Development and validation of bankruptcy prediction indicators of JSE listed companies

RJ Cassim


orcid.org/0000-0001-9597-8623

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Promoter: Prof P Lucouw

Co-promoter: Prof MJ Swanepoel

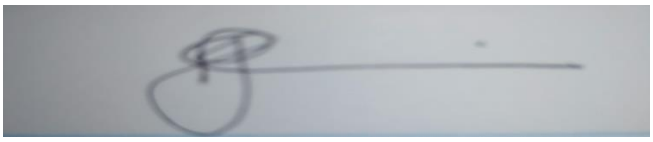
Graduation ceremony: June 2021

Student number: 22036040

DECLARATION

I, RJ Cassim, solemnly declare that this work is original and the result of my own labour. It has never, on any previous occasion, been presented in part or whole to any institution or board for the award of any degree.

I further declare that all information used and quoted has been duly acknowledged by complete reference.



19 February 2021

Signature

Date

DEDICATION

I dedicate this thesis to my father, Reginald Mecuur, who has passed away.
He has always had confidence in my abilities, even when I did not.

ACKNOWLEDGEMENTS

I want to give all the honour, glory and praise to the author and finisher of my faith, JEHOVAH JIRAH, who has provided me with the ability, strength, grace and wisdom to successfully complete this thesis. Thank you, Father, for sending me the Holy Ghost, who has been my ever-present Help in trouble and continually taught me and called me to remembrance every time I did not know which way to go (John 14:26 and Psalms 46:1). Thank you, Father, Son and Holy Spirit. I am because YOU are.

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ABSTRACT

DEVELOPMENT AND VALIDATION OF BANKRUPTCY PREDICTION INDICATORS ON JSE-LISTED COMPANIES

Keywords: Bankruptcy, business failure, company performance, financial health, failure prediction, financial ratios, financial ratio analysis, financial statements, Johannesburg Stock Exchange Financial Indicators, Johannesburg Stock Exchange

The first attempt to identify bankruptcy as a result of financial distress dates back to the 1930s, when the first researchers Fitzpatrick (1931) and Merwin (1942) attempted to identify the potential of financial ratios as indicators of financial distress. Since then many studies have been conducted attempting to predict bankruptcy or financial distress. Bankruptcy has the ability to not only effect the bankrupt business itself but also their various stakeholders within the business. The ripple effect stretches to the corporate, social and political sphere surrounding businesses. Due to the potential bankruptcy has to cause significant damage, it is highly beneficial when bankruptcy can be predicted before if happens. The studies conducted in the field of bankruptcy prediction objective is to develop a model with the ability to accurately and consistently predict bankruptcy or business failure.

A gap was indicated between theory and practice by the literature review performed in this thesis. Firstly, the majority bankruptcy prediction models are sector-based as no generic model exist. Secondly, South African bankruptcy prediction models developed are either based on American or European foundations and due to the diversity of South Africa these are not a perfect fit. The models are either too rigid or complexed or too flexible, which effect the consistency of the models. Based on these findings this thesis evaluated which financial ratios are able to adequately predict bankruptcy by applying an exploratory mixed-method research design. The financial ratios identified were nine ratios, return on equity, return on assets, total assets turnover, quick ratio, cash flow to debt, sales growth, earnings growth and interest cover. Five financial ratios were statistically significant: return on equity, return on assets, total assets turnover, cash flow to debt, and interest cover. In an attempt to meet the objectives this thesis sought to develop a generic bankruptcy prediction indicator as a tool that is easy to understand and

apply by companies within any industry (excluding financial and mining). The quantitative findings of secondary data were supported by qualitative findings from the literature review. Both these findings support the newly develop bankruptcy prediction indicators.

The newly developed bankruptcy prediction indicators were tested on Johannesburg Stock Exchange-listed companies, the study's population. The study sample was acquired through the application of the following criteria:

1) Period of study – 2002–2016: period covering three different economic periods:
   - Pre-global crisis (2002–2006);
   - During global crisis (2007–2011); and
   - Post-global crisis (2012 – 2016).
2) Excluding financial and mining industry;
3) Including companies delisted (failed) due to bankruptcy; and
4) Available financial data five years prior to delisting resulting in a study sample of 17 failed companies, 46 non-failed companies and 5 out-of-sample companies.

Three phase testing were done to validate the bankruptcy prediction indicators by comparing it to the renowned Altman's Emerging market score model employed to study as a benchmarking measure.

- Phase 1: Failed companies vs Non-failed companies – matched per sector
- Phase 2: Failed companies – Different sectors
- Phase 3: Out-of-sample data

The study concluded that the bankruptcy prediction indicators are able to successfully predict bankruptcy or financial distress prior to business failure. Furthermore, it gives a good indication of bankruptcy or financial distress compared to the EMS in a South African context. The study proves that the newly developed bankruptcy prediction indicators can be understood and applied by all stakeholder within the business arena.

Many studies attempted to predict failure, but none can ultimately be labelled as consistently accurate. The aim of this thesis was to examine whether the bankruptcy

prediction indicators approach is able to predict bankruptcy or business failure early enough so that company management can take appropriate timeous remedial action.

OPSOMMING

DIE ONTWIKKELING EN STAWING VAN AANWYSERS VAN DREIGENDE BANKROTSKAP VOORSPELLING VIR MAATSKAPPYE WAT GELYS IS OP DIE JEB

Sleutelwoorde: Bankrotskap, maatskappy ondergang, finansiële gesondheid, voorspelling van ondergang, finansiële verhoudings, finansiëleverhoudingsanalise, finansiële state, Johannesburgse Aandelebeurs Finansiële Aanwysers, Johannesburgse Effektebeurs

Die eerste poging om bankrotskap te identifiseer na aanleiding van finansiële benoudheid dateer terug tot die 1930's. Toe die eerste navorsers Fitzpatrick (1931) en Merwin (1942) gepoog het om die potensiaal van finansiële verhoudings as aanduiders van finansiële nood te identifiseer. Sedertdien is daar baie studies gedoen is om bankrotskap of sakemislukking te voorspel. Bankrotskap het die vermoë om nie net die bankrot besigheid self te beïnvloed nie, maar ook hul verskillende belanghebbendes binne die onderneming. Die rimpeleffek strek tot by die korporatiewe, sosiale en politieke sfeer rondom ondernemings. As gevolg van die potensiële bankrotskap wat groot skade aanrig, is dit baie voordelig wanneer bankrotskap vooraf voorspel kan word as dit gebeur. Die studies wat gedoen is op die gebied van bankrotsvoorspelling se doel is om 'n model te ontwikkel met die vermoë om bankrotskap of besigheidsmislukking akkuraat en konsekwent te voorspel.

'n Gaping tussen teorie en praktyk is aangedui deur die literatuuroorsig van hierdie proefskrif. Eerstens is meerderheid voorspellingsmodelle sektorgebaseer aangesien geen generiese model bestaan nie. Tweedens is Suid-Afrikaanse bankrotvoorspellingsmodelle wat ontwikkel is, gebaseer op Amerikaanse of Europese fondamente en as gevolg van die diversiteit van Suid-Afrika pas dit nie perfek nie. Die modelle is te rigied of ingewikkeld of te buigsaam om die konsekwentheid van die modelle te bewerkstellig. Op grond van hierdie bevindings het hierdie tesis geëvalueer watter finansiële verhoudings bankrotskap voldoende kan voorspel deur 'n ondersoekende navorsingsontwerp vir gemengde-metode toe te pas. Die finansiële verhoudings wat geïdentifiseer is, was nege verhoudings naamlik opbrengs op ekwiteit , opbrengs op bates , totale inkomste-omset , vinnige, kontantvloei na skuld , verkoopsgroei , verdienste

groei en rentedekking . Vyf finansiële verhoudings was statisties beduidend: opbrengs op ekwiteit , opbrengs op bates , totale omset op die bate , kontantvloei na skuld en rentedekking. In die poging om die doelwitte te bereik, het hierdie tesis probeer om 'n generiese voorspellingsaanwysers vir bankrotskap te ontwikkel as 'n instrument wat maklik is om te verstaan en toe te pas deur maatskappye binne enige bedryf (uitgesluit finansies en mynbou). Die kwantitatiewe bevindings van sekondêre data is ondersteun deur kwalitatiewe bevindings uit die literatuuroorsig. Albei hierdie bevindings ondersteun die nuut ontwikkelde aanwysers vir bankrotskap.

Die nuut ontwikkelde aanwysers vir bankrotvoorspelling is getoets op die Johannesburgse Effektebeurs wat in die studiepopulasie voorkom. Die steekproef van studie is verkry deur die toepassing van die volgende kriteria:

1) Studietydperk ─ 2002─2016: periode wat drie verskillende ekonomiese periodes dek:
    - Voor-wêreldwye krisis (2002─2006);
    - Tydens wêreldwye krisis (2007─2011); en
    - Wêreldwye krisis (2012─2016).
2) Uitsluitende finansiële en mynbedryf;
3) Ingesluit maatskappye wat weens bankrotskap gedenoteer is; en
4) Beskikbare finansiële gegewens vyf jaar voor die denotering, wat gelei het tot 'n steekproef van 17 mislukte maatskappye, 46 nie-mislukte maatskappye en 5 maatskappye wat buite die steekproef is.

Driefasetoetse is gedoen om die aanwysers van die voorspelling van bankrotskap geldig te deur dit te vergelyk met die bekende Altman's Emerging Market Score Model.

- Fase 1: Mislukte maatskappye teenoor nie-mislukte maatskappye ─ ooreenstem per sektor
- Fase 2: Mislukte ondernemings ─ verskillende sektore
- Fase 3: Data buite die monster

Die studie kom tot die gevolgtrekking dat die aanwysers van bankrotskapvoorspelling suksesvol bankrotskap of finansiële nood kan voorspel voor die mislukking van die

onderneming. Daar is gevind dat dit 'n goeie aanduiding gee van bankrotskap of finansiële nood in vergelyking met die EBW in 'n Suid-Afrikaanse konteks. Die het studie bepaal dat die nuut ontwikkelde aanwysers vir die voorspelling van bankrotskap deur alle belanghebbendes binne die bedryfsarena verstaan en toegepas kan word.

Baie studies het gepoog om mislukking te voorspel, maar nie een kan uiteindelik as konsekwent akkuraat bestempel word nie. Die doel van hierdie tesis is om te bepaal of die bankrotskapvoorspellings aanwysingsbenadering vroeg genoeg bankrotskap of mislukking van die onderneming kan voorspel sodat die bestuur van die maatskappy gepaste tydige regstellende stappe kan neem.

TABLE OF CONTENTS

DECLARATION ..... **i**

DEDICATION ..... **ii**

ACKNOWLEDGEMENTS ..... **iii**

ABSTRACT **v**

OPSOMMING ..... **viii**

TABLE OF CONTENTS ..... **xi**

LIST OF TABLES ..... **xvii**

LIST OF FIGURES ..... **xx**

LIST OF ABBREVIATIONS, SYMBOLS AND ACRONYMS ..... **xxii**

REMARKS TO THE READER ..... **xxv**

CHAPTER 1 INTRODUCTION AND BACKGROUND TO THE STUDY **1**

1.1 INTRODUCTION **1**

1.2 BACKGROUND **2**

1.3 PURPOSE OF THE STUDY **5**

1.4 PROBLEM STATEMENT **5**

1.5 OBJECTIVES OF THE STUDY **6**

1.5.1 Primary objective 6

1.5.2 Theoretical objectives 7

1.5.3 Empirical objectives 7

1.6 RESEARCH DESIGN AND METHODOLOGY **8**

1.6.1 Literature Review 9

1.6.2 Empirical study 10

1.6.3 Target population 11
1.6.4 Sampling frame, method and size 11
1.6.5 Data collection 12
1.6.6 Measuring instrument and data analysis 14
1.7 ETHICAL CONSIDERATIONS 16
1.8 CONTRIBUTIONS OF THE STUDY 17
1.9 CHAPTER CLASSIFICATION 18
1.10 SUMMARY 21
CHAPTER 2 THEORETICAL ANALYSIS OF GLOBAL CRISES, BANKRUPTCY AND PREDICTION MODELS 22
2.1 INTRODUCTION 22
2.2 GLOBAL FINANCIAL CRISES 23
2.2.1 Definition of a crisis 24
2.2.2 Different financial crises 26
2.2.3 Historical overview of global financial crises 30
2.2.4 Common triggers 40
2.2.5 Early warning signs 46
2.2.6 Global financial crises the catastrophic build-up to bankruptcy 47
2.3 BANKRUPTCY 50
2.3.1 Definitions of bankruptcy 51
2.3.2 Evolution of bankruptcy 53
2.3.3 Causes of bankruptcy 54
2.3.4 Continental perspective of bankruptcy 57
2.4 SUMMARY 64
CHAPTER 3 REVIEW BANKRUPTCY PREDICTION MODELS 66
3.1 INTRODUCTION 66

3.2 HISTORICAL OVERVIEW 67

3.3 FINANCIAL RATIOS – HISTORICAL OVERVIEW 73

3.3.1 Origin–1919 73

3.3.2 1920–1929 75

3.3.3 1930–1939 76

3.3.4 1940–1949 77

3.3.5 1958–1974 77

3.4 FINANCIAL RATIOS – TO CURRENT 78

3.5 INTERNATIONAL AND SOUTH AFRICAN MODELS 80

3.5.1 Altman's models (1968, 1977, 2006) 81

3.5.2 Hossari (2006) 85

3.5.3 South African models 87

3.5.3.1 De la Rey Study (1981) – K-model 87

3.5.3.2 Naidoo's Study (2006) – Financial Risk Analysis Model (FRAM) 89

3.5.3.3 Hlahla's Study (2010) 91

3.5.3.4 Rama's Study (2012) 91

3.5.3.5 Cassim study (2015) 91

3.6 PREVIOUS SOUTH AFRICAN STUDIES SHORTCOMINGS 92

3.7 SUMMARY 94

CHAPTER 4 RESEARCH METHODOLOGY 97

4.1 INTRODUCTION 97

4.2 RESEARCH PROCESS 98

4.2.1 Research design 99

4.3 RESEARCH METHODOLOGY 110

4.3.1 Research types 112

4.3.2 Research purpose 114

4.3.3 Population and sampling 117

4.3.4 Data collection 142
4.3.5 Data analysis 158
4.3.6 Validity and reliability 167
4.3.7 Ethical consideration 169
4.4 DEVELOPMENT OF BANKRUPTCY PREDICTION INDICATORS 170
4.5 SUMMARY 171
CHAPTER 5 DEVELOPMENT OF THE BANKRUPTCY PREDICTION INDICATORS APPROACH 173
5.1 INTRODUCTION 173
5.2 TESTING PROCEDURES 174
5.2.1 Profiles of companies used 174
5.2.2 Pairing of companies 177
5.2.3 Profile of financial statements used 178
5.2.4 Profile of financial ratios used 180
5.3 ANALYTICAL APPROACH 189
5.3.1 Emerging Market Score model (EMS) 190
5.3.2 Bankruptcy prediction indicators 191
5.3.3 Multivariate discriminant analysis (MDA) 193
5.4 DEVELOPMENT OF THE BANKRUPTCY PREDICTION INDICATORS APPROACH (BPIA) 196
5.4.1 First phase: Compile potential ratios 198
5.4.2 Second phase: Statistical testing 199
5.4.3 Third phase: Final financial ratio established 199
5.5 SUMMARY 205
CHAPTER 6 DATA ANALYSIS AND RESULTS 206
6.1 INTRODUCTION 206

6.2 MULTIVARIATE DISCRIMINANT ANALYSIS (MDA) 207

6.2.1 Means and standard deviations 209

6.2.2 Correlations 209

6.2.3 Frequency 210

6.2.4 Mann-Whitney (Statistical testing) 211

6.3 THE BANKRUPTCY PREDICTION INDICATORS APPROACH (BPIA) 214

6.3.1 First phase compiling potential ratio 214

6.3.2 Second phase statistically testing using multivariate discriminant analysis (MDA) 215

6.3.2.1 Frequency 216

6.3.2.2 Means and standard deviation 218

6.3.2.3 Correlations 220

6.3.2.4 Mann–Whitney (*U*) test (Statistical testing) 224

6.3.3 Third phase establishing the financial ratio to be included in BPIA 235

6.4 THE RESULTS OF THE BANKRUPTCY PREDICTION INDICATORS APPROACH (BPIA) 241

6.4.1 Matching failed with non-failed companies (Objective 1) 241

6.4.2 Using the EMS model to validate the results of the BPIA (Objective 3) . 273

6.4.3 Determine the reliability of the Third phase testing and results: validation of indicators with testing group (Objective 4) 328

6.5 SUMMARY 353

CHAPTER 7 CONCLUSION AND IMPLICATIONS 355

7.1 INTRODUCTION 355

7.2 OVERVIEW 356

7.3 REVISIT RESEARCH OBJECTIVE, PROBLEM STATEMENT AND CONCLUSION 358

7.4 IMPLICATIONS 369

7.5 CONTRIBUTIONS OF THE STUDY 372

7.6 LIMITATIONS 375

7.6.1 Financial Statement data 376

7.6.2 Measurement 376

7.6.3 Reason for delisting 376

7.7 FURTHER STUDIES 377

7.7.1 Non-financial indicators 377

7.7.2 Current tax 378

7.7.3 Deferred tax 378

7.8 SUMMARY 380

REFERENCE LIST 382

ANNEXURES 422

ANNEXURE A FAILED COMPANIES 423

ANNEXURE B: NON-FAILED COMPANIES 429

ANNEXURE C ANNUAL BANKRUPTCIES 458

ANNEXURE D TOTAL DELISTED (FAILED) COMPANIES PERIOD 460

ANNEXURE E PUBLISHED ARTICLE 473

ANNEXURE F DECLARATION OF LANGUAGE EDITING 475

LIST OF TABLES

Table 2.1: Third-generation model market distortions 44
Table 2.2: Vulnerability indicators within different sectors 47
Table 2.3: Causes of bankruptcy 56
Table 2.4: Bankruptcy chapters 60
Table 3.1: Bankruptcy prediction models 70
Table 3.2: Altman's z-score model 82
Table 3.3: Altman's Zeta model 83
Table 3.4: Altman's EMS model 84
Table 3.5: De la Rey's K model 88
Table 4.1: Dimensions of research design 105
Table 4.2: Population of JSE-listed industries per sector 118
Table 4.3: Probability sampling categories 123
Table 4.4: Non-probability sampling 125
Table 4.5: Elimination criteria – Failed companies 129
Table 4.6: Stages of elimination: Period and industry in sampling process 129
Table 4.7: Number of companies failed due to bankruptcy (2002–2016) 131
Table 4.8: Sample JSE-failed companies due to bankruptcy (2002–2016) 133
Table 4.9: Stages of the elimination process 135
Table 4.10: Out-of-sample companies 136
Table 4.11: Elimination criteria – Non failed companies 137
Table 4.12: Stages of elimination of non-failed group of companies 138
Table 4.13: Non-failed companies-Similar sector 139
Table 4.14: Non-failed companies matched failed companies 141
Table 4.15: Ten commandments of data collection 143
Table 4.16: Grouping of Altman (2006) 148
Table 4.17: Grouping of Hossari (2006) 149
Table 4.18: Grouping of Fülbier (2008) 152
Table 4.19: Grouping of De la Rey (1981) 153
Table 4.20: Grouping of Naidoo (2006) 154
Table 4.21: Grouping of Cassim (2015) 155
Table 4.22: Ratio pool of ratios is selected from 157
Table 4.23: Central philosophy of the prospect theory 159
Table 4.24: Pool of ratios 162

Table 4.25: Levels of testing 166
Table 5.1: Frequent sector companies 176
Table 5 2: Summary of the elimination process 178
Table 5.3: Ratios pool of ratios created from 181
Table 5.4: Pool of ratios 184
Table 5.5: Pillar and measuring 187
Table 5.6: Sample description 188
Table 5.7: EMS ratios 191
Table 5.8: Progression of the Z-score model 195
Table 5.9: Bankruptcy prediction indicators 200
Table 5.10: Level 1 selected ratio appearing within nominated studies 202
Table 5.11: Level 2 selected ratio appearing within nominated studies 204
Table 6.1: Frequency of (n=61) participants 217
Table 6.2: Means and standard deviations 218
Table 6.3: Non-failed companies: Descriptive statistics and correlations (1996–2016) 220
Table 6.5: Kolmogorov-Smirnov tests of normality (1996–2016) 225
Table 6.6: Independent samples Mann-Whitney (*U*) test results (1996–2016) 226
Table 6.7: Mean ranks of failed and non-failed companies 229
Table 6.8: Independent samples Mann-Whitney (*U*) test results 230
Table 6.9: Mean ranks of failed and non-failed companies 233
Table 6.10: Reason for the failed group of companies' lower means 235
Table 6.11: Ranking of selected ratios 237
Table 6.12: Levels of testing 238
Table 6.13: Ratio guidelines (benchmarks) 240
Table 6.14: NF companies matched failed companies 243
Table 6.15: Homechoice (HCH) vs. Pick 'n Pay (PIK) 244
Table 6.16: Ninian & Lester holdings (NIN) vs. Woolworth's holdings (WHL) 248
Table 6.17: Metje & Ziegler Ltd vs Barloworld Ltd 252
Table 6.18: Fashion Africa Ltd vs Shoprite Holding Ltd 257
Table 6.19: Siltek Ltd vs Netcare Ltd 261
Table 6.20: Universal Growth Holdings Ltd vs Clicks Group Ltd 265
Table 6.21: Bioscience Brands Ltd vs Tiger Brands Ltd 269
Table 6.22: EMS cut-off points linked to the bond rating 274

Table 6.23: Companies tested in the second phase of testing 275
Table 6.24: Softline (SFT) 277
Table 6.25: Softline (SFT) 278
Table 6.26: The Lazer Group Ltd (LSR) 282
Table 6.27: The Lazer Group Ltd (LSR) 284
Table 6.28: Net 1 Applied Technology Holdings Ltd (APL) 287
Table 6.29: Net 1 Applied Technology Holdings Ltd (APL) 288
Table 6.30: Global Technology Ltd (GLT) 292
Table 6.31: Global Technology Ltd (GLT) 294
Table 6.32: Frontrange Limited (FRO) 297
Table 6.33: Frontrange Limited (FRO) 299
Table 6.34 Beget Holding Limited (BEE) 303
Table 6.35: Beget Holding Ltd 305
Table 6.36: Africa Cellular Towers Ltd (ATR) 308
Table 6.37: Africa Cellular Towers (ATR) 309
Table 6.38: Erbacon Investments Holdings (ERB) 313
Table 6.39: Erbacon Investment Holdings (ERB) 314
Table 6.40: Sanayati Holding Ltd (SAN) 318
Table 6.41: Sanyati Holding Ltd (SAN) 319
Table 6.42: Sea Kay Holdings Ltd (SKY) 323
Table 6.43: Sea Kay Holdings Ltd (SKY) 325
Table 6.44: Howden Africa Holding Ltd (HWN) 329
Table 6.45: Howden Africa Holding Ltd (HWN) 331
Table 6.46: Edgars Consolidated Stores Ltd (ECO) 334
Table 6.47: Edgars Consolidated Stores Ltd (ECO) 335
Table 6.48: Basil Read Holding Ltd (BSR) 339
Table 6.49: Basil Read Holding Ltd (BSR) 340
Table 6.50: Steinhoff International Holding (SNH) 343
Table 6.51: Steinhoff International Holding (SNH) 345
Table 6.52: Group Five Holding Ltd (GHO) 348
Table 6.53: Group Five Holding Ltd (GHO) 349
Table 7.1: Revisiting the Problem statement, primary, theoretical and empirical objectives 359

LIST OF FIGURES

Figure 2.1: Overview of Chapter 2 23
Figure 2.2: Occurences ultimate leading to bankruptcy 29
Figure 2.3: Triggers at business level 42
Figure 2.4: Triggers at an economy level 46
Figure 3.1: Overview of Chapter 3 67
Figure 4.1: Overview of Chapter 4 97
Figure 4.2: Research foundation, process and paradigms 103
Figure 4.3: Data collected 107
Figure 4.4: Research Methodology 116
Figure 4.5: Demonstration of JSE hierarchy 121
Figure 4.6: Population and sample selection 127
Figure 5.1: Overview of Chapter 5 174
Figure 6.1: Overview of Chapter 6 207
Figure 6.2: Statistical testing route 213
Figure 6.3: Statistical testing route 216
Figure 6.4: Comparing ratios: Homechoice (HCH) vs. Pick ‘n Pay (PIK) 247
Figure 6.5: Comparing ratios: Ninian & Lester holdings (NIN) vs. Woolworth’s holdings (WHL) 251
Figure 6.6: Comparing ratios: Metje & Ziegler Ltd vs Barloworld Ltd 256
Figure 6.7: Comparing ratios: Fashion Africa Ltd vs Shoprite Holding Ltd 260
Figure 6.8: Comparing ratios: Siltek Ltd vs Netcare Ltd 264
Figure 6.9: Comparing ratios: Universal Growth Holdings Ltd vs Clicks Group Ltd 268
Figure 6.10: Comparing ratios: Bioscience Brands Ltd vs Tiger Brands Ltd 272
Figure 6.11: EMS: Softline (SFT) 278
Figure 6.12: Level test: Softline (SFT) 281
Figure 6.13: EMS: The Lazer Group Ltd (LSR) 283
Figure 6.14: Level test: The Lazer Group Ltd (LSR) 286
Figure 6.15: EMS: Net 1 Applied Technology Holdings Ltd (APL) 288
Figure 6.16: Level test: Net 1 Applied Technology Holdings Ltd (APL) 291
Figure 6.17: EMS: Global Technology Ltd (GLT) 293
Figure 6.18: Level test: Global Technology (GLT) 296
Figure 6.19: EMS: Frontrange Limited (FRO) 298

Figure 6.20: Level test: Frontrange Limited (FRO) 301
Figure 6.21: EMS: Beget Holding Limited (BEE) 304
Figure 6.22: Level test: Beget Holding Ltd (BEE) 307
Figure 6.23: EMS: Africa Cellular Towers Ltd (ATR) 309
Figure 6.24: Level test: Africa Cellular Towers Ltd (ATR) 312
Figure 6.25: EMS: Erbacon Investments Holdings (ERB) 314
Figure 6.26: Level test: Erbacon Investments Holdings (ERB) 317
Figure 6.27: EMS: Sanayati Holding Ltd (SAN) 319
Figure 6.28: Level test: Sanayati Holding Ltd (SAN) 322
Figure 6.29: EMS: Sea Kay Holdings Ltd (SKY) 324
Figure 6.30: Level test: Sea Kay Holdings Ltd (SKY) 327
Figure 6.31: EMS: Howden Africa Holding Ltd (HWN) 330
Figure 6.32: Level test: Howden Africa Holding Ltd (HWN) 333
Figure 6.33: EMS: Edgars Consolidated Stores Ltd (ECO) 335
Figure 6.34: Level test: Edgars Consolidated Stores Ltd (ECO) 338
Figure 6.35: EMS: Basil Read Holding Ltd (BSR) 340
Figure 6.36: Level test: Basil Read Holding Ltd (BSR) 343
Figure 6.37: EMS: Steinhoff International Holding (SNH) 344
Figure 6.38: Level test: Steinhoff International Holding (SNH) 347
Figure 6.39: EMS: Group Five Holding Ltd (GHO) 349
Figure 6.40: Level test: Group Five Holding Ltd (GHO) 352
Figure 7.1: Overview of Chapter 7 356

LIST OF ABBREVIATIONS, SYMBOLS AND ACRONYMS

$	Dollar
€	Euro
n	Number
r	Effective size
F	Failed
R	Rands
APL	Net 1 Applied Technology Holdings Ltd
ATR	Africa Cellular Towers Ltd
AUD	Australian dollar
BAW	Barloworld
BEE	Beget Holdings Ltd
BFA	Bureau for Financial Analysis
BIO	Bioscience Brands Ltd
BPIA	Bankruptcy Prediction Indicators Approach
BRICS	Brazil, Russia, India, China and South Africa
BSR	Basil Read
BV Equity/TE	Book value of equity to Total Equity (EMS model)
CACL	Current Asset to Current Liabilities
CFTD	Cash Flow to Total Debt
CFA	Communaute Financiere Africaine
CLS	Clicks
DRC	Democratic Republic of Congo
EAC	Eastern African Countries
Earnings (CY-PY)/ PY	Earnings growth
EBIAT	Earnings before interest after tax
EBIATTA	Return on Assets
EBIT	Earnings before interest and tax
EBIT/TA	Earnings before interest and tax: Total Assets (EMS model)
EBITI	Interest cover
EBITS	Net Operating Profit Margin
EBITTA	Operating Return on Assets
ECO	Edcon Holding
EMS	Emerging Market Score
ERB	Erbacon Investment Holdings Ltd
FIFO	First-in, First-out
FRAM	Financial Risk Analysis model
FRO	Frontrange Ltd
FSD	Financial Statement Data
FSH	Fashion Africa Ltd

GDP	Gross Domestic Product
GIGO	Garbage-in, Garbage-out
GLT	Global Technology Holdings Ltd
GRF	Group 5 Ltd
HC	Network Health Holdings
HCH	Homechoice Holdings Ltd
HWN	Howden-Africa Holding
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
IMF	Internal Monetary Fund
ITO	Inventory turnover
JSE	Johannesburg Stock Exchange
LIFO	Last-in, Last-out
LSR	The Laser Group Ltd
LTD	Limited
MDA	Multiple Discriminant Analysis
MVE/TL	Market value of equity to Total Liabilities (EMS model)
MZG	Metje & Ziegler Ltd
NF	Non - failed
NIS	Net Profit Margin
NITE	Return on Equity
NIN	Ninian and Lester Holdings Ltd
NPM	Net profit margin
OPM	Operating profit margin
P/E	Price earning
PIK	Pick ‘n Pay Stores
QACL	(Current Asset - Inventory) to Current Liabilities
RE/TA	Retained Earnings to Total Assets (EMS model)
RETA	Retained Earnings to Total Assets
REG	Real Earning Growth
RSG	Real State Growth
S & P	Standard & Poor's
SINV	Inventory Turnover
S/TA	Total Asset Turnover (EMS model)
S/TA	Total Asset Turnover
Sales (CY-PY)/ PY	Sales growth
SA	South Africa
SARS	South African Revenue Services
SAN	Sanyati Holdings Ltd
SADC	South African Development communities

SD	Standard Deviation
SFT	Softline Ltd
SHF	Steinhoff International Holding Ltd
SHP	Shoprite Holding Ltd
SKY	Sea Kay Holdings Ltd
SOCE	Statement of Changes in Equity
SOCF	Statement of Cash Flow
SOCI	Statement of Comprehensive Income
SOFP	Statement of Financial Position
SOH	State of health
SPSS	Statistical Package for the Social Sciences
STK	Siltek Holdings Ltd
TATO	Total asset turnover
TBS	Tiger Brands
TETA	Shareholders' Equity
TETL	Total Equity to Total Liabilities
TIE	Times interest earned
TLTA	Debt
TLTE	Debt to Equity
UK	United Kingdom
UN	United Nations
UNG	Universal Growth Holdings Ltd
USA	United States of America
USD	U.S. Dollar
vs	Versus
WC/TA	Working Captial to Total Assets (EMS model)
WCTA	Working Captial to Total Assets
WHL	Woolworths Holdings
Y1	Year five (five years prior to failure)
Y2	Year four (four years prior to failure)
Y3	Year three (three years prior to failure)
Y4	Year two (two years prior to failure)
Y5	Year one (one years prior to failure)
ZAR	Zuid-Afrikaanse Rand (South African Rand)

REMARKS TO THE READER

The literature review in this thesis including seminal research is based on a plethora of sources ranging from 1925 to 2020. The research is spread over the mentioned period to incorporate recently performed research and the improvements in the field over numerous years and highlights the importance of the information.

The format and referencing of this thesis are presented in accordance with the policies of the North-West University (Vanderbijlpark Campus). The **Harvard Style** referencing method was applied in this study in accordance with the latest referencing guidelines of the North-West University (2020 version). According to the North-West University reference guide, no page numbers are shown in cases of internet sources. The first indicated surname is cited, followed by the term et al. in cases where the argument of three or more authors is quoted within a text, for example: 'According to Correia et al. (2015:5.24) …'. The North-West University does not require all surnames of three or more authors to be indicated. For more information on referencing techniques applied in this study, please visit the North-West University's referencing link at http://www.nwu.ac.za/sites/www.nwu.ac.za/files/files/library/documents/verwysings .pdf

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Tables and figures are placed on pages throughout the thesis and annexures are at the end of the thesis. The submitted article is submitted in accordance with the journal's author guidelines.

- Annexures ─ Confirmation of journal article of submission – Annexure E
- Language editing certificate – Annexure F

The following article was published in an IBSS indexed and internationally peer-reviewed academic journal:

Cassim, R.J. & Swanepoel, M.J. 2020. The bankruptcy prediction approach: An empirical study of comparison between emerging market score model and bankruptcy prediction

indicators approach in the Johannesburg Stock Exchange**.** Journal of Economic and Financial Sciences**, Published**. https://jefjournal.org.za/index.php/jef/article/view/539

The submitted article was written by the PhD candidate as first author (Cassim, R.J.) and contributed more than **50%** of the article in accordance with the North-West University guidelines.

The co-promoter of this PhD thesis and second author Swanepoel, M.J. was responsible for the review of the article prior to submission.

The period of study is 2002–2016 and the data collected over period the 1996─2016 to be consistent with literature by collecting data five years prior to business failure. The period 2002 – 2016 was identified to highlight the pre global crisis period, global crisis perios and the post global crisis period.

Statistical evidence included in Chapter 5 and Chapter 6 was reported in accordance with prescriptions by Pallant (2016). This required the statistical results to be rounded to two decimals.

The study adopted the term delisted as failed and listed as non-failed and was also used interchangeably

This thesis is a continuation of the masters degree obtain by RJ Cassim in 2015.

The EMS model is well developed and widely acceptance in the discipline is employed within the study as a benchmarking measure. The models ratios will have / (indication of how ratio is presented) for differenciation and easy reading purposes (WC/TA, RE/TA, EBIT/TA and BE/TL)

CHAPTER 1
INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

The phrase “too big to fail” was popularized by U.S. congressman Steward B McKinney at a 1984 congressional hearing (Dash, 2009). The 2008 global crises rebutted this popular metaphor. Le Roux (2014:1) explains that financial aid had to be provided to global industry giants when those that were “too big to fail”, failed. Hossari (2006:10) echo that failing companies have serious repercussions not only for the failing company, the ripple effect give rise to social problems, unemployment and the economy at large. Chen and Xu (2018:9) explain that academics, market participants and the government welcome an effective bankruptcy prediction model. Such a model is crucial in forecasting business failure timeously as it can avoid or at least reduce the impact of business failure.

Various financial models were designed and created over the years in an attempt to predict financial distress and failure (Fitzpatrick, 1931; Winakor & Smith, 1935; Merwin, 1942; Ngwenya, 2018). The current prediction models utilized statistical processes which are complexed (univariate, multi discriminant analysis (MDA), logit, recursive partitioning (RPA), survival analysis, neutral network analysis (NNA), human information processing (HIP); rough sets; risk index model; case-based forecasting (Laitinen & Kankaanpaa, 1999:67-68; Rama, 2012:13; Tuvadaratragool, 2013:49). Other researchers (Altman 1968 and 2000; Springate, 1978; Ohlson, 1980; Kleinert, 2014; Yelkenci, 2015; Gerritsen, 2015; Xu, 2018) used simpler measures like financial accounting ratios, interpreting what it measures and analysing its movements (Laurille, 2020:6). Regardless of the methods used, business failure prediction has become an important subject matter for scholarly debate and research (Ngwenya, 2018:656). The aim of this study is to contribute towards literature by developing a generic bankruptcy prediction model that enable prediction ability using financial ratio which is easy to comprehend and apply.

The chapter is divided into 10 sections as depicted in Figure 1.1. Section 1.1 outlines the introduction of the chapter including the structure, which is followed by Section 1.2 that outlines the background to the research. Section 1.3, the purpose for the study is given, and the problem statement emanating from the gaps identified in literature is described in Section 1.4. The study's primary, theoretical and empirical objectives are defined in

Section 1.5. Section 1.6 discusses the studies research design and methodology including literature review, empirical study, target population, sample frame and sampling method is described followed by the data collected, measuring instrument and how data will be analysed. The ethical consideration is covered in Section 1.7 followed by contribution of the study in Section 1.8 and an overview of the chapter's classification from chapter 1 to 7 is given Section 1.9 and the chapter's summary is drawn in Section 1.10.

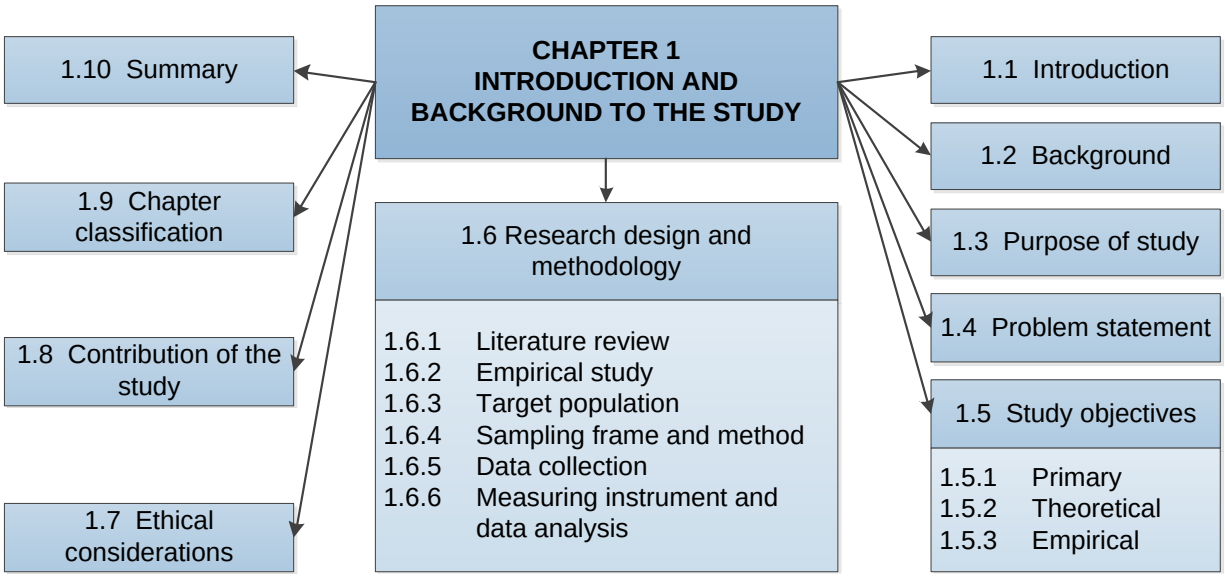


Figure 1.1: Overview of Chapter 1

1.2 BACKGROUND

Companies use financial ratio analysis as a management tool to provide information relating to the liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow of the business. If the interpretation of these financial ratios indicates an unsatisfactory situation it could be an indication of the possibility of bankruptcy (Darmawan & Supriyanto, 2018:112).

Numerous studies applying financial ratio analysis were performed since the 1930s to date either individually or within various bankruptcy prediction models with the aim to develop efficient bankruptcy prediction or financial distress detection model. Sabela *et al.,* (2018:2) explains various studies opine that Beaver (1966) and Altman (1968) models

have been the most influential in terms of predicting bankruptcy and financial distress applying financial ratios.

The ratios are still being used despite extensive changes in technology, the economic market and the environment globally (Cassim, 2015:3). Mossman, Bell, Swart and Turtle (1998:37) assert that despite this, no presiding ratio model exists. Eidleman (1995:52-53) supported by Rama (2012:30) states that Altman's model has been identified as one of the most reliable business failure prediction models universally. Altman developed a multiple discriminant analysis model (MDA) with the use of a statistical technique in 1968 and this analysis has been in use in many disciplines like behavioural and biological sciences (Altman, 1968:594). This analysis was called the z-score model and the core industries were in manufacturing. Later in 1977, Altman assisted by Narayanan revised the z-score model, the financial ratios applied remained the same however, the type of companies being evaluated changed. The revised model was based on private and non-manufacturing industries and was named the Zeta model (Altman, 1993:203-204).

Altman and Hotchkiss modified the Zeta model in 2006 by changing the variables from five to four, the weighting and the cut-off zones. Three zone of discrimination, the safe zone safe zone (score>2.60), a grey zone (1.10>score>2.60), and a distress zone (score<1.10). Safe zone indicated company is financially health and almost certain to succeed. Second zone of discrimination being grey zone specifies the area of uncertainty, when company falls in the scope of uncertainty it could also be the cause of faulty interpretations. The last zone is the distress zone, this zone signifies that the company is almost certain to fail or has failed (Paolone & Rangone, 2015:491). Altman and Hotchkiss (2006:239-280) explain that the aim was to improve accuracy and called it the Emerging Market Score model (EMS). The results of the EMS model when widely applied to companies in emerging markets were impressive in predicting bankruptcy.

Critiques however, proposes that stakeholders can make more effective decision by assessing both financial indicators and non-financial indicators (Roxana-loan & Petry, 2017:424). Marx (2019:1) agrees with Topazio (2018:1) that integrated reporting addresses non-financial indicators. Rathore and Elwaku (2020:9) concludes that non-financial indicators are fuzzy. Jakubczyk and Kamiński (2017:301) describes a fuzzy approach, allows fuzziness into decision making. The fuzziness being the non-financial

indicators which cannot be tested and Mendel (2017:259) refers to it as “footprint of uncertainty”. Purves, Niblock and Sloan (2015:3) concurring with Tuvadaratragool (2013:195) that by incorporating non-financial indicators into a bankruptcy prediction model, the results are not significantly more accurate than when a bankruptcy prediction model only rely on financial indicators. Therefore, by considering the aforemention this study will not include any non-financial indicators in the development and validation of bankruptcy prediction indicators on JSE Listed companies.

This study aims to develop and validate generic bankruptcy prediction indicators within a South African context by considering a range of financial ratios collectively, in order to indicate early warning signs of financial distress or failure. This aim is not to define bankruptcy, financial distress and business failure as little consensus have been reached. Different studies developed their own perfect fit within their studies. It is therefore important that the key term that is used in this study is identified. This study incorporates adopted the term financial distress as defined in section 128 (1) of the Companies Act 71 of 2008:

> “(i) It appears to be reasonably unlikely that the company will be able to pay all of its debts as they fall due and payable within the immediately ensuing six months;
>
> or
>
> (ii) it appears to be reasonably likely that the company will become insolvent within the immediately ensuing six months.”

The research employs Altman’s EMS (2006) comparing it to the developed generic bankruptcy prediction indicators. It should be noted that the comparison is not only done between companies within the same sectors but also companies within different sectors. Disagreeing with Salmi, Dahlstedt, Luoma and Laakkonen (1986:333) that concurs with Beaver (1966:74) when companies in different industries are compared difference exist but the difference are trivial when companies compared within the same industry. Notion is supported by Palat (2006:3) adds same industry comparisons prevent incorrect results.

1.3 PURPOSE OF THE STUDY

The endeavour of the study is to develop and validate generic bankruptcy prediction indictor approach that is simple and easy to understand, use and apply within a South African context. Considering a range of financial ratios collectively and using a selected classic statistical approach in order to indicate early warning signs of bankruptcy or financial distress and whether remedial action needs to be taken by the company and their stakeholders. The research aim is to provide indicators that will detect or predict financial distress not to define what financial distress comprise of. The research employs Altman's EMS (2006) as a benchmarking measure comparing it to the developed generic bankruptcy prediction indicators. It should be noted that the comparison is not only done between companies within the same sectors, only but companies within different sectors as well.

1.4 PROBLEM STATEMENT

Extensive research on bankruptcy prediction has been conducted since the 1930's. Financial ratios have been used over many years to discovery the best predictors of business failure. The EMS model a financial ratio-based bankruptcy prediction model has produced remarkable results in predicting bankruptcy within emerging markets (Altman & Hotchkiss, 2006:280). Correia, Flynn, Uliana and Wormald (2015:5.24) mention the EMS model has an accuracy level that is greater in superiority than Altman's previous models in predicting financial distress. Within a South African context also being an emerging market and with the great success rate of the EMS model Cassim (2015:207) found that the EMS model was unsuccessful. Current gaps in literature and practice, with regards to bankruptcy prediction modelling is the subjectivity of prior studies. This study will not be concentrating on the subjectivity but rather the objectivity, adapting what we have to be applied within a South African context. The first gap is that the majority the bankruptcy prediction models employs industry based financial ratio analysis. Secondly the majority of the studies conducted in South Africa (Daya, 1977; Clarke, Hamman and Smit, 1991; Hlahla, 2010; Maeteltsa & Kruger, 2011; Rama, 2012; Sabela, brummer, Hall and Wolmarans, 2018) is based on the American bankruptcy prediction models of Beaver (1966) and Altman (1968). Thirdly the models developed within a South African context are either too rigid or complex, vast number of ratios and complicated computations (De

la Rey, 1981; Van der Colff & Vermaak, 2015) or too flexible, researchers have autonomy effecting the model's uniformity (Naidoo, 2006). Cassim (2015) study investigated the successful prediction of business failure of JSE listed companies which highlighted the preceding gaps in literature and laid the foundation of the current study.

A need exists in South Africa for a generic easy to use, understand and apply bankruptcy prediction approach. Indicators with the ability to detect early warning signs of bankruptcy or financial distress of JSE listed companies. These indicators can be integrated in to monthly or quarterly financial reporting and may have an impact on the decision making of management. This study will design a generic bankruptcy prediction indictors approach (BPIA) that is able to examine whether financial indicators (ratios) is able to adequately predict bankruptcy or financial distress for South African companies in different industries and different economic conditions.

This has let to the formulation of the following research question. Can a generic easy to use, apply and understand bankruptcy prediction approach be developed within a South African context?

In an attempt to answer the research question. This BPIA consists of integrating a fusion of financial ratios and comparing the results to the EMS model, a sophisticated prediction model with the aim of authenticating the efficiency of the bankruptcy prediction indicators approach (BPIA). The development of the BPIA approach will be discussed later in the study.

1.5 OBJECTIVES OF THE STUDY

In order to address the primary objective, the theoretical and empirical objectives were formulated for the study through extensive literature review and document analysis.

1.5.1 Primary objective

The primary objective of the study is to develop and validate bankruptcy prediction indicators to detect or predict warning signs of bankruptcy or financial distress. These bankruptcy prediction indicators will be tested over different economic conditions being pre- (2002–2006), during (2007–2011) and post (2012–2016)-global financial crisis,

testing JSE companies within similar and different sectors by applying a combination of a cross-sectional and longitudinal analysis approach.

1.5.2 Theoretical objectives

In achieving the primary objective, the following supporting theoretical objectives are formulated for the study based on intensive literature review study:

i. To analyse the history, different crises included the global crises and the eras of a global crisis as a contributing factor of bankruptcy (Section 2.2.1-Section 2.2.3);

ii. To analyse the common triggers, warning signs and the build-up to bankruptcy (Section 2.2.4-Section 2.2.6);

iii. To examine the generic terms and evolution of bankruptcy (Section 2.3.1-Section 2.3.2);

iv. To Identify possible causes of bankruptcy (Section 2.3.3);

v. To assess the perspectives of bankruptcy within the United States of America (USA), United Kingdom (UK) and South Africa (SA) legal provision (Section 2.3.4);

vi. To explore the origins of bankruptcy predictions (Section 3.2);

vii. To analysis of financial ratios as fundamental factors to predict bankruptcy (Section 3.3 -Section 3.4);

viii. To examine financial ratios as part of international and South African bankruptcy prediction modelling (Section 3.5) and

ix. Previous South African studies' shortcomings (Section 3.6).

1.5.3 Empirical objectives

The theoretical objectives gave the background for the development of the following empirical objectives. Findings will also be addressed through the developing and validating of bankruptcy prediction indicators on JSE listed companies. These empirical objectives will be achieved using document analysis:

i. Examining the development and validation of generic BPIA approach of JSE listed companies explicitly indicating the research design and methodology applied (Section 5.4)

ii. Determine how BPIA performs during different economic conditions namely; pre-crisis (2002–2006), during crisis (2007–2011) and post crisis (2012–2016). Through matching failed with non-failed JSE companies to observe possible future failures (Section 6.3.1).

iii. Evaluate whether the developed BPIA is a reliable tool for predicting bankruptcy or financial distress. Achieved through empirically testing the failed JSE companies comparing BPIA approach results with EMS model results (Section 6.3.2).

iv. Examine whether the developed bankruptcy prediction indicators are a reliable tool for predicting bankruptcy outside of the sample period to validate it's use on JSE companies. Out-of-sample data empirically test and results to be compared to the EMS model (Section 6.3.3).

1.6 RESEARCH DESIGN AND METHODOLOGY

Babbie (2013:283) refers to research design as an overall plan to link the theoretical research to the relevant empirical research. This is done by expressing the data required, methods used to collect and analyse the data. This process includes the population, sampling frame, sampling method, sample size, data collection method and the processing and analysis of data. De Vos, Strydom, Foche & Delport (2015:73) defines research design as a set of logical arrangements enabling researches to select one to meet their specific research goals. Trochim & Donnelly (2010:8) supported by Robbetze (2016:79-80) posits research design needs to ensure the research problem is addresses effectively in the overall strategy selected by the researcher. The study made use of combined cross-sectional and longitudinal design to achieve the objectives set out in Section 1.5. In order to achieve these objectives inferences will be drawn from different JSE listed companies within different industries over extended economic conditions through analysing the data.

Babbie (2013:3) refers to methodology and epistemology as sciences, the methodology being “the science of finding out” and epistemology “the science of knowing”. Bless, Higson-Smith and Sithole (2013:1) define epistemology as how to acquire the knowledge. Brynard, Hanekom and Brynard (2014:38) refer to methodology as a route researcher take to implement the research project and can be perceived as either quantitative or qualitative, the academic arena or discipline in which research is conducted is often connected with the research methodologies.

Palat (2006:3-4) posits a minority of non-sectors-based bankruptcy prediction models exist. Literature suggests there is neither any documentation of an easy to understand and apply bankruptcy prediction model within a South African context. Therefore, an exploratory study needs to be applied, accordig to Kumar (2019:13) in areas where little is known exploratory reaserch is the most suitable reseach type. De Vos *et al*, (2015:48) explains deductive reasoning characteristics are present when research moves from general to specific, meaning from a general theoretical understanding to specific testing. Kivunja and Kuyini (2017:31) believe the positivism paradigms theory can be utilised to follow a method of investigation, predict and control results. According to Rehman and Alharthi (2016:56) to gain understand of social phenomena in their context interpretivism is required, Maree (2019:22) explains fact are not able to speak for themselves interpretation is needed. Within this study from a theoretical understanding of bankruptcy models, an expectation is created as need has been identified followed by the development and testing thereof (positivism), understanding is gained through interpretation of data (interpretivism) to determine the efficiency of the newly developed model. The positivism an interpretivism paradigms is selected, positivism paradigm is able to uncover the phenomena whilst the interpretivism paradigm purpose is to understand a phenomenon rather to uncover it (Ben-Haim, 2018:904; Swanepoel, 2018:98).

1.6.1 Literature Review

The background of the study is established through the literature review conducted on seminal studies since 1925 to date. Bless *et al*. (2013:20-21) refer to the literature review as the drive to learn first-hand what has already been studied within the specific field of study and knowledge is attained of the theory. According to Kumar (2019:86), a literature

review is embarked on in order to familiarise readers with accessible knowledge within the field of study. Secondary data sources based on both national and international journal articles, newspaper articles, relevant textbooks (electronic and published), published theses and dissertations and internet sites.

The purpose of the literature study to gain an understanding of the theory of the diverse bankruptcy prediction models of prior research and the problems associated with the different models. Exploring the strength and weaknesses of these bankruptcy prediction models could add value in supporting the empirical research for the period 2002 to 2016.

1.6.2 Empirical study

When a qualitative and a quantitative approach is used concurrently it is a mixed-method approach exist (Schwester, 2015:165). An exploratory mixed-method approach was applied in gathering, analysing and interpreting empirical data by means of document analysis and secondary data. Maree (2019:329) posit exploratory mixed-method approach firstly explores qualitative data subsequently to measuring it quantitatively. Robbetze (2016:81) explains secondary data is data from existing sources. Harmse (2017:124) posits a document analysis is the analysis of qualitative data using a quantitative approach. The researcher is encouraged to collect background information to better understand the phenomenon under investigation. Swart (2018:199) utilised secondary data as qualitative and quantitative methods and document analysis to analyse and interpret the literature. This method it provides the information to generate data for the research study and enables the researcher to perform a systematic evaluation of the data (Saunders, 2016:55).

For the study, a document analysis involving a process of analysing the content of documents to collect data was carried out, qualitative and quantitative secondary sources are to be used. The secondary data collect by means of analysing published annual financial statements forming part of the qualitative data followed by quantitative data being the financial ratios, collected and statistical analysed (Maree, 2019:329). Hammarberg, Kirkman & de Lacey (2016:499-500) qualitative analysis is applied to gain knowledge within a field of study and is able to reveal potential problems.

Therefore, the exploratory mixed-method design was applied. Firstly, qualitative data were collected and used as a guide that subsequently developed the measuring instrument from the quantitative data collected, measuring instruments being the newly developed BPIA (De Vos *et al*., 2015:441; Maree, 2019;329-330).

This is achieved by the application of the combined cross-sectional and longitudinal study of financial ratios readily accessible from the reputable INET McGregor BFA database over period 1996–2016 for quantitative analysis. The numerical collected data over periods were statistically analysed to identify whether a relationship exists between variables (Robbetze, 2016:84). The bankruptcy prediction indicators are used as a validation tool to identify timely financial distress detection in accordance with the primary objective. The conclusion drawn from the result could influence the financial remedial action taken by the company's management. The empirical portion of this study comprised the following methodology dimensions being the population, sampling, data collection and analysis.

1.6.3 Target population

The target population relevant to this study is defined as follows:

- All JSE listed companies
- Excluding: financial industry and mining sectors
- Period: 2002 - 2016

A more detailed discussion of the data collected, and the criteria are presented in Chapter 3.

1.6.4 Sampling frame, method and size

Frame: The sampling frame also known as a working population according to Zikmund, Babin, Carr and Griffin (2013:387) consist of JSE listed companies (2002 – 2016). The financial statements data over this period will be collected up to five years prior to failure, a range of 10 years (1996 - 2016) was used for the study. The sample selection is limited to the sampling frame and the data obtained from secondary sources.

Method: The study applied the non-probability quota, convenient sampling. Smith and Dawber (2019:2) posits non-probability sampling are applied when non-random methods are used to draw a sample, researcher applies own judgement.

According to De Vos *et al.* (2015:232) when certain characteristics of the population are chosen, quota sampling has been applied. This sample was selected based on the criteria as indicated Table 3.5. Schwester (2015:181) explains convenient sampling is when data "happens to cross the researcher's path".

The convenient quota sampling technique is relevant as the sample was selected from the sampling frame meeting certain selection criteria and being conveniently accessible. For this study quote sampling was used, based on the criteria as indicated in table 3.9. A number of 28 failed companies were identified of which 17 met the set criteria.

In the first phase of testing seven (7) of these failed companies were applied. The remaining 10 failed companies were selected based on already assessable companies (convenient sampling) and were applied in second phase of testing. For the non-failed company's, a selection criterion was also applied as indicated in (Table 3.12). A total of 46 non-failed companies were conveniently selected based on the availability of non-failed companies. These companies fall within eight (8) out of ten (10) JSE industries as well as an out-of-sample data group (five failed companies after 2016).

Size: The sample consist of JSE companies. From a total of 68 companies drawn 46 were non-failed companies, 17 companies failed due to bankruptcy and 5 out-of-sample data companies within different sectors. The sample size is in the range of numerous prior studies using financial ratios to predict corporate failure, such as, Altman (1968) used 33 companies, Edmister (1972) 42 companies, Bei and Liu (2005) 31 companies, in 2006 Ugurlu and Aksoy used 27 companies and He and Kamath only 20 companies (Tuvadaratragool, 2013:49). This is justification that the sample size applied within this study is sufficient and therefore this study is content with utilising 68 companies in total.

1.6.5 Data collection

The study intends to collect data regarding bankruptcy prediction ratio based modelling and financial ratios based on theoretical popularity and bankruptcy prediction ability

assessed in previous studies (Watts & Zimmerman, 1990; Peasnell, Pope & Young, 2000; Paolane & Pozzoli, 2017). Bless *et al*. (2013:20) explain data collection is the point in the research process whereby the research mechanism is applied to the sample and the data are collected. Babbie (2013:6) states that data collection tackles the observation facets and the data collection techniques are associated with the research approach, therefore, the data collection process will differ depending on the research approach used namely the qualitative or quantitative research approach. The data collected consisted of literature from prior studies conducted within this field of study, journal and newspaper articles and relevant textbooks and the internet was also utilised. Grove, Burns and Gray (2012:97) refer to literature as a synopsis of what has already been published on a specific topic covering the qualitative area.

The literature on global crises, bankruptcy, bankruptcy prediction models and financial ratios are covered as financial ratios have contributed widely in the field of study (Ohlson, 1980; Altman, 2000; Claessens and Kose, 2013; Kleinhert 2014; Gerritsen, 2015; Xu, 2018; Laeven and Valencia, 2018). Secondary data is collected when the researcher obtains information for from others' empirical work that was previously collected (Grove *et al*., 2012:204). This study use secondary data as the data were collected from the annual financial statements of South African companies. Data collection allied the prospect theory. Khan (2017:5) explains prospect theory is a behavioural model that shows how human behaviour influences financial decisions.

According to Abdellaoui, Bleichrodt, L'Haridon and van Dolder (2016:1) prospect theory is an alternative when making decisions under risk and investors are more sensitive to losses than gains. Hossari (2006:61) examined 84 studies and found that there are 44 ratios that are being used. The 44 financial ratios and financial ratios within other seminal studies nationally and internationally (De la Rey, 1981:169; Naidoo, 2006:33; Hossari, 2006:61; Altman & Hotchkiss, 2006:239; Fulbier, Silva & Pferdehirt, 2008:128; Tuvadaratragool, 2013:87; Cassim, 2015:72) were adopted by this study according to the ratio frequency and bankruptcy prediction abilities, nine ratios were obtained. Financial ratios were selected based on their frequency and predictive ability demonstrated in previous studies. As indicated by the primary objective the studys' aims to determine the effectiveness of financial ratios in predicting financial distress and failure in a continually

changing economy. The bankruptcy prediction indicator is divided into two levels, statement of comprehensive income ratios (return on equity (ROE); earnings before interest and tax to interest (EBITI); return on assets (ROA) and the statement of financial position ratios (cash flow to total debt (CFTD); total assets turnover (TATO). More detail is discussed in Chapter 4.

1.6.6 Measuring instrument and data analysis

The method used to gather, explore and analyse the required data within this study was done by means of secondary sources document analysis, namely the INET McGregor BFA database, a South African supplier of quality publicly available financial data (Sabela *et al.,* 2018:3). According to Boen (2009:27) document analysis is a systematic procedure utilised with the aim of giving a voice and meaning to analyse and interpret documents. The document analysis data were published annual financial statements that were measured using financial ratios. The credibility, reliability and validity of the data were enhanced by making use of document analysis. Financial information was analysed for period the 1996–2016, analysis conducted five years prior to failure. This period was selected because it covers different economic conditions. Purpose of this study is to develop bankruptcy prediction indicators enabling a comprehensive understanding of a company's financial health prior to failure. In order to test the predictive power of the bankruptcy prediction indicators, approach the results of nine financial ratios representing the four pillars of companies' financial health were statistically analysed. The result of the statistical analysis was five financial ratios being the proxy for the two-level testing. The BPIA is easy to understand and apply by not only management. Enhancing decision-making and allowing management to take quick corrective action with the aim to avoid or reduce the impact of potential bankruptcy or financial distress.

Babbie (2013:6) explains data analysis is a comparison of what is expected to what is actually observed by looking at patterns in the observations. Kumar (2019:80) refers to data analysis as being reliant on two things, one being the type of information collected and two the manner in which the collected data are communicated to the readers. According to Harding and Whitehead (2018:1) data analysis is the delivery of the type of finding seeking after, a link needs to exist between the data collected and required result. According to Tie, Birks and Francis (2019) and Swanepoel (2018:10) in order effectively

analyse the data collected theoretical sensitivity techniques needs to be applied of the techniques is coding of data.

This is when there is a relationship between the understanding of the data collected and data analysis method by understanding the data the theory is built on. In South Africa different ratio-based measures have been used to examine annual published financial statements failure detecting ability. Mosalakae (2007:142-143) identified two studies by De la Rey (1981) and Naidoo (2006) the latter being too complex and former being too flexible (De la Rey, 1981:15 -169 and Naidoo, 2006:188).

Theory has established that data from financial statements have the ability to detect business failure using 17 financial ratios over the period 2007–2012 (Cassim, 2015:207). This study explored the prediction power of merged published data of annual financial statement (five financial ratios) into the BPIA to detect financial distress during different economic conditions in South Africa. An analytical tool of that nature, examining the ability to detected financial distress using financial ratios, is sought after.

The analytical techniques, the comparative and ratio trend analysis were the techniques the BPIA apply in combination with the EMS. The bankruptcy prediction indicators were tested on two levels. The first level is the statement of comprehensive income level being the survival level, this level consists of statement of comprehensive income ratios. The second level being the thriving level, this level comprises statement of financial position ratios.

In the case where the bankruptcy prediction indicators predict signs of financial distress in Level 1 testing (survival level) investigation for the root cause of the financial distress should be identified, corrected were possible before Level 2 (thriving level) testing can continue. An in-depth discussion on the selected financial ratios is done in Chapter 3.

In order to analyse the validity of the nine ratios, a statistical analysis indicated below was conducted. The results obtained consisted of five ratios to be tested as bankruptcy prediction indicators, the instrument developed by this study and four ratios for the EMS model. During the research process, the researcher made use of IBM Statistical package for social sciences (SPSS) Statistics Software (Version 25) and the INET McGregor BFA database. Descriptive analysis was applied to descriptive trends within the data, followed

by the significance test basically how significant financial ratios are. Normality tests were conducted to determine if the population of the data is distributed normally and lastly the non-parametric test was conducted in order to determine whether there is statistical significance differences within the data.

The following statistical methods were applied on the empirical data sets:

- Descriptive statistics: describes the trend a pattern of data within a study (Laerd, 2020a:1). The empirical study aims to recognise trends or patterns of selected financial ratios.
- Significance testing: statistical significance is measured, testing how significant financial ratios are to determine whether they were statically significant to predict bankruptcy based on p-values (Pallant, 2016:137).
- Normality testing: conducted to determine if data have been normality distributed (Field 2018:185). Non-parametric testing needs to be conducted since the population was not normally distributed. Non-parametric testing: a Mann-Whitney (*U*) non-parametric test had to be performed on the means of the selected financial ratios of the failed and non-failed JSE entities whether there is a statistical significance difference within the data (Ngwenya, 2018:667).

1.7 ETHICAL CONSIDERATIONS

Welman, Kruger and Mitchell (2005:181) state that issues such as honesty and respecting the rights of others are of the ethical behaviour that is important in research as it arises in all research. Sapsford and Jupp (2006:293) concur stating that all through the research projects these research ethics need to be addressed. The study, however, is required:

To comply with the minimum ethical standards pertaining to academic research. All data are obtained from secondary sources that are publicly available from INET McGregor BFA, a reputable JSE portal database.

Data collected were applied to develop and validate the bankruptcy prediction indicators, the findings were treated as confidential and will not be disclosed individually at any point in research, but rather in aggregate or a summary thereof. The research was approved

by the Economic and Management Sciences Research Ethics Committee from North-West University (NWU-00847-20-A4).

1.8 CONTRIBUTIONS OF THE STUDY

A major concern is the consistent closure of companies. The closure of companies influences the closed company, all stakeholders as wel as the economy at large. Studies have been conducted as far back as the 1930s regarding bankruptcy predictions. Yet most of the studies conducted by the pioneers in the field namely Beaver, Altman and Blum were based on companies within the United States of America.

Not much research has been conducted in a South African context, to date. De la Rey (1981), Naidoo (2006), Hlalhla (2010), Rama (2012) and Cassim (2015) have conducted empirical research, investigating the prediction of the financial failure of companies within a South African context. De la Rey's (1981), Naidoo's (2006) and Hlahla's (2010) samples consisted of companies listed on the JSE within the industrial sector only, meaning the model was sector-based. Hlahla (2010:1-35) applied Beaver's univariate model through pairing 14 failed with non-failed JSE-listed companies while Rama (2012:5) applied the Altman's Z-score model. Rama (2012:5-35) applied the model to the top 40 JSE-listed companies. Cassim (2015:7) applied the comparative and trend ration analysis and compared it to Altman's EMS model, all three studies excluded the mining and financial sectors due to these sectors specialised nature and asset structure in comparison to other JSE-listed sectors. This study comprises a comparison of companies within the same industries sectors and across different industries sectors and the comparison is done using the same ratios based on the correlation results obtained from the statistical techniques applied in the study.

The purpose of developing the generic bankruptcy prediction indicators is to serve as a test that can be performed to detect early warning signs of financial distress or failure. Using one model to detect financial distress or failure across different sectors over the different economic conditions pre-crisis (2002 – 2006), during crisis (2007 – 2011) and post crisis (2012 – 2016). The study designed to examine whether the BPIA can be adequately applied to predict bankruptcy or financial distress for South African companies under three different periods ecomonic conditions. The first period is normal conditions,

second period is a period of financial crisis and the third period the South African ecomony received a financial boost. This test may be done within small intervals of time (monthly or quarterly) to detect financial problems as soon as possible. Where the bankruptcy prediction indicators predict financial distress or failure during level 1 (survival level) testing. This is a red light and further investigation of the cause of the financial distress or failure is crucial and where possible remedial action needs to be taken, it should be taken before commencing with the level 2 (thriving level) testing.

The outcome of this study could be important in the detection of business failure in a South African and emerging market perspective. These results can be important to all stakeholders by alerting them of potential financial distress. It will assist in decision-making and making all stakeholders attentive to possible financial distress or failure while indicating whether remedial action needs to be taken.

1.9 CHAPTER CLASSIFICATION

A summary of all the chapters of this study is outlined in the figure below

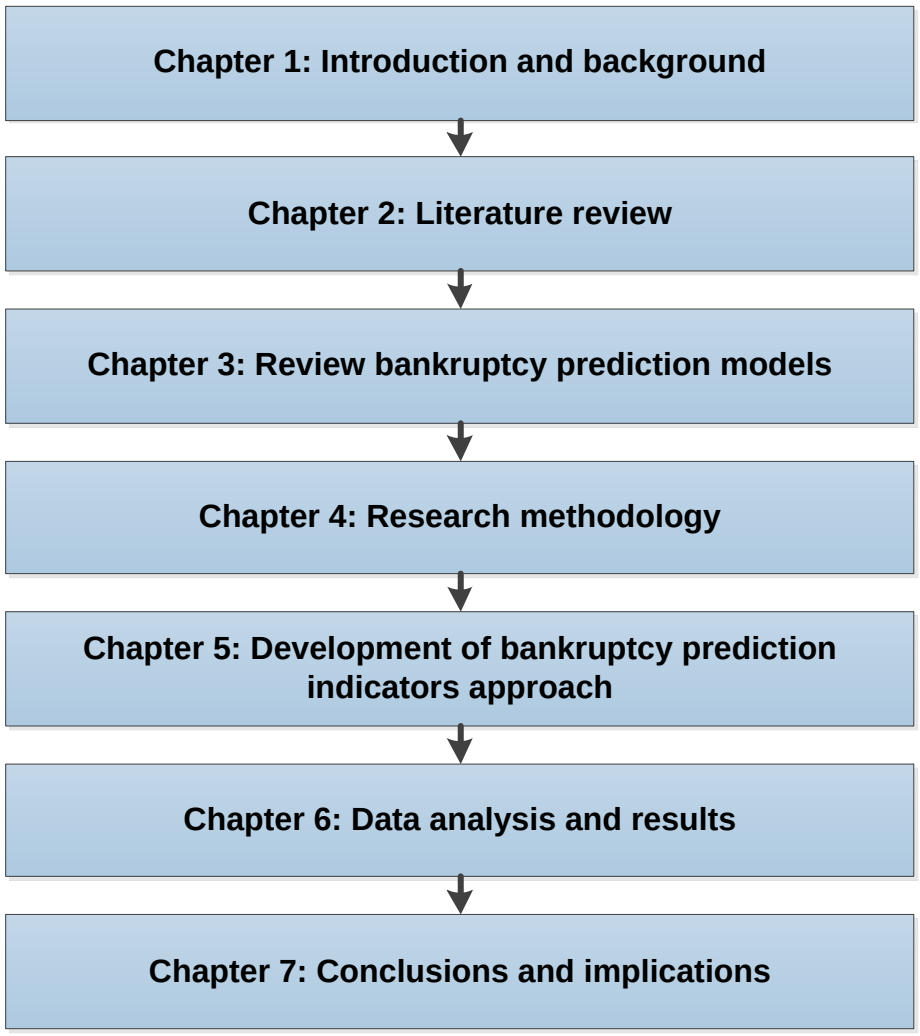


Figure 1.2: Study outline

Figure 1.2 displays the chapter outline within this study, a brief summary of each chapter is given below.

Chapter 1: Introduction and background to the study

An introduction to the study and background and the purpose of the research are provided and the term used within the study, followed by the research problem and research objective containing primary, secondary, theoretical and empirical objectives. Thereafter a summary of the research methodology the terms used within the study, the ethical consideration and the chapter classification and the justification thereof are described. Lastly, a summary of the chapter is provided.

Chapter 2: Literature Review

The literature on bankruptcy and the causes thereof are reviewed. In order to attain gaps in the studies of business failure in South Africa, the development and the theoretical background of business failure prediction models within South Africa and elsewhere are provided. The generic terms used in previous studies and the usefulness of business failure models are included. The evolution of financial ratios and financial ratio analysis are explored and the financial ratios as cornerstones of different bankruptcy models are addressed.

Chapter 3: Review Bankruptcy prediction models

The literature is presented relating to financial ratios and previous bankruptcy prediction studies. A summary of the history of financial ratios has been conducted as financial ratio has been applied the bankruptcy prediction models since 1930. The chapter continues by focusing on prior relevant international and South African studies with the aim of examining the bankruptcy prediction modelling globally and the shortcoming within South African studies.

Chapter 4: Research methodology

A description of the research stages, research problem and formulation of the research are given, followed by the research design, the target population and the sampling methods. The chapter further describes the data collection, data analysis by means of applying coding and the analytical process thereof.

Chapter 5: Development of bankruptcy prediction indicators approach

A design to analyse the data collected is presented. The sample used is described, followed by the profiling of the companies selected, analysed and the pairing of the companies, financial statement used, and the selection of the financial ratios are discussed. The chapter commences with defining the analytical approach adopted. Followed by the development of the bankrupt prediction indictors approach in accordance to the methodology portrayed in Chapter 4. The application and results of the developed bankrupt prediction indictors approach will be dealt with in chapter 6.

Chapter 6: Data analysis interpretation

Statstical measures (mean and standard deviation) was applied by SPSS to the empirical data set. Follwed by test for frequency, correlation to determine the correlation within different sectors, normality and Mann-Whitney (*U*) test. Testing was done based on the identified bankruptcy prediction indicators and the correlation and significance between these indicators were the basis against which firstly the companies within the sectors were compared, followed by the remaining failed companies across industries within the sample were compared to Altman's EMS Model. Finally, the indicators were tested using the effectiveness group (out-of-sample data).

Chapter 7: Conclusions and recommendations

The results of the objectives and the problem statement are presented, followed by the summation of the previous chapters. The chapter continues with the study's limitations, conclusions, contributions and recommendations. Finally, suggestions for further studies are presented in the conclusion of the chapter.

1.10 SUMMARY

An introduction, background and the purpose of the study are presented in this chapter and the defining term used within this study. Including an overview of the problem statement and objectives to the study, which were followed by the research design and methodology. The chapter further then discussed the ethical consideration, the study's contribution, chapter classification followed by a conclusion.

Chapter 2 will highlight the theoretical analysis of global crises, identify the importance and existence of bankruptcy, local and global bankruptcy prediction models and the build up to bankruptcy. Therefore, the next chapter will consist of a literature review which addresses the theoretical objectives 1 to 9, set out in Section 1.5.2.

CHAPTER 2
THEORETICAL ANALYSIS OF GLOBAL CRISES, BANKRUPTCY AND PREDICTION MODELS

2.1 INTRODUCTION

An introductory outline of this study was presented in Chapter 1. Since the focus of this study to develop and validate bankruptcy prediction indicators to detect or predict warning signs of bankruptcy or financial distress. It is essential to provide an overview of global financial crisis and the link to business failure. The global crises in general where created by numerous independent either security, economic, political, financial or environmental crises which have been overlooked and have built up through time (Georgiera, 2020). Solt (2020:138) notion shared by Oxenford (2018:1) and Maredza and Ikhide (2013:2) explain that the existence of a global crisis is normally caused by when individual crises are underplayed, which then sequels and increases in size. Global financial crisis occurs when the banking system and the financial market experience a period of extreme stress (RBA, 2018). According to Zhang (2018:4) the repercussions of financial crises not handled with caution can timeously progress into a global financial crisis, recovery could take years if recovery is a likelihood at all. Due to the severe nature of global financial crisis economists were driven to learn more about this phenomenon, the different crises types, triggers and the impact it has on the economy (Padayachee, 2016:1 supported by Mafukata, 2017:569).

Since this study focuses on the different financial crises and their severity, what starts off as one crisis could rapidly spread into another according to Claessens and Kose (2013:3). When some of these crises are present simultaneously it could be said without a doubt that it highly possible to transfer into bankruptcy (Demirgüç-Kunt, Peria & Tressel, 2020:1, Laeven & Valencia, 2018; International Monetary Fund, 1998). It is therefore imperative to share light on this to those who are not familiar with this field of study, this has been discussion in par 2.2.1. This chapter also presents:

1) the various global financial crisis that are able to affect the financial system in turn prompting bankruptcy; and

2) generic term used to define bankruptcy, evolution and how far it has come.

Companies do not enter into a state of financial distress at once but over time, included within the chapter is prediction attempts to avoid or minimize the impact through timely financial reconstruction (Ashraf, Feix and Serrasaqueiro, 2019:2). This is demonstrated through a method of detecting bankruptcy applied within literature and the different bankruptcy prediction models that have been applied both internationally and within South Africa.

The chapter is organized into four sections, an overview of it is depicted in Figure 2.1. Section 2.1 outlines the structure and objective of the chapter. Section 2.2 discuss the important aspects of the global financial crisis. This section includes the global financial crisis definitions, historical overview, triggers early warning signs and the build-up to bankruptcy. Section 2.3 reflects generic terms used in bankruptcy, bankruptcy development followed by the different causes and categories of bankruptcy. Subsequently, Section 2.4 give a summary of the chapter. Figure 2.1 provide a visual illustration of the overview of Chapter 2.

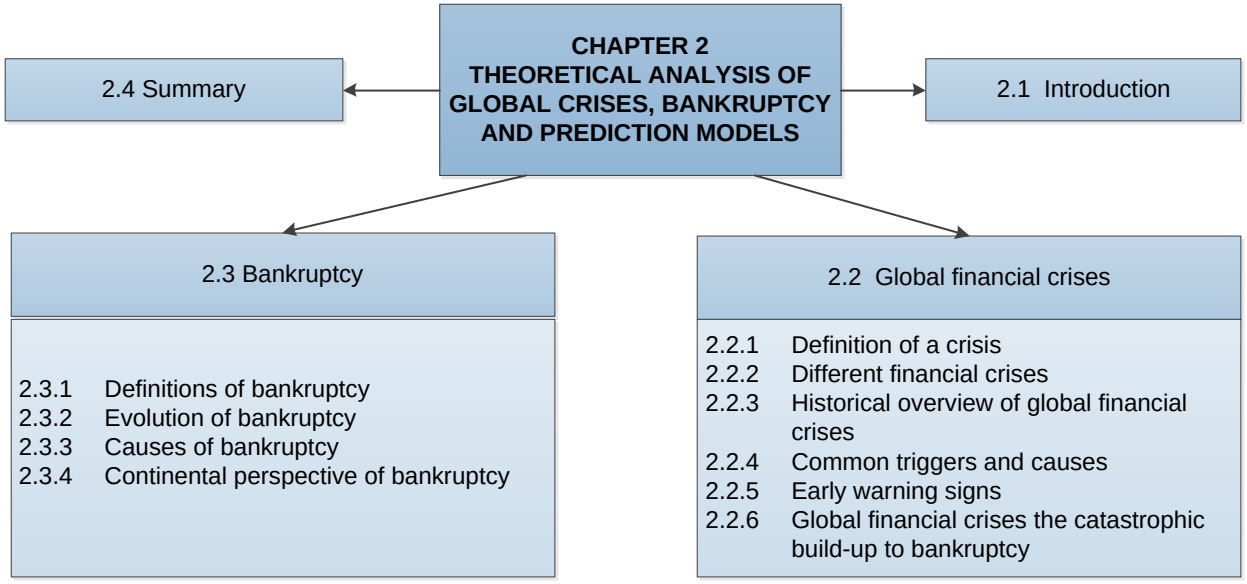


Figure 2.1: Overview of Chapter 2

2.2 GLOBAL FINANCIAL CRISES

Global financial crises are very important to the financial well-being globally. Moshirian (2011:502-503) elucidates that numerous studies have attempted to determine and identify the causes of financial instabilities that ultimately lead to global financial crises.

When global financial crises intensify it causes the global economic outlook to disintegrate, failure of financial institutions globally not forgetting the reduction of international trading activities. According to Claessen, Demirgüç-Kunt and Moshirian (2009:1950), a long period of time is needed in order to better understand the financial difficulties related to global crises. For better comprehension the definition of a crises follows. The data collected included the period 2007─2011 that represents the global financial crises. Therefore, it is important to shed some light of global crises.

2.2.1 Definition of a crisis

The development of bankruptcy prediction model is the focus of the study. Currently in literature there are many models including those that have been applied with an attempt to predict bankruptcies in response to a financial crisis. The statistical methods available being: MDA, logistic regression, artificial intelligence, artificial neural network, support vector machines, rough sets (RS), case-based reasoning, decision tree and genetic algorithm (Altman, Iwanicz-Drozdowska, Laitinent and Suvas, 2020; Balcaen & Ooghe, 2006; Aziz & Dar, 2006; Min, Lee & Han, 2006). Yet wrong tools are still being applied to wrong data conditions and situations which are detrimental to global financial well-being, it is important for the correct data to be applied to the correct tools for the correct research purpose (Alaka, Oyedele, Owolabi, Kumar, Ajayi, Akinadef & Bilaaim, 2018:165-166). Therefore, it is of great importance to know the background of the data and information the study is based on to ensure the most appropriate tool may be select with the aim of developing a positive performing bankruptcy prediction model. The starting point is to define financial crisis, being the elements of a global financial crisis.

The genesis of a financial crisis affects both developed and undeveloped economies dating back to 33AD. Having a greater effect on the undeveloped economies due to their financial instability (Georgieva, 2020). Other definitions of financial crisis are:

- According to Mitchell (1941) and Veblen (1904) financial crisis is “A liquidation of credits that have built up in a boom”.
- Schwartz (1985), Miron (1986) and Wolfson (1986) agree financial crises occur when the demand for reserve money is so extreme it is unable to be met (Kopliku, 2010:3)

- Yokoi-Arai (2002:7) echoes financial crisis when the insolvency of many banks occurs when banks assets sharply decline.
- Therefore, a financial crisis can be defined as the penetration of intrusions into the monetary market that causes vulnerability within the market and curbing the flow of credit (Ffrench-Davis, 2004:5).
- Taylor (2008:1) defines financial crisis as monetary excesses that occur frequently resulting in bubble bust that are unavoidable
- The term financial crisis has been defined by Jickling (2009:1) as financial market disturbances and constrained credit flow.
- Kopliku (2010:3) explains a financial crisis as bubbles that gradually develop and eventually burst as a result of monetary excesses

Grant and Wilson (2012:1) explains there is a much broader crisis than the financial crisis and more dangerous to the economic system, the global financial crisis. Furthermore, Grant and Wilson (2012:2) assert this crisis has the potential to take collapsed companies and contaminate the entire economy. The aftermath of global financial crisis is that it can affect advanced countries, developing countries even countries that were not experiencing a financial crisis at the time. The countries largely affected are where no efficient legal and financial systems are in place (Demirgüç-Kunt *et al.*, 2020:1). Bordo (2017:3) remarks that crises are not once-off events, due to the economy changes caused by different factors. Factors being for example crisis, inflations rates and exchange rate monetary systems (gold standard and Bretton Woods system) have been put in place devoted to preventing and solving the problems created by one or all of these changes. According to Lewis (2018:31), concurring with Bordo and Schwartz (1999:684), a defective government faces a more substantial challenge than that of a stable government when facing a financial crisis. A financial crisis also does not appear in a single form. Usually a financial or economic crisis can further divide into a systematic financial crisis, foreign debt crisis, balance-of-payment crisis, currency crisis, banking crisis, twin crises, triple crises or a contagious currency crisis (International Monetary Fund, 1998:74-75).

Glick and Hutchison (2011:6) concur with Nurul (2008) stating that banking and currency crises are frequently connected with each other, with the bailout by the government of a distressed bank, the bank run can cause an attack on the currency when liquidity escalates. A bank crisis can lead to a currency crisis and vice versa and when both crises are present it is known as a twin crisis, which in turn is a financial crisis. The identification of the different types of financial crises is pivotal in order to apply the appropriate remedial action. If incorrect remedial action is applied, one crisis (e.g. currency or banking) could snowball into an ever more severe type of crisis, giving rise to the twin crisis.

A broader understanding of the different definitions of financial could be more meaningful to South African decision makers. Not all financial crisis results in bankruptcy, some crisis remedial action can be taken financial distress symptoms can be identified timeously. Other crisis will have to be addressed by means of business resue and other crisis the moment financial distress manifest it is too late for any remedial action to be taken.

2.2.2 Different financial crises

Systemic financial crisis: This crisis spreads financial trouble not effecting institutions but also have the domino effect by also effecting financial markets and continues until the entire monetary and financial system are affected (Acharya, Pedersen, Phillippon & Richardson, 2017:2).

Foreign debt crisis: Investopedia (2020a) defines it as the inability of a country to repay their public debt over prolonged periods caused by government's expenditure exceeding the tax revenue.

Debt crisis: Bordo and Meissner (2016:2) state that it is linked to over borrowings and has been around for centuries. Verick and Islam (2010:8) give an update of the period 1970 to 2008, during which 63 debt crises occurred.

Balance-of-payment crisis: Kohler (2012:14) asserts this crisis occurs when the government budget is unable to service the current government debt. Kaminsky and Reinhart (1999:474) opine this crisis leads up to banking crisis and is also called the currency crisis.

Currency crisis: Glick and Hutchison (2011:2) define a currency crisis as the occurrence of speculative attacks on the foreign exchange resulting in a currency downgrade. Compelling the government to shield the currency by raising domestic interest rates or by peddling foreign exchange reserves. Economies with pegged exchange rates policies are pressured to give up the current pegged exchange rate policy and could create a loss in foreign interest rates. If not sterilised, could lead to credit crunch known as the financial crisis (Kaminsky & Reinhart, 1999:465-475) and (Chen, 2019:2). Verick and Islam (2010:8) mention that over the period 1970 to 2008, 208 currency crises transpired. Glick and Hutchison (2011:2) inform that this type of crisis featured during the Bretton Woods period (1971–1973) and had its share in the breakdown of the monetary system. This type of crisis made its appearance again in Europe when the European exchange rate mechanism nearly collapsed, this was not the last time this crisis reared its ugly head. Once again in 1976, the currency crisis emerged in Europe with the British pound crisis, again when Latin America had the Tequila crisis (1992–1993). The crisis had hit North America with the Mexican peso crisis (1994–1995) and left many casualties when it emerged with the global crises globally (2008–2009). This crisis can lead to a local banking crisis when debt repayments of financial instruments are recalled and financial institutions are unable to comply (Berthold & Stadtmann, 2018:43).

Banking crisis: Allen and Gale (2007:10) assert that a banking system is critical enough to deteriorate most if not all of the capital within a banking system. According to Laeven and Valencia (2018:4-5), this crisis does not arise due to a single event but occurs when many banks within a country simultaneously experience liquidity or solvency problems. Bordo and Meissner (2016:4) state a banking panic would surface when the public tries to transform their deposits into cash. These banking panics are now known as banking crises after the arrival of the deposit insurance. Grossman (2010:53-54) explains as from before the Great Depression banking panics in essence change to a banking crisis. At that point the time leading to the change government intervened by occupying the role of the lenders as last resort. This is when banking panic sored in developing countries. A direct connection between government's statement of financial position and banking system was evident. Bordo and Meissner (2016:5) supported by Laeven and Valencia (2018:4-6) argue this crisis has the ability to cause severe financial damage. Has the ability to chaperon affected economies into recession and is also highly contagious,

rapidly spreading to other countries if not apprehended. Kamisky and Reinhart (1999:474) say both the currency and banking crisis are the common cause of the twin crisis. Verick and Islam (2010:8) notified 124 banking crises occurred over the period 1970–2008 while Laeven and Valencia (2018:1) identified 151 systematic crises for the period 1970–2017.

Twin crisis: According to Bordo and Meissner (2016:6), it is when a currency and banking crisis occurs concurrently. Allen and Gale (2007:12) refer to a twin crisis as being much worse than both the currency and banking crisis. This type of crisis was very severe during the Great Depression more than any of the other periods, it declined during the Bretton Woods and intensified during the more recent era. Twin crises increased during the Great Depression, reduced during Bretton Woods and was at its worse during the recent era within the emerging markets. During the period 1970─2008 there were 42 such crises (Verick & Islam, 2010:8).

Triple crisis: Bordo and Meissner (2016:2-6) posit that this crisis is when debt, banking and currency crises are present simultaneously. The authors explain that these three crises (debt, currency and banking) are connected through the Bretton Woods system. They originated when the government guaranteed the liabilities of the banking system. Verick and Islam (2010:8) inform that in the period from 1970─2008 there were ten triple crises.

Contagious currency crisis: International Monetary Fund (IMF) (1998:83) identifies this crisis as when one currency spills over and spreads to currencies of other countries with sound fundamentals. Goldstein and Razin (2015:167) explain this crisis occurs when one country reacts or is effected by the crisis of another country. Verick and Islam (2010:8) identify that this crisis occurs every ten years, causing a global economic downturn. The IMF (1998:83) identified three reasons for currency contagion.

1. crisis may originate from causes that are common
2. crisis in one country may influence the macroeconomic basics in another country, either in light of exchange and capital market linkages
3. country may lead creditors to reconsider the essentials of different countries, regardless of the possibility that these have not equitably changed or may lead to creditors lessening the risk of their portfolios

Hutchison and Glick (2000:3-4) explain that a banking crisis leads to a currency crisis as a result of unsound banking systems. A currency crisis, on the other hand, lead to a banking crisis when banks are loaned up and the deposited money is used to speculate within the foreign exchange markets. Global financial crises are like history that is confronting and unavoidable over time. It is of great importance to measure the relationships between the crises as crises do not occur in a set form or always in isolation, they have different challenges and effects on the economy when there is a dual occurrence. According to Laeven and Valencia (2018:3), there are designed policies available for the different crises with the purpose of either resolving or eliminating the impact of the different crises on the economy. Therefore, it is vital for the specific crisis to be identified correctly, the links between the different crisis if any exist to enable to apply the best corrective action that needs to be taken. The study focus is to identify the crisis at the beginning phase through applying the BPIA with the aim of predicting the financial distress and taking corrective action immediately. A synopsis of the occurances leading to financial crises and ultimately to bankruptcy is illustrated in Figure 2.2 below.

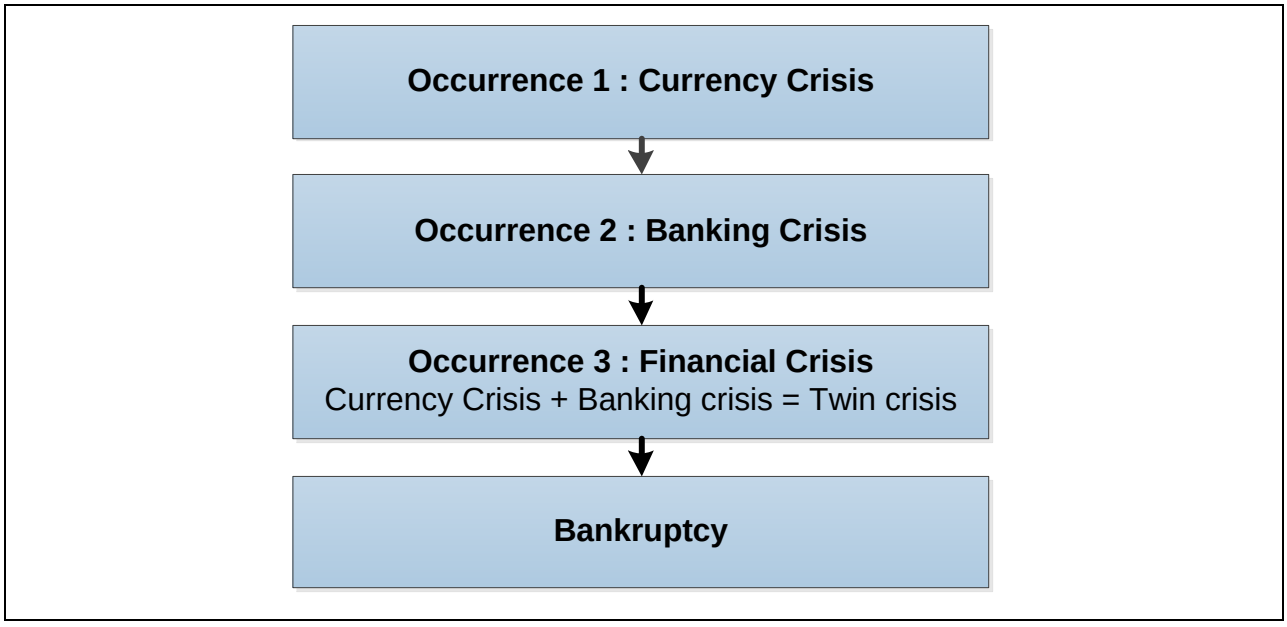


Figure 2.2: Occurences ultimate leading to bankruptcy

Source: Author

Figure 2.2 graphically illustrates the precence of currency crisis and banking crisis in isolations (occurrence 1 and 2) timely remedial action can be taken but in the case of twin

crisis, simultaneous presence of both currency and banking crisis (occurrence 3) indicates a financial crisis is highly probable could eventually leading to bankruptcy. Purpose is to establish a foundation in order to comprehend preceding occurrences which lead to bankruptcy. Aim is to understand bankruptcy to construct a predictive model or even lessen a company's financial blow.

2.2.3 Historical overview of global financial crises

"This time is different" according to Reinhart and Rogoff (2009a:1) this is what is said every few decades and is known as the "this time is different syndrome". The authors are also of the opinion this is "unrealistic optimism" as it burdens many stakeholders. Reinhart and Rogoff (2009a:3) further define that the "this time is different syndrome" is rooted in the firmly held belief that financial crises are things that happen to other people in other times. Reinhart and Rogoff (2009a:53) state the authors suffering from this syndrome believes things are done smarter, a cut above the rest and have learnt from past mistakes. This has been proven over a period of time and this research only looks at the different crises over four main eras. The purpose is to clearly indicate that different financial crisis occurred within the different eras based on different economic and financial decisons made within the different eras. The eras ranging as far back as 1880. Allen and Gale (2007:10) explain that these crises range over four eras namely:

i the era of the gold standard (1880–1913)

ii the Great Depression era (1919–1939)

iii Bretton Woods (1945–1971)

iv Recent period (1973–to date)

Gold standard era (1880–1913)

Bordo (2008:1) asserts that the management of a country's money supply, is the quantity and growth were done through a domestic standard known as the gold standard. Braithwaite and Drahos (2000:95) state that all coins being copper, silver and gold were ultimately replaced by a uniform currency. Europe settled universally on one coinage being gold while the main supporters of the bimetallic being the gold and silver standard

in Europe being France. Other countries namely the USA, France, Switzerland, Italy and Belguim formally adopted the bimetallic. France lost the campaign for the bimetallic standard and the universal standard in Europe was the gold standard. By 1880 the USA also adopted the gold standard. Money and other forms of money was freely converted into gold at a fixed price. Participating countries committed to fix the price of their domestic currencies based on the predefined measure of gold. Since the production of new gold would only add small portions to the cumulated stock and the authorities ensured the conversion of gold into non-gold money would be free, the gold standard guaranteed that the money supply and the price level would not fluctuate much (Eichengreen & Bordo, 2002:15-17).

Selgin (2015:258) regards Bordo's (2008) interpretation as outdated and ambiguous, it looks at the pre-1914 fiscal arrangements through a post–1941 looking glass. Arriving at a chaotic universal monetary scheme. It was to a large extent a compulsive development. A country's currency value was determined in terms of other international standard currencies, also being the gold standard and gold became the generally recognised media of exchange. Exchange rates linked to gold were essentially fixed due to countries adhering to the standard maintained fixed gold price. Due to the fixed exchange rates, price levels moved together globally, this was brought on by the gold standard. According to Newby (2012:1499) during difficulties as a result of the war and government was in need of revenue, a government would briefly disregard the gold standard and convertibility would be restored at original parity. An automatic adjustment to the balance-of-payment (balance-of-payment is the difference between the money that a country receives from export and the money that it spends on imports) is a process called the price specie-flow mechanism. Negishi (2014:9) summarises how the price specie-flow mechanism works. Price specie-flow mechanism is the modification of costs as gold ("specie") flows into or out of a country, bringing about a change in the flow of goods.

- Gold inflow has a tendency to escalate costs.
- Gold outflow has a tendency to plunge costs.
- In the event where a domestic country has a current account surplus in an overabundance of the non-reserve financial account, gold earned from exports into the country resulting in raising domestic prices and lowering foreign.

- Domestic goods turn out to be expensive while foreign goods become inexpensive, reducing foreign country deficits and domestic country current account surplus and deficits. A quota of external balance is attained for all countries.

Central banks should adhere to the “rules of the game” in order for the gold standard to work completely. Selgin (2015:259) explains that these rules were imposed by private and not public laws of contracts. The rules of the game being when:

- The aim is to increase gold inflow momentum; the discount rate is lessened to encourage gold outflow.
- The discount rate (interest rate) is inflated and the central bank lends money to other banks.
- If it is run at a balance-of-payment deficit, the rules permit outflow of gold until the price level ratio is at a level whereby the key trading partner was established to the par rate of exchange.

If the bank of England adheres to the “rules of the game” they would elevate their bank rate (discount rate) through prompting the increase of other interest rates in the UK. The aim of the increase is to decrease other investment expenditure. The decrease would, in turn, reduce the domestic spending and price levels holistically. Simultaneously, the increase in bank rate will stop the outflow of capital in the short-term and entice short-term funds from abroad. The countries that did not follow the “rules of the game” would not permit sufficient elevation of interest rates in order to decrease the domestic price levels (Eichengreen & Bordo, 2002:15-17).

Within this era there were 15 banking crises, eight currency crises and nine twin crises (Eichengreen & Bordo, 2002:42). Many conditions contributed to the success of the gold standard, yet the government implied maintaining the gold standard economic policy as a primary goal is not realistic. The last traces of the gold standard vanished in 1971.

Great Depression era (1919–1939)

Bordo and Schwartz (1999:658) state that the gold standard made the financial crisis unavoidable and the loans that were received with the attempt of bailing out countries were fruitless because it was flawed. Eichengreen, Rose and Wyplosz (1995:4-12)

explains that the link between the economy crumbling and the Great Depression brought on by a threat to the economic prosperity and financial instability was the gold standard. Bordo and James (2008:17) point out that organisations were affected at all government levels. Government centralisation resulted in power increases and this brought on the Great Depression. According to Kopliku (2010:7), 1929 was the final burst of the stock market bubble that was created by the gold standard, this was when shares were dumped in great masses by investors creating a wave of panic in Wall Street and this distraught the American economy as many shares wound up to be useless.

Kopliku (2010:7) continues by saying Europe and other countries' industrial areas were quickly affected as it extended from the US to the UK. It brought on the vanishing of consumer confidence and caused great turbulence in America leaving the only choice to buy on credit increasing their indebtedness level. Ozkan and Unsal (2012:4) theorise the increase in the indebtedness caused the repossessions level relentlessly to increased. According to Schularick (2010:11), this loss in confidence also affected investors' confidence in banks' solvency as they started demanding their deposits in cash. President Herbert Hoover was of the opinion that the government should not intervene in the economic crisis and that the crisis would run its course, yet the crisis deteriorated and got worse. Madubeko (2010:9) stated that on 4 March 1933 Franklin D Roosevelt won the election for president and quickly moved to address the countries' economies misfortune. Roosevelt proclaimed a "bank holiday" this is when all banks would close. Only the banks that were determined to be solvent should and would reopen. Reinhart and Rogoff (2011:1682) point out that the Great Depression extended to the 1950s due to its rigorousness and length the Great Depression turned into the worse crisis ever. A total of 18 banking crises along with 16 currency crises and twin crises at a total of 15 (Eichengreen & Bordo, 2002:42). The magnitudes being share price reductions, a decline in the demand for goods, 9000 banks went bankrupt and the unemployment rate escalated. Kopliku (2010:7) argued that compliance with the gold standard and the consent of countries around the globe were to fix the currency exchange rate. These actions spread the Great Depression from the US to the world, especially Europe due to imbalances and weakness.

Bretton Woods (1945–1971)

Braithwaite and Drahos (2000:97) noted that delegates from 44 countries met in July 1944 for a United Nations monetary and financial conference in Bretton Woods. The aim of the conference was to make plans for the three major worldwide institutions. These institutions being the International Trade Organization, International Monetary Fund and the World Bank. Also bearing in mind in order to accomplish important monetary co-ordination between countries would require more than just a gentlemen's concession. Ghizoni (1944:1) states an open door to create a new international monetary system was identified after World War II. This system would be constructed by extracting from the lessons of the past gold standard and the experience of the Great Depression. With the purpose to create a system that would not just evade stringency prior the international monetary system but would likewise address the resistance of those systems among countries.

The desire was to create a system that would address the resistance among countries on those systems but also evade the sternness of the previous international monetary system. Braithwaite and Drahos (2000:97) indicate that the Bretton Woods represented a different kind of operation as the gold standard was abandoned after World War I, it allowed government to embrace aggressive devaluations as well as setting up prohibitive trade policies that exacerbated the Great Depression (Ghizoni 1944:1)

In order to clarify Ghizoni (1944:1) states that even though all the participants consented to the new system's objective being to advance economic growth, prohibit ambitious devaluations and ensure a stable exchange rate, yet the execution thereof differed.

John Maynard Keynes the British Treasury adviser believed when crises occur public institutions should have the capacity to intervene. His plan involved a Cleaning Union, which is a worldwide central bank. This bank would distribute a new international currency called the "bancor". This currency will be used to settle international imbalances. Countries will receive constrained credit that would keep them from running a balance-of-payment deficit. However, every country would likewise be discouraged from running surpluses in order to remit extra bancors to the Cleaning Union (Ghizoni 1944:1).

Harry Dexter White (1944) a chief international economist at the Treasury Department proposed to restrict powers and resources. It mirrors the concerns that a great portion of the financial resources of the Cleaning Union envisioned by Keynes would be utilised to acquire US goods resulting in the US holding the majority of bancors. According to Ghizoni (2013:1), White suggested instead of issuing a currency, rather have a new monetary institution and call it the Stabilisation Fund. It would be funded with the limited pool of national currencies and gold would, in turn, limit the supply of reserve credit.

Bretton Woods embraced White's proposal with a few concessions due to Keynes's concerns. Two new institutions were consented on by 730 of the delegates.

1. International Monetary Fund (IMF) – Monitoring exchange rates and making loans to countries with balance-of-payment deficits.

2. World Bank – The International Bank for Reconstruction and Development, providing financial assistance for less developing countries for post-World War II reconstruction

In 1958 currencies got to be convertible when the Bretton Woods system became completely functional. President Richard Nixon ended the dollar convertibility to gold in 1971. The US persistent balance-of-payment deficit led to foreign-held dollars surpassing the US gold stock signifying that the US could not satisfy its commitment to recover dollar for gold at an official price (Dammasch, 2007:5)

Different crises had been identified by Claessen and Kose (2013:11), Bordo and Schwartz (1999:684) and Hardy and Pazarbasioglu (1998:5). Among these different crises that have been identified: no banking crises, 37 currency crises, debt crises and financial crises. The only two crises that influenced the Great Depression was the banking and currency crisis (Eichengreen & Bordo, 2002:42). According to Claessen and Kose (2013:17), a banking crisis is when the severity of financial distress results in the deterioration of most or all the banking systems' capital. According to Allen and Gale (2007:12), the banking crisis has been found to be at its lowest during the Bretton Woods era in both the emerging markets and the industrial countries. During the era of the gold standard, the crisis increased in both emerging markets and the industrial countries and falling to a low during the Bretton Woods era and again increased during the recent era. This crisis was at its highest during the Great Depression.

Bordo and Schwartz (1999:684) contend that the currency crisis occurs when a fixed exchange rate is abandoned or a change in stability is forced or when it is an international rescue. Allen and Gale (2007:12) point out that the movement of this currency type as being at its lowest during the implementation of the gold standard in both the industrial countries and in the emerging markets. In the Great Depression era, further growth occurred in the industrial countries and in the emerging markets increasing even further within the Bretton Woods era and at an ultimate high within the recent era.

Recent era (From 1973)

According to Eigner and Umlauft (2015:2-5), the 2007 financial crisis was the most serious and due to its length and its impact, the only crisis that is similar to the Great Depression era. The 2007 global financial crisis had many fatalities from continents, industrial countries and emerging markets were excluded from this crisis. Included in this era were the following continental crises European, Asian, Russia (spanning over two continents Europe and Asia) and South America. Srinivas (2018:8-12) identified the following crises over a period, the international debt crises (1982–1989) many countries were unable to repay their loans. Followed by the Russian economic crisis (1992–1997) the inflation was in excess of 300% causing the standard of living to fall as many Russians were unable to afford basic necessities due to their lack of savings. Then came the Latin American debt crisis (1994–2002) this was due to an increase in the interest rate and simultaneously the peso depreciated significantly. Huge external reserves losses placing pressure on the foreign exchange and financial markets. Next was the East Asian economic crisis (1997–2001) shaped by poor prudential regulations, hefty external deficits, inflated share and property values and adding insult to injury the Japanese Yen declined by 35% to the US dollar. The European continent will include Britain regardless of the Brexit. The Brexit is the exit of Britain from the European Union on 23 June 2016, 47 years ago in 1969 when negotiations for British membership were given the go-ahead (Hunt & Wheeler, 2017:1). The reason for the inclusion is Britain was still part of the European Union during the period of this study and forms part of our categories of bankruptcy in Section 2.3.4.

- **European continent**

According to Allen and Gale (2007:14-16) Norway, Finland and Sweden experienced crises over-the period 1985–1991. In Norway (1985–1986) there was a rise in the asset prices, lending increase by 40% with a decline in the value of investments and oil consumption. These activities resulted in a severe banking crisis and a recession.

Allen and Gale (2007:14) also indicated that Finland (1987–1991) had a huge credit expansion resulting in an increase in house prices by 68%. In order to curb this credit expansion, interest rates were increased, and reserve requirements were applied by the central banks. The economic situation was worsened by the fall in trade and it had its own repercussions being the asset prices folding and the GDP shrinking. As per Madubeko (2010:10) resulting from the above, banks had no option but to ask for assistance from the government.

Sweden's (late 1980–1991) credit expansion, in turn, led to a property boom, interest rates were increased with the aim to limit credit. The result was not as anticipated and Sweden also requested the government for a bailout regardless of the government's intervention a severe recession still followed (Allen & Gale, 2007:14-15).

- **Asian continent**

Allen and Gale (2007:15-16) stated that the Asian continent experienced unstable markets in 1997. Japan's assets prices reached an ultimate high in 1980 when the asset prices gradually increased after the financial bubble burst and the burst affected both the stock and real estate markets. The new Japanese governor at the time tightened the belt on the monetary policy by escalating the interest rates. This occurred in early the 1990s as the governor's priorities were to fight inflation rather than backing the US dollar. Madubeko (2010:11) adds that after the financial bubble burst one of the four leading security companies including three of the large banks failed. This caused major defaults resulting in financial system retrenchments, due to this abrupt decline of the real estate prices, the fall of the Nikkei followed suit.

The other countries within the continent took measures in order to protect themselves against the unstable currency market. One of the actions was that central banks stopped defending their currencies because although they protected their currency foreign reserves were still lost. Taiwan allowed the depreciation of its currency and was not so severely affected. Bordo and Meissner (2016:15) stated that due to this crisis being connected to government guarantees, it resulted in banking, currency and debt crises. The foreign borrowings were the crucial medium that steered to a banking crisis as the securities where extensively dominated in foreign currency. Hutchison and Glick (2000:2) said the crisis later transformed into a speculative outbreak (the occurrence of the currency crisis, either depreciating the value of currency or force the government to intervene in a bailout).

- **South American continent**

In 1997 Argentina experienced economic growth and a low inflation that was brought on when the peso was pegged one-to-one with the dollar by the currency board. Madubeko (2010:13-14) indicated regardless of their positive progress Argentina had experienced a low share of exports and an increase within the public debt sector. Government tried to better the situation by taking numerous measures. The operation of the currency board was modified, tax was paid by importers and exporters, were exposed to subsidised exchange rates. The repercussions of these measures aimed to lower confidence instead of increasing it. According to Allen and Gale (2007:17-18) the economy eventually caved in end 2001, the imports, construction and industrial production fell and in 2002 the GDP and inflation also fell as well as debt that was defaulted by government.

Eigner and Umlauft (2015:3) raise the question, whether post-crisis statues and crisis responses mended the deficiency of the structure or has it made it worse, have lessons been learnt? Eigner and Umlauft (2015:6) continue by saying Charles Schumer (1984) wondered whether it was sensible for government to permit banks to enter into further real estates, securities or insurance while government is of the opinion that some organisations are too important to fail? Madubeko (2010:35-36) deduces in the 1930s that government's intervention was the solution to the market problem through government direct bank proprietorship. Scholars now debate that government is the problem due to the moral hazard in the financial system. Due to government's

contradictory macroeconomic policies and the market forces, has government moved from abolishing crises to creating them?

- **African continent**

Not one cause can be singled out as the straw that broke the camel's back. Mezui, Nalletamby and Kamewe (2012:1) define financial crises as a blend of different weaknesses such as:

- Inability to prepare a compelling policy reaction;
- Current account deficits;
- Statement of financial position instabilities;
- Insufficient regulations and supervision; and
- Adverse fiscal balances

There have been occurrences when the above weaknesses individually would be the cause of great financial concern. Allen and Maghmbi (2009:8) mention that sub-Saharan Africa's financial institutions had minimal direct exposure to the US subprime market. Adding no substantial bailouts for African banks have been declared. Allen and Maghmbi (2009:10) continue by stating the global financial crisis occurred when African countries were fortifying their development and game plan after a long history of dormant development. The global financial crises only added extra weight to already stressed economies, caused by current diverse difficulties. From which African countries were still recuperating from being the 2008 food and oil shock, political crises and continue environmental hardship struggles (Allen and Maghmbi, 2009:9).

Mezui *et al.* (2012:1) state that banking, currency and debt crises are strongly connected and adds that an emerging market like Africa are particularly prone to be hit by all three of these crises simultaneously. A debt crisis affects growth output and in turn influence banking crises. Banking crises created by either coexistent private or public defaults or the default of government or private sector debt is exhausted through accumulated debt requiring large payment by government. When these crises coincide, it could lead to a currency crisis.

According to the studies conducted by Claessens and Kose (2013:32-33), in agreements with Mezui *et al.* (2012:2), it has been found that a total of 431 various crises have occurred globally. Of the total currency crises when the currency experiences a sharp depreciation or collapse of the exchange rate regime was 217 (51%), banking crisis when stability system of the banking system is low, was 147 (35%) and debt crises, crises when the government is unable to service their existing debts obligations was 61 (14%). The effect is aggravated when there is a twin or triple crisis former totalled 68 (16%) of the total crises and latter 8 (2%). Laeven and Valencia (2018:25) explain twin crisis is when banking crises occur with either currency or debt crises, least common form is when banking crises or debt crises is associated with currency crises. The most common type is when currency crises occur with either banking or debt crises. Triple crisis is quite rare and is the simultaneous occurrence of all three crises.

- **South Africa**

Asuelime (2018:129) explains South Africa became the S in BRICS, the fifth member of the elite club in 2010, BRIC (Brazil, Russia, India and China) the four major emerging economies. The BRICS membership empowered South Africa to absorb globalisation the surprises and dangers. These favourable circumstances gave South Africa a voice in worldwide issues, increased bargaining power, trade and market access and foreign direct speculation, these are just some of the prospects for the country. Padayachee (2016:2) mentions during the period prior to World War I, South Africa was one of the engineers of growth. This was during the time of international migration and was sparked by the open world economy, making SA a notable player in the international markets. Due to the close international links, it was expected that South Africa will greatly be affected by the global financial crisis. According to Baxter (2009:112), South Africa is not safe from the global financial crisis economic recession, as South Africa is dependent on foreign savings to support domestic savings and is foreign trade-reliant and in turn effect business environment. Next common triggers of financial crisis will be looked at, firstly at a business level followed by the economy level.

2.2.4 Common triggers

De Jager (2017:96) supported by De Jongh and Mncayi (2018:116) the business environment is significantly effected by loss of confidence is experience in the business

environment and influence financial crisis within a business causing business failure or bankruptcy. Trade Economics (2019) identifies the following changes within business: confidence (units), consumer confidence (units) and consumer spending (millions) within South Africa within the period 1975 to second quarter 2019.

Business confidence expressed in index, diminished to 38 from 42 in 2016. Further plummeting to 27 in 2017, increasing to 31 in 2018. By the second quarter of 2019 the index was at 21 and at this point concerns about the economic health grew. Business confidence had an average of 44.88 from 1975 until 2015, achieving an all-time high in 1980 of 92 and in 1988 was at 12 but a record low of 10.20 in 1985.

Consumer confidence conveyed in index. In 2016 index decreased from 11 to -3. Index raised to 22 in 2017 following a further increase to 26 in 2018 and further decline to 5 in in 2019. From 1982 until 2016 customer confidence reached an average of 1.53, index points from 1985 until 2019 reaching a high of 26 in 2007 and decreasing to -33 in of 1985.

Consumer spending expressed in ZAR (Rands). In 2016 consumer spending moved from R1871475 million in 2016 to R1857815 million in 2017. In 2018 R1947528 million and R1960885 million in 2019. Arriving at R899949.82 million average from 1960 until 2016, and from 1960 to 2019 the average was at R947337.12. Highest of R1960885 million and the lowest of R260612 million in 1960.

De Jager (2017:96-97) opines although different factors have an underlining effect on the business environment recent studies have come to recognise both business nad consumer confidence is significant with regards to the influence of financial crusis within a business causing business failure. A relationship does exist between business and consumer confidence that in turn effects consumers spending (De Jongh & Mncayi, 2018:118). Business and consumer confidence are very similar; the only difference is the perspective. Business confidence if from a business perspective and consumer confidence is from the perspective of the consumer. Depending on the level of confidence in the economy the business or the consumer's action is determined. When the management of a business is confident or satisfied with the business condition it determines whether further investments will take place or funds will be retained within the

business. With consumers, the more confident they are about their financial situation and the economy, in general, the more they will spend, purchase more goods and services. If not so confident, consumers will opt to rather save. When consumer confidence decreases it indicates a decline in their confidence, consequently consumers' spending should also decrease. De Jongh and Mncayi (2018:118) state business and consumer confidence are leading indicators of ecomonic instabilities. Figure 2.3 gives a summary of the triggers at a business level.

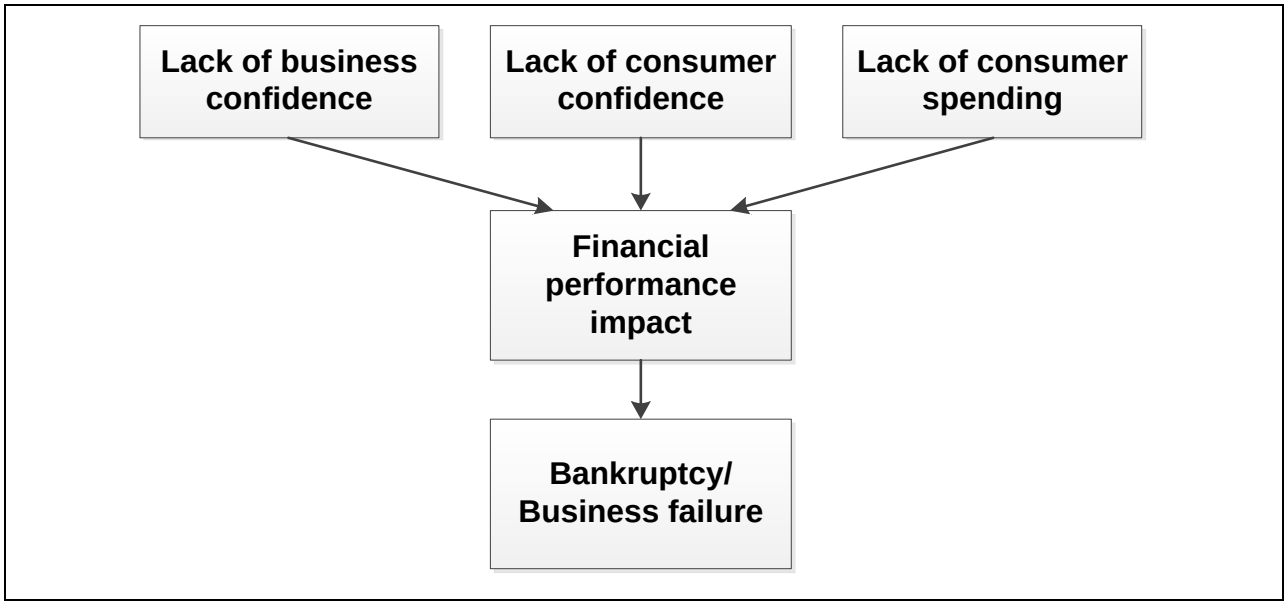


Figure 2.3: Triggers at business level

Source: Author

In Figure 2.3 the aim is to understand the triggers of financial crisis or business failure on business level is closely related to financial performance deduced from financial ratios decline and bankruptcy. When financial performance is poor it leads to potential bankruptcy, bankruptcy needs to be understood to be predicted. Baxter (2009:113) articulates South Africa had relatively strong fundamentals in place when the global financial crisis storm hit. The Southern African economy weathered the global financial crisis storm quite well due to the financial buffers that were in place.

Giacche (2017:5) agrees with the IMF (1998:75) identifying that the banking and currency crisis (financial crisis) have common starting points and triggers. The starting points being economic imbalance developments that are unsustainable and cost of resources or

exchange rates that are misaligned. When economies experience high levels of weakness a crisis may be considered to be the outcome of financial-economic disturbances meaning not all imbalance corrections involves a crisis. Bank and currency crises are prompted by confidence loss in the banking system and currency, monetary weaknesses, a severe drop in asset prices, financial institution failures, sudden asset cost adjustments and disturbances to external and credit flows of finance.

Berthold and Stadtmann (2018:44) concur with Claessens and Kose (2013:12-13) and Glick and Hutchison (2011:2-4) who explain the causes of a crisis are frequently grouped as models. A first-generation model is when there are inconsistencies present within the macroeconomics inland policies, the collapse of the fixed exchange rate and also included the breakdown of the Bretton Woods system early 1970 (Goldstein & Razin, 2015:156). When deficits are identified government has one of two options to either:

- fund the budget deficit through borrowings, or
- drain their foreign reserves.

The indefinite application of one of these options or both is not realistic. Government's last resort will be to create money, which has its own consequences (Selgin, 2015:1). Additional creation of money creates excess money that prompts inflation that effects the exchange rate merely because government was unable to keep it fixed, hence the breakdown of government is predicted as unavoidable by the first-generation model.

The second-generation model is when the cost and benefits from shielding the currency taken outweigh the benefit. Goldstein and Razin (2015:156) indicate at this point in the early 1990s the European Exchange Rate Mechanism and the first-generation model no longer seemed suitable. The question is whether government is keen to give up an exchange rate target or would they rather sustain it. Once government decides to sustain the exchange rate target, speculative attacks will be on the horizon. This is even when there are no irregularities between the exchange rate commitment and the current policy.

The third-generation models have identified as market distortions. These market distortions came in different forms prompting the financial crisis being unfounded exchange rate expectations. When emerging economies were hit by a wave of crises in late 1990's. According to Goldstein and Razin (2015:156) due to a combination of

collapses the distortions identified being credit constraints, capital, collateral constraints and government bailouts. This model is therefore difficult to characterise. Table 2.1 below gives a synopsis of some of the market distortion authors have identified.

Table 2.1: Third-generation model market distortions

Author	Year	Distortion
Aghion, Bacchetta and Banerjee	2001	**Credit constraints**: Cost of the foreign currency debt commitment increase due to devaluations of currency, profits are dropped, which restricts the ability of borrowing.
Chang and Velasco	2002	**Unrestricted capital markets**: Banks have investments that will not be able to be converted into cash in bank run events due to their long-term illiquid investments, yet they issue deposits in domestic and foreign assets in economies that have no capital market restrictions highlighting self-fulfilling global liquidity crisis likelihood.
McKinnon and Phil	1996	**Collateral constraints**: Both foreign and domestic credit expansion are involved to persuade banks to stimulate lending boom. Interest rates response by increase interest rate before and at the moment of a financial crisis and reduce the interest rate after the financial crisis.
Braggion, Christiano and Roldos	2005	
Dooley	2000	**Government bailouts**: Banks are exposed and vulnerable to crisis through implicit and explicit government guarantee bailouts.
Burnside, Eichenbaum and Rebelo	2004	

Source: Berthold and Stadtmann (2018:44), Goldstein and Razin (2015:156), Claessens and Kose (2013:12-13) and Glick and Hutchison (2011:3-4)

Table 2.1 indicates the third-generation model focuses on the distortion within the banking system and financial markets, these distortions can lead to currency crisis. Not all researchers characterise their opinions of crisis causes. Reinhart and Rogoff (2008:1) indicate that distortions can be identified as currents accounts with large deficits, inflation of assets prices, economic growth slowly developing. It displays almost all signals that the country is on the brink of a financial crisis. Aiginger (2009:1) stated “The root of the crisis is not to be found in the financial sector but also in the macroeconomics imbalances, in regulation failures and insufficient policy coordination”. Reinhart and Rogoff (2009b:1) opine equity prices, housing, government income and expenses and unemployment as

the similarities that developed and developing have in common as a result of the aftermath of a crisis. Portes (1999:3) identified more than one distortion and refers to the distortions as proximate or initial causes of financial crises:

- Speculative attack on the exchange rate – Here we must distinguish between attacks based on deteriorating “fundamentals” and those that exhibit self-fulfilling expectations
- Financial panic – A bank run or its international analogue – in this case, no degree of “transparency” or better information will eliminate herd behaviour, which is based on a collective action problem.
- The collapse of an asset price bubble.
- A crisis induced by moral hazard (implicit or explicit guarantees of bailout).
- The recognition of a “debt overhang, followed by a disorderly workout”.

These are but only some of the market distortions identified can be used as early warning signs guidelines. These signs can be beneficial when close surveillance of the warning sign is done. Brief summary of the generation being the triggers at an economy level is illustrated in Figure 2.4 below

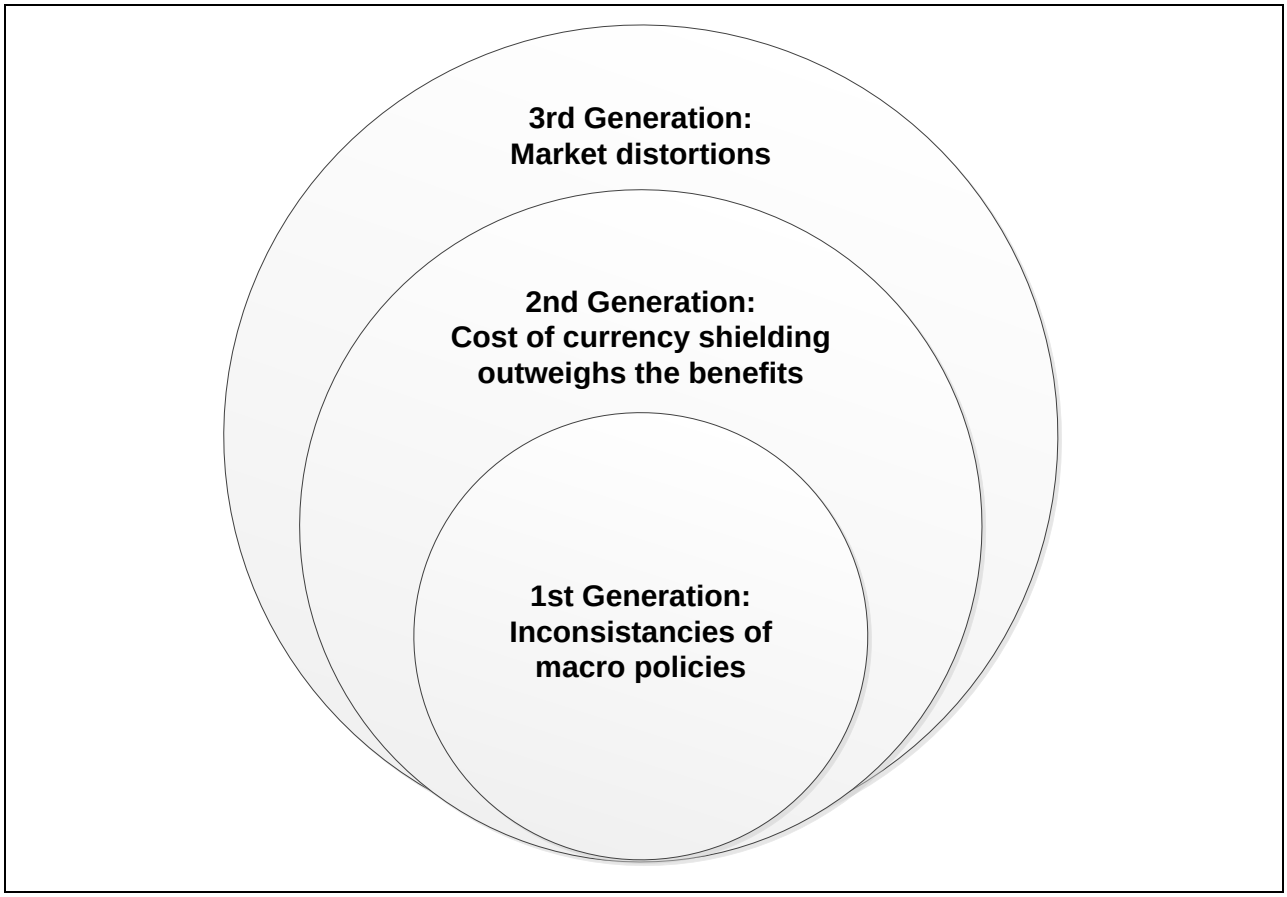


Figure 2.4: Triggers at an economy level

Source: Author

The purpose of Figure 2.4 is to understand the triggers holistically, from an economy level. Therefore, it is imperative for these triggers to be identified at both business and economy level.

2.2.5 Early warning signs

IMF (1998:88-89) supported by Claessens and Kose (2013:10) states that it is exceptionally impossible that a set of indicators could be identified that could identify future crises sufficiently, early and with a high level of certainty. It seems helpful to explore whether there are variables that have consistently related to crisis vulnerability. In circumstances where an economy faces the risk of a crisis being activated by changes in the economic conditions, such indicators of vulnerability could be very useful. Pham (2017:1) concurring with Glick and Hutchison (2011:10) and the IMF (1998:88), who assesses it is possible to identify these vulnerability indicators if close attention is paid to

the similar behavioural patterns that appeared in past crises. A summary of the vulnerability indicator in four sectors namely fiscal, financial, external and real is given in Table 2.2. The vulnerability indicators shed light to early warning signs. These indicators are not a one-size-fits-all but differ from sector to sector.

Table 2.2: Vulnerability indicators within different sectors

Sector	Vulnerability indicators			
Fiscal	Fiscal deficit	Financial and trade openness	Government consumption	Credit to general public sector
Financial	Private sector credit developments	Domestic interest rate structure	Foreign financing needs	Bank assets' quality are measured by the degree of non-performing loans
External	Current account balance	Changes to trade terms	Domestic and foreign interest rate differences	Changes in the level and development structure of foreign capital inflows
Real	Output growth rate	Unemployment rate	Political advancements	Overvaluation of real excha rate

Source: Pham (2017:1), Glick and Hutchison (2011:10) and IMF (1998:88-89)

Table 2.2 points out the sectors and the vulnerability indicators within each. These are not cast in stone that certain indicators are allowed to surface in designated sector. Vulnerabilities can manifest within various stages on their development in various sectors also bearing in mind that problems in one sector are highly likely to spread to another. When these vulnerabilities manifest simultaneously, they could lead to a catastrophic effect within the economy.

2.2.6 Global financial crises the catastrophic build-up to bankruptcy

Madubeko (2010:3-4) referred to the 2007's global financial crisis as being the Tsunami of all business failures. Even the global financial crisis was not an isolated event but rather events that occurred over time. Kamiya (2018:721-722) concurred with Jackling (2009:2) that many people were able to buy houses they were unable to afford in reality. Subprime balloon payment loans (loans with unfavourable condition e.g. high interest rate) were awarded to many borrowers with questionable credit. The US Federal Reserve allowed

this through relaxed US mortgage lending policies and government entities (Fannie Mae and Freddie Mac) guaranteed these mortgages (Acharya *et al*., 2017:2).

Amromin, Huang, Sialm and Zhong (2018:1975) explain the subprime mortgages were a popular borrowing instrument during an aggressively confident housing market. The mortgage loans were financed through quick and easy terms, borrowers were able to speculate. These credit standard housing policies created abundant credit behind the scenes, low-interest rates and rising housing prices, raising the house prices to levels they were unable to maintain (Wray, 2008:3).

In 2006–2007, according to Wray (2008:3), interest rates started increasing and house prices started to drop. At this point the financial markets players were real estate, insurance brokers, appraiser and regulators, borrowers were unable to repay, or refinanced as promised. The banks stopped transacting with each other as the loans were backed by worthless mortgage collateral, brought on a severe shock to the financial system and banking system. Rugh (2019:1) identified a dramatic increase in defaults and mortgage foreclosures were created when interest rates were reset at a higher rate, borrowers were unable to repay or sell their homes causing a catastrophe in housing market prices. Wray (2003:3) remarks that the regulatory system at this point in time was unable to contain the repercussion causing a domino effect. This was the conception of the financial bubble.

Kamiya (2018:721) explains the bursting of the housing bubble triggered the financial crises. The banking system was experiencing a crisis due to bankers losing trust in each other and stopped inter-lending and systematic crisis due to the different markets effected (Lioudis, 2019:2). The burst was caused when the financially distressed homeowners' debt exceeded their repayment abilities and debt relief refinancing became a way for the financially distressed homeowners to avoid losing their homes. When refinancing was no longer an option relief was found in bankruptcy, little stigma and low cost were attached to bankruptcy filing (Kamiya, 2018:721-725). Opening the door to high asset debt and high-income debtors also taking advantage of bankruptcy. The banking law had to raise these costs in order to reduce the number of bankruptcy applications (Amromin *et al*., 2018:1975–2007).

Early warnings were given beforehand yet in the midst of the storm when the bubble burst many companies found themselves on the brink of bankruptcy and blame was casted. According to Madubeko (2010:3) and Kaganov (2019:256), some of the accusations were a lack of government supervision, the greed of lenders, borrowers being misled into taking loans they were unable to afford, and appraisers escalated house values. Borrower's borrowers also got the blame for over-stating their income on their applications, knowing well that they will not be able to meet their payment commitments. The financial bubble was created and burst regardless of the various warning of the risk of the subprime mortgage, some of the warning being given were:

2000: by Edward Gramlich the governor of the Federal Reserve from 1997 to 2005. Gramlich suggested to Alan Greenspan the chairman of the Federal Reserve to audit the finance lenders to consumers as greedy lending has become alarming. Alan Greenspan opposed it (Ferguson & Johnson, 2009:13).

2003: "The boom in housing prices cannot last forever, when it falls great losses will be experienced in mortgage loans", these were the words by Congressman Ron Paul to the House of Financial Service Committee also in an attempt to try and warn of the effects on the housing bubble (Paul, 2008).

2005: An economist Dean Baker gave a warning of the housing bubble on 25 August 2005.

2005: As former Federal Reserve chairman Alan Greenspan told Congress in June 2005: "I think we've learned very early on in economic history that debt in modest quantities does enhance the rate of growth of an economy … but in excess, creates very serious problems" (Foster and Magdoff, 2009:49).

2006: Med Jones a strategic expert gave failure prediction warnings of the housing bubble on 2 June 2006. Peter Schiff an investment manager also gave a warning on 16 December 2006. Merrill Lynch an analyst also warned how the subprime investment will eventually cause companies to suffer.

Wyman (2011:6) states the 2007 global crisis was not the last, regardless of a relative calm period prior to 25 years. Even though business has suitable safeguards in place

their main focus has been to survive. The truth be told even with appropriate buffers in place companies still shift into survival mode according to Baxter (2009:113). Survival mode take radical action by overreacting to information. Global financial crises have the tendency of rendering economies unable to sustain financial stability that leads to bankruptcy. It is submitted that a bankruptcy prediction model can possibily buffer this overreaction to information by indicating to the investor that there is not threat to their investment yet. Different financial crises could also be a good indicator of trouble these crises are normally brought on by the common triggers and warning signs not identified timely. By means of human intervention if the triggers are not indentified or warnings sign are misread could result in panic of business and consumers. Lack in business confidence, lack in consumer confidence and spending alternatively effects the finanicla performance of a company leading to bankruptcy.

Predicting bankruptcy is the focus of this study, the aim is to develop a bankruptcy prediction model able to timely predict bankruptcy. This could allow companies to take corrective action. For this to be realised bankruptcy should first be investigated, understanding where it comes from, what it is, how it is cause and its different categories.

2.3 BANKRUPTCY

Rajkumar and Adukia (2015:13) explain that some people believed that the term bankruptcy originated from the Italian term “banco rotto” which means broken bench. It is said the financial concept originated in Florence, Italy. The Ponte Vecchio, a well-known medieval bridge over the Arno known for having shops built along with it. When a vendor failed or was unable to meet his repayment obligations, the bench that was used to do business (the "banca") was physically broken ("rotta") and this was called "bancarotta" (broken table). This was done to inform the public that he was not able to sell anything more to anyone, as he was bankrupt.

Bankruptcy is a threat to all businesses, and it makes no discrimination to size, nature or age of a company. Charitou, Neophytou and Charalambous (2004:465) refer to bankruptcy as being “one of the most significant threats for many businesses today, despite their size and the nature of their operations”. Tuvadaratragool (2013:32-33) explains bankruptcy does not only threaten the livelihood of the company effected and its

stakeholders but it also tarnishes relationships. Management and employees' employment are threatened as their service could be terminated. Creditors face threats to financial losses due to the debtor (bankrupt company) being unable to meet their financial commitments. Suppliers are confronted with a reduction in production if a bankrupt company was their major customer. They may also have to reduce the credit terms or even stop supply completely. Customers could be met with the lack of availability leading to them losing business, resulting in low sales due to customers taking their business elsewhere because of slow or late deliveries. Shareholders and investors are then faced with potential financial losses due to the loss of their financial injection or investment within the bankrupt company.

2.3.1 Definitions of bankruptcy

Bankruptcy is triggered when a company is unable to repay its debt due to inadequate cash and can no longer acquire any additional financing, also known as inadequate financial flexibility (Mossman *et al.*, 1998:37). For a very long-time bankruptcy prediction has been a controversial issue in financial research. Muller, Steyn-Bruwer and Hamman (2009:22) identify a major concern in the field of study is the absence of consensus on referring to bankruptcy as bankruptcy is known for its many forms namely insolvency, distress, corporate failure, collapse, liquidation, default, failure and closure. Dimitras, Zanakis and Zopounidis (1996:487) state that the literature contains many different ways in which failure can be defined. A company's specific condition determines the definition used by a researcher and therefore the definitions used are not uniform.

Beaver (1966:71) on the other hand uses the term financial distress and defines it as an overall failure, a company being incapable of meeting their current financial obligations. Beaver (1966:71) continues stating operationally a company has failed in the presence of either an overdrawn bank account, bankruptcy, bond non-payment or divided payment defaults.

Queen and Roll (1987:9) mention that financial distress is when a publicly listed company (from here on referred to as non-failed) goes private or be suspended from trading and Coats and Fant (1993:147) opine it being the liquidation, acquisition, privatisation and any

reason of the non-assurance of a going concern of a company and bankruptcy just being one of the financial distress consequences.

Gilbert, Merion and Schwartz (1990:161) are of the opinion that not all risky companies fail. There are risky companies that survive and in agreement Hill, Perry and Andes (1996:60) are of the view that bankruptcy is not always the end result of distressed companies due to their financially weak status.

Kahya and Theodossiou (1999:7) argued that when it is based on a debt default criteria such as attempts to renegotiate debt with creditors.

Routledge and Gadenne (2000:234) refer to financial distress as a company being reorganised or reconstructed while Jones and Hensher (2004:1020) argue it is the inability of a company to pay the required listing fees annually.

Altman and Hotchkiss (2006:4) use the term business failure and defines it as "the realised rate of return on invested capital is significantly and continually lower than prevailing rates on similar investments".

Muller *et al.* (2009:22) notion is supported by DePamphilis (2019:13) write financial distress can either be absorptions, mergers, liquidations, delisting or major changes to the structure of a company. According to Van der Colff and Vermaak (2015:244), this has not changed.

Financial distress according to section 128 (1) of the Companies Act 71 of 2008 is as follows:

"(i) It appears to be reasonably unlikely that the company will be able to pay all of its debts as they fall due and payable within the immediately ensuing six months;

or

(ii) it appears to be reasonably likely that the company will become insolvent within the immediately ensuing six months."

Bankruptcy is a legal process that is entered when a business publicly acknowledges their inability to pay their debts or unable to recover from their losses they have incurred. The only way is to bow out in whichever form it be reorganisation, reconstruction, suspension from trading, privatisation, debt renegotiation, liquidation. Furthermore, companies with the inability to continue, is a growing concern as result of being through financial structure collapse, mergers and JSE-delisting. (Van der Colff & Vermaak, 2015:244).

2.3.2 Evolution of bankruptcy

Charalambous, Charitou and Kaourou (2000:404-425) state bankruptcy is an ordeal on its own, the economic cost that is associated with it just before its fall is remarkable. Charitou *et al.* (2004:466) in agreement add that not only is the business itself affected by such a turn in events, it also severely affects the stakeholders known as the investors, creditors, management and employees within the company. Ijaz, Hunjra, Hamseed, Maqbool and Azam (2013:863) scribe that the financial losses caused by bankruptcy is not only financial but also contains non-financial losses, which include legal proceedings that goes hand in hand with the reorganisation of bankrupt companies. Giordani, Jacobson, Von Schedvin and Villani (2015:1071) point out that bankruptcy influences unemployment, financial stability within different markets and economic growth.

Muller *et al*. (2009:21) opine that many organisations started focussing on corporate ethics and governance triggered by the collapse of WorldCom, Enron and Arthur Anderson. The focus was brought on with the aim to reduce the corporate risk of financial distress. Even though corporate ethics and governance have become a financial distress prevention podium, creditors and investors still prefer early failure prediction and detection as it is able to protect their financial investment and this could have been the case with VBS Bank and Steinhoff international (Rossouw & Styan, 2019:163-170). Charitou *et al.* (2004:466) explain the increasing need for reliable and early bankruptcy detection models have intensified. The genealogy of bankruptcy models can be trailed as far back as 1966 primarily introduced by Beaver. It is crucial that the model inherently possess the ability to promptly and accurately detect failure before it occurs. It enables preventive or corrective remedies to be applied in order to promote confidence within the different industries, encouraging effective crisis management.

Outecheva (2007:29) support by Ijaz *et al*. (2013:864) emphasises that failure occurs over a period of time and not suddenly, with the passing of time the growth and seriousness increase in phases and the phase closes to failure is the most significant. It is therefore crucial for any financial distress or signs thereof to be detected as early as possible. The later it is detected it may be impossible to apply any remedial action and the only outcome could be bankruptcy.

Alaka *et al*. (2018:178) opines financial variables alone are not able to sufficiently predict failure. Liang, Lu, Tsai and Shin (2016:562) agrees that a combination of both financial and non-financial variables (as indicated in Table 2.3) being macro-economic variables tend to enhance bankrupt prediction modelling to better perform than when the model only includes financial variables (Lin, Liang & Chu, 2010; Chen, 2019). Therefore, it is important to incorporate both financial and non-financial variables. Even though this study is financial variable dominant the non-financial variable will not be ignored.

2.3.3 Causes of bankruptcy

Becchetti and Sierra (2003:2099) state that better prediction of a company financial health is obtained from using traditional financial ratios in combination with non-financial data than when traditional financial ratios are applied in isolation. According to Slotemaker (2008:22). non-financial data have predictive power significance. Argenti (1976:153-163) is the initiator and author of the trajectories process, being the identification of different business types and the consequences of failure based on non-financial factors. Weak corporate governance is due to the absence of transparency, lack of accountability with no sense of conviction and commitment. Poor management is seen as one of the bases of failure among causes (Vita, 2019:15). This is caused by incompetence, maladministration, misconduct and management self-interest (Yadav & Chakraborty, 2016:50). Hlahla (2010:7) alludes to the trajectories as pathways taken by companies that generally fail. Each trajectory phase has its own weakness.

Cassim (2015:10-12) explains at the first trajectory being a typical start-up newly formed company that will probably fail within five years, unskilled management is their weakness. A company in its early phase is referred to as the second trajectory this type of company's weakness is their sharp drop after an abrupt growth as no attention is paid to growth

management. The third trajectory is the established companies that have been trading successfully for decades. Their weakness being companies that are set in their ways and do not react to environmental transformation. Ooghe and De Prijcker (2008:233-238) adopted this model from Argenti and added a fourth failure process category: an apathetic established company in addition to an unsuccessful start-up company, ambitious growth company and dazzled growth company. According to Ooghe and De Prijcker (2008:233-238), the apathetic established growth company weakness is the lack of motivation, commitment and strategic rewards by management. The symptoms of different trajectory phases differ, and the imperfections based on non-financial causes being management and corporate culture of companies are highlighted in Table 2.3 below.

Table 2.3: Causes of bankruptcy

Trajectory			
	1	2	3
Company phases	Start-up	Growth	Mature
Symptoms	Newly formed fail within five years	"Know-it-all" not open to advise	Growth company
Imperfections			
Management			
Skills	Unskilled	Erroneous sale estimations	On par
Competence	Inadequate	Absence of financial background	On par
Style	Autocratic/Rash	Risk lovers/ Persuasive	Over-optimism
Motivation	Short-lived	Enduring	Very motivated
Corporate culture			
Overall plan	No advantage	Improper	Poor financial planning
Business expense	No imperfections	Overstated	Expertise deficiency
Finance	No adjustment made to environmental	Not modified	Immensely geared

Source: Agbasonu and Osuagwu (2015:113) and Hlahla (2010:9)

There are many reasons for bankruptcy, businesses fail being one of them, but generally, it is inadequate risk management. Table 2.3 summarises the causes of failure at different phases in the life cycle of a business and the symptoms linked to the phases indicating the specific risks companies need to be on the lookout for. Agbasonu and Osuagwu (2015:113) of one mind with Hlahla (2010:7-8) begin by explaining that companies can be categorised into three phases being the start, growth and maturity phase. Within these different company phases, the signs or reason behind failure have been defined as "symptoms". The imperfections being the major causes have been identified as

management and the culture of the corporation. A further split has been identified as management skills, management competence, management style and management motivation. Subject to the culture of the corporation was the overall plan, business expenses and finance (Vita, 2019:16-17). Taking all these aspects into consideration researchers have identified and ranked the bankruptcy symptoms. The ranking was based on researchers' personal opinion of bankruptcy symptoms with the aim to formulate bankruptcy prediction models able to detect or curb bankruptcy early on.

Hlahla (2010:7) supported by Yadav and Chakraborty (2016:50) indicates there are various reasons companies fail and it is not limited to the phase companies were in, symptoms or imperfections a combination of all three is possible, not one specific reason has been identified. Reasons being management skills, competence, and style could influence business failure as well as corporate culture. The financial data collected for symptoms this study has revealed the results of the failed companies were bankrupt, the The reasons for failure were not explained within the study as the build-up to bankruptcy was not due to one specific reason.

Bankruptcy does not discriminate between countries if the correct systems are not in place the repercussions will be the same regardless of the country. The only difference between countries is the term used, the packaging differs but the content remains the same.

2.3.4 Continental perspective of bankruptcy

According to Rajkumar and Adukia (2015:3), a company's financial statements could give contradicting results. The same financial indicators could have different results depending on the financial statement. The cash flow may suggest the company as being insolvent while the company's statement of financial position indicates solvency. This happens when the non-current assets affect the cash flow negatively when it increases without negatively affecting the statement of financial position. These two terms are synonymous as though they both deal with when liabilities exceed assets. Due to the similarities, we will look at bankruptcy and legislation in the United States, the United Kingdom and South Africa. The reason for selecting USA, UK and SA is:

- Foundation of the legal system of these countries (USA, UK and SA) are all built on the English Common Law and applied similarly (Nagel, Boraine & de Villiers, 2015:4-10).
- Jurisdiction similarity. Bankruptcy within all three countries consist of the same procedures. Investopedia (2020b) bankruptcy is a legal proceeding involving individuals or companies that are unable to repay their debt. The process and the aim being the same. A court proceeding is set for both bankrupt individuals and bankrupt companies, the only difference is in the different terminology used in legislation (GovUK, 2020; Mabe, 2019:1). Refer to Table 2.4 below.

United States

Adukia (2015:18-19) describes the United States Constitution which permitted Congress to enact "uniform laws on the subject of bankruptcies throughout the United States." The Code has been amended subsequent to 1978, entities were allowed to file a petition for relief under a number of different chapters of the Bankruptcy Code when seeking relief. This depends on the different bankruptcy cases and is normally referred to by the chapter under which the petition is filed. For general provisions it will be Chapter 1, Chapters 3 for case administration, five is used for creditors, debtors, and the estate, Chapters 7 is for liquidation, nine deals with the adjustment of debts of a municipality, 11 with reorganisation. Chapter 12 is used for the adjustment of debts of a family farmer or fisherman with regular annual income, 13 for the adjustment of debts of an individual with regular income and 15 used for ancillary and other cross-border cases.

United Kingdom

Adukia (2015:37-40) explains the United Kingdom's insolvency law regulates companies in the United Kingdom that are unable to repay their debts. While the UK bankruptcy law is concerned with the rules for natural persons, the term insolvency is generally used for companies formed under the Companies Act 2006. "Insolvency" means being unable to pay debts. Since the Cork Report of 1982, the cutting-edge policy of the UK insolvency law has attempted to rescue a company that is in financial trouble, to minimise misfortunes and fairly distribute the burdens between the community, workers, creditors and different stakeholders as a result of business failure. If an organisation cannot be

saved if it is liquidated, The Insolvency Act 1986 basically governs issues relating to personal bankruptcy, liquidation, Individual Voluntary Plans and every single authoritative request identifying with company insolvency.

The Insolvency Act 1986 deals with the insolvency of individuals and companies. The Act is divided into three groups (which is separated further) and 14 Schedules. The reason why the UK has been included in this section is due to their 49-year relationship with the European Union and during the period of this study the UK was still part of the EU.

South Africa

Burdette (2002:34) states corporate insolvency was an anonymous concept amid the early period of the insolvency law of South African. The evolution of company law only begun to advance from the mid-nineteenth century onwards. The South African insolvency law is neither immaculate Roman-Dutch (normal) law, nor unadulterated English law. South African common law, comprising the Roman-Dutch law and the judgements of the courts, it forms the basis of the non-statutory insolvency law still applicable to this day. According to Adukia (2015:60) supported by Levenstein (2016:8), business owners in South Africa become personally liable for the business' debts that had at any stage traded while insolvent. Key Legislation:

- Companies Act 61 of 1973, Chapter XIV; replaced with Companies Act 71 of 2008
- Insolvency Act 24 of 1936
- Constitutional Act 108 of 1966

All of the above-mentioned countries' legislation regarding bankruptcy is categorised. The basis of the categorisation is as follows: for the USA it is chapters, while the UK groups, that are subsequently divided into parts and South Africa, it is acts. Due to the diversity within the countries, a one-size-fits-all approach cannot be applied. The diversity is evident within the figures released by Trade Economics (2019), the maximum company bankruptcies in the USA at 24 985 companies, UK 3 575 companies and SA with the lowest amount of company bankruptcies at 159 companies. Table 2.4 relates to theoretical objective (Section 1.5.2, v) and provides details regarding the legal perspectives of bankruptcy of the USA, UK and SA.

Table 2.4: Bankruptcy chapters

Bankruptcy – Foundation: English Common Law								
United States of America (USA)			**United Kingdom (UK)**			**South Africa (SA)**		
Ch	**Type**	**Description**	**Divisions**	**Part**	**Type**	**Act**	**Section**	**Type**
1	General provisions		1	7	Insolvency: Company	Companies Act 71 of 2008	S80	Insolvency: Company
3	Case administration		2	4	Insolvency: Individual	Insolvency Act 24 of 1936		Insolvency: Individual
5	Creditors, debtors, and the estate		3	8	Miscellaneous matters bearing on both company & individual insolvency	Insolvency Act 24 of 1936	S9	Creditors, debtors, and the estate
7	Liquidation	• When a debtor has difficulty in repaying debts due • Unsecured debts • Cannot apply if income is insufficient	Schedules	14	Power of different participants with a vested interest	Companies Act 71 of 2008	S80	Liquidation

Bankruptcy – Foundation: English Common Law								
United States of America (USA)			**United Kingdom (UK)**			**South Africa (SA)**		
9	Adjustment of debts of a municipality	• Only applies to municipalities • Allows for their reorganisation				Constitutional Act 108 of 1996	S80	Adjustment of debts of a municipality
11	Reorganisation	• Reduction in debt application • Apply through reconstruction • Debts needed in the continuation of operations. • Apply under this chapter if when over Chapter 13 debt limitation • Unsecured debts				Companies Act 71 of 2008	S133	Reorganisation

Bankruptcy – Foundation: English Common Law								
United States of America (USA)			**United Kingdom (UK)**			**South Africa (SA)**		
12	Adjustment of debts of a family farmer or fisherman with a regular annual income	• Only for debt adjust of a family farmer or fisherman						Adjustment of debts of a family farmer or fisherman with a regular annual income
13	Adjustment of debts of an individual with regular income	• Reorganisation of debt • Secured debt • Debt should not exceed a certain amount • Bankruptcy code allows the debtor a maximum 5-year period to pay the debt				Insolvency Act 24 of 1936	S18A	Adjustment of debts of an individual with regular income

Bankruptcy – Foundation: English Common Law								
United States of America (USA)			**United Kingdom (UK)**			**South Africa (SA)**		
15	Ancillary and other cross-border cases	• When debtors have both assets and debt in the United States and in another place						Ancillary and other cross-border cases

Source: Adukia (2015:14-19), Companies Act 71 of 2008, Insolvency Act 24 of 1936, Constitutional Act 108 of 1996

Table 2.4 illustrates there are different categories of bankruptcy with the same process and only the wording differs. The aim of including legal perspective in the study is to indicate that perspectives of bankruptcy is similar according to Bryant (2019:10) within USA, UK (first world countries – developed country) and SA (third world country – developing country) only the terms differ, supporting the basis on which the study is built to develop a bankruptcy prediction model able to outline the similarities for the same purpose being bankruptcy. The intention is to align this study's bankruptcy prediction model's foundation with the foundations already laid by the first world countries and capitalising on models used by these first world countries with the aim of the third world striving to become first world. It is submitted that economy types based on first world and third world do not influence the bankruptcy proceeding from a legal perspective. This finding enables the researcher to construct a predictive model that is not only within the SA context but also be universally applied regardless of the world order.

2.4 SUMMARY

This chapter commenced by defining and naming the different crisis as per the literature conducted. These crises can be further divided into either a systematic financial crisis, foreign debt crisis, balance-of-payment crisis, currency crisis, banking crisis, twin crisis, triple crisis or contagious currency crisis and a combination of these crises can snowball into a global financial crisis. A historical overview of the global financial crisis conveyed through portraying global financial crises events and the crises within continents. The chapter continued by indicating common triggers and causes of financial crisis also and the early warning signs to be watchful for paying attention to the crises leading build up to bankruptcy. The next section focussed on the review of bankruptcy indicating some of the different term available in literature, followed by bankruptcy evolution, bankruptcy is not a single event but continuous underplayed financial situations or conditions. The progression of bankruptcies overtime portrays corporate gaints, Enron, Worldcom, and in South Africa, Steinhoff International indicate there are various reasons. Which include financial, non-financial and state of the ecomony that plays a role in company collapse, this study focus is on the financial aspects only even though non-financial aspects and the state of the ecomony are major players. The causes and categories of bankruptcy

were examined in order to provide brief knowledge and background to bankruptcies. As bankruptcy needs to be understood to be able to be predicted.

CHAPTER 3
REVIEW BANKRUPTCY PREDICTION MODELS

3.1 INTRODUCTION

The attempt of timeously predicting bankruptcy has been around since 1930 when Fitzpatrick (1931) with the absence of statistical techniques aimed to explore symptoms of corporate failure by utilizing financial statements and doing a comparison of financial ratios and trend percentages of the failed companies. This opened the door to many bankruptcy prediction models' studies to come. With the intention being the same, predicting bankruptcy Beaver (1966) developed first bankruptcy prediction model called the univariate model, Altman (1968) followed suit developing the Z-score model. The difference in the models was the approach, Beaver (1966:100) use the univariate approach analysing one variable at a time and Altman (1968:592) applied a multiple discriminant analysis known as (MDA) approach, when several variables can be analysed simultaneously.

Timely and accurate bankruptcy prediction is vital to our economy as bankruptcy has the ability to be catastrophic and detrimental to financial markets and stakeholders due to the fact that there are multiple factors that can contribute to bankruptcy (Van der Colff, 2017:27). Becoming even more imperative due companies functioning in a globalised and complex society increasing the potential to affect a company's financial position. The constant and rapid changes in the economic conditions, political environment, technology and regulatory policies could have dire consequences for companies already experiencing financial difficulty, opening the door to possible company bankruptcy (Van der Colff, 2017; Cassim 2015, Hlahla 2012).

The demand for more timely identification of bankruptcy has increase as not only does bankruptcy have a ripple effect within an economy but is also very costly and is of great importance for stakeholders to identify bankruptcy or the warning signs there to be able to take timeous and appropriate remedial action in order to alleviate or at least buffer the financial effect (van der Colff, 2017:29; Hossari, 2006:107). Bearing in mind in some instances regardless of all stakeholder efforts bankruptcy is inevitable (Correia *et al.,* 2015:1.16).

It is evident due to the increase in research in the field of bankruptcy prediction modelling the aim is to develop a bankruptcy prediction model with the ability to timely and accurately predict or detect financial distress. Failure ultimately bankruptcy has not been developed yet, therefore this study aims to develop a South African generic BPIA that is easy to use and apply by all stakeholders.

As graphically reflected in Figure 3.1 this chapter is divided into the following sections. In Section 3.1 an introduction to the study is given followed by the historical overview in Section 3.2. Subsequently, Section 3.3 and Section 3.4 discuss the history of financial ratios to date of this current study. Section 3.5 addresses studies of international and South African bankruptcy prediction models followed by the South African shortcomings. Section 3.6 and chapter is summarised in Section 3.7. Below is Figure 3.1 which provides a visual illustration of the overview of Chapter 3.

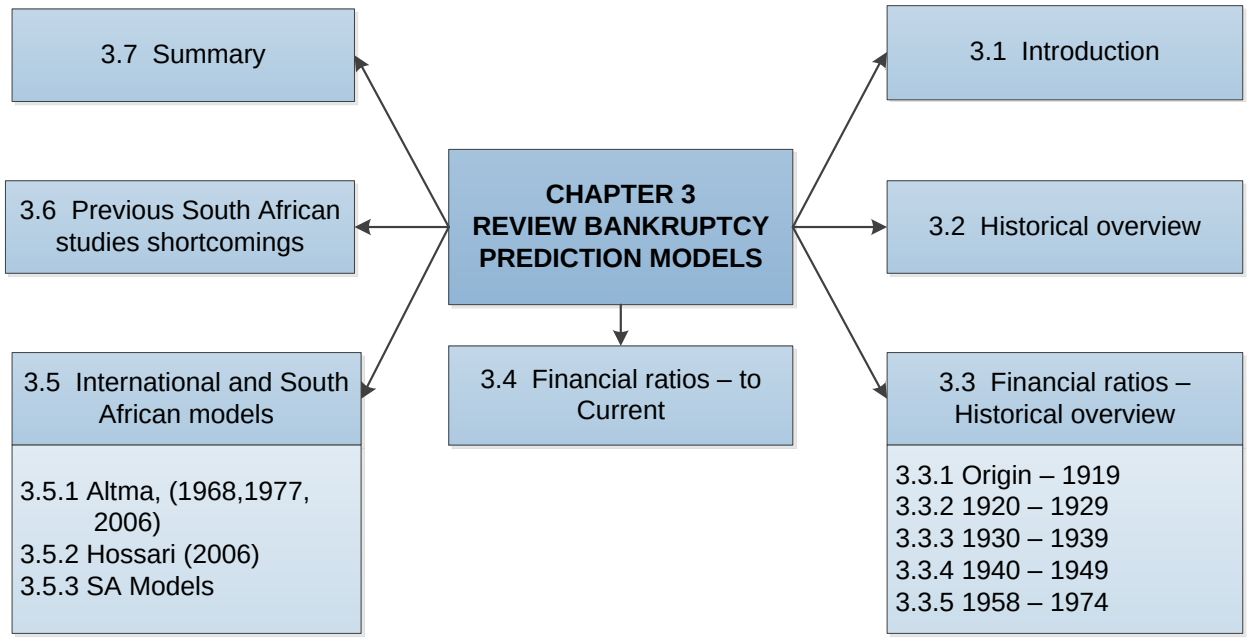


Figure 3.1: Overview of Chapter 3

3.2 HISTORICAL OVERVIEW

Over time numerous prediction models have been developed. Four models have been included within this study namely the financial ratio model, market return variation models, the market return model and cash flow model. These models have been tested using a

single sample and found that all the models one year prior to bankruptcy were statistically significant.

Mossman *et al.* (1998:36-37) illustrated that, there are four types of bankruptcy prediction models that contain descriptive or predictive abilities. The four models are:

- financial ratio models
- market return variation model
- market return models
- cash flow model

Mossman *et al*. (1998:38-52) explain that empirical models have the ability to discriminate between bankrupt and non-bankrupt companies before the event occurs. Be that as it may, these models (financial ratio; cash flow; market return; market return variation) are all inclined to predict bankruptcy. The outcome demonstrates that all the models are statistically important one year prior to bankruptcy. A test conducted on the four bankruptcy prediction models indicated no model can be singled out as being particularly reliable to differentiate between bankrupt and non-bankrupt companies.

The abovementioned models have been used by different authors for different reasons depending on their desired outcome. Altman and Hotchkiss (2006:251) emphasise the importance of these models stating, “none of the models may be excluded without a loss in explanatory power”. The financial ratios model is solely based on financial ratios. Pioneers; Beaver (1966), Altman (1968) and Blum (1974) in the field of study indicated that have found that this model financial ratio type delivers significant results especially when a company going concern status is evaluated (Cassim, 2015:14).

According to Slotemaker (2008:18), the cash flow model is a better predictor of business failure than the financial ratio model because cash flows are more closely connected to a company’s valuation. Bankruptcy is triggered due to inadequate cash flow and the inability to acquire additional funding. Companies experiencing detrimental changes have a better chance of survival, the greater their net cash flow is as cash flowis the top financial stability indicator (Correira *et al.*, 2015:5.9).

With the return variation model, Beaver (1966:8) has found equity (cash flow/total debt) and (total debt/total assets) is a stronger failure predictor than liquidity ratios. A positive relationship exists between financial distress and market returns (Malik, Aftab & Noreen, 2013:8). Mossman *et al*. (1998:38) supported by Cassim (2015:17) found that these models have prediction power. In the author's opinion, when these four models can be used in conjunction bankruptcy prediction ability will be greatly increased.

Table 3.1 below points out that different actions have been applied through bankruptcy prediction models, yet the aim is similar, to predict bankruptcy timeously. Altman and Hotchkiss (2006:251) refer to these models as different, but restrictive. The restriction being the bankruptcy prediction model's focus. The cash flow model focusses on cash flow as a bases, basically ignoring other variables, yet if a company's growth is not monitored the going concern assumption will be questioned. The market return focus is on the share price, if a company's profit is of no concern eventually an underperforming company will result in underperforming share prices. The market return variation model priority is equity is able to curb the losses shareholder and employees may suffer, but equity without solvency defeats the purpose. Mclaren (2019:63) explains financial ratios measure company performance revealing better understanding of a company's overall health. As financial ratios are the cornerstone of this study it is dealt with in more detail.

Table 3.1 gives a brief rundown of the four models mentioned.

Table 3.1: Bankruptcy prediction models

Name of model	Author	Year	Findings
Financial ratios	Altman	1968	Altman and Hotchkiss (2006:251) stated financial ratio models' groundwork was based solely on financial ratios. Mossman *et al.* (1998:52) found ratio-based models offer more positive results than the financial base variables model with only common variables, yet it does not perform as well as models constructed with only financial ratios. Hlahla (2010:8) calls attention that companies are faced with many different problems, for example, poor sales, poor profitability, poor cash flow, and poor liquidity. However, setting up financial ratios in place on their own will not defeat the problem. The managers in key positions need to have the ability to interpret the ratio that has been put in place in order for the ratios to be effective. Mossman *et al.* (1998:37) opine even though this model has been applied with favourable outcomes and yet no agreement exists as to which financial ratio can be prescribed as the best predictors of bankruptcy. Mossman *et al.* (1998:36-37) clarify that the financial ratio model is most effective to explain the likelihood of bankruptcy the year prior to bankruptcy.

Name of model	Author	Year	Findings
Market return variation model	Aharony, Jones and Swary	1980	Aharony, Jones and Swary (cited by (Mossman *et al.*, 1998:38), recommend a bankruptcy prediction model founded on the variance of market returns. According to Malik, Aftab and Noreen (2013:82) a positive relationship between financial distress and expected market returns has been found. However, Blum (1974:14) reasons that the market does not necessarily know the timing of business failure. According to (Mossman *et al.*, 1998:38), Aharony, Jones and Swary found that four years prior to bankruptcy being made public contrast was discovered in the performance variations in the behaviour of bankrupt and non-bankrupt companies. As bankruptcy draws closer the unpredictability of company return increase.
Market return model	Clark and Weinstein	1983	Clark and Weinstein (1983:504-509) established when a company files for bankruptcy, it is possible that its share market risk can be adversely adjusted and the shareholder's gains are then at the mercies of the courts. The month in which the bankruptcy was declared, the studies have revealed that shareholders experience escalating losses. Clark and Weinstein (1983) explain that shares that lose their value tend to suffer more losses. This was the outcome of their research comparing market returns shares, which become valueless and those that maintain some value before bankruptcy. According to Mossman *et al.* (1998:37-38) Beaver's (1966) research is of the first to find that bankruptcy is foreseen sooner when equity returns are used than when financial ratios are used in aim to predict bankruptcy. The findings of the research revealed that at least three years before bankruptcy, negative market returns appear.

Name of model	Author	Year	Findings
Cash flow	Aziz, Emanual and Lawson	1988	According to Lawson (1995:162) authors, Aziz, Emanuel and Lawson (1988) developed the first cash flow model of bankruptcy and the model is based on the essential finance principle being that the value of a company is evenly matched to the net present value of its expected future cash flows. Mossman *et al.* (1998:37) explain that tax on cash flow can be utilised as a warning to whether a company is financially fit or not. A financially fit company will be taxed on its income and a financially unfit company will not have income to tax. Slotemaker (2008:19) found cash flow information does not give added information over and above that of the accounting information. The cash flow from operations' information is misleading; as it is open to manipulation by management. Findings reveal that a cash flow model consistently discriminates between bankrupt and non-bankrupt companies from two to three years prior to bankruptcy.

Source: Malik, Aftab and Noreen (2013:82); Rama (2012:38); Hlahla (2010:8); Slotemaker (2008:19), Altman and Hotchkiss (2006:251); Mossman *et al.* (1998:35-53); Lawson (1995:162); Clark and Weinstein (1983:504-509) and Blum (1974:14)

3.3 FINANCIAL RATIOS – HISTORICAL OVERVIEW

Ratios have the ability to aid analysts through evening out the playing field by placing all companies on the same level. This is done based on companies' performance and not on market share, size of a company or sales volumes. Ratios also have the capacity to disclose beyond numbers. It reveals the liquidity of a company, how profitable a company is, whether a company manages its assets effectively. Also, whether a company's financing is well-balanced or if a company is over-geared or whether company is strong enough to survive and grow within the economy (Nadart & Wahar, 2019:2). A ratio also has the potential to identify trends within certain industries and this is crucial to determine industry norms or benchmarks. These being yardsticks against which other industry participants can be measured.

Financial ratios have been around for many years, some ratios utilised more than others. A synopsis is given in order to highlight important information and events. The following chronological scheme is followed:

1) Origin–1919
2) 1920–1929
3) 1930–1939
4) 1940–1949
5) 1958–1974, empirical and statistical studies.

3.3.1 Origin–1919

Brady (1999:5) explains that around 300 BC Euclid, a Greek mathematician, prepared and applied reasoning to geometry in a book he wrote: Book V of his elements. This was the origin of financial ratio analysis. Cambridge advance learners dictionary (2015:1177) explains a ratio is the relationship between two groups or amounts.

Nadar and Wadhwa (2019:2) scribe in 1890 financial statement analysis by creditors evolved and increased tremendously gaining significance. After the 1890s a distinction was made between current and non-current items, noticing the different financial statement items. This resulted in the development of the current ratio.

Brown (1955:13) points out during the second half of the nineteenth century America's commitment was towards industrial maturity. Stakeholders developed a need for financial statements as a result of the information overflow of the capital markets. The creditor's purpose during this period was to measure the ability of repayment while managements was to measure the company's profitability. Nadart and Wahar (2019:3) explains these functions of the creditors and management overlapped. In solution to this, elements of both these functions were adopted during the transfer of management from enterprising capitalist to being professionals. The purpose of managerial control increased greatly. The creditor's purpose within the financial ratio analysis development path differs from that of management.

Some important developments were formed within financial ratio analysis from 1913–1918, being the period post and during World War I, Carreras-Simó and Coender (2019:20) indicate financial ratios analysis became common practice to assess company management. These developments resulted in an increase in financial ratio analysis demand. These new financial ratios analysis developments being (Bordo & Haubrich, 2017:530; Brady, 1999:11 and Horrigan, 1968:185):

- Creation of a large ratio variety
- The 2:1 current ratio criterion being the most popular absolute ratio
- The employment of the Federal Income Tax Code of 1913
- The Federal Reserve System of 1914

Brady, (1999:11) points out that this was the first official study in ratio analysis by the end of this era. Regardless of these developments, not many analysts used ratios and if they did, they would mostly use the current ratio.

Podhorska and Siekelova (2020:1) share notion with Nadar and Wadhwa (2019:3), Wall (1919) has been perceived as the pioneer in ratio works known as the study of barometric, not on the grounds that he was the first to utilize ratios but because he was the first to introduce a ratio technique for analysis. This was his advancement within the field of study, moving from the use of a single ratio to multiple (seven different) ratios. Saus–Sala, Farreras–Noguer, Arimany–Serrat, and Coenders (2020:3) explains in the same period, Du Ponte (1919) a chemical company in the United States of America (USA)

began applying the ratio triangle pyramid framework aim to evaluate operating results obtained by comprehensively by means of three ratios and the ratios applied were:

- Return on investments
- Profit margin
- Turnover ratios

Nadart and Wahar (2019:3-4) state that the three ratios allowed management to exercise control leading to the improvement of the ROE. The management managerial efficiency was evaluated in the retail sector. These developments were credited to the study of Wall (1919). Important ratios have been developed during this period. In the following paragraphs the history of ratio analysis is summarised. It establishes an understanding on when which ratios were first used, relating to theoretical objective (Section 1.5.2, vii).

3.3.2 1920–1929

Bliss (1923) was a firm advocate that ratio analysis and with regards to the ratio analysis two school of thoughts exist. The first being ratio analysis as a crucial measure the other an artificial measurement of a business enterprise. Through his beliefs, Bliss (1923) displayed lucid ratio system, formed completely of ratios bound together in a systematically manner. The ratios measured cost and expenses, turnovers and earnings through applying ROE, current ratio, sales revenue and sales growth (Basu, Prakash & Waymire, 2004:3; Brady, 1999:13; Horrigan, 1968:287).

Gilman (1925:111-112), the first ratio analysis critic and as a result of his many difference in opinions regarding ratio analysis, presented the trend percentage analysis as its substitution. One of the researcher's disagreements was the accounting data limitation being the foundation of financial ratio analysis calculations. Doubting and disagreeing with the authenticity of the analysis due to ratio indicator diversity. Gilman (1925) opines that it cannot be said that financial ratios illustrate the relationship between businesses. This is due to the difference in time when the numerator and denominator variations are used as measurement and a holistic outlook of the company is not displayed. Therefore, it is important to reduce concern by applying the match approach when applying financial ratio analysis between companies. Companies are matched according to the industry

classification, asset size and statement date as per previous studies (Deakin, 1972; Blum, 1974; He & Kamath, 2006) (Tuvadaratragool, 2013:44). In line with the empirical objectives (Sectio 1.5.2, i) of this research the sales growth ratio was selected for use in this study.

3.3.3 1930–1939

Brady (1999:14) explains as an employee at the Dun & Bradstreet group Foulke (1930) was able to obtain industry data of 14 ratios that later became extremely significant as influential industry average ratios. The ratios selection criteria were based on years of experience (Foulke, 1961:176). According to Horrigan (1968:288), Foulke's ratios were published in the Dun & Bradstreet's monthly reviews, the three publications include:

- balance sheet ratios – August 1933
- sales ratios – May 1934
- net profit ratios – November 1934

Boigues (2016:12-13) mentions these ratios were referred to as "basic procedure for ratios analysis in USA".

Fitzpatrick (1931) conducted a study with 20 failed and 19 non-failed companies employed and a total of 13 ratios were used over the period 1920─1929 (Brady, 1999:15). According to Tuvadaratragool (2013:104), the findings indicate that ratio analysis can also be a valuable tool to assist stakeholders to identify business failure symptoms and not only predict it. In conclusion, all ratios have the capacity to predict failure to a certain degree. The two ratios superior in prediction of business failure were ROE and total equity to total debt, recommending companies with long-term liabilities, less importance should be place on the current ratio and quick ratio (Bellovary *et al.*, 2007:3). For the purpose of this study, the quick ratio from this period was selected for inclusion as the quick ratio is a good reflection of liquidity as it avoids inventory, which may be difficult to convert into cash (Cassim, 2015:208).

3.3.4 1940–1949

Boigues (2016:13) echoes in Merwin's (1942) study, a sample of 939 during the years 1926–1936 was used. Merwin analysed an unspecified number of ratios to determine a pattern of the previous six years on failed and non-failed companies sample selected. Bellovary *et al.* (2007:3) indicate that the results suggest three key ratios have been identified as best predictors of business failure, current ratio, net working capital to total assets and equity to total debt.

Beaver (1966) led an immediate investigation of the prescient force of proportions. Both studies directed by Beaver (1966) and Merwin (1942) could anticipate organisation disappointment up to five years, however, the factual systems after-effect of Beaver's (1966) study was all the more effective.

Ratio was still used during World War II (1940–1945). The importance of the ratio was not the ratio itself but rather the ratio's performance over time. An uproar was created (1950) when it was determined that the return on investment ratio could be used for the purpose of managerial analysis. The 1950s also considered the effects of different accounting procedures for example; First-in, First-out (FIFO) vs Last-in, Last-out (LIFO) have on ratios and the behaviours of ratios that pretend to measure the same thing (Brady, 1999:17). Ngwenya (2018:661) explains Beaver's study paved the way for statistical prediction models. Bellovary *et al*. (2007:1) describe Beaver's study is the most recognised univariate study. Therefore, the study by Beaver was selected as one of the seminal studies upon which this current study is based.

3.3.5 1958–1974

Empirical research and statistical analysis (quantitative methods) foundation were developed over the period. Studies over this period found the current ratio and working capital to total assets as good indicators of predicting business failure. Yet two studies over the same period found working capital to total assets is more useful in indicating growing company weaknesses than the current ratio (Nadart & Wahar, 2019:3; Anjum, 2010:126-127).

- Many of business failure prediction research is done.

- Seminal studies within the field of study were done by pioneers.
- All used the one-to-one match, otherwise known as the pairing approach.
- Comparison of financial statements of failed companies to those of non-failed companies' financial statements.
- WH Beaver (1966), Altman (1968), Edmister (1972) and Blum (1974).

Yet two studies over the same period found working capital to total assets is more useful to indicate growing company weaknesses than the current ratio (Nadar & Wadhwa, 2019:3; Anjum, 2010:126-127).

Even though there were other ratios created after 1974, the study thereof stopped in 1974 as these ratios up to 1974 are the foundation, it is still the basis of financial ratios today. The purpose of the timeline is to provide an indication of the foundation on which the study bankruptcy prediction model will be built. The financial ratio foundation creates the layout, structure and strength required on which this study's bankruptcy prediction model are formulated.

3.4 FINANCIAL RATIOS – TO CURRENT

According to Chen and Xu (2018:14) extensive research has been conducted, results different financial ratios have been used for different reasons. Chen and Shimerda (1981:51) posit diverse ratios are often embraced by different researchers. With the use of financial ratios being objective based on the researcher's judgement, there is one recurring question: "Which ratios among the hundreds that can be computed from available financial information, should be analysed to obtain the information for the task at hand?"

Wiersema (1998:40-42) posits inventory turnover is important (Cost of goods sold/Average inventory), suggesting a high inventory ratio indicates high cash flow, which in turn indicates that the business is thriving.

Trevino and Robertson (2002:83-84) accentuate the significance of the price earnings (PE) ratio (Share price/Average net income). Their view is that it is a demonstration of investors or potential investors' eagerness to invest and to determine whether a

relationship exists between P/E ratio and subsequent holding period of returns. It was found that the PE ratio is not helpful when predicting short-term returns (Khatwani, Raghuram, Agrawal & Upadhyay, 2019:30). In addition, in estimating long-term average returns the current P/E ratio is useful. Even so, the investors will not be capable of timing the market if the current PE ratio is isolated. Investors should, when the current P/E ratio is high, expect lower returns and when low, expect high returns.

According to Bary (2003:17-18), the cash ratio (Total cash/Total assets) is important to measure a company's financial performance and it is not a depreciable asset, making it an exceptional way to compare earnings over long periods of time.

Arnott and Asness (2003:70-84) contend that the pay-out ratio (Total dividends/Net income) urges the eagerness to invest. Michalkova and Kliesstil (2019:218) explains despite the fact that equities are not and have not been cheap, their recommendation is in favour of acquiring equities. The intention of the study was to demonstrate that low pay-out ratios are solid positive signs for future development; unfortunately, Arnott and Asness's (2003:84) views were inconsistent with the historical evidence. However, it was concluded that a low pay-out ratio ushers a low earning growth. Despite the fact that values are not and have not been modest, their suggestion is supportive of obtaining values.

The purpose of the timeline is to provide an indication of the foundation on which this study's bankruptcy prediction model was built. The financial ratio foundation creates the layout, structure and strength required on which this study's bankruptcy prediction model was formulated. The foundation of similar statical analysis was established within this period, likewise the ratios selected for the current empirical study are statistically analysed in Chapter 6 of this study.

This leads to bankruptcy predictive model based on financial ratios analysis have been accepted to be appropriate in this study as a result they are easy to apply and understand, information is quickly obtainable, and the models have demonstrated predictive abilities (Ogachi, Ndege, Gaturu, & Zoltan, 2020:2; Smart & Graham, 2012:45). Gouws and Lucouw (1999:107) clarify that ratio analysis is only a device to help interpretation. A ratio analysis in itself does not provide any answers (Brady, 1999:7). Knowledge is obtained

when financial figures are interpreted. Models applying financial ratio analysis are still generally acknowledged internationally and locally as the most accepted financial distress prediction tools (Le Roux, 2014:3).

In order to present concise and comparative information the above-mentioned researchers are used as a foundation. Access is given to various academic developments through applying financial ratios as basic inputs. The ratios most frequently used over this period have been selected, period up till 1919 the current ratio, up to 1929 ROE and sales growth ratios, as far as 1939 the quick ratio, till 1949 the debt to equity ratio and to 1974 ratios applied was the study of Beaver (cash flow to total det, total assets turnover ratio, working capital ratio). Altman's was debt to equity ratio. The ratios after 1974 where ratios within the seminal studies selected as a foundation for this study as indicated in Section 4.3.4.

3.5 INTERNATIONAL AND SOUTH AFRICAN MODELS

In this section the financial ratios as part on international and South African bankruptcy prediction modelling in relation to theorectical objective (1.4.2.1, viii) is reviewd and put into percespective. Tuvadaratragool (2013:37) explains in the 1930s the use of financial ratios to indicate business failure was inaugurated. At that point in time, there were no statistical techniques, which were only introduced at a later stage of research within this field. Vast studies conducted over the years have included the use of dichotomous research. Tuvadaratragool (2013:69) highlighted when a variable is measured, a dichotomous variable takes on one of only two possible values that represent the measured variable. According to Tredoux and Durrheim (2019:365), a study is dichotomous when there is a classification of the data into groups e.g. failed and non-failed. Wide-spread studies being dichotomous in nature has been steered on an international and on a national level. The following studies have been selected as the foundation on which the current study will be built on, these studies are seminal studies within the field of study both internationally and within a South African context. Any of the selected studies that will be replicating or base on an existing study or model will be excluded, their financial ratios will be excluded from the pool of ratios. The selected internationally studies are by Altman (1968), Hossari (2006), Fulbier (2008) and in South Africa is studies by De la Rey (1981), Naidoo (2006) and Cassim (2015). International

study Tuvadaratragool (2013) will not be discussed as study adopted the study by Hossari (2006) and local studies by Hlahla (2010) adopted study of Beaver (1966) and Rama (2012) adopted study of Altman (1968) therefore these studies will not be discussed neither included in the pool of ratio, these studies adopted previous studies included in the pool of ratio by including these duplications will occur. These studies will be used to select a pool of appropriate ratios. A synopsis of the pool of ratios will be made up of given financial ratios that will be discussed in chapter 3.

3.5.1 Altman's models (1968, 1977, 2006)

Altman's (1968:589) focus for conducting this study is to "assess the quality of ratio analysis as an analytical technique". The reason for the study is the academics/scholars in the field pouncing on the relevance of financial ratios. They questioned whether the gap between traditional and statistical techniques could be closed, bearing in mind that the statistical techniques are recent, popular and more precise.

Altman (1968) applies the MDA as a statistical technique. It statistically groups companies as either failed or non-failed. This type of analysis has been used in other disciplines, namely in behavioural sciences and biology for the first time in the 1930s. Altman (1968:591) applied the MDA in order to obtain a linear combination to discriminate best between failed and non-failed groups. Altman and Hotchkiss (2006:239) state "This technique has the advantage of considering an entire profile of characteristics common to the relevant companies, as well as the interaction of these properties."

The z-score model was developed by Altman (1968) who later enhanced the model to the Zeta model in 1977 and modified the Zeta into the EMS in 2006. All these models were based on ratios and consist of five variables consisting of working capital to total assets (WCTA), retained earnings to total assets (RETA), earnings before interest and tax to total assets (EBITTA), market value of equity to book value of total liabilities (TETL) and sales to total assets (STA). For the z-score model, the sample selected was 66 companies and 22 ratios were used. For each bankrupt company, a matching non-bankrupt company was selected, known as the pairing approach. The cut-off period was 1946–1965. The selection criteria were based on industry and asset size ($.7million-$25.9 million) of manufacturing companies that have filed for bankruptcy under Chapter

X of the National Bankruptcy Act. Data were collected from the same year, but the groups were not completely similar, due to industry and asset size differences. Of the 22 ratios, an overall of five ratios performed the best to predict bankruptcy holistically (Altman & Hotchkiss 2006:241). Altman (1968:604) explains that the z-score model's accuracy deteriorates, the longer the time period before bankruptcy. In years one and two before failure, the accuracy rate dropped from 95% to 72%. A further decrease in years three and four before failure from 48% to 29%. In year five before failure, the accuracy rate increases slightly to 36%. Altman (1968:604) clarifies that the reason for the fluctuation is that the z-score model's prediction ability over longer periods before bankruptcy becomes less reliable and it is a better predictor within two years before failure. Anjum (2012:212) stated that the Altman's z-score model can be applied to the modern economy to predict bankruptcy and distress up to three years in advance. Eidleman (1995:52-53) supported by Rama (2012:5) and Laurila (2020:11) holds that the Altman (1968) z-score model is globally the most reliable business failure prediction model. This model has a cut-off period, which is referred to as zones. These zones make interpretation easier, depending on where the companies lie (Altman, 1968:606). Table 3.2 below distinguishes the cut-off period as:

Table 3.2: Altman's z-score model

Safe zone	**Grey zone**	**Distress zone**
Z-score>2.99	1.81< Z-score<2.99	Z-score<1.81
Weighting factor: $Z = 0.717_{x1} + 0847_{x2} + 3.107_{x3} + 0.420_{x4} + 0.998_{x5}$		

Source: Altman (1968:594 - 606)

Table 3.2 above indicates the safe zone (>2.99) is when the company is not bankrupt, the distress zone (<1.81) is opposite of the safe zone, which it is when a company is identified as bankrupt. The grey zone (>1.81<2.99) is when a company has been identified or classified as bankrupt, yet that prediction is not certain.

Altman (1993:203-204) modified the Z-score model to the Zeta model to enable it to be used for private and non-manufacturing companies. This resulted in the variable to remain at five (5) which led to a change in the weighting factors and the cut-off zones. The

model's variable number four's numerator was revised and changed from the market value of equity to the book value of equity by Altman (1993:203-204). The cut-off zone for the Zeta model in Table 3.3 are as follows:

Table 3.3: Altman's Zeta model

Safe zone	**Grey zone**	**Distress zone**
zeta >2.90	1.23<zeta<2.90	zeta<1.23
Weighting factor: Zeta = 0.717_{x1} + 0847_{x2} + 3.107_{x3} + 0.420_{x4} + 0.998_{x5}		

Source: Altman (1993:203-204)

Table 3.3 reflects the cut-off zone for Zeta model as the safe zone (>2.90) is when the company is not bankrupt; the distress zone (<1.23) is contra to the safe zone: it is when a company is identified as bankrupt. The grey zone (>1.23<2.90) is when prediction is not certain. The change in the factor is also shown.

Altman and Hotchkiss (2006:267-268) upgraded the Zeta model and called it the EMS with the aim to improve accuracy. The EMS original was applied as the groundwork and adjusted for the emerging corporate bonds scoring system. With the amendment only, the zones change the variables (financial ratios) and weights remained the same. The Enron and WorldCom cases were used to test EMS and it was found that there were warning signs before the occurrence. Enron filed for bankruptcy in December 2001 and in June 2001 the (EMS) score was below the safe zone. WorldCom filed for bankruptcy mid-July 2002 and at the end of the first quarter, the EMS score was also below the safe zone. The change is shown in Table 3.4.

Table 3.4: Altman's EMS model

Safe zone	Grey zone	Distress zone
Original Emerging Market Score		
ems>2.60	1.10<ems<2.60	ems<1.10
Corporate Bonds Scoring System		
ems>5.85	4.15<ems<5.85	ems<4.15
Weighting factor: EMS = $3.25+6.56_{x1} + 3.26_{x2} + 6.72_{x3} + 1.05_{x4}$		

Source: Altman and Hotchkiss (2006:239-241), Altman (2002:25) and Altman (2018:34)

Table 3.4 mirrors the overall weighting and the cut-off zone changes for both the original EMS score and the corporate bonds scoring system. The original EMS model was applied in this study. EMS: safe zone (>2.60); grey zone (>1.10<2.60); distress zone (<1.10). Corporate bonds scoring system: safe zone (>5.85); grey zone (>4.15<5.85); distress zone (<4.15). The difference between the scorings is the zones, the original EMS was originally created for manufacturing, non-manufacturing industrial companies and companies within emerging markets. The corporate bonds scoring system is for the same companies being within the manufacturing, non-manufacturing and emerging markets the difference being this model is linked to the US bond rating credit scoring system (Altman, 2018:28-34). The original EMS score was selected and was not utilised in the development of the BPIA but rather it applied to authenticate and validate the results of the newly developed BPIA.

Bellovary *et al.* (2007:1) has analysed 165 bankrupt prediction studies over period 1965 –2007 has found the model developed by Altman (1968) as the most well know. According to Atlman, Iwanicz-Drozdolska, Laitinen and Suvas (2016:133) the z-score model after 45years continue to be used as main or supporting tool worldwide. Mahajan and Moholkar (2019:2) found the z-score model to be the most efficient financial failure detection model. Therefore, Altman model will be included as one of the foundations of this study.

3.5.2 Hossari (2006)

Hossari (2006:23) supported by Tuvadaratragool (2013:23) conducted studies consisting of 84 studies over period the 1968–2004, 44 financial ratios were selected that is potentially useful to predict business failure. Three types of data were utilised:

- Financial ratios
- Non-financial ratios
- Non-financial data

This study will make use of financial data, a ratio-based approach based on financial data and not non-financial data making it quantitative in nature. Because ratio-based uses financial data that is be measurable due to its mathematical characteristics. Comparisons between various companies are easily drawn when using ratio rather than absolute values (Hossari, 2006:31&32).

Marx (2019:82) assert incompatibility of data is reduced when ratios are used, and companies are easily compared to their peers within an industry. One of the major contributing factors of incompatibility is the effect of a company's size. This is eliminated using ratios. Regardless of the size of a company when absolute values are transformed to percentages through using ratios companies become comparable (Hossari, 2006:29-32).

Hossari (2006:56-71) groups the financial ratios into the following groups. Possession measured by assets, ownership measured by equity, liquidity measured by liabilities, performance measured by sales and peripheral measured by all other financial statements excluded above. According to Hossari (2006:81), the ratios with the highest overall usage are: current assets to current liabilities (43%), total liabilities to total assets (40%), net income to total assets (38%), WC/TA (32%), earnings before interest and tax to total assets (31%).

Hossari (2006:37) concluded of the pool of 208 studies conducted 145 of these studies (70%) were solely based on financial ratios. Total of 44 ratios were identified as having the ability to predict corporate failure. The comprehensiveness of this study is the motivation of this study being included in the pool of ratios for the current study.

Fulbier, Silva and Pferdenhirt (2008:128) conducted a study for period 2003 – 2004, the final sample consisted of 90 German non-failed companies. Total of 32 companies were eliminated due to insufficient data. The purpose of the study was to measure financial and operating risk covered in three areas and the financial ratios were grouped accordingly being:

- Structural change
- Profitability
- Impact of company's valuation from a market's perspective

The first set of calculation is to measure the risk related to structural change, change between financing activities, being debt and equity financing. Important aspects to note include whether the asset are able to cover debt when the asset is financed by the debt and if the asset will be settled when the debt is sold. Another measures the interest payment obligation to be met and the inability to do so could lead to solvency and legal implications.

Profitability of the company then calculated, aim to measure the return shareholders will receive on their investment, if not profitable, the risk shareholders may search for other investment opportunities that will yield better returns. Another measure is to determine whether the use of the company assets produced profits. How the assets have been financed is also of importance, because the source of finance will determine the effect on the company's net profit, equity finance has no effect while debt finance effects the net profit by interest paid.

The last area of calculation is the impact on the valuation of companies from a market perspective. Companies' performance based on earning and the amount of risk investors are willing to take. How much investors are willing to pay, for higher risks investors are prepared to pay lower prices? The aim of this study is to develop a generis model, which is the reason for including the study of Fülbier *et al.* (2008). The reason being the three areas of testing that are effected namely structural change, change in profitability and change in the valuation of a company from market perspective. The South African (local) studies to be included are discussed in the following section. The studies included were not based on an existing seminal study internationally and locally.

3.5.3 South African models

Five South Africa studies have been included in this research. Three of these studies utilised financial ratios to conduct their research namely Hlahla (2010), Rama (2012) and Cassim (2015). Hlalhla (2010:34) used the Beaver's univariate model using 64 ratios and Rama (2012:4) used Altman's (1968) Z-score model consisting of five ratios. Cassim (2015:74) applied a financial ratio 17 of the 44 non-failed in only five categories, financial performance being liquidity, profitability, solvency (debt management), asset management (market performance) and operating cash flow. The remaining two studies referred to were conducted by De la Rey (1981) and Naidoo (2006), authors who developed their own models. These studies are significant as the present study uses both these models and EMS as a foundation on which the development of a model is built in order to try predicting failure accurately in the South African context.

3.5.3.1 De la Rey Study (1981) – K-model

De la Rey (1981:10) defines the financial failure of companies as their inability to meet their current obligations. De la Rey (1981) further explains that because of financial failure significant amounts of money are lost in the country. Therefore, the need for bankruptcy prediction models is pivotal. The model can be used as a tool to assess whether a company is still able to continue with their operations. De la Rey (1981:26-75) explains the aim of the study is to develop a model that can measure risk and states there are many reasons why companies fail and believes the risk of failure can be measured using certain financial ratios. Failed company criteria utilised within the study specified by De la Rey (1981:11) being:

- The matching approach was used, matching failed companies with non-failed companies.
- Companies with negative equity.
- Companies have either been suspended from the JSE, declared insolvent, unable to continue operating as a going concern and under judicial management.
- Companies have made no profit for two consecutive years or two out of three continuous years.

- The company is unable to pay a preference dividend on time due to various lack of liquidity reasons.
- The company declares no ordinary shares dividends during the 4th year since the business started.
- Capital giants take over due to two years of poor performance.

The sample identified by De la Rey (1981:27) is industrial JSE-listed companies, consisting of 26 failed and 26 non-failed companies over the period 1970–1979. The ratios selected were all the ratios used in Beaver's (1966) study. Data were obtained from the Bureau of Financial Research at the University of Pretoria. De la Rey (1981) explains the process of the development of the model was divided into segments:

- Firstly, a discriminatory test: Wilk's Lambda step-by-step process, interpreting when there is a greater mean difference it results in a smaller measure of discrimination and vice versa.
- Secondly, the standard deviation: to identify ratios able to identify distinct differences between failed and non-failed companies.
- Thirdly, factor analysis: applied to group of ratios (25 ratios) adopted from study by Beaver (1966) with high correlations (six ratios). (Mosalakae, 2007:77)
- MDA was resulting model development, weighting and cut-off indicated in Table 3.5 below.

Table 3.5: De la Rey's K model

Health	**Ignorance**	**Failure**
k-score >+0.20	-0.19<k-score<0.20	k-score <-0.19
Weighting factor: K-model = -0,01662a + 0,0111b + 0,0529c + 0,086d - 0,0174e + 0,01071f + 0,36119		

Source: De la Rey (1981:27) and Naidoo (2006:72)

Table 3.5 reflects the overall weighting and the cut-off zone for the K–score, health state at (>+0.20) is when the company is at a state of ignorance (>-0.19<+0.20) it is a state of

uncertainty and unable to classify company state as healthy or potential failure and when at a state of failure at (<-0.19) this is contra to the healthy state, potential failure.

Regardless of the complexity of the De la Rey's k-model, it has laid a foundation for bankruptcy prediction studies within a South African context. De la Rey (1981:146) attempted to develop a model that is able to indicate to an investor the risk profile involved in a reasonably reliable manner. The model correctly classify companies failed or non-failed at a 96% overall accuracy one year prior to failure applying BFA-Net financial analysis service (Ngwenya, 2018:662; Van der Colff & Vermaak, 2015:251; Naidoo,2006:9). Rowlings (2016:69) referred to De la Rey as a pioneer within the field of study within a South African context. Even though his study is within a SA context, De la Rey created formulations that are difficult to calculate. Bearing in mind even though De la Rey's study has laid a South African research foundation it leaves room for inconsistency and the financial ratios applied within this model is not general and cannot be accessed on the INET McGregor BFA platform. Due to this study's focus being within a South African context it lays a foundation to further South African-based studies and can assist in establishing a sound foundation for the newly developed BPIA.

3.5.3.2 Naidoo's Study (2006) – Financial Risk Analysis Model (FRAM)

Naidoo (2006:2) developed a multi-stage model (a model with more than one stage) while using the term prediction of financial health whereas most authors use prediction of bankruptcy. The aim of the study to predict the state of companies categorising it into different levels. According to Honsberger (cited by Naidoo, 2006:2), "Bankruptcy does not strike like a bolt of lightning". In fact, there are many indicators or predictors of its approach and it is an enigma why some of the bankruptcies still take place unexpected. Sharma and Mahajan (1980:80) state that one of the causes of business failure is that management believes business failure is not slow, but an unforeseeable process. The multi-stage of Naidoo (2006:4-9) consisted of two main stages.

First Stage: **Development of model predicting company state of health**

The state of a company's health was determined by the computation of real earnings growth (REG) for 42 companies (failed and non-failed) over the period 1970–1999 with

the aid of statistical models (Naïve model, CHAID (Chi-square Automatic Interaction Detection and MDA. The states were:

- Health = positive REG
- Intermitted = negative REG
- Distress = negative Earnings

Second Stage: **Developed Financial Risk Analysis Model (FRAM).**

Naidoo (2006:10) explains the second stage of the Financial Risk Analysis model (FRAM) is detailed company analysis and it is independent of the first stage, which clarifies that if this stage is excluded the study would be incomplete. Four variables (growth, performance analysis, investment analysis and financial status) on which the financial ratios are based, based on the work of Thompson (1993:174). These variables, as set out below, were applied through financial ratio analysis over a five-year period. The second stage utilised ratios divided into the following categories Naidoo (2006:6):

- Growth: utilises real earning growth (REG) and real state growth (RSG)
- Performance analysis: profitability is analysed using networking capital and Asset turnover ratio
- Investment analysis: compare profitability to shareholders' equity fund
- Financial status: solvency and liquidity analysed

The purpose of this stage is to enable stakeholders to establish a holistic, meaningful picture of the company and future appropriate strategies that can be taken in order to improve their status e.g. from distress to intermitted or health. The selected ratios within this study form part of the pool of ratios for this South African-based study. The development of the bankruptcy prediction model is a multi-levelled process and include the categorisation of the ratios and is supported by the steps taken to develop the bankruptcy prediction model within this study. Maeteletsa and Kruger (2011:2) assert business failure is not instantaneous but continuous, therefore, research within this study needs to align by also being continuous. Mosalakae (2007:88) states the development of the model by Naidoo (2006) was done in two stages with four levels testing, for the purpose of this study only the development of the model is discussed and not the testing.

3.5.3.3 Hlahla's Study (2010)

Hlahla's study (2010:19) applied 64 financial ratios used by Beaver (1966) and Altman (1968). The study was excluded from the pool of ratios created in Chapter 3 in order to avoid duplications as ratio were applied in study of De la Rey (1981). Mosalakae (2007:77) integrates the financial ratios use by Daya (1977) and Beaver (1966) and applied it to the study by De la Rey.

3.5.3.4 Rama's Study (2012)

Rama (2012:6) purpose of the study was to determine the ability of the Altman's (1986) failure prediction model to predict bankruptcy within a South African context. In order to avoid duplications this study is excluded it from the pool of ratios created in Chapter 3 as the ratio is applied in study of Altman (1968, 1977, 2000). Rama (2012:4) explains the Altman's (1968) model has been used to perform the empirical testing.

3.5.3.5 Cassim study (2015)

According to Cassim (2015:3), the aim of the study is to examine whether financial ratio analysis can effectively predict business failure of JSE-listed companies in the current worldwide condition. Since there have been boundless changes in the global economic environment, the market and technology. Cassim (2015:58-60) informs research was conducted over the period 2007–2012 based on a prescribed criterion in three stages.

- **Sectors**
  - Financial and mining sectors excluded.
  - Pairing the failed companies with non-failed companies within the same sector.
- **Reasons**
  - Failure had to be due to bankruptcy
- **Financial data**
  - Over a five-year period for both failed and non-failed companies

Cassim (2015:72) utilised 17 financial ratios classified within the five major financial performance areas that were applied to the 44 ratios adopted from only five categories if financial performance being liquidity, profitability, solvency (debt management), asset management (market performance) and operating cash flow. This study has found

financial ratio analysis is useful to predict bankruptcy as it was compared to Altman's EMS. The EMS model has been indicated as being very successful to predict failure in the USA and BRIC (Brazil, Russia, India and China) but it is not so successful in a South African context. The ratio of this study was included in the pool of ratios as this study being the motivation and bases of the current study.

Like the seminal bankruptcy studies indicated these South African studies are not without shortcomings. The study only addresses the South African studies', mentioned above, shortcomings.

3.6 PREVIOUS SOUTH AFRICAN STUDIES SHORTCOMINGS

In this section the shortcomings of prior South African studies are looked at in proportion to theoretical objective (Section 1.5.2, ix). In the quest for the optimal bankruptcy prediction model, researchers over the decades in this field attempted to formulate an effective bankruptcy prediction model that is able to efficiently detect bankruptcy prematurely. Empirical studies have been conducted in South Africa, however, the seminal studies in this field have been conducted in countries abroad like the USA. Even though the seminal studies have played a crucial role within this field of study, there have been disagreements among the studies conducted. Altman and Hotchkiss (2006:239) disagreed with Beaver (1966:85) regarding the univariate analysis failure prediction ability. Their view is that this analysis technique does have the potential to predict bankruptcy, however, to improve on this analysis technique, a multivariate model needs to be applied. The multivariate analysis is based on objective weight to expel the ambiguity to no longer be misleading. This has become the core reason for the foundation of using the MDA. Tuvadaratragool (2013:49) and Laitinen and Kankaanpaa (1999:67-68) concur even though the studies conducted by Blum (1974:2) and Edmister (1972:1479) were based on different criteria, both using the MDA.

In this endeavour to predict bankruptcy efficiently in advance different variables and techniques were applied, most researchers mentioned in this study have utilised financial statement data to predict bankruptcy. Of the major empirical research conducted in South African, disadvantages have been found:

- De la Rey – developed own model titled k-model. According to Mosalakae (2007:142), De la Rey's (1981) study required complicated calculations and included ratios used by Beaver (1966).
- Naidoo's – own developed model titled Financial Risk Analysis Model. Mosalakae (2007:143) explains the study by Naidoo allowed analysts to select the desired group of ratios creating flexibility within the model and therefore the uniformity in the analysis is likely to be lost.
- Hlahla – used Beaver's 64 ratios and Altman's ratios applied in the z-score – disadvantage is the exclusion of cash flow ratios. According to Hlahla (2010:34-35) in both emerged and emerging countries, financial health can be determined by the level of cash a company produces.
- Rama – used Altman's z-score model. Rama (2012:38) found when the z-score is either negative or within the grey area the model is inaccurate.
- Cassim – used both the traditional financial analysis (trend and comparison) and the EMS model. Cassim (2015:207) found that even though the EMS model is a renowned bankruptcy prediction model, it was not so successful within a South African context like the traditional method applied.

The majority of the bankruptcy prediction models using financial ratio analysis are applied to companies within the same industries/sector and same economic conditions. No empirical research has been piloted within a South African context whereby an easy to use and understand generic bankruptcy prediction model that is not industry/sector based has been employed with the aim to successfully predicting bankruptcy over different economic conditions.

Most of the studies in South Africa focussed over a certain period. Taking companies from different sectors to apply the developed generic BPIA and comparing it to EMS model. These comparisons were applied within the different economic periods' pre-(2002–2006), during (2007–2011) and post (2012–2016)-global financial crisis. Therefore, the history of the global financial crisis, the different warning signs and causes leading to bankruptcy build up are looked at. Followed by the different terms, causes of bankruptcy and categories of bankruptcy within different countries. The basis of

bankruptcy predictions and financial ratios as the foundation of bankruptcy prediction modelling and their shortcomings.

Considering the presented theoretical objectives looked at little research has been conducted over different economic periods. Most studies in South Africa focussed on a certain period. In order to overcome the shortcomings, the approach taken was applying a cross-sectional analysis. Further discussion follows in the next chapter.

3.7 SUMMARY

This chapter reviewed the historical overview of financial ratios and the evolution thereof over a period. According to Hossari (2006:31), it can be said that ratio-based financial data are superior to the others due to the fact that companies are based on percentages rather than absolute amounts, making it easier to draw comparisons between various companies. The origins of financial ratio were highlighted as some of these ratios are still significant and able to effectively predict bankruptcy to date. The most common bankruptcy models as identified by literature within the field of study were developed by Beaver (1966), Altman (1968), Edmister (1972) and Blum (1974). The ratio-based studies that have impacted the current study forming the foundation both international and local studies were identified as Altman (1968,1977,2000); Hossari (2006); Fülbier *et al*. (2008), De la Rey (1981), Naidoo (2006) and Cassim (2015). The key reasons for including these studies is Altman's (1968) model is regarded as a globally accepted sophisticated bankruptcy prediction instrument able to accurately predict bankruptcy or financial distress (Ngwenya, 2018:661). Hossari (2006) conducted an extensive study that reviewed 84 studies over period the 1968–2004. Study by Fülbier (2008) takes into consideration the effect contributed by changes in companies structural, profitability and valuation. De la Rey's study (1981) has a proven track record in bankruptcy prediction within a South African context (Van der Colff & Vermaak, 2015; Van der Colff, 2013; Naidoo, 2006). The study conducted by Naidoo (2006), also within a South African context, represents a combination of a sophisticated ratio-based prediction model for business failure and multiple statistical analytical techniques. Finally, Cassim's (2015) study has found financial ratio analysis is more useful to predict bankruptcy within South Africa compared to a globally recognised bankruptcy prediction model and it is the backbone of the current study.

Financial ratios are a critical part in modelling business failure as they are the foundation instrument and predominant predictors for predicting bankruptcy or financial distress. This study takes this opportunity to explore the ability of bankruptcy prediction when selected studies are used in combination and the financial ratios were generally selected based on the predictive ability they demonstrated within these previous studies as the pool of ratios within this study. Therefore, a total number of 94 ratios were identified as potential predictors, from which a total of 19 ratios were selected in pool of ratios and only the statistically significant financial ratios are included in the final model.

Other South Africa ratio-based studies have been omitted as their studies are based on financial ratios already included within the study. Inclusion based on Beaver (1966), Beaver (1966) and Altman (1968) or only Altman (1968). Studies based on Beaver (1966) only study were studies by:

- Strebel and Andrew (1977)
- Van der Colff (2013) that was based on study by De la Rey (1981) that is based on the study by Beaver (1966).

Combination of Beaver (1966) and Altman (1968) were studies by:

- Daya (1977)
- Hlahla (2010).

Lastly, studies based on the Altman only were studies by:

- Kidane (2005)
- Jacobs (2007)
- Rama (2012)
- Coelho (2014)
- Ngwenya (2018).

There are many studies on bankruptcy prediction models, however, not many relate to South Africa and the studies that do related to South Africa, not many are ratio-based. In summary, according to Rama (2012:30) this could be the reason why many studies still apply the Altman's (1968) bankruptcy prediction model. The studies of importance not forming part of the foundation have also been indicated and the reason for their exclusion has been provided, international is Tuvadaratragool (2013) and local Hlahla (2010) and Rama (2012). Examing the literature has provided a basis for the development of the

BPIA, with the aim of developing a South African-based generic bankruptcy prediction approach that is easy to use and apply by all stakeholders. The elements of the newly developed bankruptcy prediction approach indicating it effectiveness are as follows:

- Continual downward spiralling trend of company's financial position.
- Company indicated financial weakness when compared to peers.
- Failed companies and non-failed companies correct classification at 50% and above.
- Cross-sectional method applied to compare failed companies with non-failed companies.
- Time-series (longitudinal) method used to study the data being the financial ratios.

The development of the BPIA is discussed later in the study.

The next chapter explains the research methodology of the study.

CHAPTER 4
RESEARCH METHODOLOGY

4.1 INTRODUCTION

The literature review in the previous chapter dealt with the historical overview of different financial crises. The chapter discussed the different bankruptcy prediction models used locally and internationally along with their shortcomings. The purpose of this chapter is to provide an overview of the of the research methodology followed by describing the research design to meet the research objectives. Secondary data and empirical data available on the internet is collected and analysed.

This chapter consists of five sections as presented in Figure 4.1. Figure 4.1 below presents a summary of the chapter overview.

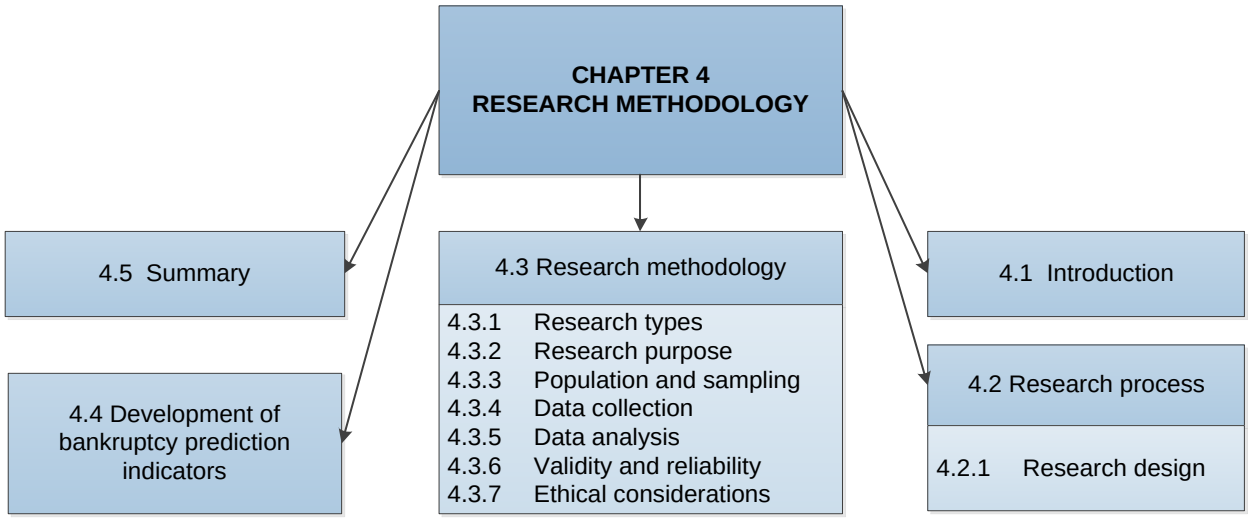


Figure 4.1: Overview of Chapter 4

Section 4.1 serves as the introduction to the research methodology. Followed by an explanation of the research process in Section 4.2. Section 4.3 explains the research methodology by observing research types, purpose, population and sampling, data collection, data analysis, validity and reliability and ethical consideration. This is followed by the bankruptcy prediction indicators development process in Section 4.4 and the chapter conclusion is drawn in Section 4.5.

4.2 RESEARCH PROCESS

Research is a process whereby scientific methods and procedures are applied with the purpose of obtaining knowledge and increased understanding in an area of interest (Leedy & Ormrod, 2014:2). Shaghi (2018:7) and Welman *et al*. (2005:2) posit the obtained knowledge can be used to improve decision-making.

Research is an action that springs from work by others from which new thoughts are spawn, which leads to the discovery of new knowledge according to Van Zyl (2014:2&3). The importance of this knowledge is the foundation on which new data are logically arranged, taking similar ideas. This is in order to describe occurrences that have happened and forecasting of occurrences that may happen (Marx, 2019:61).

The best point of departure to acquire knowledge on a new subject is always from the beginning according to Dane (2017:3). Tuvadaratragool (2013:60) notes the beginning of the research process is problem identification followed by the formulation of the problem to set the extent and route the research will take. Brynard *et al.* (2014:18) further opine the research and the focus of planning the research are guided by the research problem. This view is shared by Zikmund *et al*. (2013:8) that by identifying problems is the primary stage in business research. Tuvadaratragool (2013:60) says a research problem signals interest in a specific area, it does not always signify that something is wrong. According to De Vos *et al.* (2015:79), there needs to be a lucid vision of the study's direction in place, which can be filtered into a research problem.

According to Brynard *et al.* (2014:17) and Leedy and Ormrod (2014:27), the research problem is the heart of research and it is important that the identification and formulation are concise and clear. Mouton (2011:48) agrees with Welman *et al.* (2005:13) that this is a transformation stage, a general research idea is fine-tuned into a specific idea that is relevant enough to be researchable and feasible.

In formulating the research problem, the researcher needs to decide whether the intention is to advance theories regarding a particular topic in order to increase knowledge in a certain area, the researcher would apply basic research (Brynard *et al.*, 2014:7). If the study's objective is mainly to solve current problems through addressing issues having immediate relevance to those problems, the researcher would do applied research.

In this study, the research problem is a statement being expressed in Chapter 1 Section 1.4, the primary objective of the study is to develop and validate bankruptcy prediction indicators to detect or predict warning signs of bankruptcy or financial distress. These bankruptcy prediction indicators will be tested over different economic conditions being pre- (2002–2006), during (2007–2011) and post (2012–2016) global financial crisis, testing JSE companies within similar and different sectors by applying a combination of a cross-sectional and longitudinal analysis approach. The primary objective is a gap that has been identified within this field of study even though extensive research has been conducted on bankruptcy prediction industry-based and not across industries internationally and in a South African context, there is also room for improvement (Siiman, 2018:9). After the primary objective has been identified the research design assists the researcher with the plan to link the research problem with the data (Creswell, 2015:293 and Kumar, 2019:77)

4.2.1 Research design

The research design is developed after the research problem is identified and formulated. Zikmund *et al.* (2013:64) explain the research design specifies the steps as to collect and analyse the necessary data needed, calling it a master plan. Mouton (2011:55) refers to research design as a “blueprint” revealing the researcher’s intention of the execution of the research. This is motivated by the ontology philosophy according to Ryan (2018:2), it is what a researcher knows and believes to be real. Tuvadaratragool (2013:61) stated the research design equips the researcher with the appropriate means and methods of solving the research problem. Swanepoel (2018:97) supports the notion of Creswell (2009:5) that research design is the result of the researcher’s philosophy, philosophy being the lens through which the researcher views the world. How researchers believe data should be collected, analysed and used in a particular field of study (Kivunja & Kuyini, 2017:26; Sauders, 2009:124). Researchers used research paradigms being ideas, practices, beliefs and assumptions referred to as foundations to create and observe knowledge (Rehman & Alharthi, 2016:51). According to Kivunja and Kuyini (2017:26), paradigms define a researcher’s philosophical direction. Sauders (2009:124) explains regardless of whether a researcher is consciously aware or not, at every stage in the research process there will be assumptions, foundations about how knowledge is

created (epistemology), how research exist (ontology) and methods used (methodology). These foundations shape the understanding of the research questions, the methods used and how findings are interpreted (Rehman & Alharthi, 2016:52). The research process to acquire knowledge either deductive or inductive (Swart, 2018:192). The view shared by Smith (2011:12), Mentz (2014:147) and Grix (2010:164) is that research commencing from a general statement to an observation is referred to as inductive research and the inverse is deductive research.

Data cannot explain itself in its original form. Grix (2010:59) states ontology is any researcher's starting point followed by epistemology and methodology. Durrheim *(*2006:6-7) suggests that the research process has three different dimensions or philosophies being ontology, epistemology and methodology. Grix (2010:75) advises that there is no better place to commence research than from the three building blocks being ontology, epistemology and methodology. These building blocks implies design construction, structure or process of logic and scholastic thoughts, ethics and expectation (Thomas, 2010:92). Kivunja and Kuyini (2017:26) refer to the building blocks as the foundations, as individual perspectives that have a huge influence on the perceived relative importance of reality aspects and the researcher's investigation is guided by these perspectives (Harrits, 2011:151). These distinctive ways of seeing the world have its consequences in most areas of academics yet none of these perspectives are considered as being superior to another. According to Thomas (2010:292), they are suitable for some purpose and for certain reason inadequate or overly complex. Ontology and epistemology knowledge viewed holistically while methodology is the strategy used to discover it. Moons and Blackman (2014:1168) reveals when research possesses the understanding of the philosophical principle (foundations) it can be interpreted in a meaningful and appropriate manner. When philosophical principles and assumptions are misinterpreted by the research study, the integrity and validity in their disciples could be compromised. While in other disciplines lack of understanding could lead to limited or distorted research outcome interpretation.

The process researchers will take to study what is believed can be known, the research process can either be deductive or inductive (Durrheim, 2006:6). Schwester (2015:164-165) indicates the point of commencement could either be from observation to creating

theory (inductive) or a deductive starting point is the reverse first theory to confirmation. Zalaghi and Khazaei (2016:228-229) clarify with the inductive process at the commencement of research no theory exists, theory is constructed at the end of the research as it evolves as a result of research and a deductive starting point is based on existing theory (Babbie, 2014). Zalaghi and Khazaei (2016:229) supported by Woiceshyn and Daellenbar (2018:6) state that inductive research is based on human observation, the researcher is the observer making the conclusion falsifiable due to the observation not being free from bias, impartiality, preconception or prejudgment, the researcher could also be influenced by their limited knowledge of the data being researched (Saghafi, 2014). Carmichael and Graham (2012:57) differentiate between inductive and deductive research by explaining, with inductive old solutions are applied to new problems and deductive being the opposite, new solutions are applied to old problems. Zalaghi and Khazaei (2016:229) point out that even though with the inductive research there is no need for pre-fabricated frameworks and models due to the conclusion being drawn is generalised, the conclusion still needs to be verified through a logical method being deductive research. Woiceshyn and Daellenbar (2018:7) consistent with Zalaghi and Khazaei (2016:228) as well as Mentz (2014:146) postulate that a deductive research approach creates observations. The observations are developed from existing theory and a research plan is formed and through observations the theory can then be tested (Grix, 2010:164). Durrheim (2006:4) explains at this stage, after the theory of the nature of the world, that an empirical test needs to be applied to draw a conclusion. Rossman and Rallis (2016:40-49) refer to the approach as paradigms. Paradigms are collections of commonly held theories or assumptions influencing research and serves as a pattern for a particular phenomenon (Brynard *et al*., 2014:5). Paradigm principles provide for theoretical thinking and perspective and is use to obtain knowledge of reality, it is also referred to as a pattern of collecting and interpreting data enabling researchers to view the research material. Paradigm is a model used by researchers to view research objectives within a discipline (De Vos *et al*.,2015:41-513). Rossman and Rallis (2016:40-49) have mentioned four different paradigms and identified two primary paradigms being positivism and interpretivism. Positivism predicts future occurrences to obtain understanding, only objective as observable facts are a basis for science (Maree, 2019:22). Durrheim (2006:7) identifies the aim of interpretivism is to give an explanation regarding the reason and meaning that lies behind action.

Positivism research based on an ontological perspective the phenomenon being studies has an inherent ontological status enabling an objective external study. From an epistemological viewpoint the belief being through the use of scientific techniques knowledge can provide clarification of occurrences by exploring related experiences with respect to a specific phenomenon (Maree, 2019:59-60). Mouton (2011:113) explains interpretivism gives new interpretation to already existing data. Maree (2019:22-63) echoes facts are unable to speak for themselves, interpretation is needed and there is no solitary, but various realities of a phenomenon and these realities differ across time and place. With interpretivism increases knowledge and understanding of the realities being constructed, enhancing research theoretical and conceptual background (Pharm, 2018:3). A synopsis of the foundation, process and paradigm are illustrated in Figure 4.2 below:

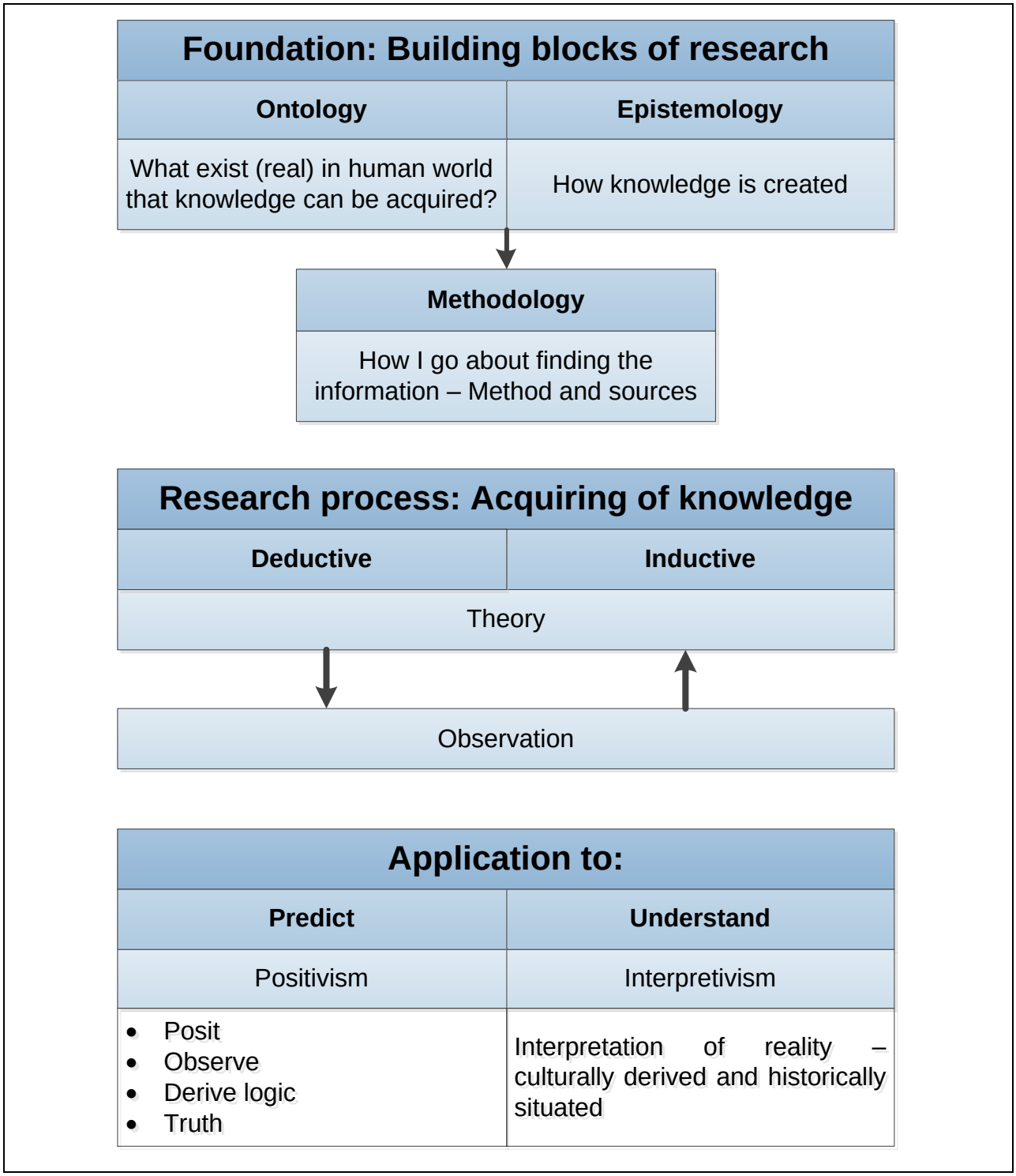


Figure 4.2: Research foundation, process and paradigms

Source: Moon and Blackman (2014:1169), Rossman and Rallis (2016:11)

Figure 4.2 above illustrates Bless *et al.'s* (2013:1) systematic rational to gain knowledge about the human being and the world they live in is by means of observation. Figure 4.2

is a combination of the study by Moon and Blackman (2014:1169) and Rossman and Rallis (2016:11) to better explain the building blocks of research that fit this thesis' research methodology. The approach to take is not only knowing what knowledge can be acquired (ontology) but also how knowledge is created (epistemology) and how to go about to find the information (methodology) (Ryan, 2018:2-5). Acquiring knowledge depends on the intention of the researcher. Gravetter and Forzano (2016:18) explain the inductive approach uses a specific example to produce a general statement. On the other hand, when the researcher's objective is to reach a general conclusion, the starting point will be with a specific example as the inductive approach builds theory while the deductive approach evaluated theory (Swart, 2018:191). This study applied the deductive approach and the deductive process is relevant to the current research as the research problem was first compiled in Chapter 1 (Section 1.4), data tested in Chapter 6 (Section 6.3), and conclusion or result was drawn in Chapter 6 (Section 6.4) whereas with the inductive approach the starting point is the result with the aim to determine the reason why. Swart (2018:192) supports the notion by Mentz (2014:148) when a model is developed a deductive approach is applied.

According to Smith (2011:1) accounting is dependent on other disciplines because not much research theory has been developed. Swanepoel (2018:98) and Ryan (2018:7) concur that accounting forms part if social sciences applies two paradigms namely positivism and interpretivism paradigms are reported as the most popular research paradigms in social science which is also applied in this study. According to Makombe (2017:3367-3374) the research design and method is influenced by paradigms, paradigms guide the claims of knowledge and the approach to research is guided by the research design and method.

Research designs are customised with the aim to address a variety of questions. Enabling the choice of a good research design to be made, the limitations and advantages of each design should be evident. Mouton (2011:144-146) categorises a research design into four dimensions, presenting details of the type of data used within this study and the researcher's level of control over the research design. The four dimensions are explained in Table 4.1 below.

Table 4.1: Dimensions of research design

DIMENSION	CATEGORIES	DESCRIPTION
Dimension 1: Study	**Empirical**	When data are collected and conclusions are drawn based on the collected data (Kumar, 2019:48). Empirical data, according to Zikmund *et al.* (2013:41), is data that are used to test research against reality, knowledge is substantiated through conducting these tests by means of experience and observation. Grove *et al.* (2012:100-111) are in agreement adding knowledge is also obtained from regular studied research being published and unpublished studies. Bryman (2016:8) explains this approach being the reality approach, has been obtained through sense and experience is admissible.
	Non-empirical	This type of study is based on an already existing belief, existent real-world evidence or earlier known facts (Fidelis, 2017:25-26). Robbetze (2015:81) asserts non-empirical studies are theory induced not being directly dependant on data.
Dimension 2: Data collection	**Primary data**	Data being the closest to "truth-revealing-facts" (Leedy & Ormond, 2014:80). According to Chawla and Sondhi (2011:11), primary data are original data that were collected first hand, new data. Brynard *et al.* (2014:7) call this data type, data collected by the researchers themselves.
	Secondary data	Data that have been compiled for the use of prior or earlier studies (Chawla & Sondhi, 2011:11). Brynard *et al.* (2014:7) add that secondary data have been collected by another research, the researcher of the study was not involved in the data collection process.

DIMENSION	CATEGORIES	DESCRIPTION
Dimension 3: Data type	**Numerical data**	Data involving numbers and statistical information. Greener (2011:3) explains that numerical data is when data are applied to the purpose of calculating statistics.
	Textual data	Data are the written word, it is data conferred in written word or images (Greener, 2011:3). Yet the researcher has an option to incorporate both these two data types. In order to fulfil the objectives of the study, numerical data are collected and statistically analysed with the aim to develop a distress indication model.
Dimension 4: Degree of control	**High**	Signals the level of control a researcher has over research (Mouton, 2011:146). Welman *et al.* (2005:115) explain that the nature of the variables being studied is influenced by the researcher's control over a study. Only the researcher's judgement in the choice of method and sources to be used can be applied.
	Medium	
	Low	

Source: Fidelis (2017:25-26), Bryman (2016:8), Robbetze (2015:81), Kumar (2019:48), Leedy and Ormond (2014:80), Brynard *et al*. (2014:7), Zikmund *et al*. (2013:41), Grove *et al*. (2012:100-111), Chawla and Sondhi (2011:11), Greener (2011:3), Mouton (2011:146). Welman *et al*. (2005:115)

Table 4.1 indicates that in this study an empirical analysis was conducted in order to meet the objectives of this study. Data were collected and analysed enabling the study to answer the objectives stated in Chapter 1 (Section 1.5). The study relied only on existing data. Secondary data collected over the period 2002–2016 from INET McGregor BFA and the JSE for both the literature and empirical review. The nature of data involves numbers and statistical information. Textual data with the aim to better explain prior literature in this field of study and numerical data to better indicate whether financial distress could be indicated or not. Lastly, a medium level of control is present as secondary data are used, reason being the already existing data, which the researcher

uses, cannot impact or influence the research but can be used in a manner to attempt to meet the study's objectives.

De Vos *et al*.'s (2015:109) notion supported by Tuvadaratragool (2013:61) posits research design equips the researcher with suitable methods and techniques for solving the research problems (Davis, 2005) and (Zikmund *et al,*2013). According to Kumar (2019:172-190), research design can further be divided and based on different viewpoints as indicated in Figure 4.3 below.

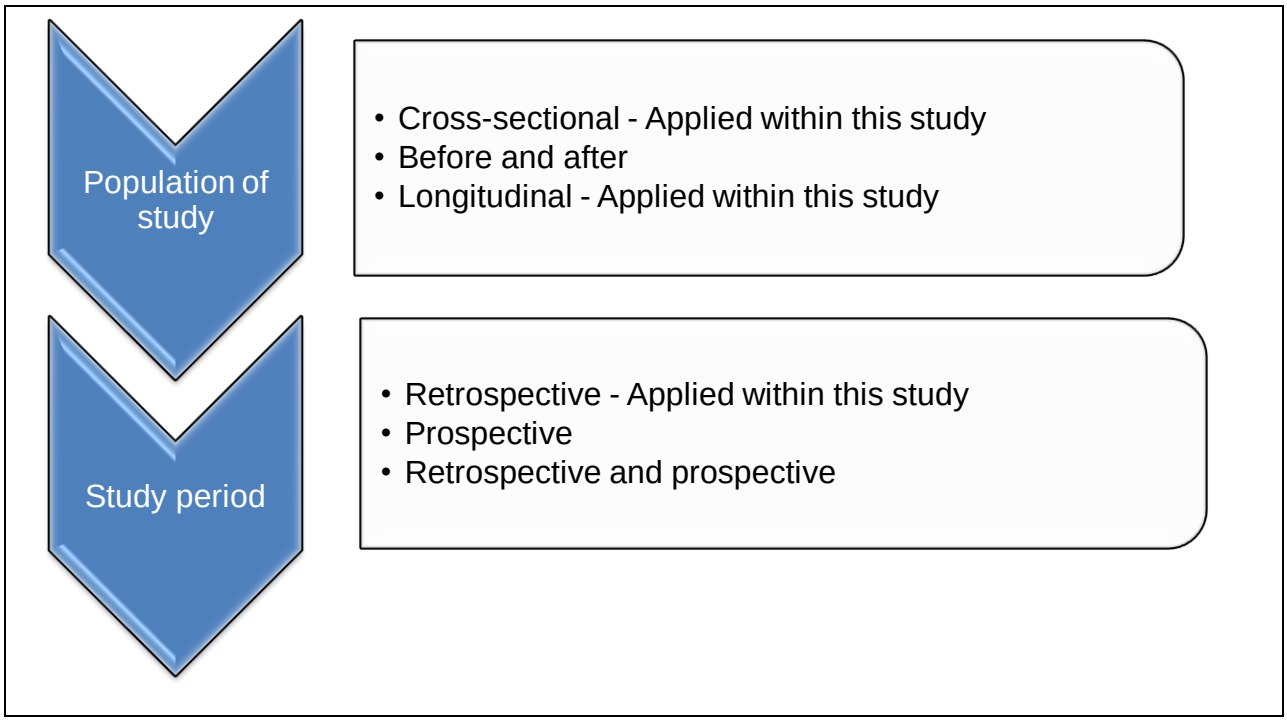


Figure 4.3: Data collected

Source: Kumar (2019:171) adapted

Figure 4.3 above gives a synopsis of the study design with regard to data collected, according to Kumar (2019:171). Figure 4.3, based on Kumar, is adapted to fit the current research methodology by better explaining the study's data collection method. The research design can be divided into three different arbitrary perspectives being the population of the study, the study period, nature of the research, Figure 4.3 was adjusted to two perspectives namely the nature of the research was excluded from the study as it focussed on the experimental study type which this study did not apply. The rationale of

the selected aspects is indicated within the different perspective (cross-sectional, before and after and longitudinal) discussions below.

Population of the study

- Cross-sectional data are collected at two points in time and analysed through comparison (Neuman, 2011:44). According to Kumar (2019:172-173), this collection approach is beneficial in order to achieve an overall picture at a specific time of the study. The aim of this design is best-suited when a common occurrence or problem needs to be identified. The design is simple yet unable to measure change. According to Cassim (2017:144), a cross-sectional study is when a comparison is made across different groups and when the comparison is applied across time it is a combination of cross-sectional and longitudinal studies, like this study as indicated in Chapter 1 (Section 1.6).
- Before and after consists of two data sets, data collected before testing and again after testing, known as pre- and post-test design (Kumar, 2019:174). The before and after data collection is included for clarity as it does apply to this study.
- Longitudinal studies, as explained by Burns and Grove (2011:219), is the examination of changes within a subject, using repetition. Therefore, careful planning and implementation are required. Adams, Khan, Reaside and White (2009:27-28) explain that a longitudinal study is capable to answer the source of change as it is a sample continually covering a long period of time. Kumar (2019:176-177) asserts data are gathered over a longer time period that are not fixed yet identical. The research is able to measure change in data patterns, because data are gathered from the same population. Cassim (2017:53) theorises a longitudinal study is when a particular group is studied for a long period of time. In this study a combination of a cross-sectional, longitudinal approach was applied as different delisted (from here on refer to has failed) companies from the same sample were tested using the same set of ratios comparing companies across different industry sectors over the period 2002–2016 in order to meet the objectives in (Section 1.5). Within this study the collected longitudinal data were observed over the same 20-year period (1996–2016) applying the same ratios, the ratios were also applied cross-sectionally over different industry sectors. Next follows a discussion over the period over which the problem is reviewed.

Study period

Retrospective period is data with regard to the past (Kumar (2019:179-180). While a prospective study period is when the likelihood of a future outcome is determined. A retrospective-prospective study is the continued investigation of past trends into the future. The study uses the retrospective study period as data were gathered from 2002–2016.

A synopsis of the research design applied in this study began with the foundation as the building block of the research. According to Swanepoel (2018:97) “researcher’s ontological perspective determines how the epistemological framework will be applied to knowledge”. Ontology will determine epistemology, Kivunji and Kuyini (2017:27) explain ontology is the researcher’s belief that data makes sense, which will determine the faith the researcher has in the data (epistemology) being applied to knowledge. The research design has identified a deductive reasoning approach. The problem statement was developed from identifying a gap within the existing literature. Resulting from the formulated problem, a bankruptcy prediction indicator was developed that will be utilised to validate the bankruptcy prediction indicators on JSE-listed companies. Furthermore, both positivism and interpretivism paradigms were applied. A Positivism paradigm was applied as an understanding was gained through reasoning of the collected data and interpretivism. According to Maree (2019:63), there is a relationship between theory and research. Theory on bankruptcy and bankruptcy prediction modelling illuminate our understanding on the phenomenon assisting in making research decisions on the most fitting research design to be applied in order to make sense of the collected data. In addition, a cross-sectional, longitudinal method was used with secondary data both textual and numerical with the researcher having medium control over retrospectively period (2002─2016). The conclusion of the research design is the plan to meet the research objectives and address the research problems based on researcher philosophical paradigms and data collected are indicated. The JSE-listed companies’ data were collected from the INET BFA (now IRESS, a South African supplier of quality financial data). Paradigms applied were primarily the positivism as the groundwork of the newly developed model was based on the knowledge obtained through the facts gained. Followed by the interpretivism paradigms by analysing and interpreting the results in order

to bring understanding (Ryan, 2018:4-8). Next, the research method, the strategy to be used to implement the plan is presented.

4.3 RESEARCH METHODOLOGY

In order to satisfy the research objectives, this chapter describes the research methodology used to collect and analyse the data. Mouton (2011:56) explains the objective of the research design focuses on the study being planned and results aimed at the end product being the focus. Whereas the research methodology's starting point is the collection of data. The focus being the research process and tools utilised and procedures to be applied. Burns and Grove (2011:20) sum up research methodology as the research methods plus research design equals research methodology. Greener (2011:5) asserts the research methodology is when different research methods are explored and compared with the aim to determine the knowledge these methods can bring about. Research methodology is the discipline and theory responsible for all research (Adams *et al.*, 2009:25). Grove *et al.* (2012:707) state it is the steps of the study conducted by means of a specific plan or process. Henning, Van Rensburg and Smit (2004:36) depict methodology as the study's value and the motive why the study has been selected and not simply just methods being collected. Research methodology can be divided into major sections, these activities being of importance in meeting the objectives of this study. Sileyew (2019:2) shares the sentiment of Creswell (2015:3) the different sections that fall under research methodology can be identified as research methods, research types, purpose of research, population and sampling of research and data collection. Data analysis, validity and reliability of data collected, and ethical considerations also form part of the research methodology (Welman *et al*., 2005:2).

At this point, it was considered if the research was to take on a numerical or non-numerical nature. Welman *et al*. (2005:2) clarify it is crucial to use the appropriate research methods since an inappropriate method can be detrimental to the study. Maree (2019:184) concurs with Sharma (2018:4) and Robbetze (2016:84) that when the sample in a population acquires numerical collected data and is transformed into statistics in order to identify the relationships between variables.

Welman *et al.* (2005:281) scribe a method is the process utilised to collect and analyse data with the aim of pursuing knowledge. A specific direction and procedures within the research design are provided for through the three research methods choices, being qualitative, quantitative or mixed methods (Creswell, 2014:10-11). Adams *et al.* (2009:26) opine research methods are applied with the intention to obtain the best responses to research methods. The qualitative method being research spoken or written words with regard to perceptions and experience (Brynard *et al.*, 2014:39). According to Bless *et al. (*2013:44) when words and sentences are used in order to document data, a more meaningful and sensitive way of recording human experiences is provided through language, the research is qualitative in nature.

When data consists of words, images or non-numerical forms, the data are of a qualitative kind (Greener, 2011:3). Grix (2010:32-120) concluded this research type involves interpreting biased experiences and studying the viewpoint of individuals through observing participants. This type of research unpretentiously captures the researchers' desires since their own words can be used (Greener, 2011:3). Leedy and Ormrod (2014:97) opine that this approach cannot be brought to numerical values as it looks at characteristics. When greater depth of understanding is given a concept is required a researcher uses a qualitative data collection approach as more accurate information is obtained (Swanepoel, 2018:101). The primary focus of qualitative research is not explaining but rather the understanding of a phenomenon (De Vos *et al.*, 2015:31).

Quantitative on the other hand, predominantly depends on measurement in order to compare and analyse (Bless *et al.*, 2013:43). Swanepoel (2018:15) explains the intention of quantitative differs from that of qualitative. The quantitative aim is to deductively explain, compare or find a correlation of a phenomenon or event through using numerical or statistical data. Grix (2010:117) voices this approach can be divided into finding variables, uses it within study and measuring the variables. Quantitative research assigns numbers to observation thus data are collected through counting and measuring objects (Brynard *et al.*, 2014:39). Brynard *et al. (*2014:39) supported by Maree (2019:184) state from the research sample that numerical data are obtained. Welman *et al.* (2005:9) explain the aim of quantitative research is too keep research as steady and stable as

possible, as the researcher controls the research structure. Financial ratios collected further, put through statistical process.

Creswell (2014:4) explains the mixed method is the accumulation and integration of both qualitative and quantitative data. As this method type included components of qualitative and quantitative data. In other words, the mixed-method approach comprises the strong point of both qualitative (personal experiences) and quantitative (statistical trends) of data collected when integrated and an interpretation is drawn. The aim is to obtain a better understanding of the research problem. According to Swanepoel (2018:105), the choice of a research method depends on nature, purpose, research questions and the type of data needed for the study. The purpose of this study is defined in Section 1.5. Firstly, the qualitative framework was determined through an extensive literature review and document analysis of bankruptcy indicators. The development and analysis of financial ratios as fundamental factors to bankruptcy prediction and financial ratios being an integral part of global and local bankruptcy prediction modelling made out the quantitative portion. Thereafter the development of bankruptcy prediction indicators able to timeously prediction of bankruptcy or financial distress could be applied, allowing early remedial action to be taken is the quantitative workings of the study. Therefore, the most suitable research method for this study is a mixed-method approach. Grove *et al.* (2012:208) add that mixed methods offer researchers an opportunity to make use of the strengths of both qualitative and quantitative methods. Secondary qualitative data were collected, subsequent to quantitative secondary data.

4.3.1 Research types

The primary motive of the research study needs to be made known at this point. If research will be used to address a specific decision according to Zikmund *et al.,* (2013:5) applied research is conducted. They continue by stating basic research is when no specific decision is in mind and no specific needs are addressed, the purpose is not to solve a specific problem but to increase knowledge in general. Applied and basic research study the same situation only embarked upon from a different standpoint.

Applied research approaches a situation by investigating whether the policies in place are properly applied or not, enabling the decision maker to make informed decisions. Chawla

and Sondhi (2011:6-8) indicate applied research focus on immediate results and the aim of research is action-orientated, being problem specific. According to Adams *et al.* (2009:27), the aim of research is to improve human conditions by means of making decisions about real life problems. Durrheim (2006:45) points out the intent of applied research is to amplify problem-solving, policy analysis and decision-making. This research purpose is carried out when the aim is aiding the solving of certain problems under control or creating interventions with the help in resolving it, being specific problems faced by specific communities (Bless *et al.*, 2013:44). Marx (2019:86) clarifies the difference between these two research types is the different study perspectives of the same phenomena. The applied research type is discussed next in the discussion on the basic research type.

Basic research studies the causes of the same situation through collecting facts and information with the aim to contribute general academic knowledge and allows existing theories to be challenged (Durrheim, 2006:45). The aim of this research type is to contribute knowledge and understanding in a specific area of study. Bless *et al.* (2013:44) point out in order to obtain the above, data and facts are gathered and allows current theories to be questioned and new theories to be developed. When the newly obtained knowledge is unimportant to the research, basic research is applied. According to Durrheim (2006:45), when knowledge is enhanced about the world we live in, basic research is applied. Chawla and Sondhi (2011:6-8) explain the purpose of this research type is to add substance.

Leedy and Ormord (2014:106) state the distinction between basic and applied research is based on what the research results will be used for. Either direct implementation or application of the result (applied) or enhancement or improvement of general knowledge (basic). In this study as indicated in Section 1.5 and Section 2.4 the origins and evolution of bankruptcy prediction were explored. Going as far back as 1966, since the development of the first bankruptcy model by Beaver (1966). The aim is to expand and contribute to the existing base of academic knowledge of the study field. Therefore, this reseach project may be classified as basic research.

4.3.2 Research purpose

Dane (2017:6-7) refers to the purpose of research as the goals of research. The goals are the strategy on finding which research questions to ask with the attempt of finding the appropriate answers. Neuman (2011:37-38) explains that research studies are divided into three groups namely: exploratory, descriptive and explanatory research. As a result of the research purpose, researchers have come to know what they know (McMurry, 2007:11). Particular fields of study are often linked to different research purposes (Brynard *et al.*, 2014:8). Durrheim (2006:44) avers the type of conclusion the researcher aims to draw reflects the purpose of research.

Descriptive research according to Brynard *et al.* (2014:8), draws a conclusion through observation and describing what was observed in words. The aim is to use words to paint a picture by asking questions such as who, when, where and how (Neuman, 2011:38). The primary purpose of this research is describing a phenomenon (Bless *et al.*, 2013:43) and providing descriptive information (Tuvadaratragool, 2013:62). Cassim (2015:49) explains descriptive research clarify the why explanation of an event through description and observation.

Neuman (2011:40) indicates the objective of explanatory research type is to explain the reason for events and further extend, elaborate, build or test a theory. Explanatory research proves that a change in one variable causes change in another through demonstration of the relationship between variables (Bless *et al.*, 2013:43). Kumar (2019:51) explains when a relationship among phenomena needs to be clarified explanatory research is undertaken. Robbetze (2016:84) agrees with Tuvadaratragool (2013:62) by stating through the application of this research type relation among research subjects with the aim of clarification is the goal of the research. Brynard *et al.* (2014:9) make it clear that this research type identifies why something is the way it is.

Exploratory research, on the other hand, is research that is applied when little is known about the area of interest (Bless *et al.*, 2013:43). Potential business ideas are discovered through highlighting a vague situation. Cooper and Schindler (2008:146) argue, that when questions are developed for further investigation to discover areas for future research it is classified as exploratory research. Neuman (2011:33) believes this research type is

normally the first step in research. Conducting extra research is anticipated in order for conclusive proof to be provided. “When qualitative data builds up to the quantitative data that will be interpreted as the starting point, the qualitative phase will follow the quantitative phase” (Creswell, 2014:220–225). Chawla and Songhi (2014:6) opine that a better understanding of a concept is gained and direction is provided in order to initiate research that is more structured. Maree (2019:337) introduces that in an exploratory mixed-method design the starting point will be the collection and analysis of qualitative data and on completion the researcher moves to collecting and analysing quantitative data (Creswell, 2009:8). This phenomenon is first explored using qualitative data. Subsequently, the qualitative investigation of data is applied and the results guide the application of quantitative data. The quantitative data are used to develop an instrument to measure the qualitative results.

Zikmund *et al. (*2013:54) explain on different occasions that these three research types could be described as building blocks. The foundation of descriptive research is laid by the exploratory research and in turn explanatory research is established through descriptive research. This study is able to apply all three, the explanatory research could be used to recognise the reason for bankruptcy or business failure, descriptive possibly will describe it (Cassim, 2015:49). Exploratory could comprehend the problem. Therefore, the most suitable research type for this study is the exploratory study as it explores the usefulness of selected financial ratios in a South African context. De Vos *et al. (*2015:95) emphasise that when research is conducted with the aim to obtain insight into a situation regarding a specific area of interest and there is a lack of knowledge or information, the exploratory research type is employed. To be more specific, the exploratory mixed-method research was employed. The study first explores already failed companies’ financial statements (qualitative data collected and analysed), subsequently the financial ratios of the companies within the sample listed on the JSE for the period under review were selected, statistics were applied to obtain bankruptcy prediction indicators (further discussed in Chapter 6), the bankruptcy prediction indicators were used to test the failed companies obtained (qualitative data). A synopsis of the research methodology is given in Figure 4.4 on next page.

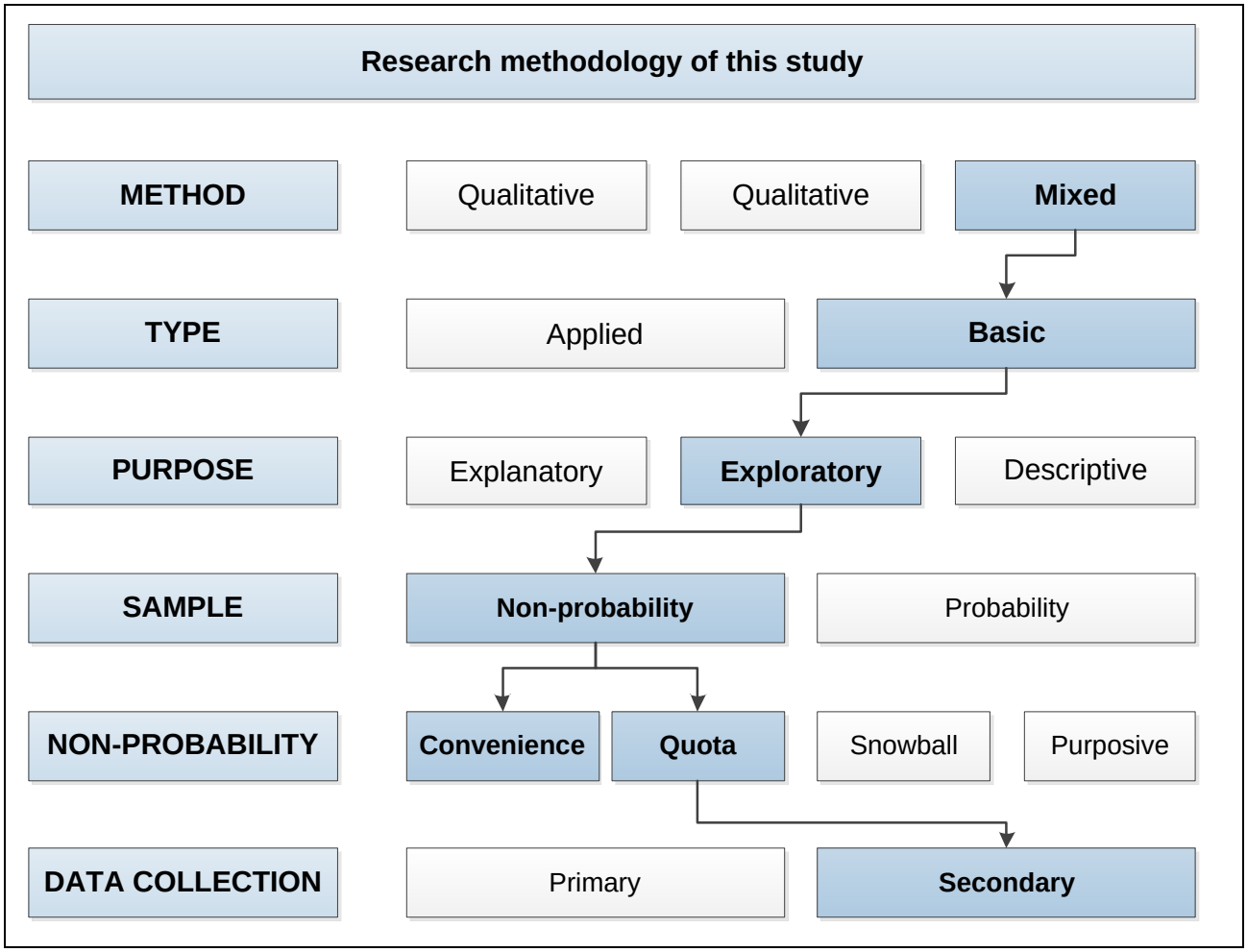


Figure 4.4: Research Methodology

Source: Tuvadaratragool (2013:3) adapted

Figure 4.4 illustrates the research methodology of the study. This model is created by Tuvadaratragool and adapted to best describe this thesis's research methodology process and the flow followed. When both the qualitative and quantitative method are being applied this is referred to as the mixed method. The basic research type is an expansion of existing knowledge being bankruptcy prediction. The purpose of the research is the exploratory mixed method according to Cavana, Delahaye and Sekaran (2001:108) who find that where exploratory research is applied, better comprehension of the problem is given. The sample selection was based on convenience, personal judgement and selection criteria. A quota convenience sample method was applied and the sample was selected, which fits some characteristics in this study being a failed group

of companies due to bankruptcy and data availability. Secondary data being second-hand data were collected.

4.3.3 Population and sampling

Regardless of how dominant research techniques are, if a researcher is unable to establish a suitable population that bears expected results it will be unproductive (Tuvadaratragool, 2013:65). Denscombe (2008:13) refers to a population as “every instance included”. Adams *et al.* (2009:96) explain an instance is a well-defined set of elements. Gravetter and Forzano (2016:134) and Marx (2019:71) state the target population is an entire set of individuals that are of interest to the researcher. Schwester (2015:168-188) concurs and refers to the target population as a theoretical population and from this population, the working population is drawn.

Zikmund *et al.* (2013:387) call this working population the sample frame being the components from which the sample will be drawn. This sampling frame is understood to be the accessible population and the portion of the larger population consisting of participants that are accessible to be recruited in the study (Gravetter & Forzano, 2016:135). The individuals selected from these accessible participants constitute the sample, meaning the sample will be selected from the sampling frame.

The JSE from which the target population is obtained being founded on 8 November in 1887, is the oldest and largest existing stock exchange in Africa providing financial information on non-failed companies (Mabhunu, 2004:13). The JSE consists of ten primary industries and within these industries are sectors within the sectors are subsectors and the subsectors contain non-failed companies from which the sample has been selected. The reason for employing financial data of non-failed companies is that their financial data are more easily accessible, available and required by legislation to be audited as stated in Section 28 in the Companies Act 71 of 2008 than that of private or non-listed companies (Cassim, 2015:51). Table 4.2 below gives an indication of the industries which is an umbrella covering companies within parallel business activities available on the JSE. Sectors is a group of companies sharing common attributes while subsectors is a smaller part into which the sector is further divided, including the number of companies per sector (Investopedia, 2019).

Table 4.2: Population of JSE-listed industries per sector

INDUSTRY	SECTOR	SUBSECTORS	COMPANIES
1. Basic materials	1. Chemicals	Chemicals	9
	2. Basic resources	Forestry and paper	4
		Industrial metals	16
		Mining	132
2. Consumer goods	3. Automobiles and parts	Automobiles and parts	6
	4. Food and Beverages	Beverages	7
		Food producers	27
	5. Personal and Households	Households goods	2
		Leisure goods	2
		Personal goods	8
		Tobacco	1
3. Consumer services	6. Retail	Food and drug retailers	9
		General retailers	39
	7. Media		17
	8. Travel and leisure		24
4. Financials	9. Banks		9
	10. Financial services	General financials	21
		Real estate	10
	11. Insurance	Life insurance	10
		Non-life insurance	7
	12. Investment Instrument	Equity investment instrument	24
		Non-equity investment instrument	8
	13. Real Estate	Real estate Investment & services	36
		Real estate investment trust	54

INDUSTRY	SECTOR	SUBSECTORS	COMPANIES
5. Healthcare	14. Health care	Health care equipment and services	9
		Pharmaceuticals and Biotechnology	7
6. Industrials	15. Construction and Material		36
	16. Industrial Goods and Services	Aerospace & Defence	-
		Electrical components and Equipment	16
		Support services	36
		General industrial	15
		Industrial engineering	12
		Industrial transportation	11
7. Oil and gas	17. Oil and gas producers		5
8. Technology	18. Technology	Software and computer Services	37
		Technology hardware and equipment	5
9. Telecommunication	19. Telecommunication	Fixed-line telecommunication	3
		Mobile telecommunications	6
10. Utilities	20. Utilities	Electricity	2
		Gas, Water & Multi-utilities	-
Total industries: 10	**Total sectors: 20**	**Total subsectors: 35**	**Total companies: 727**

Source: INETBFA (2018)

As per Table 4.2 above, there is a total of ten industries and there are 20 sectors within the ten industries, 35 subsectors within the 20 sectors and 727 companies within the 35 subsectors. Khumalo (2015:15) clarifies not all the industries listed on the JSE have any sectors namely oil and gas, technology, telecommunications and utilities. This study excludes the mining sector and financial industry due to the specialised nature of this industry and sector and therefore their assets structures and profitability vary from the

other industries and sectors (Rama, 2012:7). Thereafter the industries in which there are no failed group of companies were also eliminated.

The target population of this study consist of all the industries listed on the JSE excluding the financial industry and mining sector due to their specialised nature with different profitability and asset structures (Ngwenya, 2019:663; Rama, 2012:7). The reason for using non-failed companies is that their financial statements are more easily accessible and available and are required by legislation to be audited as states in the Companies Act 71 of 2008 Section 28 than that of non-listed or private companies. The target population period is from 2002–2016 that was utilised as this study focusses on different periods of economic circumstances. Literature has shown bankruptcy prediction models have been industry- or sector-based. Palat (2006:3) supported by Salmi *et al*. (1986:333) and Beaver (1966:74) remarks that the comparison of companies among different industries presents incorrect results. This study aims to develop a generic bankruptcy prediction indicator and validated these indicators using JSE-listed companies not limited to the same industry sectors, the model will also be applied across different industry sectors. The target population include all JSE-listed companies consisting of failed and non-failed group of companies. Figure 4.5 on the next page illustrates the interconnection between JSE industries and companies utilised in this study.

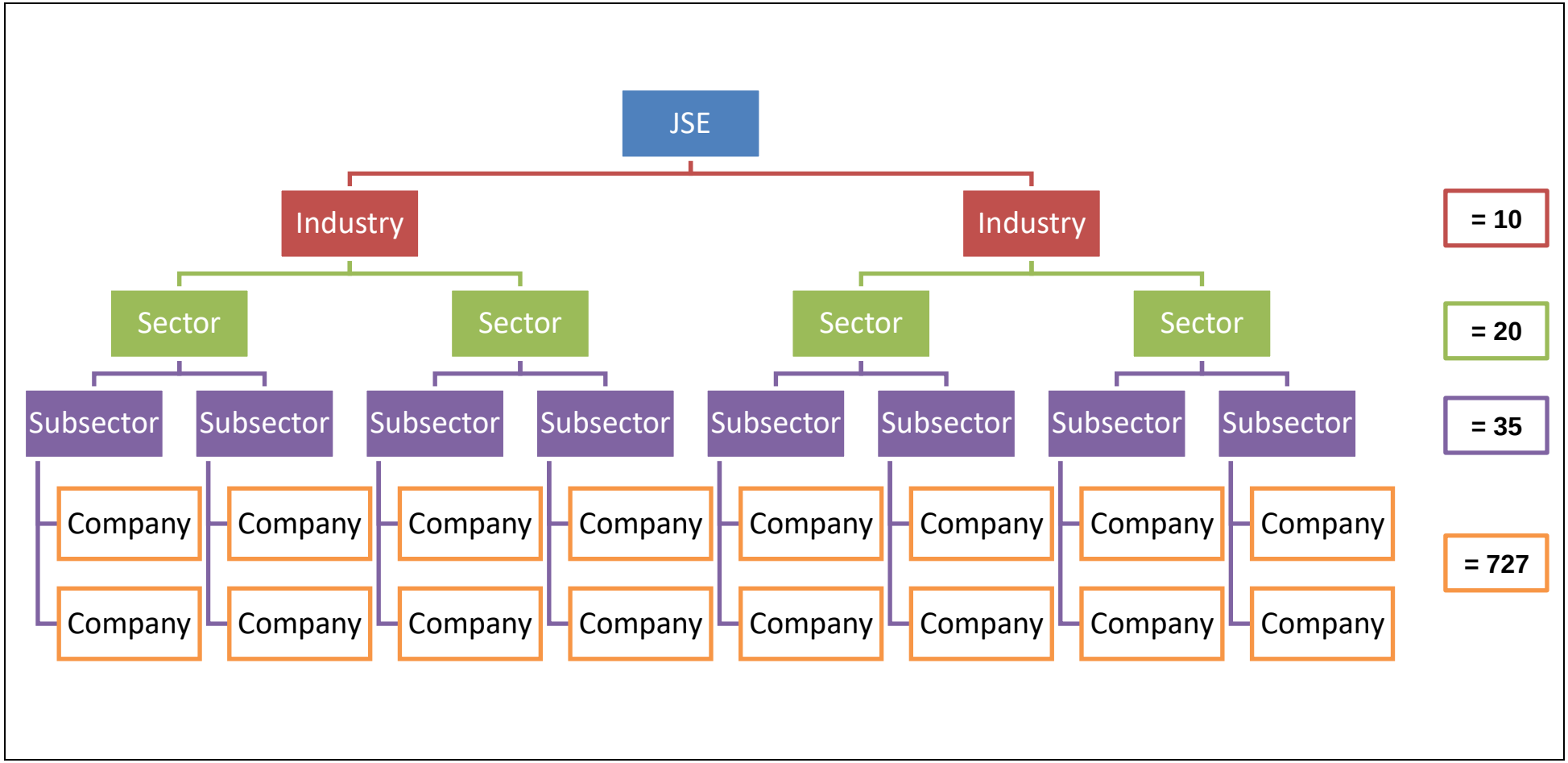


Figure 4.5: Demonstration of JSE hierarchy

Source: INETBFA (2018)

Sampling

Sampling is a technique by which characteristics of a whole population are selected (Adams *et al*., 2009:87). According to Schwester (2015:167), a sample is systematically chiselled out of a tiny piece of the population. A sample is a smaller subset that portrays a larger population and makes the workload of a researcher manageable. Sampling is used to simplify research, cutting costs, saving time and distinct properties of a whole are determined (Brynard *et al*., 2014:56-57). Bryman (2016:171) opines that when a selection of a sample is influenced by too much personal judgement, bias is created, and bias should be eliminated. According to De Vos *et al*. (2015:227), random probability sampling is when each element of the population has an equal chance to be included in the sample as discussed in Table 4.3 below.

This sampling method occurs when all elements within a population have the same or an equal opportunity of being selected into the sample. Sampling errors are not eliminated by the use of probability sampling, but the sampling errors can better be kept in check using this method than using non-probability sampling (Bless *et al.*, 2013:100; Robbetze, 2016:87). Non-probability sampling is when the sample selection process is influenced by personal judgement and some elements are more likely to be selected with a sample than others within a population (Bryman, 2016:171). In summary Welman *et al.* (2005:560) explain that with the random probability sampling elements within a population have an equal chance to be selected and with the non-probability selection probability cannot be specified. Random probability sampling includes the following types of samples; simple random sampling, systematic sampling, stratified sampling and cluster sampling while non-probability sampling consists of convenient sampling, quota sampling, snowball sampling and purposive sampling (Schwester, 2015:167-181; Marx, 2019:72). A summary of the different categories is explained in Table 4.3 below.

Table 4.3: Probability sampling categories

CATEGORY	CLARIFICATION
Simple random sampling	With simple random sampling, the selection of elements within a population has an equal independent opportunity of selection (Kumar, 2019:272). According to Bryman (2016:172), this is the most basic form of random probability sampling. The best way to eliminate bias from a sample is to select elements through use of a random process and this is the ideas on which this sampling method is based. Due to this fact, all elements have the same selection chance, where bias arises when the sample is large enough is balanced out among the selected (Greener, 2011:63).
Systematic sampling	Systematic sampling is when sampling is random yet systematic (Adams *et al*, 2009:89). The starting point is selected randomly from the population thereafter elements are selected at equal intervals (Bless *et al.*, 2013:102). Adams *et al*. (2009:89) continue by stating that the use of this sampling method guarantees that elements cannot be selected more than once. Example: if this sampling method had to be applied every k^{th} (number between 0 e.g. 10) name would be selected (k^{th} =10th every 10th name will be selected) (Van Zyl,2014:100).
Stratified sampling	Elements within the populations are divided into similar groups or strata before sampling (Babbie, 2013:91). The reason for the division according to *Bless et al*. (2013:103) is that each population element belongs to only one stratum and within each stratum, random sampling is performed. Greener (2011:63) states that due to the selected group's ability to be connected to research questions as it is being more careful and systematically thought about. Therefore, reliance is on randomness and bias is eliminated during the study. Hence stratified sampling is more reliable and executed in a more informed manner.

CATEGORY	CLARIFICATION
Cluster sampling	Cluster sampling is more used to cover a broad geographic area (Neuman, 2011:257). With cluster sampling, the population is divided into subpopulations or clusters and will be randomly selected and included in the sample. Cluster sampling overcomes one of the major constraints prevalent to the above-mentioned sampling methods being the availability of a complete list of elements, the divided subpopulation from which elements are randomly selected to form the sample (Bless *et al.*, 2013:104). Through using cluster sampling time required to collect data and costs are reduced.

Source: Kumar (2019:272), Bryman (2016:172), Van Zyl (2014:100), Bless *et al.* (2013:102-104), Babbie (2013:91), Greener (2011:63), Neuman (2011:257), Adams *et al.* (2009:89)

Table 4.3 exemplifies the different probability sampling techniques available in research. In the case of probability sampling when it is probable all elements will be included within a sample. The non-probability sample is presented next.

Non-probability sampling

Welman *et al.* (2005:56) supported by Marx (2019:74) reveal the reason for using non-probability sampling is mostly for the sake of convenience and for the economy. Bless *et al.* (2013:105) state that all elements taken for the sample are unrestricted, elements are taken until the desired size has been reached and it opens the door to serious bias. Kumar (2019:280-281) asserts that these sampling methods are applied when elements within a population cannot be recognised or are anonymous, therefore selection is done based on other considerations. Table 4.4 explains and gives a better understanding of non-probability sampling. According to De Vos *et al*. (2015:227), not all elements have the same likelihood to be included in the sample. Examples of non-probability sampling are convenience sampling, quota sampling, snowball sampling and purposive sampling.

Table 4.4: Non-probability sampling

CATEGORY	CLARIFICATION
Convenience sampling	Neuman (2011:242), supported by Bryman (2016:178) argue that researchers have the freedom to select any elements available for use, it is by virtue of its accessibility. Convenience sampling is cheap, easy to conduct but the least reliable (Adams *et al. (*2009:90) supported by (Swart, 2018:11).
Quota sampling	Schwester (2015:181) remarks that quota sampling mirrors a population that fits a certain socio-demographic description being characteristics such as age, gender, ethnicity and demographic origin. Bless *et al.* (2013:106) comment that the aim of quota sampling is to base identical proportions of a typical feature of the population as the sample is drawn. Quota sampling is expressed as the stratified sampling non-probability equal.
Snowball sampling	Snowball sampling is on a referral basis when participants are recruited through a referral system (Schwester, 2015:181). Kumar (2019:283) articulates snowball sampling as beneficial when there is little knowledge about what the group researcher wants to study, only a few individuals in a group need to be identified, who can identify other members in the group.
Purposive sampling	Purposive sampling is when a sample is selected based on the researcher's own or personal judgement. Bryman (2016:186) clarify the aim of purposive sampling is the participants chosen are relevant to the study and selected in a strategic manner based on researchers' experience and ingenuity. Welman *et al.* (2005:69) explains because research may use different means of acquiring a sample and evaluating whether the sample is an appropriate portrayal of the population is impossible.

Source: Kumar (2019:283)**,** Swart, **(**2018:11**),** Bryman (2016:178)**,** Schwester (2015:181), Bless *et al.* (2013:106)**,** Neuman (2011:242), (Adams *et al. (*2009:90), Welman *et al.* (2005:69)

Table 4.4 illustrates the different non-probability sampling techniques available in research. The non-probability technique is implemented in this study. According to Gravetter and Forzano (2016:138-148), with the non-probability approach, the odds of a

particular item in a population being selected is not known. The sample is selected for the entire population and no extensive knowledge of the population is required. Unlike as with a probability method selected from a restricted group making it unbiased. This study employed quota convenience sampling. Leedy and Ormrod (2014:220) surmise that quota convenience sampling is a type of sampling that systematically selects items not in a random manner. Gravetter and Forzano (2016:148-149) concur that that subgroups are to be included in the study and identified through sampling. Within the current study, subgroups are equally represented:

- The failed group of companies are equally represented by financially sound groups of companies (non-failed companies)
- Selection and match criteria applied to both failed and non-failed group of companies

The selection sequence of both subgroups failed, and non-failed group of companies is consistent with prior failure prediction research. Considered as the customary manner in which empirical studies are structured within this field of study (Beaver, 1966; Altman, 1968; Blum, 1974). Therefore, companies were not randomly selected from the population, selection was conducted on quota convenience basis. Firstly, quota sampling was applied per selection criteria accordingly followed by the convenience sampling (Robbetze, 2016:88 and Swanepoel, 2018:115). Based on the available data over period 2002–2016 within the boundaries set out in Table 4.6 (failed group) and Table 4.12 (non-selection criteria. Figure 4.6 below summarises the sample selection.

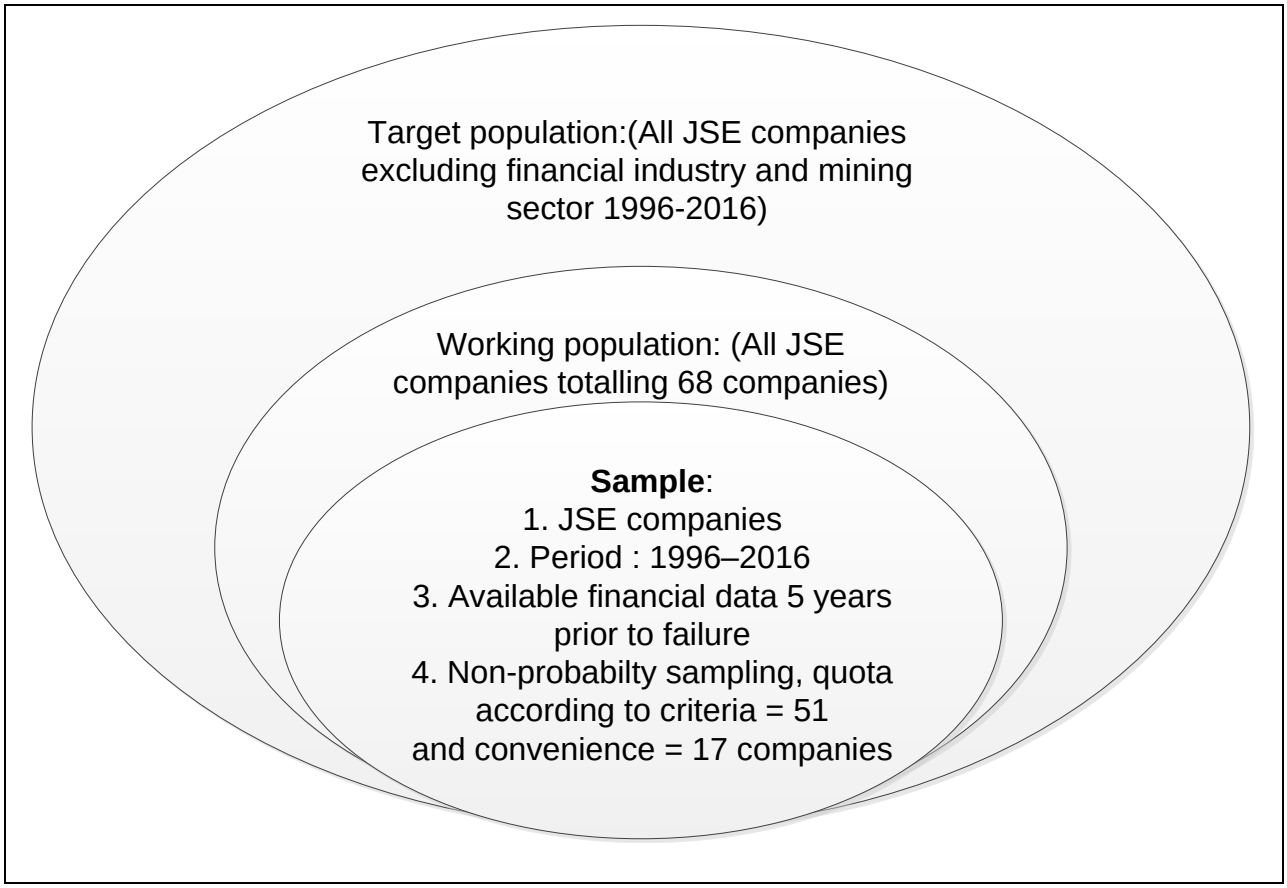


Figure 4.6: Population and sample selection

Source: INETBFA (2018)

Figure 4.6 Illustrates this study's target population consists of all companies on the JSE over time interval being 1996–2016 excluding the financial industry and mining sector due to their reporting differences. The working population, also known as the sample frame, are all the companies and the sample companies are those companies that meet the selection criteria. The stages of elimination applied within the study are presented.

Stages of elimination

A list of all the failed companies was collected from the JSE for the period 2002–2016). The failed group of companies list consisted of companies being failed for difference reasons. Cassim (2015:55-56) concurring with BDO (2011:40-42) highlights some of the reasons why companies failed or are being failed as:

- The responsibility and the cost identified with compliance are monotonous.

- Due to the liquidity deficiency, investors have no interest.
- Shares are sold exclusively to significant investors.
- Regardless of large dividends being paid, there is no increase in the share price.
- The share price is not moving in accordance with the companies' profits in the long term.
- The listing is no longer rewarding due to the excessive costs associated to the companies that are and remain non-failed.

Tuvadaratragool (2013:66) asserts financially weak companies will always end up going bankrupt. Coat and Fant (1993:147) and Routledge and Gadenne (2000:233) disagree and argue that bankruptcy is not an exclusive final result and in order to manage financial distress, companies would reorganise.

A list of all the JSE-failed companies was obtained from the JSE for the period 2002–2016. As companies delist for different reasons, the primary reasons being mainly due to mergers, company disposals, restructuring and scheme of arrangement etcetera. The companies that have failed due to schemes of arrangement have been indicated, including the companies having entered into an arrangement based on the definition in the Companies Act 71 of 2008, Section 114 as: "Unless it is in liquidation, or in the course of business rescue proceedings in terms of Chapter 6, the board of a company, may propose and, subject to approval in terms of this part, implement any arrangement between the company and holders of any class of its securities, including a reorganisation of the share capital of the company by way of, among other things—(a) a consolidation of securities of different classes; (b) a division of securities into different classes; (c) an expropriation of securities from the holders; (d) exchanging any of its securities for other securities; (e) a re-acquisition by the company of its securities; or (f) a combination of the methods contemplated in this subsection." As supported by the Companies Act from the total sample of failed companies, a number of companies were deleted as they are not suitable for the purpose of this research. The elimination is conducted in four stages. An outline of the elimination stages is illustrated in Table 4.5

Table 4.5: Elimination criteria – Failed companies

Stage: 1	Period of study	1996 – 2016
Stage: 2	Industry/Sectors excluded	Financial and Mining
Stage: 3	Reason for exclusion	Non - bankruptcy
Stage: 4	Financial data availability	Five years prior bankruptcy

Source: Author

In Table 4.5 above a synopsis demonstrates in Stage 1 the total failed companies for only these years 2002–2016 but financial statement data collected five years prior to first delisting being 1996. The financial and mining sectors have been eliminated in Stage 2 and Stage 3 being the companies excluded due to non-bankruptcy reasons. The application of the next stage of elimination is presented below in Table 4.6.

Table 4.6: Stages of elimination: Period and industry in sampling process

Stage 1: Period	**Cut-off**	**Total**	**Data Collection**
	2002–2016	15 years	1996-2016
Stage 2: Industry	Total failed companies	Financial and Mining	Total population
	358	122	236

Source: Cassim (2015:56)

Table 4.6 exemplifies the results after Stage1 of the elimination process have been applied totalled, 15 years. The total population after Stage 2 of the elimination process have been applied, all failed companies regardless of reason total 358 (Annexure D) of which only 28 (13%) was due to bankruptcy. Table 4.6 was created by Cassim (2015) and adapted to fit this thesis elimination process. From the total sample of 28 failed companies, companies were deleted as they are not suitable for purpose of the study.

In order to be included in the sample failed companies had to satisfy the following sample criteria for this study, criteria are follows:

- Companies need to be failed from the JSE due to bankruptcy however the companies failed due to mergers, disposals, and scheme of arrangements etcetera, were eliminated from failed sample group.
- Companies should be failed from JSE during period 2002-2016. Companies within the financial industry and mining sector were disregarded from failed sample group.
- The period of study 2002-2016 represents the period in which companies failed but the financial statements data of these companies will be collected up to five years prior to failure. Therefore, financial statement data for the range of 10 years (1996-2016) were used for the study.
- The financial statement data were drawn five years prior to bankruptcy or based on the availability of the financial statement data over a five-years period prior to bankruptcy. The financial statement data order does not have to be immediately subsequent to the delisting, the importance statement data is over an uninterrupted five-year period within the period of study (Cassim, 2015:87)

Beaver (1966:102) supported by Hamer (1983:295) and Prusak (2018:2) states that a five-year period is a good investigation period because for at least five years before failure ratio analysis can be useful to predict failure. Hossari (2006:222) agrees with the sufficiency of the five-year period explaining that the purpose of any failure prediction model is to predict failure before it happens. If the testing period is too lengthy failure signals may not be detected. Furthermore, when it is too short it may be too late for any remedial action to be taken or implemented.

According to the data collected from the JSE (2017), the total number of companies that have failed for the period 2002–2016, excluding the financial industry and mining sector and only due to bankruptcy totalled 28 companies and are exhibited in Table 4.7 on next page.

Table 4.7: Number of companies failed due to bankruptcy (2002–2016)

YEAR	NUMBER OF DELISTING	PERCENTAGE OF DELISTING
2002	0	0%
2003	8	29%
2004	1	3%
2005	8	29%
2006	2	7%
2007	0	0%
2008	0	0%
2009	0	0%
2010	0	0%
2011	3	7%
2012	0	0%
2013	0	0%
2014	0	0%
2015	0	0%
2016	7	25%
Totals	**28**	**100%**

Source: INETBFA (2018)

Table 4.7 above gives a breakdown of the companies failed annually due to bankruptcy for the cut-off period 2002–2016 as 28 companies in total.

- In 2002, 2007–2010, 2012–2015 no companies were failed due to bankruptcy.
- In 2003 eight companies (29%) failed.
- In 2004, 1 (3%) of the 28 companies failed meeting the above-mentioned criteria.
- In 2005, 8 (29%) and 2006 (7%) being 2 of the total failed companies.

- In 2011, 3 (7%) and 2016, a total of seven companies failed, portraying 25%.

Hlalha (2010:5) expressed the rationale for prohibiting the financial industry and mining sector is due to the "*strict regulations*" of this industry and sector. The specialised nature of both the mining sector and financial industry have different profit and asset structures (Rama, 2012:7). Table 4.8 identifies the sample that was used in this study after the exclusion of companies whereby no financial data are available.

Table 4.8: Sample JSE-failed companies due to bankruptcy (2002–2016)

COMPANY	CODE	DATA AVAILABLE	INDUSTRY	SECTOR
YEAR FAILED: 2003				
Softline Ltd	SFT	No match	Technology	Hardware
Homechoice Holdings Ltd	HCH	1997–2003	Consumer services	Food & Drugs
Ninian and Lester Holdings Ltd	NIN	1997–2001	Consumer services	General retail
Forza Group Ltd	FOZ	No Fin Data	Consumer services	Food & Drugs
The Laser Group Ltd	LSR	No match	Consumer services	Travel & Leisure
Metje & Ziegler Ltd	MZG	1998–2003	Industry	General industry
Accord Technologies Ltd	ACR	No Fin Data	Telecommunications	Mobile
Afribrand Holdings Ltd	ABR	No Fin Data	Consumer goods	Food producers
YEAR FAILED: 2004				
Net 1 Applied Technology Holdings Ltd	APL	No match	Technology	Hardware
YEAR FAILED: 2005				
Advanced Technical Systems Ltd	ADT	No Fin Data	Consumer services	General retail
Choice Holdings Ltd	COI	No Fin Data	Consumer goods	Food producers
Dynamo Retail Ltd	DNM	No Fin Data	Consumer services	Food & Drugs
Fashion Africa Ltd	FSH	1998–2002	Consumer services	Food & Drugs
Leisurenet Ltd	LST	No Fin Data	Consumer services	Travel & Leisure
Siltek Holdings Ltd	STK	1996–2000	Health care	Equipment
Universal Growth Holdings Ltd	UNG	1996–2000	Consumer services	Food & Drugs

COMPANY	CODE	DATA AVAILABLE	INDUSTRY	SECTOR
Global Technology Holdings Ltd	GLT	No match	Technology	Hardware
YEAR FAILED: 2006				
Frontrange Ltd	FRO	No match	Technology	Software
Omega Alpha International IT Holdings Ltd	OAI	No Fin Data	Technology	Hardware
YEAR FAILED: 2011				
Beget Holdings Ltd	BEE	No match	Technology	Hardware
Best Cut Ltd	BCH	No Fin Data	Consumer goods	Food producers
YEAR FAILED: 2016				
Africa Cellular Towers Ltd	ATR	No match	Technology	Hardware
Bioscience Brands Ltd	BIO	2008–2012	Consumer goods	Food producers
Erbacon Investment Holdings Ltd	ERB	No match	Industry	Construction
Faritec Holdings Ltd	FRT	No Fin Data	Technology	Hardware
Sanyati Holdings Ltd	SAN	No match	Industry	Construction
Sea Kay Holdings Ltd	SKY	No match	Industry	Construction
Square One Solutions Group Ltd	SQE	No Fin Data	Technology	Software

Source: INETBFA (2018)

As indicated in Table 4.8, 28 companies failed due to bankruptcy. A total of 17 companies within five (5) JSE industries met all the sample criteria besides the financial availability criteria. Included is consumer goods, consumer services, healthcare, industrials, technology and telecommunications. Nine sectors/subsectors within those industries were included in the sample. Eleven companies did not have the sufficient financial data available expressed as “No Fin Data”, they are therefore eliminated from the sample.

Results after the application of the third stage of elimination, the exclusion of non-bankrupt failed companies with a total of 28 companies and fourth stage of the elimination process are presented with financial statement data availability being five years prior to delisting, which amount to to 17 companies as referred to in (Section 5.2).

Table 4.9: Stages of the elimination process

Stage 1: Period	Cut-off 2002–2016	Total 15 years	Data Collection 1996-2016
Stage 2: Industry	Total failed companies 358	Financial and Mining 122	Total population 236
Stage 3: Reasons	Total population 236	Bankruptcy (Sampling frame): 28	Other 208
Stage 4: Financial data	Total sampling frame 28	Five years prior bankruptcy (Sample) 17	Other 11

Source: Cassim (2015:62)

Table 4.9 created by Cassim and adapted to best fit this thesis stages of elimination process. Table 4.9 above addresses the failed group of company's sample that has been further reduced based on the matching criteria indicating 28 companies remaining after failed companies selected over the period 2002─2016, excluding industries (financial and mining). In Stage 3 the reason for delisting was applied, failed only due to bankruptcy followed 17 companies remaining after Stage 4 application, available financial data. Sample total of 17 companies for the failed group of companies remained. Out-of-sample data were selected. Beaver, McNichol and Rhei (2005:14) explain the purpose of out-of-sample data is to examine the probability of predicting bankruptcy or financial distress in another sample period.

Five companies were then selected with similar criteria, companies either failed due to bankruptcy or companies on the brink of bankruptcy or experiencing financial difficulty. Only difference in the out-of-sample data period was for period 2017 and 2018 with the aim to test and validate the effectiveness of the newly developed bankruptcy prediction indicators for that out-of-sample data period. Table 4.10 illustrates the out-of-sample group of companies selected.

Table 4.10: Out-of-sample companies

COMPANY	CODE	INDUSTRY	SECTOR
Basil Read	BSR	Industrial	Construction
Edcon Holding	ECO	Consumer services	Retail
Howden Africa	HWN	Industrial	Industry
Steinhoff	SHF	Consumer goods	Personal and household
Group 5 Ltd	GRF	Industrial	Construction

Source: INETBFA (2018)

Table 4.10 indicate the out-of-sample group of companies that were tested, which are outside the initial study period (2002-2016). The intention of testing this out-of-sample group to determine the selected bankruptcy prediction indicators' ability to predict bankruptcy or detect financial distress timely, enabling proactive correction to be taken.

Babbie (2013:103) indicates in order to obtain comparability between an experimental group and a control group (in this study referred to as non-failed group of companies) the matching needs to be applied. Van Zyl (2014:240) explains that the primary matching rule is to obtain a measure of variables to be matched. The closest variables are then matched. The basis on which variables are to be matched needs to have a strong connection to the dependent variable of interest, if not, no sense can be made to matching. The majority of previous studies practised this approach particularly Beaver (1966), Altman (1968) and Blum (1974). According to Beaver (1966:74), this approach intends to help control the components that may cause the link between ratio and failure to be ambiguous. Blum (1974:6), on the other hand, explains the reasoning behind the matching criteria is to steer clear from matching contrasting companies. Because bankruptcy prediction indicators are financial ratios, to investigate bankruptcy ability of financial ratios both failed and non-failed companies are required. When a sample consists only of failed companies it will be inadequate for the study of this nature. As the traditional ratios analysis, being trend analysis and comparative analysis, measure and compare financial ratios of both failed and non-failed companies (Beaver, 1966; Altman, 1968; Blum, 1074; Hlahla, 2010; Rama 2012 and Sabela *et al.,* 2018)

In order to keep this study consistent with previous studies conducted by the field pioneers the matching approach is applied in this study (Ashraf, Félix & Serrasqueiro, 2019:3; Muller *et al*., 2009:22). Matching is done based on the similarities of variables within a study. The available data of the non-failed JSE companies within all eight JSE industries (1996–2016) were used as the non-failed group of companies were included in the statistical computations. The JSE non-failed companies over the period under study and the study criteria for non-failed companies in the study were as follows:

- Period 2002–2016 matched with failed companies in the same sector.
- All non-failed companies within the population including all sectors excluding financial and mining we included.
- Available financial data with the same year-end date were used to help ensure the companies being compared is in the same period as failed as stated in Table 4.12 below.

Companies not matched were compared to Altman's EMS model.

The non-failed group of companies were also eliminated but in three stages taking the elimination criteria into consideration. The process to be followed is outlined in Table 4.11 below.

Table 4.11: Elimination criteria – Non failed companies

Stage: 1	Industry/Sectors excluded	Financial and Mining
Stage: 2	Sectors excluded	Not on failed sample
Stage: 3	Financial data availability	Five years prior bankruptcy

Source: Author

Tables 4.11 above indicates the stages of elimination of the non-failed companies, elimination is based on industry and sector exclusion, financial data availability and the industry and sector of the failed companies. Over the period of study, Table 4.12 below indicates the stages of elimination applied for the non-failed group of companies. Companies were then matched with failed companies and the remaining ten (10) failed companies were validated by applying the newly developed BPIA and the results were

compared with the EMS model. While the non-failed companies were included in the statistical computations. In Table 4.12 the after-effects of the elimination process that excluded the financial industry and mining sectors are summarised and the selected criteria mentioned above have been applied.

Table 4.12: Stages of elimination of non-failed group of companies

Stage 1: Industry	Total industry 10	Financial and Mining & dissimilar industry to failed sample 4	Other 6
Stage 2: Sector	Total sectors 20	Sample sector 9	Other 11
Stage 3: Financial data	Total companies 46	Period of study (1996–2016) 46	Other 0

Source: Cassim (2015:62)

Table 4.12 created by Cassim (2015) and adapted to fit this thesis, non-failed companies stages of elimination process. The elimination stages and the result are demonstrated in Table 4.12 above, indicating after eliminating the financial industry and mining sector, six of the ten industries remained resulting in only nine of the 20 sectors included in the sample of the non-failed companies. A total of 46 companies had available financial data for five years before bankruptcy as per the failed sample, the five years need not be consecutive to the bankruptcy date. The importance is that there is financial data over an uninterrupted five-year period.

After the selection criteria procedure, 46 of the non-failed companies and 17 failed companies remained within the sample:

- A total of seven of the failed companies in Table 4.10 could be matched to non-failed companies in Table 4.14. Matching was done based on the matching criteria
  - Same sector – companies operating under the same business conditions
  - Same statement date – ensure companies in the same period is compared
  - Available financial data - over a continuous five-year period in order to determine the financial distress detection ability over a five-year period.

- The remaining 10 companies were tested and compared to Altman's EMS model that are communicated as "No match". The rationale for comparison with the EMS model, Altman and Hotchkiss (2006:280) assert after the application of the EMS model to the BRIC (Brazil, Russia, India and China) including Mexico's and Argentina's impressive bankruptcy prediction results have been reflected.
- Out-of-sample in Table 4.10 were tested applying the newly developed BPIA compared to the EMS model

Thereafter shown in Table 4.13 below is the list of the non-failed companies that were matched to the 7 failed companies after the eliminations process was applied based on related sectors.

Table 4.13: Non-failed companies-Similar sector

COMPANY	CODE	INDUSTRY	SECTOR	AVAILABILTY OF FINANCIAL DATA
YEAR: 2003				
Barloworld	BAW	Industrial	General	1998–2002
Pick 'n Pay Stores	PIK	Consumer services	Food and Drugs	1997–2003
Woolworths Holdings	WHL	Consumer services	Food and Drugs	1997–2001
YEAR: 2005				
Network Health Holdings	HC	Health care	Equipment	1996–2000
Shoprite	SHP	Consumer services	Food and Drugs	1998–2002
Clicks	CLS	Consumer services	Retail	1996–2000
YEAR: 2016				
Tiger Brands	TBS	Consumer goods	Food Prod	2008–2012

Source: INETBFA (2018)

Table 4.13 above indicates the non-failed group of companies that were matched to failed companies according to similar sectors, the other years were not able to be matched. The sample size was divided into three categories.

Category 1: Matching of the failed to the non-failed companies as illustrated in Table 4.14 below. These were the only companies able to be matched per sector. These companies were tested through the application of the new developed BPIA. These non-failed companies were also included in the statistical calculation with the focus to determine the correlation between financial ratios.

Category 2: Remaining ten failed companies indicated “no match” that have not been matched to a non-failed company per the same sector and were tested also applying the developed BPIA. The results were compared to Altman’s EMS model as Correia *et al.* (2015:5.24) refer to the EMS model as having a superior level of accuracy than Altman’s prior models.

Category 3: The developed BPIA will lastly be used to do the testing of the effectiveness group (out-of-sample) and the results were compared to the Altman’s EMS model.

Table 4.14 below illustrates the non-failed companies that were matched to the sample of failed companies and in the statistical computation.

Table 4.14: Non-failed companies matched failed companies

NO	NON-FAILED COMPANIES	FAILED COMPANIES	INDUSTRY CODE	SECTOR	AVAILABILITY OF FINANCIAL DATA
YEAR FAILED: 2003					
1	Pick 'n Pay Stores	Homechoice Holding Ltd	CS	Food/Drugs	1997 - 2003
2	Woolworths Holdings	Ninian and Lester Holding Ltd	CS	General retail	1997 - 2001
3	Barloworld	Metje & Ziegler Ltd	Ind	General industry	1998 - 2003
YEAR FAILED: 2005					
4	Shoprite Holding	Fashion Africa Ltd Ltd	CS	Food / Drugs	1998–2002
5	Network Healthcare Holdings	Siltek Holdings Ltd	HC	Equipment	1996–2000
6	Clicks Group	Universal Growth Holdings Ltd	CS	Food / Drugs	1996–2000
YEAR FAILED: 2016					
7	Tiger Brands	Bioscience Brands Ltd	CG	Food / Producers	2008–2012
Note: INDUSTRY: Consumer Goods – CG, Consumer Services – CS, Industry – Ind, Technology – Tech, Telecommunication – Telecom, Health Care – HC					

Source: INETBFA (2018)

In the final matching of the failed and non-failed companies as indicated in Table 4.14 above is a total of seven companies matched per sector, 11 companies eliminated due to insufficient financial data and ten companies tested and compared to the EMS model followed by the testing of the out-of-sample. The validation of the BPIA was applied at a two-level testing as follows:

- **First testing**: the developed bankruptcy prediction indicators were applied to seven failed companies that were matched with seven non-failed companies within the same sector. The seven matched companies illustrated in the above table have been matched according to the required criteria, the failed with the non-failed companies.

The aim is to determine whether financial distress can be detected within the failed companies over the five-year period prior to failure

- **Second testing**: the remaining ten failed companies are tested using the developed bankruptcy prediction indicators and then the results are compared to the same failed companies tested by means of applying the EMS model. The rationale for testing and comparing results to the EMS model of the ten companies is to determine the effectiveness of the bankruptcy prediction indicators as the results were compared to a renowned emerging market bankruptcy prediction model.
- **Third and final testing**: the five out-of-sample data group (effective group) of companies are tested applying both the bankruptcy prediction indicators and the EMS model and results were compared. The objective of testing the five out-of-sample companies is to test the trustworthiness of the bankruptcy prediction indicators.

Two groups of companies were selected at initial state: JSE-failed and non-failed companies. The process followed:

1. To clean up the data by applying an elimination process on the population of companies to derive the final list of companies used for empirical analysis.
2. Companies were eliminated due to change of financial year resulting in no consecutive financial statements.
3. Among the group of companies only companies that were failed due to bankruptcy were included in failed group of companies.

The above elimination process resulted in a set of failed companies and non-failed (46) that were further match and tested. Subsequently, the data collected is presented.

4.3.4 Data collection

Welman *et al. (*2005:135) supported by Grix (2010:125) states that data can be collected through various sources. The purpose is that the data collected needs to be relevant to the research problem. According to Bless *et al.* (2013:112), the intention for data being collected is to enable the research objectives to be met and addressing the research problem. In the collection of the empirical data the study applied the ten commandments of data collection. According to Van Zyl (2014:160) when this data collection process is

followed fatal errors can be avoided and is the purpose of the application. Table 4.15 illustrates how the “ten commandments of data collection” have been applied within the study.

Table 4.15: Ten commandments of data collection

NUMBER	COMMANDMENT	THIS STUDY
First	Obtain needed authorisation to collect data from e.g. management.	Access to information on the INET McGregor BFA database
Second	Data collected relevance need to be considered.	Data collected (financial statements) for the period 1996–2016, relevant period of investigation
Third	Data type and collection place need to be considered.	Published and audited financial statement from a reputable database, JSE portal
Fourth	Ensure the collection instrument is coherent and easy to use.	Desktop research and access to the database
Fifth	Duplication of the data should be kept at another site.	Accessible archives from database archives
Sixth	Assistance should be obtained from skilled data collectors to avoid data being compromised.	Desktop study
Seventh	When and where data will be collected should be set out in a detailed plan.	INET McGregor BFA – JSE portal
Eighth	Data sources should be refined.	Reputable database with publicly available data
Ninth	Study sample dropouts should be followed up to avoid data biasedness.	Only necessary data obtained
Tenth	Original data should not be thrown out.	Original data housed on INET McGregor BFA database

Source: Van Zyl (2014:160-161) adapted

Once the sampling process has been formalised, the data collection has been done with care as indicated in Table 4.15 reflecting the ten commandment of data collection and the process may commence (Adams *et al.*, 2009:87). Table 4.15 created by Van Zyl and adapted to fit the data collection process in the current study’s research methodology by

including the action taken by researcher. The data collection process begins by obtaining standardised published financial statements collected from reputable and reliable financial information databases being the JSE and the INET McGregor BFA database.

Standardised values need to be used in order to make values comparable (Oberholzer & Van der Merwe, 2010:33). Steyn, Smit, du Toit and Strasheim (1996:141) concur that it is essential to apply the standardisation techniques when individual values need to be likened in one dataset to another. A comparison of published financial statements is executed, this format was utilised, as published financial statements represent actual amounts. Published statement of financial position, statement of profit and loss and other comprehensive income and statement of cash flow of failed companies were compared with that of the non-failed companies.

These financial statements were obtained from the INET McGregor BFA database in a standardised format, data based on the accessibility of the financial statement data over a five-year period before bankruptcy were collected. The financial statement data were drawn five years prior to bankruptcy or based on the availability of the financial statement data over a five years period prior to bankruptcy. The financial statement data order does not have to be immediately subsequent to the delisting, the importance is that financial statement data is over an uninterrupted five-year period within the period of study (Section 4.3.3). The failed group of companies is the basis according to which the non-failed group of companies' data were drawn. Financial statements to be collected include the statement of financial position and statement of comprehensive income and the statement of cash flow, as well as the notes to the financial statements.

Service (2017:38) subjects that the objective of the financial statements is to provide useful financial information to the stakeholders aiding them in their decision-making and through obtaining a better understanding of the company's financial state of affairs. Van Auken and Carraher (2013:324) reason that regardless of how reliable, accurate or current financial statements are they will be insufficient if the users of the financial statements are unable to understand or interpret them. Financial statements need to meet basic characteristics being relevance and a faithful representation (Service, 2017:40-41). When decisions are made without taking into consideration the financial impact, financial distress could be lurking around the corner as poor financial decisions could have a direct

impact on the company's financial stability. Therefore, financial statements are significant as it supports the company's strategic goals. It is of great importance that financial statement users have strong financial skills in order to understand the financial statements and the impact their decision may have. Different user's decisions have different outcomes due to their different needs, for example, tax authorities' decisions will be based on tax implications and would be made for tax purposes.

In spite of the abundance of data contained in a group of financial statements, it cannot give a holistic picture of a business on its own (Kolitz, Quinn & McAllister, 2009:12). Therefore, a more comprehensive analysis and an understanding of the financial statements are required. The type and degree of the analysis performed depends on the individual user, the data accessibility to the user and the specific needs of the user. Service (2017:1262-1263) reasons that regardless of the tedious disclosure requirements financial statements need to adhere to intrinsic shortcomings that still exist. These shortcomings should be kept in mind when performing financial analysis and interpretation. The shortcomings being as follows:

- Historical figures – Excludes inflations
- Predictive value restricted – No or little relevance on the future as it is based on past events explained by the definition of assets and liabilities being as follows (Service, 2017:47):
- Qualitative information restricted – Contains a minor amount of qualitative information and it could influence the users' decision-making.
- Risk – Risk is of great importance to investors as higher risk equal higher returns yet not all risk is published.
- Comparability restricted – Different accounting policies applied have the ability to compromise the comparability between companies and from one year to the next.

According to Grossman and Livingstone (2009:31), financial statements are only as reliable as the source from which financial information has been obtained. Financial statements essentially compromise five main statements of which only three were covered in this study being the statement of financial position, statement of comprehensive income and profit and loss and the statement of cash flow (Lovemore,

Brümmer, Hall & du Toit, 2003:35-36; Service, 2017:58). Tuvadaratragool (2013:78) explains that a large number of financial ratios can be extracted from these financial statements, due to this fact, it is important to determine or identify which of the many ratios should be used and is best-suited. Beaver (1966:71-72*)* defines ratios as a "quotient of two numbers". Tuvadaratragool (2013:78) stated financial statements provide information for both the results of companies' operations and economic decision-making. In order to fulfil the aim of the study, only the most relevant ratios should be used (Chen and Shimerda 1981:51).

Within this study, financial data were obtained in the form of financial statements from INET McGregor BFA database in a standardised format. INET McGregor BFA was previously referred to as the Bureau of Financial analysis and operating since 1965 at the University of Pretoria (Cassim, 2015:65). Financial ratios were obtained and the financial statements were then analysed and obtained through a collection of basic relevant data from which the researchers can draw a conclusion (Bryman, 2016:376). This is done with a specific end goal being to identify whether bankruptcy or distress could have been detected in the failed companies in comparison to the non-failed company, by assessing the result of the analysis conducted.

Mixed method was applied to collect data. Qualitative data were firstly collected followed by the quantitative data worked through in phases to get a pool of appropriate ratios from which the bankruptcy prediction indicators were selected.

- Firstly, financial ratios selected by various studies both international and locally. Based on the frequency and reliability of the financial ratios identified by trailblazer in this field of study, internationally seminal studies by Altman (1968), Hossari (2006), Fülbier (2008) and local studies by De la Rey (1981), Naidoo (2006) and Cassim (2015).
- Secondly, nominated studies of the financial ratios were divided into the six categories to measure company performance which is according to Correia *et al.'s* (2015:5.16) notion supported by Fatihudin and Mochklas (2018:553) liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow. According to Naidoo and Du Toit (2007:40-42), researchers would use alternatives for the ratios because different industries have different risk profiles and resulting in not all ratios being categorised.

The selection pool from which possible bankruptcy prediction indicators were selected were created by the ratios that appear in all the indicated seminal studies and based on their frequency and popularity of use in previous global ratio-based studies conducted in 1968, by Altman, 1981 by De la Rey, 2006 by Hossari and Naidoo, 2008 by Fülbier and Cassim study conducted in 2015 were indicated as “pool selection”. The studies excluded because financial ratio was already included in the selected studies.

Further ratios shortlisted for the bankruptcy prediction indicators were based the four pillars of company financial health according to South African Reserve Bank (SARB) (2019:1-4), Cassim (2015:212) and Naidoo (2006:6).

- Profit potential – Ratio demonstrating whether company assets and equity are viably utilised and producing returns. Suggested ratios ROE, ROA and total asset turnover.
- Financial stability – Cash flow being important because if a company has insufficient income, they cannot proceed as a going concern. Recommended ratios, quick ratio and CFTD.
- Growth potential – Establish whether the company’s sales and earnings are increasing. The ratio considered sales and earnings growth.
- Risk – Provides an indication of the financing utilised by the company and whether they can at least reimburse the interest commitments. A selected ratio debt and interest cover.

The justification for selecting the four pillars according to the SARB,2019:1-4) is the risk to financial stability is routinely assessed by the SARB. The purpose is to relieve any vulnerabilities identified that may be available within the domestic system. The vulnerabilities were financial stability, growth, profitability and risk. SARB explains growth cannot be sustained without financial stability e.g. increase unemployment or decrease in fixed investments brought about by weak business confidence. This in turn will lower profitability for instance when depreciation in exchange rate leading to increase in replacement cost, statement of financial position being negatively impacted. Resulting in higher risk due to increase in borrow prerequisites causing an increase in finance cost. The seminal studies from which the pool of ratio will be created is presented below.

The first study from whom research ratios were selected is Altman (1968:594-604). His original model called the Z-score consists of five ratios and the sample included only manufacturing industries. In 1977 Altman (1993:203-204) enhanced the Z-score by changing the sample to private and non-manufacturing and named it the Zeta model. Altman and Hotchkiss (2006:239-241) explained and supported by Tuvadaratragool (2013:42) and Ngwenya (2018:663) the Zeta model was modified and called the EMS model. The aim of the changes was to improve the model's accuracy and the changes included a move from five to four ratios and changes to the cut period as well (Altman, 2018:28-34). Table 4.16 below consists only of the upgraded EMS model.

Table 4.16: Grouping of Altman (2006)

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
WCTA	Total debt/Total equity	Liquidity	X
RETA	Retained earnings/Total assets	Profitability	X
EBITTA	Earnings before interest and tax/Total assets	Profitability	X
MVETL	Market value of equity /Total liabilities	Liquidity	X
STA	Sales / Total assets	Asset management	X

Source: Altman and Hotchkiss (2006:239-241)

Table 4.16 identifies the financial ratios of best-known model according to Correia *et al*. (2015:5.29). Altman has been referred to the pioneer in the field of study also the reason why this model has been included in the thesis pool of financial ratios. The pool having been selected based on the frequency of appearance of the financial ratios in the selected seminal studies of which the study by Altman (1968) meets the requirement. The total financial ratios selected were 94 ratios as per Table 4.3 and further reduction was done as seen in Table 4.4.

Hossari's (2006:56-71) study covered 44 ratios used in 84 studies over period the 1968–2004. Financial ratios arranged into the following groups:

- Possession measured by assets

- Ownership measured by equity
- Liquidity measured by liabilities
- Performance measured by sales
- Peripheral measured by all other financial statements excluded above.

The ratios are indicated in Table 4.17 below.

Table 4.17: Grouping of Hossari (2006)

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
CTA	Cash/Total assets	Liquidity	
CATA	Current assets/Total assets	Debt management	
CFTA	Cash flow/Total assets	Operating cash flow	
CLTA	Current liabilities/Total assets	Debt management	
EBTTA	Earnings before taxes/Total Assets	Profitability	
EBITTA	Earnings before interest and taxes/Total assets	Profitability	X
FATA	Fixed assets/Total assets	Growth	
LTLTA	Long-term liabilities/Total assets	Debt management	
NITA	Net income/Total assets	Profitability	
QATA	Quick assets/Total assets	Liquidity	
RETA	Retained earnings/Total assets	Profitability	X
SFA	Sales/Fixed assets	Asset management	
SFA	Sales/Total assets	Asset management	X
TETA	Total equity / Total assets	Debt management	
TLTA	Total liabilities/Total assets	Debt management	X
WCTA	Working capital / Total assets	Liquidity	X
CLTE	Current liabilities/Total equity	Liquidity	

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
EBITTE	Earnings before interest and taxes/Total equity	Debt management	
FATE	Fixed assets / Total equity	Debt management	
LTLTE	Long-term liabilities/Total equity	Debt management	
NITE	Net income/Total equity	Profitability	X
STE	Sales/Total Equity	Asset management	
TLTE	Total Liabilities/Total equity	Debt management	X
CCL	Cash/Current liabilities	Liquidity	X
CACL	Current Assets/Current liabilities	Liquidity	
CFCL	Cash Flow/Current liabilities	Liquidity	
CFTL	Cash Flow/Total liabilities	Operating cash flow	X
MVETL	Market Value of Equity/Total liabilities	Liquidity	X
QACL	Quick assets/Current liabilities	Liquidity	X
TELTL	Total Equity/Long-term liabilities	Profitability	X
TETL	Total Equity/Total liabilities	Debt management	
CS	Cash/Sales	Profitability	
CAS	Current assets/Sales	Profitability	
CFS	Cash flow/Sales	Profitability	
EBITS	Earnings before interest and taxes/Sales	Profitability	
EXPS	Expenses/Sales	Profitability	
INVS	Inventory/Sales	Profitability	
NIS	Net income/Sales	Profitability	X
QAS	Quick assets/Sales	Profitability	
WCS	Working capital/Sales	Liquidity	
ARINV	Accounts receivable/Inventory	Asset management	

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
EBITI	Earnings before interest and Taxes/Interest	Debt management	X
INVWC	Inventory/Working capital	Liquidity	
COSINV	Cost of Sales/Inventory	Asset management	

Source: Hossari (2006:61-76)

Table 4.17 indicates the financial ratios applied by Hossari's study has been selected for the thesis pool of financial ratio. Selection was due to the comprehensive nature of Hossari's study conducted.

Fülbier, Silva and Pferdenhirt (2008:128) grouped the financial ratios as following in order to measure structural change, profitability and the impact from a market's perspective of the company's valuation. De Villiers' (2012:49-55) notion supported by Cape (2019:27) explains that structural change measures change in the company's debt and equity financing stated. Profitability measures a company's profitability and valuation thus the company's value according to the market's perspective, ratios of the above is stated in Table 4.18 below.

Table 4.18: Grouping of Fülbier (2008)

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
TDTE	Total debt/ Total equity	Debt management	X
TDTA	Total debt/ Total assets	Debt management	X
EBITI	Earnings before interest and tax/Interest paid	Debt management	X
NPS	Net profit for the period/Sales	Profitability	X
NPTE	Net profit/Total equity	Profitability	X
NPTA	Net profit/Total assets	Profitability	X
EWANOS	Earnings/Weighted number of ordinary shares	Performance management	X
MPEPS	Market price/Earnings per share	Performance management	X

Source: Fülbier *et al.* (2008:128) and De Villiers (2012:49-55)

Table 4.18 illustrated the financial ratios applied in above-mentioned study conducted by Fülbier, Silva and Pferdenhirt. This study included in the thesis pool of financial ratios as this study also takes into consideration companies' financial and operating risk. The local studies are presented next.

A national study by De la Rey (1981), who developed the k-model that utilised six ratios for the testing over the period 1972–1979 of 26 pairs of failed and non-failed public companies. Even though the model could be used to test both non-failed and unlisted companies, Mosalakae (2007:143) opines that the k-model only concentrated on one industry and contains complicated calculations. A synopsis of the ratios is given in Table 4.19 below and indicates the ratio used in the k-model.

Table 4.19: Grouping of De la Rey (1981)

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
TETA	Total outside financing/ Total assets	Debt management	
EBITATA	Earnings before interest and tax/Average total assets	Profitability	
CAITCL	Total current assets plus non-failed investments/Total current Liabilities	Liquidity	X
PATATA	Profit after tax/Average total assets at book value cash flow profit after tax	Profitability	
CFPATATA	Cash flow profit after tax/Average total assets	Operating cash flows	
TIIATA	Total Inventories/Inflation adjusted total assets	Asset management	

Source: De la Rey (1981:169)

Table 4.19 reflects the financial ratios of the study applied by De la Rey (1981). De la Rey (1981:149) admits the aim of the study was to develop a practical and reliable model. De la Rey (1981) found that the model was accurate yet explains it cannot be used without adjustment. Reason for the selection of this financial ratios for the thesis pool of financial ratio is according to Naidoo (2006:9) the k-model is the model of choice, therefore the newly developed BPIA was based on a sound foundation.

Naidoo (2006:59-71) used many different models to create a final model including financial ratios. The study was divided into two stages. First stage: The classification of the companies as either healthy, intermitted and distressed thereafter statistical models, naïve being univariate analysis (one-by-one basis), MDA group basis and CHAID, when the best relationship amid a discrete response variable and one or more predictor variables is determined by means of algorithm. Second stage: FRAM, in the development of this model, ratios from a pool of financial ratios were considered. The most suitable ratios were chosen and divided into four categories namely growth, performance analysis, investment analysis and financial status. Growth is when the pursuit of a company is to capitalise on sales instead of profits and obtaining this within the limits of a minimum suitable profit level (Thompson, 1993:132). Naidoo (2006:135) on the other hand, states

profits and sales need to be looked at in concurrence with each other when growth is analysed. Exactly how well capital is used to produce revenue is performance analysis while investment analysis is the comparison between a company's profitability to the fund's shareholders have provided. Financial status is evaluating whether a company is in good financial health (Naidoo, 2006:136-137). Table 4.20 below gives an indication of the ratios used within these categories.

Table 4.20: Grouping of Naidoo (2006)

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
RSG	Total liabilities/Total assets	Debt management	X
REG	Total liabilities/Total equity	Debt management	X
GM	Gross margin/Sales * 100	Profitability	X
EBITS	Earnings before interest and taxes/Sales	Profitability	X
AIRS	Account receivable/Sales * 100	Asset management	
PATS	Profit after tax/Sales	Profitability	
NWCS	Net working capital/Sales	Asset management	
INVENTORY DAYS	Inventory/Sales * 365 days	Asset management	
RECEIVABLE DAYS	Receivables/Total assets	Asset management	
PAYABLE DAYS	Payables/Sales * 365 days	Asset management	
PATSHE	Profit after tax/Shareholders equity	Profitability	X
ASSET TURNOVER	Sales/Total assets	Asset management	X
SGR	Sales (Prior year – Current year)/Sales (Prior year)	Growth	X
EGR	Earnings (Prior year – Current year)/Earnings (Prior Year)	Growth	X

Source: Naidoo (2006:135-137)

In Table 4.20 above illustrates the financial ratios applied in the study of Naidoo. This study was selected as it meets most of the current study criteria, it is a South African-

based model, developed and tested in stages, based on key variables and the model is based on a vast number of financial ratios (pool), complete list of 68 financial ratios (Naidoo, 2006:70-145) and after processing the outcome constituted of 14 ratios.

Cassim (2015:74-81) grouped the financial ratios into debt management (measuring the safety of a company's debt structure) and operation cash flows (measuring if a company is able to meet its future obligations). Liquidity followed which measured the company's ability to repay its short-term obligations. Subsequently, asset management determines how the company's asset are utilised. Finally, profitability measures the company's effectiveness and the efficiency of their operation. Summary of the financial ratios are specified in 4.21 below:

Table 4.21: Grouping of Cassim (2015)

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
TLTA	Total liabilities/Total assets	Debt management	X
TLTE	Total liabilities/Total equity	Debt management	X
EBITI	Earnings b4 interest & tax/Interest	Debt management	X
CFTD	Cash flow from operations/Total debt	Operating cash flows	X
CACL	Current assets/Current liabilities	Liquidity	X
QACL	Quick assets/Current liabilities	Liquidity	X
WCTA	Working capital/Total assets	Liquidity	X
COSINV	Cost of sales/Inventory	Asset management	
STA	Sales/Total assets	Asset management	X
ARS	Accounts receivable/Sales	Asset management	
EBITS	Earnings before interest and taxes/Sales	Profitability	X
NIS	Net income/Sales	Profitability	X
EBITTA	Earnings before interest and after taxes/Total assets	Profitability	X

ACRONYM	DESCRIPTION	CATEGORY	POOL SELECTION
EBITTA	Earnings before interest and taxes/Total assets	Profitability	X
NITE	Net income/Total equity	Profitability	X
RETA	Retained Earnings/Total assets	Profitability	X
TETL	Total equity/Total liabilities	Debt management	X

Source: Cassim (2015:72-81)

Table 4.21 indicates the financial ratios utilised in the study by Cassim (2015). The application of these financial ratios has been proven to have the ability to adequately predict failure of JSE-listed companies. The results of this study are the foundation of the newly developed BPIA.

This study adopted the ratios based on their frequency of use in prior studies. The ratios from which the pool of ratio were created was based on seminal studies as referred to in literature. The ratios from which the pool of ratio was created was firstly backed by literature and was created where after the most relevant ratio is utilised in order to best meet the objectives stated in Chapter 1 of the study based on the following:

- Ratios successful performance in previous studies
- Popularity of specific ratio
- Categorised according to their respective attributes namely liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow.

In applying the exploratory mixed method, the qualitative criteria indicated above used to identify the financial ratios indicated in the Table 4.23 below.

Financial ratios were selected from trendsetters and other researchers within the field of study from which a pool of ratios used for this study was selected. The studies comprised international studies by Altman (1968), Hossari (2006), Fülbier (2008), and within South Africa, De la Rey (1981), Naidoo (2006) and Cassim (2015). By applying the exploratory

mixed method, the qualitative criteria indicated above were used to identify the financial ratios indicated in the Table 4.22 below.

Table 4.22: Ratio pool of ratios is selected from

International		
Author	**Year**	**Ratios**
Altman	1968	5
Hossari	2006	44
Fülbier	2008	8
National		
De la Rey	1981	6
Naidoo	2006	14
Cassim	2015	17

Source: Cassim (2015:72-81), De Villiers (2012:50), Fülbier *et al*. (2008:128), Hossari (2006:61-67), Naidoo (2006:33) and De la Rey (1981:169)

Table 4.22 gives an indication of the 94 ratios from which the pool of ratio will be constructed, from which the bankruptcy prediction indicators were selected. The pool of ratio will then be created based on the ratios that best measure the financial performance of a company within the six categories being liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow and frequency of ratios demonstrated in previous studies. Each ratio was selected based on its bankruptcy indication abilities.

Bird and McHugh (1977:29-46) opine certain grouped ratios are more suited or more successful or hold more weight or are better predictors of failure in one industry compared to another. After taking the results of the above-mentioned studies, a pool of ratio was created. Thereafter the quantitative criteria to ensure significance of the financial ratio were applied in Chapter 6. Still part of the qualitative data analysis of the exploratory mixed method was the analysis of the ratios selected from which the pool of ratio was selected, presented by the study and used to analysis data (Maree, 2019:329).

4.3.5 Data analysis

The instrument chosen to be used to conduct the data analysis should be able to match the purpose, design and data collected (Dane, 2017:313). Synodinos (2014:104) explains once relevant data have been collected the data need to be managed, translated and analysed. When better sense of a phenomenon needs to be made from numbers obtained (Leedy and Ormod, 2014:282). Supporting the notion Zikmund *et al.* (2013:68) state the objective of data analysis is to apply reasoning and understanding to the collected data. This is obtained by splitting the data into smaller controllable components (Mouton, 2011:108). Grove *et al.* (2012:46) explains the purpose of data analysis is to remove irrelevant data, reduces, organises and gives meaning to the relevant data.

Data analysis in this study was done basing it on the prospect theory. The prospect theory was developed by Kahneman and Tversky in 1971, Khan (2017:6-7) and Levy (1992:171) echo the notion of Kahneman and Tverskry (1979:279) that the prospect theory describes how people choose between various alternatives and many times biased or incorrect estimations when they make decisions, perceiving the likelihood of each of these options. When managing gains, individuals tend to be risk-averse and will choose the definite gain over a riskier possibility, despite the fact that with risk there is a possibility of gaining a larger reward. Losses are treated in a contrary manner than gains. When planning to avoid a loss, individuals become risk-seeking, take the gamble over a sure loss in the hope of paying nothing.

Fiegenbaum (1990:189) explains prospect theory was developed as an alternative theory of decision-making under risk, formed from the critique of the utility theory. The utility theory's status quo is to advise how a decision should be made and describes risk is overall disliked by individuals, when given a choice individual are risk-averse and will rather choose a sure payment (basic salary) compared to a risky payment (commission). The prospect theory, on the other hand, describes how choices are made (O'Donoghue & Somerville, 2018:91; Vimercati & Zamuner, 2014:4-8). Buisson (2016:230) explains the reason being the preconception is "losses are more painful than a gain enjoyable".

McDermott (2004:316) explains prospect theory's fundamental philosophy as indicated in Table 4.23 below

Table 4.23: Central philosophy of the prospect theory

	Risk-seeking	Risk-averse
Gain		Prospect predicts
Losses	Prospect predicts	

Source: McDermott (2004:316)

In Table 4.23 McDermott (2004:293-316) explains in the area of risk-seeking losses are expected and gains are expected in the domain of risk-averse. Meaning when a company takes a risk it expects losses and gains when companies appose risk. Indicating that decision-makers appose to risk in good times but seek risk in times of loss and crises. When companies are profitable, they do not test for unfavourable consequence due to risk is not a priority. However, when the companies do not do so well or are not profitable risk testing becomes important and many times it is too late, the damage has been done. Companies should adopt the culture of continuously testing for risk regularly as decisions involving the possibility of unfavourable consequences can be made timeously. Risk testing should not only be done in times of risk-seeking, therefore, this study suggests the BPIA should be implemented in companies biannual or quarterly reporting.

The prospect theory provides a framework as how companies make decisions under uncertainty offering explanations on the different degree of significance of financial ratio when management evaluate their risk. Not all financial ratios with bankruptcy prediction ability have the same significance when it comes to predicting business failure and the prospect theory explains why certain financial ratios are more important to a company than others. A better comprehension of perspectives towards risk, which is provided by the prospect theory, is it is critical to assess which financial ratios are able to predict bankruptcy and are more likely to be important in decision-making (Estrin, Mickiewicz & Rebmann, 2017:3-15; Abdellaoui, Bleichnodt, L'Haridon & Van Dolder, 2016:1).

In the pursuit of answers to the research objectives, the empirical study was conducted using JSE-listed companies. The period under study was 2002–2016 by means of applying the time-series approach namely the cross-sectional longitudinal design to collect secondary dual retrospective data (textual and numeric). Applying the exploratory

mixed method, financial ratios, from which the pool of ratios was selected, were identified using the qualitative data analysis criteria, the number of selected ratios has been presented. The next step is to indicate the pool of ratio founded on ratios that best measure the financial performance of a company within the six categories. Categories are namely liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow. This selection is based on the frequency of ratios as established in previous studies, this is obtained by means of coding.

De Villiers (2015:46) explains coding is applied as another form of analysing textual data. According to Creswell (2015:152-156) coding is a process taking apart textual data and analysing the data to see what it produces before putting it together again in a meaningful way, with the aim of making sense of the textual data. A code according to Elliott (2018:855) is a frequently used word or short expression that is symbolically assigned to a combination and relevant portion of textual data. According Akinyode and Khan (2018:166) and Elliot (2018:2580), coding is important as it maps data providing an overview of the data that allows researchers to make sense of the data collected into manageable, meaningful and understandable data. De Vos *et al*. (2015:418); De Villiers (2015:46) and Maree (2019:125) concur coding will be best illustrated by applying a grounded theory data analysis strategy.

Maree (2019:86) supported by De Vos *et al*. (2015:318) enlightens that the grounded theory was created in 1967 as an alternative approach within the positivist paradigm with its preference for quantitative methods of obtaining and analysing data. According to De Villiers (2015:40), Strauss and Corbin (1998) are of the sentiment that, given the manner in which grounded theory is developed, it is a reasonable tool to offer an understanding, deepen knowledge of data and a plan of action. Swart (2018:198) shares Maree (2019:86) views that grounded theory consist of three forms of coding being open coding, axial coding and selective coding.

Open coding the first approach of coding. Through an intensive analysis of the data, open coding focusses on forming an idea and the grouping of a phenomena. A deep analysis of the data that has been broken up into smaller parts with the aim of obtaining the main idea of each part. The aim is to develop a code to describe it, meaning the creation of a

wealth of codes describing the data is the overall goal of the open coding (Vollstedt & Rezat, 2019:86-87).

The axial coding process is the reconstruction of the data that was divided during open coding (Swanepoel, 2018:119). According to Swart (2018:198), axial coding aims to conclude on the connection between data in open coding through analysis and the combination of results using different methods. The relationships between concepts and categories that have been developed in the open coding process is further investigated by means of axial coding (Vollstedt & Rezat, 2019:87).

The final step in the coding process is the selective coding and can be characterised according to Swanepoel (2018:129) as the integration, interpretation, and refinement of the major categories and subcategories. Vollstedt and Rezat (2019:89) clarify the objective of selective coding is to integrate the different categories that have been developed, explained and mutually related during axial coding into one organised theory. In reaching this objective, the findings from axial coding are further explained, integrated, and validated.

In order to analyse the annual financial statements, the categories were reduced to only identify the main concepts that will be most probably used by researchers in bankruptcy prediction models. Therefore, for this to be obtained Swanepoel (2018:119) explains a coding system needs to be developed and in developing a coding system included are key categories and subcategories to interpret the document analysis. The collected data were summarised and coded, which resulted in (n=94) financial ratios (Annexure A). The open coding consists of six financial performance measurement categories (liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow) further grouped into 19 subcategories (financial ratios).

Table 4.24 below indicates the result of the open coding being the pool of ratios and what it measures from which the bankruptcy prediction indicators will be selected.

Table 4.24: Pool of ratios

ACRONYM	RATIO	FORMULA	MEASURES	CATEGORY
TLTA	Debt	Total Liabilities / Total Assets	Total liabilities in relation to their assets	Debt management
TLTE	Debt 2 Equity	Total Liabilities / Total Equity	Level of financing obtained from creditors and investors	Debt management
EBITI	Interest cover	EBIT / Interest	The ability to repay interest and debt services expenses	Debt management
CACL	Current Asset	Current Asset / Current Liabilities	The ability to pay off short-term obligations using	Liquidity
QACL	Quick Asset	Current Assets– Inventory / Current liabilities	Can company pay off short-term obligations without using inventory?	Liquidity
WCTA	Working Capital	Working Capital / Total Assets	Liquidity in relation to size measured as total assets	Liquidity
COSINV	Inventory Turnover	Cost of Sales / Inventory	Number of times inventory is sold during a period	Asset management
TATO	Total Asset Turnover	Sales / Total Assets	Sales created from company assets	Asset management
EBITS	Net Operating Profit Margin	EBIT / Sales	How much profit a company can make from operations	Profitability
NIS	Net Profit Margin	Net Income / Sales	Percentage income earned from company sales generated	Profitability
EBIATTA	Return on Assets	EBIAT / Total Assets	Income produced from company assets	Profitability
EBITTA	Operating Return on Assets	EBIT / Total Assets	Companies earning-generating capacity from company assets	Profitability

ACRONYM	RATIO	FORMULA	MEASURES	CATEGORY
NITE	Return on Equity	Net Income / Total Equity	The ability to produce income from shareholders investments	Profitability
RETA	Retained earnings to Total Asset	Retained Earnings / Total Assets	The extent to which a company uses internally accrued funds from operations	Profitability
TETL	Total Equity to Total Liabilities	Total Equity / Total Liabilities	Companies reliance on borrowed funds	Debt management
TETA	Shareholders' Equity	Total Equity / Total Assets	The extent to which assets are financed from internal funds	Debt management
CFTD	Cash Flow to Total Debt	Cash Flow from Operations / Total Debt	Total debt related to the cash flow generated from trading activities	Operating Cash Flow
SG	Sales growth	Sales CY – Sales PY / Sales PY	Company performance is measured based on sales	Growth
EG	Earnings growth	Earnings CY–Earnings PY / Earnings PY	Measures the companies' profits based on earnings, higher earnings indicate company performance is thriving	Growth

Source: Cassim (2015:72-81), Tuvadaratragool (2013:87), De Villiers (2012:50), Fülbier *et al*. (2008:128), Hossari (2006:61-76), Naidoo (2006:33) and De la Rey (1981:169)

Table 4.24 exemplifies the pool of ratios totalling 19 ratios from which the bankruptcy prediction indicators were selected based on the four pillars of a company's financial health (Section 3.4.5) (SARB, 2019; Cassim, 2015 and Naidoo, 2006). These selected bankruptcy prediction indicators also referred to as the levels of testing.

The level of testing of the companies was done in two levels (survival and thriving). The first level (survival) tested the company's profitability in order to determine whether the company's funds are used wisely. The measurement is based on the effectiveness and efficiency of its operations. If a company is not profitable, it will soon have to close their doors (Brigham & Ehrhardt, 2007:449). Profitability ratios indicated whether the assets and equity are utilised successfully and are they generating returns. Ratios representing the profitability are:

- Return on equity (ROE)
- Return on assets (ROA)
- Total asset turnover (TATO)

The financial stability of a company should also be tested at this level. The aim of this test is to determine according to Marx and De Swart (2013:72) whether a company is able to repay its short-term debt and also to determine a company's financial state. These ratios should able to answer the question of whether a company can survive or not (Grossman and Livingstone, 2009:19). Financial stability ratios being quick ratios, measures the company's ability to settle their short-term obligations without relying on inventory being sold because some companies may have obsolete inventory and are unable to sell it or may sell at a loss. Therefore, quick ratios are a better reflection of the company's profitability as the current ratio skews results. From a customary perspective profitability is a good indicator of a company's financial condition, cash on the other hand gives a true reflection of company's financial condition. Murpy (2020) explains a company can not be profitable for a certain time period yet receive enough cash from borrowings and other cash inflows to offset the loss and in turn create a positive cash inflow. The going concern assumption is questioned if a company has insufficient cash flow. Financial stability is characterized by:

- Quick Ratio (QR)
- CFTD

This level of testing is important. If a company is not profitable it may not be able to operate in the future. Survival levels determine whether the thriving level (Level 2) of testing is necessary. The survival level's inability to produce favourable results indicates

whether the thriving level is not necessary for testing. The favourable survival level is a prerequisite for thriving level testing.

The second level (thriving) of testing consists of testing the company's growth potential. If companies can no longer grow, they have reached their ceiling. Companies' growth potential is demonstrated through the company's sales and earnings growth. Companies growth is presented by:

- Sales growth (SGR)
- Earnings growth (EGR)

Company risk is also tested at this level. Due to companies obtaining financing from internal and external sources it is of importance to measure their gearing. The soundness of a company's cushioning against changing profits are signalled. Risk give an indication of the financing used by the company and whether they can at least repay the interest obligations.

- Debt/Equity (DE)
- Interest Cover (EBITI)

If a problem has been identified in Level 1, Level 2 will be used to narrow down the problem area.

The data that were divided during the open coding process are further reconstructed by the axial coding. Resulting in four pillars of financial growth, namely financial stability, profitability, growth and risk summary is indicated in Table 4.25 below.

The selective coding process as explained by Swart (2018:198) is the determining of the relationship between different categories. The selective coding process resulted in nine financial ratios as reported in Table 4.25 below. Included in the nine financial ratios are ROE, ROA, total asset turnover ratio, QR, CFTD, sales growth, earnings growth and interest cover.

The axial coding results, selective coding results and levels of testing are illustrated in Table 4.25

Table 4.25: Levels of testing

	RATIO	FORMULA
Level 1: Survival level		
Profitability	Return on equity	Net income / Total equity
	Return on assets	EBIAT / Total assets
	Total asset turnover	Sales / Total assets
Financial stability	Quick	Current assets – Inventory / current liabilities
	Cash flow/Total debt	Cash flow from operations / Total debt
Level 2: Thriving level		
Growth	Sales growth	Sales (Prior Year – Current Year) / Sales (PY)
	Earnings growth	Earnings (Prior Year – Current Year) / Earnings (PY)
Risk	Debt/Equity	Total liabilities / Total equity
	Interest cover	EBIT / Interest

Source: Author

Table 4.25 was developed for the purpose of this thesis and gives a summary of the financial ratios that have been selected as potential bankruptcy prediction indicators. These financial ratios and their position of testing are subject to change based on the outcome of the statistical tests that are conducted based on their significance and correlation to risk. These were selected as they were identified as bankruptcy prediction indicators. McDermott (2004:290) explains that the prospect theory was birthed from the foundation of a rational choice model, utility theory. This rational model is a comparison basis to examine the prospect theory's explanatory and predictive value. The ratio selected was firstly selected as risk-seeking, bankruptcy prediction indicators' aim is to

identify financial distress (risk) before it happens. The quantitative data analysis criteria was applied to ensure significance.

The statistical analysis was applied to the non-failed company ratios for the period of 2002–2016. The aim is to find a significance and a correlation between the ratios. The statistical computation is done by applying SPSS to the financial ratios obtained from INET McGregor BFA database. The significantly correlated ratios were ranked based on statistically significant importance to determine the order of testing of the bankruptcy prediction indicators. This is discussed in detail in Chater 6. The validity and reliability of data follows.

4.3.6 Validity and reliability

Chawla and Sondhi (2011:163) refer to validity and reliability as criteria for good measurement while Babbie (2013:64) calls it the criteria of measuring the quality of measurement instruments. Validity and reliability are the quality criteria that measure the quality of the research being conducted (Petersson, Lauritzen & Särndahl, 2013:24). Welman *et al.* (2005:9) state validity and reliability of results are the objectives of both qualitative and quantitative research. With qualitative data the study's objective is represented by the researcher's investigation, therefore, validity is of importance. As far as quantitative data are concerned, reliability is more the focus than the measurement, data need to be consistent, stable and repeatable. Reliability is the stability and how consistent the data collected are as validity is concerned with just how accurate the data collected are.

According to Brynard *et al.* (2014:50), validity determines the measuring instrument that has the potential to achieve what it is deemed to achieve. With validity, the aim is to determine what is actually measured by an instrument and what the results actually mean (Bless *et al.*, 2013:156). Zikmund *et al.* (2013:303) supported by Babbie (2013:65) and Bryman (2016:38) state validity is a truthful representation or accurate measurement of a concept. Van Zyl (2014:123) explains validity determines if a measuring instrument does what it is supposed to do. It is the extent to which research findings can be accurate and a true reflection of a situation (Welman *et al.*, 2005:142).

Reliability on the other hand, according to Van Zyl (2014:19), measures the stability and consistency of a measuring instrument used. Welman *et al.* (2005:145) are more interested in the research findings and whether the finding is plausible. Zikmund *et al. (*2013:301) opine it is crucial to understand reliability is the consistency of measuring. Babbie (2013:64) states reliability is when a specific technique is monotonously applied. When considering whether a measurement is reliable being 1) consistency, data conducted between observing when there is more than one 2) reliability, expectant of the same result under similar situations can be produced and 3) stability, collected data administered and re-administered need not to fluctuate.

According to Kabir (2016:203), the mixed methods approach is combining both qualitative and quantitative research data, techniques and methods within a single research framework. The methods of data analysis procedure ensuring quality (validity and reliability) of quantitative methodology vary from those found in the qualitative methodology of data collection and analysis. The techniques that were applied in collecting data were the same for both quantitative and qualitative, obtaining data from the INET McGregor BFA database. De Villiers (2015:46) explains the quantitative method tends to make abstractions that are proven statistically, instead of trying to obtain a specific answer the qualitative approach attempts to seeks to comprehend and clarify phenomena.

The use of obtaining data from a database as quantitative method in the field of bankruptcy predictions studies have been performed by Cassim (2015:72-81); Fülbier *et al.* (2008:128); Hossari (2006:61-76); Naidoo (2006:135-137); De la Rey (1981:169) and Altman (1968:594-604). These studies have demonstrated this kind of quantitative technique to not only be a significant tool to predict business failure, but also in the data collection regarding a phenomenon.

To increase the validity and reliability of the finding's alternative paradigms to more accurately reflect the qualitative approach according to De Vos *et al.* (2015:419-422) is credibility, transferability, dependability and conformability.

- Credibility ensures the subject is accurately defined and identified by means of setting paraments of the study, the population and the theoretical framework. Including a

report of the difficulties of the variables and interactions that are embedded with the data resulting from the data gathered that it cannot help but to be valid. (Section 4.3).

- Transferability entails the researcher questions whether the results of the research can be transferred from a specific situation or case to another. Testing was applied to out-of-sample data with similar results. (Section 6.4).
- Dependability entails the researcher enquires whether the research process is logical, well-documented and assessed. This study follows a well-documented rational process as aligned with prior research within the field of study. (Section 4.3).
- Conformability, being the last paradigm, holds the traditional belief that objectivity needs to be captured by the researcher. Evidence need to be delivered by the researchers that validates the findings and interpretations by means of assessment. Data were tested and interpreted. (Section 6.4).

According to De Villiers (2015:46), there are other techniques that exist to obtain data in the field of accounting education. Nevertheless, these paradigms are appropriate means to defend the validity and reliability of data.

It can be said that the data collected within the present study is valid and reliable. Due to the financial ratios generated from the financial statements that were obtained from the INET McGregor BFA database. The INET McGregor BFA database obtains first hand data from the financial reports of the companies and this data are available to the public. Under the International Financial Reporting Standards (IFRS) it is a legislative requirement that all JSE-listed companies' financial statements are made available to the public. Based on the explanations above, the collection and analysis of data could be perceived as valid and reliable, since the research data acquired are accurate and consistent, the ethical consideration isl now be addressed.

4.3.7 Ethical consideration

Ethics is all about morals and the manner of conduct, what is right or wrong, the manner in which one conducts oneself. Schwester (2015:217) explains there are two important points within research ethics. Firstly, integrity needs to be maintained within the research process by avoiding the introduction of bias and falsifying results. Secondly, human

subjects need to be protected by obtaining voluntary, formal consent from willing participants and handling their information with confidentiality and they are allowed to quit when pleased to do so. Ethics relates to honesty in the administration of research and the rights of participants need to be respected (Welman *et al.*, 2005:181). According to Mouton (2011:238–240), the aim of researchers is to ensure objectivity and integrity within their research is kept intact. Adams *et al.* (2009:35) add that researchers have an ethical responsibility to conduct research with honesty and integrity. Data on its own have no ethics, it is the abuse of data that is the problem (Brynard *et al.*, 2014:95). Bless *et al.* (2013:143) clearly state that the personal and sensitive information of participants needs to be kept confidential.

The sample drawn within this study comprises secondary data and does not include any personal information from people. No reliance was placed on any human contributors and no group of individuals are harmed in any way. Data were collected for this study with integrity, in a manner that is morally sound, not conflicted with any moral principles nor is it harmful. Secondary data were collected from a public knowledge from the INET McGregor BFA database, which is a JSE portal and the JSE itself. The study complies with the minimum ethical standards pertaining to academic research, no reliance is placed on any human participants and reliance is only be placed on secondary data from literature and analysed as descriptive statistics. Therefore, no group of individuals is harmed in any way during the research. The research was approved by the Economic and Management Sciences Research Ethics Committee from North-West University **(NWU-00847-20-A4).** The ethical considerations have been presented. The next step is to discuss the development of the bankruptcy prediction indicators.

4.4 DEVELOPMENT OF BANKRUPTCY PREDICTION INDICATORS

Financial distress or bankruptcy models based on prior studies' aim were to determine the ability to predict whether a company would fail or not or be classified as financially sound or not. In this study already failed companies were selected and tested to determine how long before they were failed from the JSE could the developed bankruptcy prediction indicators detect that a company was in financial distress. In order to do so, Le Roux (2014:4) explains required consideration needs to be taken with regard to several factors in the development of a model with predictive abilities, factors being:

- Defining distress or failure – which was dealt with in Section 2.3.
- Selecting the variables – this was covered in Section 3.5.
- Determining the statistical methods that must be applied – discussed in Section 6.2.

The purpose of the study attempted to develop indicators based on the literature and analysed as descriptive statistics empirical research conducted. The purpose of the study is to predict bankruptcy or detect financial distress or early warning signs of possible financial distress by applying a simple and easy method. The process of the selection of the nine ratios was as follows, firstly all the bankruptcy prediction indicators (ratios) were placed in the pool of ratios (open coding, Section 4.3.5). Thereafter the four pillars (axial coding, Section 4.3.5) of a company's financial health from the study of Cassim (2015:212-213) were adopted as per Section 4.4.5. The outcome resulted in the nine selected ratios (selective coding, Section 4.3.5). Lastly, the nine ratios were statically analysed in order to determine the significance of the ratios.

The indicators were then validated and tested on a three-phase approach. The testing was conducted firstly at the survival level. If there are no concerns the testing can commence to the thriving level. But if the survival level's result is alarming testing should be stopped and further investigation needs to be applied in the area of concern in order to identify the problem timely and to take corrective measures. Reason being if survival level testing is not favourable and testing continues, in the long run, the companies' now manageable or correctable issue could magnify and bankruptcy will become inevitable.

4.5 SUMMARY

As indicated in the chapter's introduction, the objective and the chapter structure were described and the research methodology to be followed was indicated and justified. An explanation of the identification and formulation of the research problem was discussed. The chapter commenced describing the research process that was followed to achieve the objectives stated in Chapter 1. The chapter continued by elaborating on the key components of the research design indicating that both positivism and interpretivism research paradigm was applied, mixed method as research design consisted of both qualitative and quantitative aspects. The basic research type was utilised as the studies aim to expand and contribute to existing theoretical knowledge, due to the research

opportunities within this field of study, the research purpose was exploratory. The populations and the sample selection criteria of failed, non-failed and out-of-sample group of companies were discussed and identifying the quota convenience sampling method applied, resulting in a total of 68 companies, 46 non-failed group of companies, 17 failed group of companies and 5 out-of-sample data group of companies.

A description of the collected data was given and explained how the data were analysed and tested within the developed model. An explanation for adopting a five-year testing period was also provided. The selection of the financial ratios from which the pool of ratios was created followed by the selection of the possible bankruptcy prediction indicators. The validity and reliability of the collected data including the ethical consideration were also considered.

The discussion turned to the development of bankruptcy prediction indicators, an indication and an explanation of the bankruptcy prediction indicators (financial ratios) that were ultimately selected for the developed model consisting of nine ratios in total before statistical computations were provided. In Chapter 5 the rationale for the selected ratios is explained and the quantitative data analysis conducted to ensure statistical significance is discussed.

CHAPTER 5
DEVELOPMENT OF THE BANKRUPTCY PREDICTION INDICATORS APPROACH

5.1 INTRODUCTION

The focus of the chapter is to implement the methodology outlined in the preceding chapter in conjunction with the data collected to comply with the objectives. The empirical objectives are presented and addressed with the aim to achieve the primary objective namely: To develop and empirically test bankruptcy prediction indicators to detect or predict warning signs of bankruptcy or financial distress over different economic conditions being pre- (2002–2006), during (2007–2011) and post (2012–2016) global financial crisis. Also testing JSE companies within similar and different sectors by applying a combination of a cross-sectional and longitudinal analysis approach within a South African context as indicted in Chapter 1 (Section 1.6).

The chapter consists of five sections as shown in Figure 5.1. Section 5.1 gives the introduction of the chapter. Section 5.2 discusses the testing procedures followed by Section 5.3 with the analytical approach, describing the analytical tools applied within the study. Section 5.4 covers the discussion of the development of the bankruptcy prediction indicators approach (BPIA). Finally, the conclusion to this chapter is drawn in Section 5.5. An outline of the chapter is given in Figure 5.1 below.

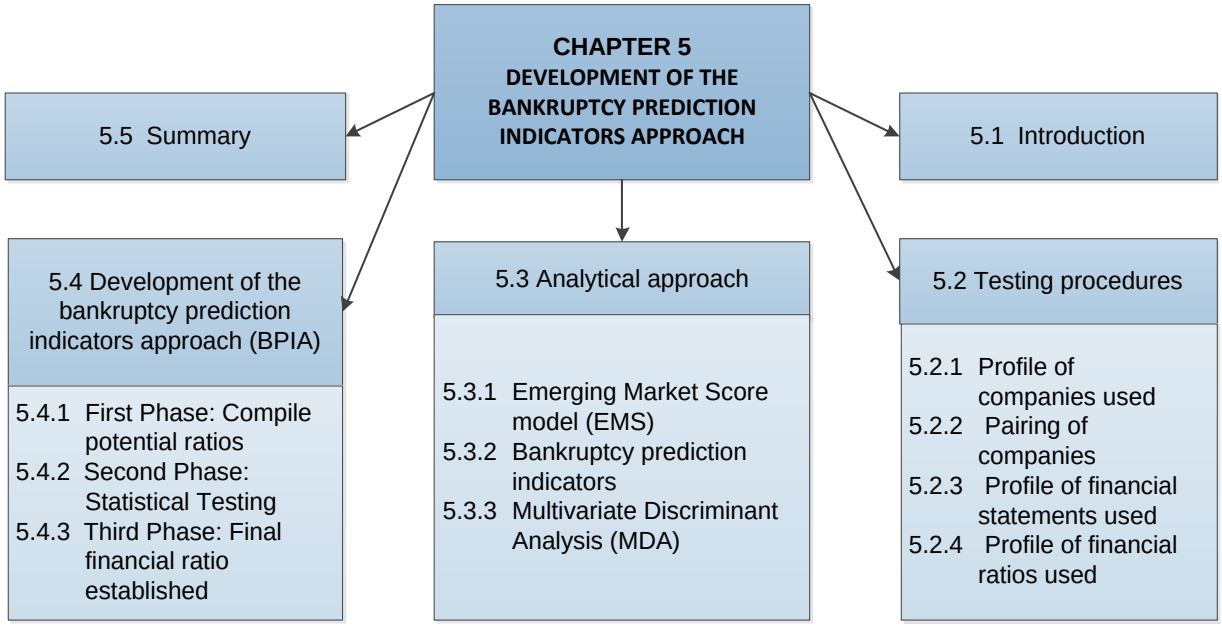


Figure 5.1: Overview of Chapter 5

When collected data are broken up into smaller manageable arguments with the aim to understand the data, this is referred to as data analysis (Mouton, 2011:108). Mouton (2011:108) supported by Grove *et al*. (2012:4) states that by reducing, arranging and giving meaning to data are the purpose of analysing data. Bogdan and Biklen (2012:159) explain that data analysis is an analytical process that arranges collected data with the aim of reaching a conclusion. According to Zikmund *et al.* (2013:68), to understand data reasoning needs to be applied to the collected data. Bless *et al*. (2013:163) explain the data analysis process depends on the research question, research design and the nature of the data itself. By applying data analysis, regular patterns can be discovered. At this point in the research process data that are immaterial were rejected and only data that are relevant to the project were retained (Brynard *et al.*, 2014:62). The relevant data collection process and the analysis thereof are discussed next. This includes the sample obtained being profiles of the companies included in the study, how the companies have been matched, the financial statements utilised and financial ratios selected, and the collecting process applied presented next.

5.2 TESTING PROCEDURES

In this section, a description of the sample that was utilised in the data analysis is given. It includes the profiles of the companies used, how they have been matched. The financial statements from where data were obtained and financial ratios to which data has been applied are also discussed. Followed by different statistics being defined by different authors, the analytical approach applied in this study is the EMS model and the BPIA. The development of the BPIA is then presented.

5.2.1 Profiles of companies used

The sample of companies used is JSE companies during the period 2002–2016. The final sample constitutes 68 companies from different sectors and different industries, 17 failed group of companies, 46 non-failed group of companies and five out-of-sample group of companies. The different groups of companies were selected based on the elimination criteria discussed in Chapter 4 (section 4.3.3). The sample selection is aligned with previous studies Altman (1968) 66 companies, Deakin (1972) 64 companies, Strebel and

Andrew (1977) 29 companies, De la Rey (1981) 5 companies, Person (1999) 41 companies, Bei and Lui (2005) 62 companies, Urguly and Aksoy (2006) 54 companies and Sookhanaphibarn, Polsiri, Choensawat and Lin (2007) 41 companies (Naidoo, 2006:57-58 and Tuvadaratragool, 2013:40-46). The years with the most failures are 2003 and 2005, both consisting of eight companies that failed due to bankruptcy followed by 2016 with seven failed companies. Two companies failed in 2011 and also in 2006 and one (1) business failure due to bankruptcy in 2004. In all other the years within the 2002–2016 period no companies failed or were delisted due to bankruptcy. The most frequently represented industry was consumer services and technology followed by consumer goods and industrials and thereafter healthcare. The financial industry also frequently represented but has not been included in the study due to the industry being highly specialised (Rama, 2012:39). Baxter (2009:112-113) supported by Maredz and Ikide (2013:553) opine solid macroeconomic policies and sound regulations were the reason South Africa was able to weather the 2008 global financial crisis's contagion and catastrophic effects. The banking sector, being the backbone of most economies, boosts consumer confidence and shelters economies against instability. Berger, Molyneux and Wilson (2019:8-10) explain that banks had a capital buffer that exceeded the minimum regulatory requirement in place and yet still failed to prevent banking failure during the global financial crisis. The banks reduced risk-weights with the aim of boosting capital it in turn lowered investments, sales growth, credit supply and employment. During short-term financial pressure, banks were unable to liquidate their assets neither borrow, facing a short-term liquidity crisis due to the inability to pay depositors on demand. The debt then rolled over speedily creating a solvency crisis (Giaconimi, 2015; Balttner, Farihan & Rebelo, 2017). Within those industries, the most repeated sector companies are summarised in Table 5.1 below.

Table 5.1: Frequent sector companies

Industry	Sector	Company
Consumer services	Food & Drugs	3
Consumer services	General retailers	1
Consumer services	Travel & Leisure	1
Technology	Hardware	5
Technology	Software	1
Consumer goods	Food producers	1
Industrials	Construction	3
Industrials	General industries	1
Healthcare	Equipment	1

Source: INETBFA (2018)

Table 5.1 gives an indication of the companies that failed within the different sectors over the period under review. South Africa was not immune to the impact of the global financial crisis despite the buffers that were in place due to its reliance on foreign trade, slow economic growth in the exports market among other effected areas. This did not help much as there were certain sectors being the retail sectors and automotive sectors that were already under pressure and the other sectors moved into survival mode.

As indicated in Table 5.2, the final sample of the 17 failed companies was reached through applying elimination criteria as discussed in Chapter 4 (Section 4.3.3) The elimination criteria was performed in Stages 1–4 (Section 4.3.3). In Stage 1 – the period of study was deliberately selected from 2002–2016 as the selection period reflects three different economic periods covering three different economic conditions, pre-global crisis (normal conditions), during global crisis (abnormal conditions) and post-crisis (after-effects of global financial crisis also including a boost into the economy brought on by the 2010 FIFA World Cup). The rationale for the period being five years prior to the 2007 global crisis (2002–2006), five years during the 2007 global crises (2007–2011) and five years after the 2007 global crises (2012–2016). According to Hamer (1983:295), the usefulness of predicting failure through financial ratios is said to be five years before the

event of the failure, therefore, the five years are aligned with previous studies by Beaver (1966), Hossari (2006) and is applied within the current research. Stage 2 industries and sectors excluded financial and mining companies due to different accounting standards being applied in the preparation of their financial statements. Stage 3 covered the reason why a company would be included in the sample, delisted (failed) due to bankruptcy as companies failed for many different reasons not always due to failure. Lastly, in Stage 4 financial data needed to be available over a five-year period prior to bankruptcy and the order need not to be consecutive. This is to ensure the measurable comparability between companies over the same are period (Fritzpatrick, 1931; Beaver, 1966). The bankrupt companies had to be compared against a non-failed group of companies. For this purpose, the pairing approach was followed. The pairing approach is discussed in the following paragraph.

5.2.2 Pairing of companies

The pairing approach has been applied to keep this study consistent with prior seminal studies. Kumar (2019:127) states that this method ensures the comparability of two groups, for the result of irrelevant variables, has to be identical in both groups. Gravette and Forzana (2016:229) agree that pairing is a process where one group is matched with a corresponding group on a one-on-one basis. In this study, each failed company was matched to non-failed companies based on same industry and same statement date. The reason for applying was to attempt to control different factors when examining the ability of new bankruptcy prediction indicators with the aim of effectively predating failure (Beaver, 1966:467). Failed companies are eliminated from pairing if there is no financial data available. In a nutshell, the breakdown of the failed companies based on the elimination process for the period 2002–2016 is given in Table 5.2

Table 5 2: Summary of the elimination process

Description	Companies
Total delisted (failed) companies during the period 2002–2016	28
Elimination 1: Remove companies with no financial data available	(11)
Total companies remaining in the sample for pairing	17
Pairing per identical industry: (failed companies paired with non-failed companies	7
Test: applying new developed model and compared to EMS model	10

Source: INETBFA (2018)

Table 5.2 describes the total sample that was utilised within the study. A total sample of 28 failed companies, of which 17 was left after 11 companies with no financial data were eliminated. Seventeen companies remaining and seven failed companies were able to be matched with non-failed JSE-listed companies within the same industry. The remaining 10 failed companies were tested applying the newly developed bankruptcy prediction model and the results were compared to Altman's EMS model. A globally recognised sophisticated emerging market prediction model being one of the two analytical tools applied within this study.

The discourse of the pairing of companies implemented in this study has been completed. The discussion now turns to profiling of the financial statement applied.

5.2.3 Profile of financial statements used

Financial statements are the source from which financial ratios are derived. Financial statements play a vital role in either predicting business failure or signalling early warning signs, by identifying the symptoms thereof timely corrective measures can be taken (Tuvadaratragool, 2013:109). This is mostly achieved through the analysis of financial statements. Service (2017:40) states financial statements according to the IFRS conceptual framework need to have certain qualitative characteristics for it to be useful. These characteristics can be divided into fundamental and enhancing characteristics. Information or data included in the financial statements need to be relevant and faithfully represented. Enhancing, on the other hand, requires financial statements to be

comparable, verifiable, timely and understandable. This is done to enhance or maintain a certain quality of the financial statements. According to Le Rouw (2014:18), a common concept used in Computer Sciences and Mathematics, Garbage-in, Garbage-out (GIGO). Baer (2019:69) defined GIGO as the quality of the information output that cannot be better than the quality of the information that went in. Meaning that the quality of the financial statement results is determined by the level of the quality that has been recorded.

According to IAS 1 (par 10), different financial statements have different purposes. The statement of financial position reveals information regarding balances of assets, liabilities and equity of a company as at a specific date. While the statement of profit and loss and other comprehensive income reveal the income and expenses for a specific period. The statement of cash flow discloses the company's cash in terms of operations, investing and financing activities through cash and cash equivalents and statement of changes in equity make known the company's net asset value (Service, 2017; Robbetze, 2015). Due to the different financial statements having different measurement purposes is the reasons why the BPIA has been split into two levels. The statement of comprehensive income (measures financial performance) level and statement of financial positions (measures financial position) level (Service, 2017:76-77).

In this study financial statements of public companies are utilised and these financial statements are a reliable source of data as they are governed by accounting standards that ensure the financial statements are reliable, relevant and understandable to users (Le Rouw, 2014:19-20). Gouws and Lucouw (1999:105) clarify financial statement reflect numbers having limited significance and meaning in and of themselves. Lucouw (2013:104) states that financial statements in isolation do not mean much. Financial statements need to be interpreted through understanding. The numbers can be converted into significant or meaningful data or into knowledge by converting the numbers into ratios (Gouws & Lucouw, 1999:103). Bernstein and Wild (1998:3) explain that when data are converted into meaningful relations, this conversion includes the analysis stage to create ratios. Financial statement analysis's most vital function is to convert financial information or numbers into significant and meaningful relationships being expressed as a ratio. The authors refer to this process as life after financial statements (Gouws & Lucouw, 1999:107).

Financial statements of companies are the source from which financial ratios are calculated from. In the sample, 17 of the failed companies had available financial statements, five years prior to failure. According to Hamer (1983:295), supported by Hossari (2006:222) and Tuvadaratragool (2013:75) predicting failure through financial ratios can be said to be useful when financial ratios are applied five years prior to bankruptcy. Therefore, financial statement data were drawn five years prior to the failure date, based on the availability of data over a five-year period and it need not be consecutive (Section 4.3.3). The computation of the financial ratios was under way once the financial statements of the sample was obtained.

5.2.4 Profile of financial ratios used

Financial ratios are a popular tool utilised by analysts to analyse financial statements. This tool being financial analysis has and is still receiving much academic interest (Gouws & Lucouw, 1999:107). Lucouw (2013:69-71) explains the ability to convert numerical data into a comparable and summarised format is called financial ratio analysis. The biggest advantage is that raw data converted into understandable figures and interpreted to provide decision-making information.

The financial ratio from seminal studies both internationally and locally were collected. Once the financial ratios were selected, they were arranged by their particular characteristics namely liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow. The pool of financial ratios was created by the financial ratios that appeared in more than one of the seminal studies with frequency, performance popularity in previous studies being the best predictors of bankruptcy. Next, selected ratio based on the best form of measurement of the four pillars of company's financial health.

The seminal studies included were studies conducted internationally by Altman's original z-score (Altman, 1968), Hossari (2006), Fülbier (2008) and locally by De la Rey (1981), Naidoo (2006), Cassim (2015). In order to avoid double counting of financial ratios, not all the studies were selected, repetition of some studies were ignored over the period. Studies were disregarded if already based on a study that applied the same set of ratios that were already included in the ratio selection e.g. Tuvadaratragool (2013) based on

the study conducted by Hossari (2006), De la Rey (1981) and Hlahla (2010) based on study by Beaver (1966) and Rama (2012) based on the study by Altman (1968) (De la Rey, 1981; Hlahla, 2010; Rama, 2012 and Tuvadaratragool, 2013). A summary of the seminal study applied in this study is illustrated in Table 5.3

Table 5.3: Ratios pool of ratios created from

International		
Author	**Year**	**Ratios**
Altman (2006:239-241)	1968	5
Hossari (2006:61-76)	2006	44
Fülbier *et al.* (2008:128)	2008	8
National		
De la Rey (1981:169)	1981	6
Naidoo (2006:33)	2006	12
Cassim (2015:72-81)	2014	17

Source: Cassim (2015:72-81), Tuvadaratragool (2013:87), De Villiers (2012:50), Fülbier *et al*. (2008:128), Altman and Hotchkiss (2006:239-241), Hossari (2006:61-76), Naidoo (2006:33) and De la Rey (1981:169)

Table 5.3 gives an indication of the seminal studies totalling 94 ratios in the pool of ratios, which subsequently stem from the bankruptcy prediction indicators that were selected. Each indicator was selected based on its bankruptcy indication abilities. The further selection process profile of the financial ratios used within the developed BPIA is presented below.

According to Gouws and Lucouw (1999:103), financial ratios have been used to interpret financial statements, converting data (financial statements) into knowledge (financial ratios). Bernstein (1998:3) explains that when data are converted into meaningful relations, this conversion includes the analysis stage to create ratios. Financial statement analysis's most vital function is to convert financial information or numbers into significant and meaningful relationships being expressed as a ratio, Gouws and Lucouw (1999:107)

refer to this process as life after financial statements. The next step in the financial ratios' selection process is classifying the ratios into their respective attributes (liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow). According to Hossari (2006:55), when ratios are categorised, they measure a certain aspect of a company and makes the task of referring financial ratios to a pool more meaningful.

According to Correia *et al.* (2015:5.19), these categories cover the company's financial condition holistically.

Liquidity: This category of ratios measures the companies' ability to repay their short-term liabilities using their short-term assets and where the company is able to remain liquid (Steyn *et al.*, 1996:53). The QR has been selected to represent this ratio category instead of the current ratio. This is because when using the QR, it indicated whether the current liabilities are covered by the most liquid current assets as it excludes inventory. This ratio is a more old-school measure of liquidity than that of the current ratio (Lucic, 2014:24-&25).

Profitability: These ratios measure whether the company's funds are used wisely and the effectiveness and efficiency of company operations (Brigham and Ehrhardt, 2007:449). The rationale for selecting the ROA and ROE ratios was based on their popularity within literature. The pioneers within the field of bankruptcy prediction modelling Beaver (1966), Altman (1968), Edmister (1972) and Blum (1974) have identified the ROA and the ROE as having the ability and the power to predict bankruptcy. Ak, Dechow, Sun and Wang (2013:565-567) indicate 13 studies where the ratios appeared nine times.

Solvency/Debt management: This indicates the measure a company's finances using debt. The debtor's ratio and interest cover ratio were selected to represent this ratio category. The debt to equity ratio gives information regarding a company's ability to borrow and repay the money and indicates the extent of companies' debt that is covered by shareholders' funds (Ahmed, 2010:16). Interest cover measures the extent earning can decline before a company is unable to meet their interest repayment obligations. The result of a company failing to meet its interest repayments obligation affects a company's

profitability and could lead to legal action being taken by creditors resulting in possible bankruptcy (Brigham and Ehrhardt, 2007:447).

Asset management: measures the effect of utilising company assets. The total asset turnover ratio was selected; this ratio determines whether the assets are used effectively to generate sales. Assets are resources, Cambridge (2015:1214) explains a resource is a valuable possession from which a benefit will be obtained, if not effectively used no benefit could be obtained from the company. If assets do not generate sufficient sales eventually the company's profitability will be affected, this could affect the companies' ability of remaining a going concern without making a profit. When companies' assets are used in a way to effectively generate sales through assets it indicates the financial soundness of the company (Correia *et al.*, 2015:5.17).

Cash flow: is the lifeblood of any company as the famous saying goes cash is king. Correira *et al*. (2015:5.19) posit without enough cash companies cannot meet future obligations as cash flow is the essence of every business and is seen as a reliable financial distress indicator.

Market ratio: with this ratio management is given an indication of the investors' thoughts regarding the companies past performance and future prospects. The sales and earnings growth have been selected to reflect this category. Sales growth according to Mappanyuki and Sarie (2017:9), is the percentage sales have grown from one year to another and the company can predict how much profit they will get if the size of the sales growth is known. Flint, Tan and Tian (2010:46) remark earnings growth is measured by comparing the prior year's earnings to that of the current year. The preferred ratio is when the current year is greater than the prior year. The next process is the creation of the pool of ratios. The pool of financial ratios', as indicated in Table 5.4, selection basis was financial ratios performance popularity and frequency in previous studies as well as what the financial ratio measure best.

Table 5.4: Pool of ratios

ACRONYM	RATIO	FORMULA	MEASURES	Category
TLTA	Debt	$\frac{\text{Total Liabilities}}{\text{Total Assets}}$	Total liabilities in relation to their assets	Debt management
TLTE	Debt to Equity	$\frac{\text{Total Liabilities}}{\text{Total Equity}}$	Level of financing obtained from creditors and investors	Debt management
EBITI	Interest cover	$\frac{\text{EBIT}}{\text{Interest}}$	The ability to repay interest and debt services expenses	Debt management
CACL	Current Asset	$\frac{\text{Current Asset}}{\text{Current Liabilities}}$	The ability to pay off short-term obligations using	Liquidity
QACL	Quick Asset	$\frac{\text{Current Assets–Inventory}}{\text{Current liabilities}}$	Can company pay off short-term obligations without using inventory?	Liquidity
WCTA	Working Capital	$\frac{\text{Working Capital}}{\text{Total Assets}}$	Liquidity in relation to size measured as total assets	Liquidity
COSINV	Inventory Turnover	$\frac{\text{Cost of Sales}}{\text{Inventory}}$	Number of times inventory is sold during a period	Asset management
TATO	Total Asset Turnover	$\frac{\text{Sales}}{\text{Total Assets}}$	Sales created from company assets	Asset management
EBITS	Net Operating Profit Margin	$\frac{\text{EBIT}}{\text{Sales}}$	How much profit a company can make from operations	Profitability
NIS	Net Profit Margin	$\frac{\text{Net Income}}{\text{Sales}}$	Percentage income earned from company sales generated	Profitability

ACRONYM	RATIO	FORMULA	MEASURES	Category
EBIATTA	Return on Assets	EBIAT / Total Assets	Income produced from company assets	Profitability
EBITTA	Operating Return on Assets	EBIT / Total Assets	Companies earning-generating capacity from company assets	Profitability
NITE	Return on Equity	Net Income / Total Equity	The ability to produce income from shareholders investments	Profitability
RETA	Retained earnings to Total Asset	Retained Earnings / Total Assets	The extent to which a company uses internally accrued funds from operations	Profitability
TETL	Total Equity to Total Liabilities	Total Equity / Total Liabilities	Companies reliance on borrowed funds	Debt management
TETA	Shareholders' Equity	Total Equity / Total Assets	The extent to which assets are financed from internal funds	Debt management
CFTD	Cash Flow to Total Debt	Cash Flow from Operations / Total Debt	Total debt related to the cash flow generated from trading activities	Operating Cash Flow
SG	Sales growth	Sales CY – Sales PY / Sales PY	Company performance is measured based on sales	Growth
EG	Earnings growth	Earnings CY–Earnings PY / Earnings PY	Measures the companies' profits based on earnings, higher earnings indicate company performance is thriving	Growth

Source: Cassim (2014:72-81), Tuvadaratragool (2013:87), De Villiers (2012:50), Fülbier *et al*. (2008:128), Altman and Hotchkiss (2006:239-241), Hossari (2006:61-76), Naidoo (2006:33) and De la Rey (1981:169) adapted

Table 5.4 indicates the most common ratios used to create a pool of ratios consisting of 19 ratios. Only the ratios that will support the aim of maximising the bankruptcy prediction model's effectiveness were applied and considered as being relevant (Amran & Aripin, 2015:152). The motive for selecting these financial ratios is further based on the four pillars of a company's financial health (financial stability, profitability, growth and risk). Financial ratios are used as proxies for the pillars of company health based on usage, measurement and predictive ability. In previous studies it is also the framework for the model validation as discussed in (Section 4.3.4). Hossari (2006:64-78) gives an indication in terms of a percentage of how frequent the ratios have been used over the period 1968–2004, consisting of a total of 84 ratios. Only ratios within the pool of ratios that best measure the four pillars of company health are available and the frequency based on percentages and ranking from highest and lowest are portrayed in Table 5.5 below

Table 5.5: Pillar and measuring

PILLARS	MEASURES	REPRESENTING RATIO	PERCENTAGE	APPEARANCE
Profitability	Income produced from company assets	Return on assets	31%	27
	Ability to produce income from shareholders investments	Return on equity	17%	14
	Sales created from company assets	Total asset turnover	21%	18
Financial Stability	Ability to pay off short-term obligations without using inventory	Quick	24%	20
	Total debt related to the cash flow generated from trading activities	Cash flow to total debt	19%	16
Risk	Level of financing obtained from creditors and investors	Debt to equity	25%	21
	The ability to repay interest and debt services expenses	Interest cover	11%	10
Growth	Company performance is measured based on sales	Sales growth	NOT INCLUDED IN THE STUDY OF HOSSARI	
	Companies' profits based on earnings,	Earnings growth		

Source: Hossari (2006:64-78)

Table 5.5 above indicates the financial ratios that have been selected from the seminal studies within the field over the period 1968–2015, categorised as namely profitability, liquidity, solvency (debt management), asset management (market performance) and operating cash flow. The next process was the financial ratios that appeared more than once within the studies and its frequent and performance popularity within previous studies. This resulted in the pool of financial ratios from which the bankruptcy indicators were selected. Based on the financial ratio that best measure the four pillars of the

company's financial health the nine ratios were selected. The study by Hossari (2006) indicated the number of times the ratios appeared within the 84 studies observed, sales and earnings growth were not included in the study by Hossari (2006). The financial ratio was ranked from higher usage percentage to the lowest highest being ROA at 31%, followed by debt to equity at 25%, QRs at 24%, total asset turnover at 21% thereafter CFTD at 19%. Hossari (2006) continues by indicating ROE at 17% and the lowest being 11% is the interest cover, sales and earnings growth was not applied in the study conducted by Hossari (2006). Swanepoel (2018:53) shed light on the prominence of the ROA ratio, improved profit performance is indicated by a higher ratio due to the association between profit and assets. When companies aim to maximise shareholders' wealth their focus should be on an increase in ROE as this ratio is directly influenced by the debt companies use to finances their assets. The above process resulted in nine financial ratios that are representations to the four pillars of a company's financial health measurement. A holistic rundown of the ratios selected for bankruptcy prediction indicators appear in Table 5.6 below.

Table 5.6: Sample description

		RATIO
Level 1: Survival Level	Profitability	Return on assets
		Return on equity
		Total Asset Turn over
	Financial stability	Quick asset
		CFTD
Level 2: Thriving Level	Growth	Sales growth
		Earnings growth
	Risk	Debt to equity
		Interest cover

Source: Author

Table 5.6 is giving a description of the results of the two-level testing developed for this thesis created from the original ratios selected as bankruptcy prediction indicators before statistical analysis and after application of the axial coding. The selections were based on the most frequently used ratios within the seminal studies over the period 1968–2015, these selected financial ratios were referred to as common ratios in six categories namely liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow (Brigham & Ehrhardt,2007 and Palat,2006). The pool of financial ratios for data analysis in the study with a total of 19 that were further cleaned up by indicating the financial ratios that best measure the four pillars of company health (profitability, financial stability, growth and risk). The result nine ratios remaining, these ratios within the four pillars will be tested in two levels and are discussed further in this chapter.

Having described the financial ratios utilised in this study the discussion turns to the analytical tool indicated in the analytical analysis section.

5.3 ANALYTICAL APPROACH

This approach is a process to break down a problem into smaller pieces necessary to solve the problem, with the aim to transform data into answers to the research question (Durrheim, 2006:52). Bless *et al.* (2013:163) opine the aim of this approach is that researchers can detect consistent patterns within the data. According to Durrheim (2006:52), the general rule of thumb is that unless there is a good idea on how data will be analysed, do not proceed with a study.

The two analytical tools being the key components for predictive ability testing by applying a ratio-based method. The EMS model and the current studies BPIA is the two analytical tools applied based on the reliance on financial ratios to satisfy the objectives of the study. This study processed the data by applying a comparative and trend ratio analysis through the BPIA. The rationale for this analysis is that it has been applied by the seminal works of Fitzpatrick (1931), Beaver (1966) and Blum (1974) and Service (2017). The EMS is discussed first followed by the BPIA.

5.3.1 Emerging Market Score model (EMS)

The foundation on which EMS has been built is Altman's original z-score. The z-score was upgraded to the Zeta model and the Zeta model was then modified and called the EMS model. The ratios used in the EMS model are the revised z-score model. By reducing the variables from 5 to 4, Altman felt the revised model's predictive ability has increased from that of the original z-score and EMS and is also simpler to incorporate (Meeampol, Lerskullawat, Wongsorntham, Scrinammuang, Rodpetch and Noonoi, 2014:1230). According to Altman and Hotchkiss (2006:265-266), with this model, WC/TA was incorporated, followed by RE/TA, then EBIT/TA, and lastly included book value of equity to total liabilities (TE/TL). The ratios used in the model in this study rely on Altman's original z-score model as the foundation of the EMS model. Improving accuracy was the aim of this model. According to Alfaro, Asis, Chari and Panizza (2019:2) supported by Correia *et al.* (2015:5.30); Tuvadaratragool (2013:109); and Altman and Hotchkiss (2006:267-268), the EMS model can examine the predictive power of financial statements of companies within an emerging market with the intention to assess the financial well-being of companies. The EMS model also takes into account the critical factors of emerging markets i.e. currency vulnerability, industry risk and competitive position. Therefore, the reason why this model has been incorporated into the study is that South Africa, being a member of the BRICS countries, has been recognised as an emerging market. Altman and Hotchkiss (2006:280) opine the EMS model was applied to Asian countries among other countries and the and the results were effective. Table 5.7 gives a synopsis of the EMS ratios.

Table 5.7: EMS ratios

EMS =	3.25+	$6.25X_1$+	$3.26X_2$+	$6.72X_3$+	$1.05X_4$
Ratio		WC/TA	RE/TA	EBIT/TA	BV EQUITY/TL
Constant	3.25				
Coefficient		6.25	3.26	6.72	1.05
Variables		X_1	X_2	X_3	X_4
Discrimination Zone	Safe		Grey		Distress
	EMS > 2.60		1.10 > EMS < 2.60		EMS < 1.10

Source: Meeampol *et al.* (2014:272)

Table 5.7 gives a breakdown of the EMS model, consisting of four ratios, with one constant value, four coefficients, 4 variables and three discrimination zones. Once the calculation has been done and the results are equal to or exceeds 2.60 the company is seen as being in the safe zone but once after the computation the results determine the company result is more than 1.10 but less than 2.60 the company is identified as being in the grey zone. While a company is branded as being in distress once calculated results are less than 1.10. This model (EMS) results were compared to the bankruptcy indicator approach due to EMS model proven track record in bankruptcy prediction within emerging markets and has been regarded as a prominent bankruptcy prediction instrument.

The EMS model's trend and comparative analysis was applied by means of multivariate analysis. The EMS model has been presented, the difference between these two methods of analysis, being the trend and comparative analysis are explained briefly below.

5.3.2 Bankruptcy prediction indicators

Validation of the BPIA was executed by means of the trend and comparative analysis. This analysis was applied with the aim to explore the abilities that the elected generic BPIA has to identify early company distress warning signs under different economic conditions.

Slotemaker (2008:15) explains that the trend analysis is very useful to predict failure by means of ratios. Through following a declining trend with greater caution, signs of business failure could be prevented early on but on the other hand, when not handled with care and caution it could lead to business failure. A trend analysis allows a business going in the wrong direction to be redirected and corrective action can be taken. This analysis has previously been applied in seminal studies by pioneers being Smith (1935), Blum (1969) and Merwin (1942). Trend analysis is a technique used mostly for future prediction as it analyses the performance of a company over several years (Sharma, 2018:28). The rationale for this analysis type is to examine in contrast one period to another with the focus of ascertaining changes with ratio patterns over time and judge the degree of change. By means of assessing and observing the degree of change before and after an occurrence, the future projection could be made (Rosenberg, 1997:5). According to Sharma (2018:28), the trend analysis technique with the support of financial statement and financial ratios have the power to identify whether a company's performance is either increasing, plummeting or relatively stable. However, Tuvadaratragool (2013:91) believes that with this technique results can differ depending on the outlook. From an individual company's point of view, the company's profitability is the focus. When observed from the point of view of industry peers the company's strength and weaknesses can be determined.

The comparative analysis applied within, between or among companies can examine the economic condition a company operates in. According to Marx and De Swart (2013:66), comparative ratio analysis is when different companies are compared with each other at the same time to give an indication of a company's financial condition. Tuvadaratragool (2013:91) clarifies that not all ratios will indicate a company's strength or weakness, but certain ratios will indicate either the strength or weakness of a company. When the ROA and ROE are high, indicating a company's strength, however, a high debt to equity, total debt to total assets and operating ratio signals a company's weakness. Brigham and Ehrhardt (2007:14) referred to the comparison of financial ratios of companies to their industry equals or higher ranked as benchmarking. This approach is known as the benchmark approach as companies are curious to know how they are performing financially in relation to their competitors and points analyst in the direction of potential

areas of concern. By performing the comparison, a company's strength and weaknesses can be determined.

According to Tuvadaratragool (2013:90), because this technique can be applied within, between or among companies, the results differ depending on which perspective is taken. From the company's perspective, this technique will indicate if the company has enough cash to settle or repay their current and long-term obligations, whether the company assets are managed effectively and making a profit or a loss. As well as measures the performance within the industry, from shareholder/owner perspective if financial performance is better than the prior years or better than the competitors the shareholders attaining from their investments and losing from their investment when visa versa. From the perspective among companies the question is whether the company's performance is better or worse than that of their competitors within the same industry.

The selected ratios were validated using a combination of both comparative and trend ratio analysis when testing and comparing BPIA with the EMS model. The discussion now turns to the MDA.

5.3.3 Multivariate discriminant analysis (MDA)

A clear improvement of statistical techniques has been evident in literature in the prediction of bankruptcy or financial distress, from the univariate analysis approach, MDA, logit, recursive partitioning (RPA), survival analysis, NNA, HIP, RS, risk index model and case-based forecasting (Sebala *et al.*, 2018:2; Tuvadaratragool, 2013:49; Rama, 2012:13; Laitinen & Kankaanpaa, 1999:67-68). Altman, Haldeman and Narayana (1977:81) established that Tamari (1964) was the principal scholar to attempt a modern statistical failure analysis. Beaver (1966), the pioneer of the univariate approach, successfully applied the primary statistical analysis and this application changed the customary research, the foundation was laid by this analysis approach for future statistical analysis namely MDA of which the architect was Altman (1968).

Beaver (1966:72-100) supported by Hanson (2003:43) and Van der Colff (2013:14) concluded that specific financial ratios have the predictive ability to detect future possible business failures utilising a pair sample of 79 failed and 79 non-failed companies for the period 1954–1964. A total of 30 financial ratios were selected and grouped them into six

groups to best describe company health. The CFTD ratio provided useful information being that the liquid assets of non-failed companies were much higher than that of the failed companies. The three criteria were the basis on which ratios were selected being firstly that ratios should reflect company conditions followed secondly that ratios should previously have performed well in prior bankruptcy studies.

According to Altman (1968:591), and notion supported by Hossari (2006:104-106) when the emphasis is placed on individual ratios the approach is vulnerable to faulty interpretations creating questionable results that are potentially confusing. The reason being companies may be viewed as bankruptcy potential companies due to poor profitability or solvency, but because of a better liquidity position the situation could be considered as not so serious. This being the essence of the inherent deficiencies of the univariate approach. In order to overcome the univariate analysis drawback, Van der Colff (2013:16) informs that Altman created the MDA. Hlahla (2010:11) refers to the MDA as being superior to the univariate analysis. This kind of analysis combined several ratios compared to the univariate analysis that examines individual ratios.

Altman (1968) applied the MDA with the intension to improve on Beaver's (1966) univariate analysis. When several ratios are simultaneously analysed, this kind of analysis is the heart and strength of an analysis (Van der Colff, 2013:17). Altman's original z-score originated in 1968. A sample of 33 companies consisting of two groups, failed and non-failed was investigated, five of the 22 were potential helpful ratios, five were selected. A selection was based firstly on ratios with the best-computed results and secondly on a mutual relationship assessment. The model consisted of five variables, five coefficients and three cut-off zones with the sample containing only manufacturing public companies. A MDA technique was applied. This analysis type has been legendary in the disciplinary area of behavioural science (Altman, 1968; Mohammed, 2016; Maina & Sakwa, 2017; Prabowo,2019).

In 1993 the model was modified to accommodate non-manufacturing private companies. The number of coefficients and variables remained the same, but the coefficients changed. A further revision was applied by means of adapting the non-manufacturing private companies for the emerging markets. The variables reduced to four, the coefficients and cut-off zone remained the same as the prior models. With all the success

of the Altman's model it is still without critique, the variables exhibit sample dependence, the sample that was chosen randomly was based on size and industry (Rees, 1995:305-306). Ahmed and Govind (2018:8) supported by Van der Colff (2013:19) and Hlahla (2010:12) inform these are just some of the shortcomings being results are only as accurate and reliable was the data provided and due a lack of evolution as the model's variables and coefficients remained unchanged since 1968. Despite these shortcomings this method is still recognised as a powerful analysis technique and widely-accepted. Premachandra, Bhabra and Sueyashi (2009:413) identify the shortcoming is when out-of-sample data are tested the forecasting ability of the model is poor, even though the sample was adequate. When the model is used to retest a more recent sample the accuracy classification fell from 83.5% in the first year to 57.8% in the following year. A summation of the model modifications and changes are provided in Table 5.8 below

Table 5.8: Progression of the Z-score model

Model	**Z-score**	**Z-score private**	**EMS**
Date	**1968**	**1977**	**2006**
Variables	WC/TA	WC/TA	WC/TA
	RE/TA	RE/TA	RE/TA
	EBIT/TA	EBIT/TA	EBIT/TA
	MV Equity/BV TL	BV Equity/TE	BV Equity/TE
	Sales/TA	Sales/TA	
Coefficients	1.2_{x1}	0.717_{x1}	3.25
	1.4_{x2}	0.847_{x2}	6.56_{x1}
	3.3_{x3}	3.107_{x3}	3.26_{x2}
	0.6_{x4}	0.420_{x4}	6.72_{x3}
	1.0_{x5}	0.998_{x5}	1.05_{x4}
Cut-off Zones	Safe: Z>2.99	Safe: Z>2.90	Safe: Z>2.60
	Grey: 1.81<Z<2.99	Grey: 1.23<Z<2.90	Grey: 1.1<Z<2.60
	Distress: Z<1.81	Distress: Z<1.23	Distress: Z<1.1

Source: Altman (2002:260)

Table 5.8 illustrates the evolution of the models by Altman (1968) laying the foundation with the MDA model. The reputation of this analysis technique preceded itself. According to Balcaen and Ooghe (2006:66) the best distinction between failed and non-failed companies is done with the MDA and variables that normally seem insignificant with the univariate analysis, supply significant information in a multivariate context. Over the years this analysis was applied to seminal studies within the field in isolation and in combination with other analysis methods. Tuvadaratragool (2013:49) and Ahmad (2010:10-11) identify that this approach has been applied for over 41 years by various authors the like of Altman (1968); Edmister (1972); Blum (1974); Jo and Han (1996); Lennox (1999); Gancsalingaan and Kumar (2001); Smith and Graven (2005); Ugurfu and Aksoy (2006); Hossari (2006); Welman *et al.* (2005:231) explain the description and summary of obtained data for individual group analysis being univariate, bivariate and multivariate is known as descriptive statistics. Data analysis is a current form of descriptive statistics (Cobb & Moore, 1997:807) and dealt with by means of statistical software such as SPSS. This concludes the MDA analysis approach to be applied within this study. The next task is to present the descriptive statistics.

5.4 DEVELOPMENT OF THE BANKRUPTCY PREDICTION INDICATORS APPROACH (BPIA)

In Chapter 4 (Section 4.3.5) an account was given as to how the document analysis was applied by means of coding. The three methods of coding as referred to by Strauss and Cabin (1990:96-97) supported by De Vos *et al* (2015:412-413) are open, axial and selective coding. Open coding is when data collected is closely examined, conceptualised and categorised. Within this study collected data were divided into six categories that measure company performance (liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow) and frequency (ratios appearing in more than one seminal study) resulting in 19 financial ratios. The axial coding is when the coded data are used to connect categories. The 19 financial ratios were connected to the four-pillar measure (Section 4.3.4). Lastly, selective coding entails the selection of the core categories. The core categories selected in this study, totalled to nine financial ratios. Noble and Mitchell (2016:34) clarify core category is the principle phenomena categories are constructed on, “theory is generated

around a core category". The coding was applied to data collected through literature and document analysis and key concepts within the study field to give meaning to the collected data. The coded results were integrated in the development of the bankruptcy prediction indicators.

This section discusses the development of bankruptcy prediction indicators. It is difficult to apply models developed within an American or European context and expecting them to be successful in South Africa due to South Africa being so diverse (Hlahla, 2010:3). Also bearing in mind that business failure on its own has many contributors, therefore, it is important that the model applied in South Africa should be entirely within a South African context and taking into consideration the limitations of traditional methods. The aim of the BPIA is to develop a generic model that is not industry-based and which is easy to use with the ability to speedily pick up any changes within the industries. According to Lui (2002:4), different characteristics are found within specific industries. Therefore, when models are developed using companies from one set of industries it may not be very precise in predicting bankruptcy. Therefore, applying a general model for all industries would be feasible. The study identified generic bankruptcy prediction indicators with the aim to predict bankruptcy or detect financial distress early enough to take corrective action across industries.

The bankruptcy prediction indicators were developed by applying an exploratory mixed-method approach. In social research, a more comprehensive understanding of social phenomena is accomplished when applying more than one method of data collection (Bless *et al*., 2013:56-57). The mix method can be a combination of quantitative and qualitative methods and the integration of both these methods will in generally give a superior understanding to the research problem (Creswell, 2014:4). Maree (2019:329) recommends that when a mixed-method approach is followed it enhances the study and will be useful to obtain understanding, gain theory, measurement instruments, different perspectives and relationships between variables. Mixed-method studies attempt to bring together methods from different paradigms. Simply stated, investigation from different perspectives is conducted to provide a more extensive understanding of the subject phenomenon thus effective bankruptcy prediction. Leading to the development of the BPIA in this study.

Berman (2017:6) explains when an exploratory mixed-methods approach is applied the aim is to develop a quantitative instrument to further explore the research questions derived motivated by the qualitative data collected and analysed. The qualitative phase of the data collection used papers and studies on financial ratios to exhibit the various facets of financial ratios. The study incorporated studies that used financial ratios as tool in their studies (Section 3.5). The quantitative phase to develop the bankruptcy indicator development will adopt a three-stage approach.

5.4.1 First phase: Compile potential ratios

Chen and Shimera (1981:51) explain financial ratios are useful and usefulness varies depending on the objective researchers want to obtain. The financial ratios collected in the qualitative phase entailed the selection of the financial ratios from studies that were identified as seminal studies within the field of study. Total studies selected were nine, four international and five South African studies. Studies that replicated an existing seminal selected study such as Altman and Beaver were excluded. The resulting total number of studies were three international studies of which Tuvudaratragool was excluded as it replicated the study by Hossari and three South African studies excluding Hlahla replicated Beaver and Rama Altman. Next the financial ratios of the selected studies were divided into the six categories, to measure a company's financial performance, namely liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow resulting in a total of 94 financial ratios. For financial ratios to be selected for the pool of ratios, financial ratios with the ability to best contribute to the study the following criteria had to be met, the successful performance of financial ratios in previous studies and the specific ratios popularity. After the criteria were applied, 19 ratios were selected for the pool of financial ratios. This pool consisted of all the ratios that appear more than once in the prior selected South African studies (Section 4.3.4, Table 4.22). A further clean-up of the 19 financial ratios was conducted by electing the financial ratios that best measure the four pillars of a company's financial health namely profitability, financial stability, growth and risk. Profitability is best measured by ROE, ROA and total asset turnover. The financial stability pillar is measured by QR and CFTD. The growth potential pillar is best measured by sales and earnings growth while debt and interest cover ratios best measure

the risk pillar (SARB, 2019; Cassim, 2015; Naidoo, 2006). This phase resulted in nine remaining ratios, which was accomplished by taking into account whether the companies have the potential to make a profit, their financial stability, growth potential, and their financing risk.

5.4.2 Second phase: Statistical testing

Statistical analysis was applied to the remaining nine (9) ratios from first phase in order to determine and identify the financial ratios with the statistical significance for this study. Adams and Lawrence (2018:123) explain that statistical significance indicates the results obtained by the data generated through statistical testing are not likely by chance or randomness but indicates confidence level. If there is a 95% confidence level the researcher can be 95% confident the observed results were real and not caused by chance. This was obtained through testing the means (averages), standard deviation (distance from the mean value), frequency (number of occurrences), correlations (strength between the financial ratios). The Mann-Whitney (*U*) test (determine statistical significance and the financial ratio are also ranked from lowest to highest). Testing dealt with in details in the next chapter.

5.4.3 Third phase: Final financial ratio established

In this phase the results of the statistical testing applied in the second phase were reviewed and put into perspective. Results from the statistical testing indicated there were five (5) financial ratios that were found to be statistically significant. These five (5) financial ratios were ranked from lowest to highest, lowest equals to one and highest equals to five. The lowest financial ratios at one ROE, followed by two interest cover (EBITI), CFTD is at three followed by ROA at four and total asset turnover (TATO) at the highest at five. From these results the final ratio profile known as the bankruptcy prediction indicators has been developed as indicated in Table 5.9 below and that were applied in Section 6.4 two-level testing.

Table 5.9: Bankruptcy prediction indicators

	Ratio	Effect size (*r*)
Level 1: Statement of Comprehensive Income (Survival level)	ROE	0.54
	EBITI	0.54
	ROA	0.50
Level 2: Statement of Financial Position (Thriving level)	CFTD	0.52
	TATO	0.46

Source: INETBFA (2018) and SPSS 25

Table 5.9 indicates the financial ratios that represent the bankruptcy prediction indicators that were tested the Setion 6.4. The judgement of the researcher has been applied by separating the selected ratios into two levels of testing. The first level is referred to as the survival level, at this level only the statement of comprehensive ratios are tested. Service (2017:1072) points out these ratios are the ROA, ROE and EBITI. The ratios were tested and compared to the benchmarks (Section 6.3) if a favourable result is obtained testing can continue to the second level while unfavourable results it is an indication the company is in the mist or heading for financial distress. It is recommended that management first investigate and apply corrective action so that the problem does not escalate. The second level is referred to as the thriving level and is a statement of financial position ratios, CFTD and TATO (Service, 2017:1072). This level is only tested when Level 1 is found to reflect a healthy financial condition.

By applying the two-level approach, Level 1 should determine whether the company is solvent or not and Level 2 should investigate whether the company is thriving as it is very important for companies to continually thrive and grow. According to Teece (2018:40), a company's success depends on the growth of a company and is crucial for its long-term survival. The ratios were tested on two levels, the statement of comprehensive income and statement of financial position. Within these levels, the ratios are tested based on the strength of the relationship between the variable from strongest to weakest. Pallant (2016:137) refers to this as the effective size mentioned in Table 5.10 above and the ratio is arranged accordingly within the level of testing. Having described the three-stage approach used to develop the BPIA the discussion now turns to the techniques applied

in this study for testing the ability of the BPA to predict bankruptcy or detect financial distress.

The BPIA is applied through using the comparative and trend ratio analysis. The validation applied through the two analytical tools the BPIA in combination with the sophisticated ratio-based EMS model. The results of these two analytical tools (BPIA and EMS) were compared to obtain a better result of the prediction ability of the BPIA. The interpretation of the results from the analytical tools (BPIA and EMS), when testing the three sample sets in Section 6.4 the three sample sets tested in Chapter includes:

- BPIA when comparison of the failed and non-failed group of companies
    1. Failed companies signal less favourable results for period of five years prior to actual failure.
    2. Failed companies show trend of weakness compared to non-failed companies for five years prior to failure.
- BPIA ratios are above and equal to the maximum classification (Section 6.3) A company is financially healthy when below the maximum but above the neutral a level of uncertainty is evident. Furthermore, below neutral and equal or below minimum further investigation is required as a result of potential financial distress or bankruptcy.
- The ability of the BPIA to correctly classify or identify failure or potential failure prior to the actual failure. This will be an indication of the BPIA's ability to predict bankruptcy or detect financial distress.
- A score higher than 2.60 on the EMS model indicates the company is financially healthy while when the score is more than 1.10 and less than 2.60 a zone of uncertainty is indicated and a company is being in financial distress of bankrupt is indicated with score of less than 1.10.

The above criteria indicate how the results of the analytical tools were interpreted for the three sample groups test that were conducted in Section 6.4. The study proceeds to discussing the levels of testing.

Level 1: Statement of comprehensive income (Survival level)

Level 1 of the BPIA illustrates companies' profit potential and the ratio indicates whether the assets and equity are used effectively and are generating returns. The risk gives an indication of the financing used by the company and whether they can at least repay the interest obligations. The financial ratios included in the first level of testing is indicated in Table 5.10 below. The table also included the number of times (%) the ratio has appeared in the studies used to create the pool of ratios. This is achieved by dividing the number of times the ratio appeared by the total number of studies.

Table 5.10: Level 1 selected ratio appearing within nominated studies

Ratio	%	Altman 1968-2006	De la Rey 1981	Naidoo 2006	Hossari 2006	Fülbier 2008	Cassim 2015
Return on Equity (ROE)	50				√	√	√
Interest cover (EBIT: I)	50				√	√	√
Return on Assets (ROA)	83	√	√		√	√	√

Source: Cassim (2015:72-81), De Villiers (2012:50), Fülbier *et al*. (2008:128), Altman and Hotchkiss (2006:239-241), Hossari (2006:61-76), Naidoo (2006:33) and De la Rey (1981:169)

As illustrated in Table 5.10 above ROE appears 50% within the selected studies, computed by dividing the number of times the ratios appeared by the total number of nominated studies. The ROE ratio measures companies' corporate performance (net income), how well a company is performing in relation to the equity invested. The amount of profit earned in comparison to the total shareholders' equity invested. High ratios point towards more cash that are generated internally and shareholders' funds are utilised more efficiently (Al Masum & Johora, 2012:10).

Interest cover ratio (EBITI) appears to be 50% of the time within the selected studies and expresses the companies' capacity to repay the interest on its outstanding debt. If a company is able to service their interest repayments, it is still able to stay afloat when

facing financial or operational challenges but once the company is incapable of paying the interest obligations the going concern status of a company is questionable. This ratio has the capacity to affect the company's profitability and indicate additional debt capacity. The cost-benefit analysis dictates borrowing money to fund company assets needs to have a positive effect. A low ratio signals financial weakness, more burdened by debt and potential financial distress (Iyakaremye, 2015:41), the next ratio being the ROA.

The ROA appears to be 83% within the nominated studies and displays managements' ability to buy assets at wise prices and invest it in higher profitable projects resulting in the higher income generated by one rand (R1) of assets. The ROA as described by Tuvadaratragool (2013:86) measures a company's earning-generating capacity in relation to their overall total asset resources. A high ratio demonstrates that a company is efficiently using their resources resulting in the company being more profitable (Correia *et al.,* 2015:5.23).

If a problem has been identified in Level 1 it is suggested that further ratio testing be done, management further investigates what the cause of the problem is and take remedial action in order to eliminate the problem and take corrective action. If the problem cannot be salvaged the company will cease to survive and applying a further test of Level 2 will only be futile as a company that is unable to survive is not able to thrive. When favourable results are achieved or obtained further Level 2 ratios testing can commence that indicate the company's capacity to thrive in the year of assessment. Next, the second level of testing is discussed.

Level 2: Statement of financial position (Thriving level)

Cash flow is important because if a company has insufficient cash flow, they are unable to continue as a going concern. Correia *et al*. (2015:5.25) explain that when a company has inadequate cash flow it has a ripple effect, resulting in the inability to meet future financial obligations followed by forced ceasing of operations. At this level, the productivity of the total assets is also measured if the company assets are not productively used to generate sales, with no sales there will be no profits indicating that the company will not be thriving in the near future. The ratios applied in this level are indicated in Table 5.11

below. The percentages are achieved by dividing the number of times the ratio appeared by the total number of studies.

Table 5.11: Level 2 selected ratio appearing within nominated studies

Ratio	%	Altman 1968-2006	De la Rey 1981	Naidoo 2006	Hossari 2006	Fülbier 2008	Cassim 2015
Cash Flow to Total Debt (CF: TD)	33				√		√
Total Asset turnover (TATO)	83	√		√	√		√

Source: Cassim (2015:72-81), De Villiers (2012:50), Fülbier *et al*. (2008:128), Altman and Hotchkiss (2006:239-241), Hossari (2006:61-76), Naidoo (2006:33) and De la Rey (1981:169)

Table 5.11 shows CFTD appeared within the elected studies at 33% calculated by dividing the number of times ratios appeared by the total number of nominated studies. According to Iyakaremye (2015:41), this ratio measures the company's ability to cover future debt obligations by comparing the company's cash flow to their total debt. A higher ratio displays the company having ample capacity to carry their total debt and the level of financial strength and a low ratio is a sign of too much debt or weak generation of cash flow. Correia *et al.* (2015:5.25) explain the CFTD has been considered by most analysts to be one of the best indicators of financial stability and found to be a reliable indicator of financial distress.

Total asset turnover ratio (TATO) appeared to be 83% within the chosen studies and measures how management uses their available financial resources to generate sales. This is achieved by relating to the number of sales the assets have generated. A high ratio specifies companies' assets are used efficiently and low indicates the opposite thus inefficient utilisation of assets (Iyakaremye, 2015:41 and Correia *et al.*, 2015:5.19). Next is the conclusion of this chapter.

5.5 SUMMARY

The aim of the bankruptcy approach is to develop a generic analytical tool that is extremely quick, easy and simple to use yet effective to detect financial distress prior to bankruptcy, using minimum financial ratios as input. The goal is to develop an analytical tool that can be applied quarterly, or bi-annually, need not only be applied at year-end and that can be applied by all stakeholders. As business failure does not only affect the company but also its stakeholders. By detecting possible business failure timely, it allows management to be accountable to investors and to apply precautionary corrective action to avoid failure. Early warning signs could signal to investors' any income losses from their investments, to suppliers and lenders the hinderances are indicated regarding timely repayments and the employees and management is the signs regarding employment redundancy.

This chapter focussed on the data analysis beginning with the sample description. The sample was described by discussing the profile of the companies used with a total of 68 companies (failed, non-failed and out-of-sample failed companies) and the selection criteria of both failed and non-failed group of companies were looked at. This was followed by a discussion on how the companies within the sample was matched in order to compare. The selection of financial ratios were identified based on seminal studies. The seminal studies and the justification of their election let to, the six categories of financial ratios which were divided into; liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow. The selection of the pool of ratios were based on the successful performance of ratios in previous studies. Followed by a further selection based on the financial ratios that best measure the pillar of company's financial health that represent the bankruptcy prediction indictor before statistical testing. The chapter continued with the analytical approach indicating the two analytical tools applied (BPIA and EMS) to be used. Statistics followed by a discussion of the MDA and the descriptive statistics applied within the study by elaborating on its purpose and an explanation of what it measures. Lastly, the development of the BPIA, the three-stage approach, guidelines on the interpretation of the analytical tools and finally the levels of testing are discussed. The testing of the data by means of the analytical tools identified are applied in Chapter 6.

CHAPTER 6
DATA ANALYSIS AND RESULTS

6.1 INTRODUCTION

Bankruptcy prediction has been around since 1966 when Beaver laid the foundation of bankruptcy predictions. Financial ratios have played a vital role in the detection of early warning signals of financial trouble (Tuvadaratragool, 2013:104). There have been numerous studies in the South African literature to date investigating the ability of financial ratios to determine accurate failure predictions. According to Mosalakae (2007:142-143), the seminal studies in South Africa were either too complex to apply or too flexible increasing the likelihood of yielding inconsistent results.

Chapter 5 reviewed the analysis of the data. In this chapter, the MDA described are applied and interpreted. The objective of the research is to validate the developed bankruptcy prediction indicators through testing. The indicators will predict potential bankruptcy, identifying the areas of concern that require further investigation before actual bankruptcy occurs, allowing management an opportunity to take corrective action. This reduces the financial bottleneck caused by uncorrected financial distress signalled resulting in so much financial damage that had been done that companies are left with no option but to commence to declare bankruptcy. The testing was done through the use of selected financial ratios that were statistically analysed and only the correlated and statistically significant indicators were used. The normality test found the study's population was not normally distrusted. Mann-Whitney's non-parametric test was conducted, comparing two sample (failed and non-failed) group of companies by their rank in the validation process. This chapter is devoted to testing the bankruptcy prediction indicators developed in Chapter 5. The aim is to determine the ability of the combinations of bankruptcy prediction indicators to timely detect financial distress. The research question is whether indicators:

- are able to detect early warning signs of bankruptcy or predict bankruptcy or financial distress within a South African context over period with different economic circumstances

In this chapter, the testing of the bankruptcy prediction indicators is done with the aim of satisfying the research objectives. The chapter comprises five sections as shown in Figure 6.1. In Section 6.1 the introduction to the chapter is followed by the interpretation of the MDA applied in Section 6.2. Thereafter the BPIA including three-phase testing was done in Section 6.3. In Section 6.4 the newly developed BPIA effectiveness are tested. Firstly, the matched failed and non-failed companies within the same sector, followed by the remaining failed companies that were tested by applying the newly developed BPIA and the results were compared to the EMS model in order to authenticate the results. The same testing process was applied to the effective out-of-sample group. Finally, the chapter summary is given in Section 6.5. The chapter plan below.

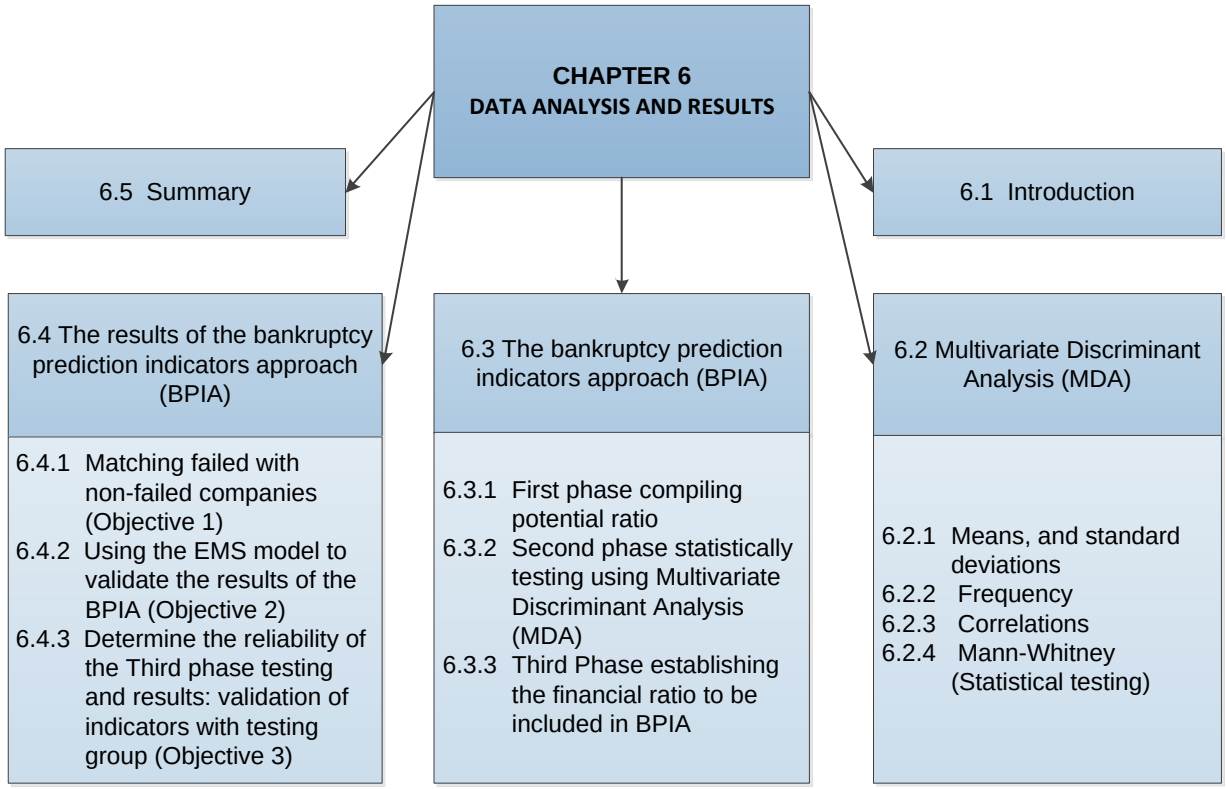


Figure 6.1: Overview of Chapter 6

6.2 MULTIVARIATE DISCRIMINANT ANALYSIS (MDA)

Statistics according to Dane (2017:335) is when numerical values are calculated from a sample. Grevetter and Forzano (2016:444) state that statistics is when a sample is described by a summary of values. Statistics can also be described as a set of collected numbers and applied mathematics used to summarise and manipulate the features of

numbers (Neuman, 2006:346). Salkind and Frey (2019:7) explain statistics is when data are arranged, portrayed and deciphered by means of set statistical tools and techniques. Statistics predominantly assist researchers to make sense of data. Statistics are desirable but not always necessary, the purpose of a study will determine the extent of the statistical application (Kumar,2019:284). Zikmund *et al.* (2013:438) sum it up perfectly: “Statistics is a researcher’s vocabulary, as knowledge of statistics is required to determine the required sample size”.

In this part of the study statistical testing is applied to the selected ratios. Harmse (2017:125) explains descriptive statistics describes and summarises data and the researchers are able to categorise patterns and describe trends within a data set through application of descriptive analysis (Laerd, 2020a). Descriptive statistics is when results of the research studies are simplified, summarised and organised with the aim to assist researchers (Gravetter & Forzano, 2016:443; Berenson, Levine, Krehbiel, Watson & Turner, 2007:6). Han, Pei and Kamber (2011:744) supported by Mishra, Pandey, Singh, Gupta, Sahu and Keshri (2019:67) explain descriptive statistics assist the researcher to make sense of large numbers of data so that it is easily interpreted. Descriptive statistics (mean and standard deviation), correlation, significance and ranking are applied (Van Zyl, 2014:392). Descriptive statistics computes the mean, standard deviation, correlation, frequency and Mann-Whitney (*U*) test of each of the following ratios: ROE, ROA, TATO, QR, CFTD, sales and earnings growth, debt to equity followed by the interest cover.

The intent is to determine the ratio with the best financial distress detection ability and ranked accordingly from highest to lowest. The combination of ratios selected was not sector-specific but rather generic. The empirical research objective is to determine whether a relationship between the bankruptcy prediction indicators using financial ratios and their ability to detect timely financial distress or red lights for further investigation exists. The financial ratios used within the developed model is based on the seminal studies within research (Beaver, 1966; Altman, 1968; De la Rey 1981; Naidoo, 2006; Hossri, 2006; Fülbier, 2008; Cassim, 2015).

6.2.1 Means and standard deviations

Pallant (2016:56) supported by Dane (2017:84) explains that descriptive statistics describes and summarises characteristics of a data set. Two categories of measure, central tendency (mean, median and mode) and variability (standard deviation and range) provide a basis of comparison. Welman *et al.* (2005:233) explain the mean is the mathematical averages of a set of scores being calculated, the sum of list of values, the data set divided by total number of values. Standard deviation (SD) measures how spread is the data around the mean, the smaller the SD the smaller the distance from the means and the larger the further the distance is from the mean, this being the spread of scores regarding averages. The computations of the statistics (mean and SD) indicated a pattern of the data set (Adams & Lawrence, 2018:598). The means and SD provides a more objective measure of opinion.

The SD, on the other hand, indicates how much the scores within the sample differ from the mean. Swanepoel, Swanepoel, Van Graan and Santana (2018:107) state the SD is the most used statistical measure of spread in practice. A high SD indicates that the spread is further away from the mean and a lower SD points to a spread closer to the mean. According to Sykers, Gani and Vally (2016:274) the SD measures the differences from the mean and offers an understanding of the deviation that exists within groups and is a good representation of a threshold. In this study, the ranges were determined by using the mean as the neutral point and the SD as the threshold point. These thresholds only serve as a guide and are not set in stone. The application of the means and SD is displayed in Section 6.3.2.1. Having presented the means and standard deviation, correlation will now be discussed.

6.2.2 Correlations

Pallant (2016:133) explains that correlation indicates patterns in the data. It measures the strength of the relationship between variables, stated that the aim of correlations is to describe the strength and direction of relationships. Adams and Lawrence (2018:586) state that correlation indicates a change in one variable could cause reaction in another, the direction is determined by (-/+) negative (-) inverse (+) same direction meaning correlation (r)

- Positive (+) – same direction relationship, increase in one variable corresponds to increase in another
- Negative (-) – indirect direction relationship, increase in one variable results in decrease in another
- Zero – indicates no relationship

According to Pallant (2016:138), a significant *p*-value is less than 0.05 and becomes highly significant when the p-value is less than 0.01. Cowles and Davis (1982:553) state that Sir Ronald Fisher established the levels for measurement of statistical significance. According to Fisher (1925:47), statistical significance should be determined at p = 0.05. In 1955 Cramér (1955:202) informed readers to consider highly significant values at 1(1/100) *p* = 0.01 (Cowles & Davis, 1982:554). The p-values obtained in this study are p > 0.05 being not significant, *p* < 0.05 being statistically significance and *p* < 0.01 being highly significant. With correlation the relationship between variable need to be determined, followed by determining whether the results are reliable obtained through statistical significance. If there is a relationship between the variables under study, the strength of the relationship needs to be determined. The strength of relationships are judged according to guidelines as per Cohen (1988:79 – 81):

- r = 0.00 - .29 – Weak
- r = .30 - .49 – Moderate
- r = .50 – 1.0 – Strong

According to Van Zyl (2014:204) the notion supported by Field (2018:55) is that the process to determine correlations, a relationship is initially determined by the direction, either (-/+) negative (-) inverse direction (+) same direction, followed by determining whether there is statistical significance at level of p<0.01 or p<0.05.Then the strength is determined (by the number) either strong (0.5 – 1.0), moderate (0.30 - 0.49) or weak (0.10 - 0.29). Next, the frequency is discussed.

6.2.3 Frequency

Tredoux and Durrheim (2019:19) supported by Adams and Lawrence (2018:588) describe frequency as an indication of how many times a score occurs in the sample. Percentage, on the other hand, is how often the same scores appear, according to Adams and Lawrence (2018:594). This was followed by the frequencies drawn being the

reorganising of the data in the data set to indicate the number of times variables occur within the sample being the frequency of sectors and subsectors. The total observations within this study is 61 as indicated in Section 6.3 (Babbie, 2013:303). Mann-Whitney (*U*) test is discussed next.

6.2.4 Mann-Whitney (Statistical testing)

In this section, the normality testing follows as the assumption of many statistical techniques is a normal distribution of the dependent variables. Pallant (2016:59) describes normal as the greater frequency score is in the middle and the smaller frequencies towards the extreme, a symmetrical bell-shaped curve.

The Kolmogorov-Smirnov (K-S test) was applied as the data in the study do not follow a normal distribution, the data are non-parametric. Ghasemi and Zahediasl (2012:487) explain that this test compares a normally distributed set of scores with the same mean and SD to scores in the sample. Field (2018:789) expresses this test is applied to determine if there is a significant difference in the score compared to the normal distribution scores. According to Pallant (2016:63), the assumption within a population is as follows, if significant the value is:

- >0.05 variables follow a normal distribution
- <0.05 variables do not follow a normal distribution

When a significant value >0.05 in the sample is non-significant and is determined non-normality exist when non-normality is determined a non-parametric test is conducted. The non-parametric test is a statistical procedure that does not assume a sampling distribution to be normal unlike that of a parametric test that assumes the data set follows a normal data spreading (Field, 2018:880).Procedures for non-parametric testing with the aim of determining if a statically significant difference exists between two groups is conducted through the Mann-Whitney (*U*) test (Welman *et al*., 2005:230).

According to Tredoux and Durrheim (2019:436), the Mann-Whitney (*U*) test is ideal where data are asymmetric and uses ranks instead of the original distribution scores. This test measures the differences between the two samples. Field (2018:878) explains the Mann-Whitney (*U*) test is a non-parametric test, testing whether the population from which the

two samples are drawn has the same location by observing for differences between the two independent samples.

The effect size was then calculated and the ratios were ranked according to size. The effective size measures the meaning and the importance of the findings. It determines the strength or magnitude of a variable (Adam & Lawerence, 2014:208). When the dataset's order is from highest to the lowest this is referred to as ranking. Tredoux and Durrheim (2019:387) continue by explaining ranks are assigned through the use of numbers, a number for example one is ranked the smallest, two is ranked second and three, ranked third and the highest. This study applied ranking by means of the effect size statistically computed. The statistical testing route to be taken has been explained above and graphically explained Figure 6.2 below.

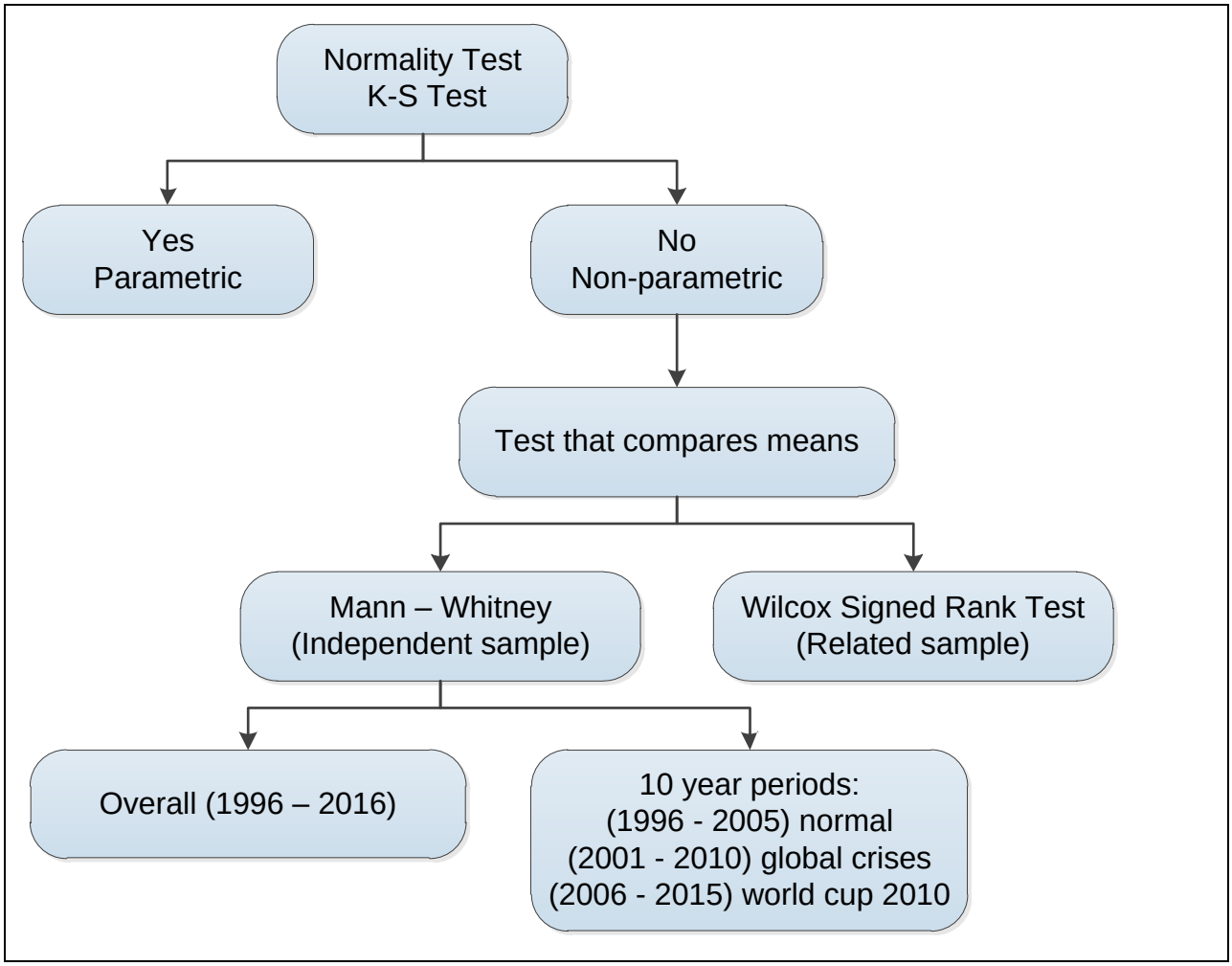


Figure 6.2: Statistical testing route

Source: INETBFA (2018) and SPSS 25

Figure 6.2 indicated the first step was the normality test, to check the assumption of data normality (Tredoux & Durrheim, 2019:146). Pallant (2016:59) scribes a bell-shaped symmetrical curve best explains normality. According to Harmse (2017:125), non-normality is when population is not normally distributed. It is important before rendering any statistical test to know whether the data are normally distributed or not. Therefore, it is important to first test data for normality, if data are normally distributed a parametric test will be used to compare means (Van der Colff, 2017:157). If data are not found to be normal a non-parametric method needs to be used that compares medians and not means. Gouws (2012:41-42) explains the importance of testing for normality. If the distribution of data is not normal the mean is not a true representation of the data and by calculating the significance level and applying the incorrect representative value, a wrong

interpretation of the data might be given and inaccurate testing leads to inaccurate results. The Kolmogorov-Smirnov (K-S) test is applied to test the normality of a small sample. When results obtained are significant (p<0.05) the sample is not normally distributed. However, when the results are not significant (p>0.05), normality is indicated (Field 2018:185). Non-parametric analyses make fewer assumptions about the structure of the data (Pallant 2016:206).

A normality test was conducted by means of Kolmogorov-Smirnov (K-S test) test to determine if the data set was normally distributed. Findings revealed the data set, the sample of this study was not normally distributed, which is called non-parametric.

A non-parametric testing Mann- Whitney was conducted with the purpose of determining if a statically significant variance occurs among the two groups (failed and non-failed groups) from the original list of nine ratios. The results from the statistically testing are the indicators that were applied in the BPIA.

6.3 THE BANKRUPTCY PREDICTION INDICATORS APPROACH (BPIA)

6.3.1 First phase compiling potential ratio

The financial statement data were collected over a period of 20 years (1962─2016) as according to the sample criteria for both failed and non-failed companies of the JSE. A total of six studies referred to as seminal studies within literature were selected and studies that replicated within studies already selected was excluded.

The total of 94 financial ratios, based on the performance of the financial ratios and their popularity (financial ratios), had been identified by previous studies as good predictors of bankruptcy of business failure or financial distress. This resulted in 19 remaining financial ratios. The study's financial rates were further reduced by selecting the financial ratios that best measure the four pillars of company health (SARB, 2019; Cassim, 2015; Naidoo, 2006). After the selected nine ratios remained and statistical testing was applied to the nine ratios, the results of the statistical testing indicated five financial ratios were highly correlated and statistically significant. These being the potential ratios formulating the BPIA.

6.3.2 Second phase statistically testing using multivariate discriminant analysis (MDA)

Descriptive statistics is also a type of statistical technique and the aim of the researcher will determine the type of technique applied (Pallant, 2016:107). Zikmund *et al.* (2013:438) explain that to profile a sample by describing and summarising the population or sample characteristics in a simple and understandable manner, descriptive statistics is applied. Descriptive statistics is when results of the research studies are simplified, summarised and organised with the aim to assist researchers (Gravetter & Forzano, 2016:443; Bereson, Levine, Krehbeil, Watson and Turner, 2007:6). Han, Pei and Kamber (2011:744) supported by Mishra, Pandey, Singh, Gupta, Sahu and Keshri (2019:67) explain descriptive statistics assist the researcher to make sense of large numbers of data so that it is easily interpreted.

According to Gravetter and Forzano (2016:445), in order to accomplish the goals of descriptive statistics data sets need to be organised or summarised. This type of statistics is used when data are hard to understand thus the quantitative data are adjusted into bite-size explanations essentially summarising the information (Schwester, 2015:28). The aim of this study is to explore group differences by applying multivariate analysis between failed groups and the non-failed groups. The multivariate analysis was applied as the data set consists of more than two variables. Followed by frequencies being the number of times a variable occur, means, SD, correlations and Mann-Whitney (*U*) test and the process is illustrated in Figure 6.3.

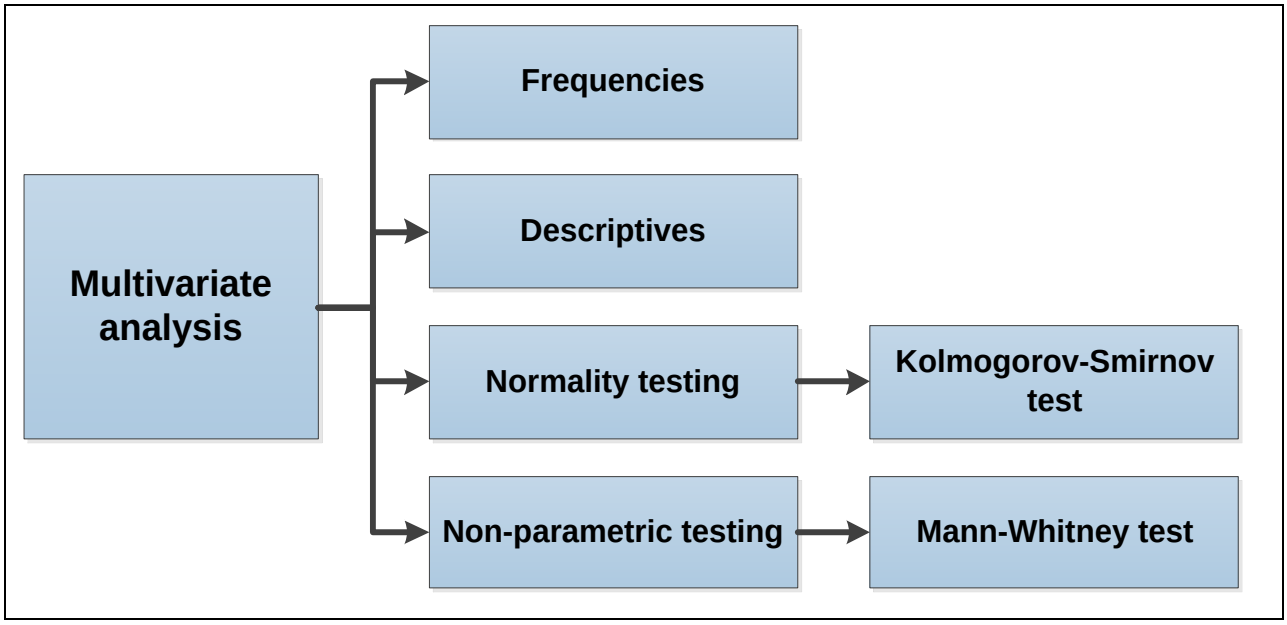


Figure 6.3: Statistical testing route

Source: INETBFA (2018) and SPSS 25

Figure 6.3 above indicates the route the statistics procedure taken in this study in applying the multivariate analysis. The frequency, descriptive (mean, SD and correlation) followed by Mann-Whitney (*U*) test will be computed in the order.

6.3.2.1 Frequency

Table 6.1 below illustrates the frequency and percentages with regard to the sample.

Table 6.1: Frequency of (n=61) participants

	Category	Frequency	Percentage
Section	Consumer goods	8	13,11
	Consumer services	21	34,43
	Health care	2	3,28
	Industry	14	22,95
	Technology	14	22,95
	Telecommunication	2	3,28
Sub section	Food and Retail	23	37,70
	General	7	11,48
	Travel	5	8,20
	Equipment	2	3,28
	Construction	8	13,11
	Hardware	8	13,11
	Software	6	9,84
	Mobile	2	3,28
Failed or not	Not failed	44	72,13
	Failed	17	27,87

Source: INETBFA (2018) and SPSS 25

The results in Table 6.1 indicate characteristics of the participants (n=61), divided into sectors, subsectors and failed (F) companies and non-failed (NF) companies. The sample contained 72.1% NF and 27.9% failed (F) companies making up a total of 61 companies in the study dataset. Included are six of the total 20 sectors namely: consumer goods (13.1%), consumer services (34.4%), healthcare (3.3%), industry (23.0%), technology (23.0%), telecommunications (3.3%). Along with eight of the total 35 subsectors: food and retail (37.7%), general (11.5%), travel (8.2%), equipment (3.3%), construction (13.1%), hardware (13.1%), software (9.8%), mobile (3.3%) on the JSE. In conclusion, the consumer services were the most frequent sector, followed by industry and technology,

next is the consumer goods and healthcare and telecommunication. The years during which companies failed varied over the period of 2002–2016. Only companies that failed due to bankruptcy formed part of the sample. The year companies failed due to bankruptcy: 2003 (8 which is equivalent to 29%), 2004 (1 equal to 3%), 2005 (8 reflects a 29%), 2006 (2 representing 7%), 2011 (2 resulting in 7%) and 2016 (7 which is equivalent to 25%). The year most companies failed due to bankruptcy were 2003 and 2005 (8 reflects 29%), therefore, no specific cause can be pinpointed. Yet no companies failed due to bankruptcy for the period of the international financial credit crunch for the period being 2007–2010. The means and SD among the financial ratios are discussed next.

6.3.2.2 Means and standard deviation

In Table 6.2 the descriptive statistics both the failed and non-failed companies are shown.

Table 6.2: Means and standard deviations

Ratio	Failed		Non-failed	
	Mean	SD	Mean	SD
ROA	(9.68)	53.16	13.91	7.86
ROE	(39.98) **	131.69	18.76**	14.42
TATO	0.94	0.76	1.90*	1.04
QR	1.42*	1.07	1.21*	0.67
CFTD	7.83	29.33	33.16**	23.45
SGR	35.52	54.07	17.99	13.25
EGR	(255.85) *	878.96	(4.13)	135.93
DE	1.28**/*	1.10	1.55**	1.19
EBITI	(1.94) *	21.63	62.56**	135.65

Note: SD – standard deviation

** p < 0.05 = 95% significance*

*** p < 0.01 = 99% significance*

Source: INETBFA (2018) and SPSS 25

Table 6.2 indicates the means and SDs for the period of study (2002–2016). The significance according to Adams and Lawrence (2018:123) is being sure statistics are reliable, statistical significance at 95% confidence level (p<.05) and 99%confidence level (p<.01). The differences between the means values indicate how much difference there is between the averages. SD determines how data are spread around the means (Van Zyl, 2014:392).

Table 6.2 above also indicates the total of nine ratios statistically significant differences between the mean values for the failed (from here on F) group and non-failed (from here on NF) groups. A total of six have displayed to be significantly different at a 5% significance level ($p<0.05$) and five at a 1% significance level ($p<0.01$) for both groups. The failed group had a total of two at $p<0.05$ and four at $p<0.01$ and the non-failed is four at $p<0.05$ and two at $p<0.05$.

In terms of the four pillars of company health (Section 4.3.4, Table 4.25) being the survival level: Profitability (ROA, ROE, TATO), Financial stability (QR and CFTD). The thriving level being growth (SGR and EGR) and Risk (DE and EBITI).

With regard to profitability ratios, failed groups are less than the non-failed (ROA, ROE, TATO). ROE (NF) is significantly different at $p<0.05$ and TATO (NF) significantly different at $p<0.01$. In terms of financial stability ratios, QR (F) more than the NF and CFTD (F) less than the NF, QR (F) and NF are both significantly different at $p<0.01$. With the growth ratios SGR (F) is higher than NF, the EGR (F) lower than NF both these ratios are significantly different. Lastly, the risk ratios DE and EBITI (F) lower than NF and both F and NF are significantly different at $p<0.05$ for DE and EBITI (F) significantly different at $p<0.01$ and NF significantly different at $p<0.05$.

In summary, the financial ratios over the period 2002–2016 according to descriptive profile, profitability was lower for the failed (F) group of companies as indicated by lower ability to generate profits from their operations than the non-failed (NF) group of companies. The financial stability of the F groups is less stable than the NF. According to SARB (2019:151), without financial stability growth is unable to be sustained. F is not able to grow as per means for both F and NF group indicate negative values. Overall deterioration of the F group over the period of study is evident and contributes to the

weakening economic conditions being profitability, financial stability, growth and risk. The nine ratios displayed a statistically significant difference between the mean values for the failed and non-failed groups. Zikmund *et al*. (2013:561) describe a correlation test as a technique that is highly favourable within research.

6.3.2.3 Correlations

The correlations between the different variables for the period 1996–2016 are presented in Table 6.3 below

Table 6.3: Non-failed companies: Descriptive statistics and correlations (1996–2016)

Variable		M	SD	1	2	3	4	5	6	7	8
1.	ROA	13.91	7.86	-							
2.	ROE	18.76	14.42	0.72‡**	-						
3.	TATO	1.90	1.04	0.06	0.32†*	-					
4.	QR	1.21	0.67	0.12	-0.19	-0.38†*	-				
5.	CFTD	33.16	23.45	0.51‡**	0.17	-0.37†*	0.52‡**	-			
6.	SGR	17.99	13.25	0.07	0.14	0.23	-0.06	-0.04	-		
7.	EGR	-4.13	135.93	0.13	0.23	0.16	-0.04	-0.05	0.14	-	
8.	DE	1.55	1.19	-0.15	0.26	0.41†**	-0.73‡**	-0.68‡**	0.01	0.01	-
9.	EBITI	62.56	135.65	0.24	0.25	0.13	0.31†*	0.63‡**	-0.02	0.20	-0.45†**
** p < 0.05* *** p < 0.01* *† r > 0.30* *‡ r > 0.50*											

Source: INETBFA (2018) and SPSS 25

In Table 6.3, both positive (+) and negative (–) correlations were observed. The following correlations were displayed between selected ratios, indicating positive (+) same direction of variables, highly statistically significant at level p<0.01 and the strength of the relationship is strong, (ROA with ROE (0.72)), CFTD with ROA (0.51), CFTD with QR (0.52), and EBITI with CFTD (0.63)). The negative (-) opposite direction of variables in the same direction, highly statistically significant at level p<0.01 and strength of the relationship is strong, (DE with QR (-0.73), DE with CFTD (-0.68)). Positive (+) is the

same direction of variables, statistically significant at level ($p<0.05$) and a weak relationship, TATO with ROE (0.32). A negative (-) indirect relationship of variables, statistically significant at level $p<0.05$ and the relationship is weak, QR with TATO (-0.38) and CFTD with TATO (-0.37). Correlation with direct relationship (+), highly statistically significant at level $p<0.01$ and the strength of the relationship is moderate DE with TATO (0.40), EBITI with DE (-0.45) with the similar significance level, strength of the relationship only difference being the direction of the relationship being negative (-).

Pallant (2016:132) explains the correlation measures the direction and the strength between variables, when positive the ratios move in a corresponding direction and when negative it moves in the opposite direction. The higher the number the stronger the relationship between the variable, meaning the ratio has a bigger influence on each other. The following significant associations can be interpreted as refer to by Cohen's (1988:79-81) regarding the strength of each relationship.

Strong positive relationship with $p<0.01$

- ROA with ROE (0.72)
- CFTD with ROA (0.51)
- CFTD with QR (0.52)
- EBITI with CFTD (0.63)

Strong negative relationship with $p<0.01$

- DE with QR (-0.73)
- DE with CFTD (-0.68)

Moderate positive relationship with $p<0.01$

- DE with TATO (0.40)

Moderate negative relationship with $p<0.01$

- EBITI with DE (-0.45)

Moderate positive relationship with ($p<0.05$)

- TATO with ROE (0.32)

Moderate negative relationship with ($p<0.05$)

- QR with TATO (-0.38)
- CFTD with TATO (-0.37)

The correlation between the ratios varied having positive and negative relationships indicating the direction of the relationship. A positive (+) relationship indicated a corresponding direction of the ratios and a negative (-) demonstrating an inverse direction. The strength of the relationship being either weak (0.00 - 0.29), moderate (0.30 - 0.49) or strong (0 .50 – 1.0) (Field, 2018; Pallant, 2016; Van Zyl, 2014; Cohen, 1988). Over the period 1996–2016) Table 6.3 and Table 6.2 illustrate that relationships do exist between the financial ratios according to the four pillars of company health. Regardless of the strength of the relationship one ratio is able to effected another, either in the same direction (increase in one ratios will cause an increase in another) or in inverse direction (increase in one ratios will cause decrease in another.

Profitability ROA effects profitability ratios (+ROE) and TATO effects (+ROE) financial stability ratios. QR effects profitability (+TATO) and CFTD effects profitability (+ROA and -TATO) and financial stability (+QR). Growth is not affected neither does it affect any of the other pillars. Risk DE effects profitability (+TATO), financial stability (-QR and -CFTD) and EBITI effects growth (+CFTD) and risk (+DE).

The following correlations were displayed between selected ratios, indicating positive (+) the same direction of variables, highly statistically significant at level (p <0.01) and strength of the relationship is strong, (ROA with ROE (0.72), CFTD with ROA (0.51), CFTD with QR (0.52), and EBITI with CFTD (0.63). The negative (-) opposite direction of variables same direction, highly statistically significant at level p <0.01 and the strength of the relationship is strong, (DE with QR (-0.73), DE with CFTD (-0.68). Positive (+) same direction of variables, statistically significant at level p <0.05 and a weak relationship, TATO with ROE (0.32). Negative (-) indirect relationship of variables, statistically significant at level p <0.05 and the relationship is weak, QR with TATO (-0.38) and CFTD with TATO (-0.37). Correlation with direct relationship (+), highly statistically significant at level p <0.01 and the strength of the relationship is moderate DE with TATO (0.40), EBITI with DE (-0.45) with the similar significance level, strength of the relationship only difference being the direction of the relationship being negative (-).

Table 6.4 below presents the ratios of the failed groups of companies. Both positive (+) and negative (–) correlations were observed.

Table 6.4: Failed companies: Descriptive statistics and correlations (1996-2016)

Variable		M	SD	1	2	3	4	5	6	7	8
1.	ROA	-9.68	53.16	-							
2.	ROE	-39.98	131.69	0.84‡**	-						
3.	TATO	0.94	0.76	0.20	0.24	-					
4.	QR	1.42	1.07	0.31	0.13	-0.53‡*	-				
5.	CFTD	7.83	29.33	0.08	0.24	-0.07	0.07	-			
6.	SGR	35.52	54.07	-0.18	-0.15	-0.35	0.20	0.15	-		
7.	EGR	-255.85	878.96	0.42	0.50†*	0.15	0.06	0.07	0.01	-	
8.	DE	1.28	1.10	-0.58‡*	-0.67‡**	0.05	-0.48	-0.06	0.16	-0.45	-
9.	EBITI	-1.94	21.63	0.48†*	0.23	-0.08	0.57‡*	0.12	0.29	0.09	-0.13
** p < 0.05* *** p < 0.01* *† r > 0.30* *‡ r > 0.50*											

Source: INETBFA (2018) and SPSS 25

In Table 6.4 the financial ratio are indicated as either being highly correlated and indicated as ** or correlated (*) and a negative correlation shown as -. The negative correlation is an opposite relationship, meaning the strength is not affected, only the ratios move in the opposite direction. As illustrated the failed group of ratios indicated there are no weak relationship, however, there are both positive and negative correlations observed.

Strong positive relationship with p<0.01

- ROE with ROA (0.84)

Strong negative relationship with p<0.01

- DE with ROE (-0.67)

Strong positive relationship with p<0.05

- EGR with ROE (0.50)
- EBITI with QR (0.57)

Strong negative relationship with ($p<0.05$)

- DE with ROA (-0.58)
- QR with TATO (-0.53)

Moderate positive relationship with ($p<0.05$)

- EBITI with ROA (0.48)

The strength of association between the ratios are signified by means of correlation applied. The rationale for the correlation's computation is that the ratios not correlated are potential ratios to be eliminated. A ratio operating in isolation is not a good fit for the bankruptcy prediction indicators as the ratio needs to work in sync and this is not possible when there is no correlation. Therefore, only the correlated ratio has been selected as bankruptcy prediction indicators that are included in the BPIA. The following ratios show that correlation exist within both the failed group and the non-failed group within the four pillars of company health. Correlated relationship indicated with the profitability pillar, the ROA effects the profitability ratio (+ROE) and no other profitability ratios are affected. The financial stability pillar, QR ratios effects profitability (-TATO). With the growth pillar, EGR effects profitability (+ROE). The risk pillar, DE effects profitability (-ROE) and EBITI effects profitability (+ROA) and financial stability (+QR).

As shown in Table 6.3 and Table 6.4 and graphically in Figure 6.2 and 6.3 above, the ratios correlated for both the non-failed and failed companies are profitability (ROE, ROA, TATO), financial stability (QR and CFTD) and risk (DE and EBITI). The ratios are both positive and negative. The strength of the relationship varies between weak, moderate and strong. The significant correlation of non-failed group of companies total to 11 relationships, 6 strong relationships of which four have corresponding direction and two have an inverse direction. Five relationship's strength is moderate with three having inverse directions and two with corresponding direction. The failed group correlations indicate six strong relationships, three with the corresponding direction and three have an inverse direction and one moderate relationship, which direction is corresponding. Having presented the correlations, the statistical testings of the Mann-Whitney (*U*) test follows.

6.3.2.4 Mann–Whitney (*U*) test (Statistical testing)

Table 6.5 illustrates the K-S test applied to determine the normality of the data set.

Table 6.5: Kolmogorov-Smirnov tests of normality (1996–2016)

	Not failed		Failed	
Ratio	**Test statistic**	**Significance**	**Test statistic**	**Significance**
ROA	0.18	0.00**	0.24	0.01*
ROE	0.07	0.20	0.26	0.00**
TATO	0.17	0.00**	0.25	0.01*
QR	0.25	0.00**	0.26	0.00**
CFTD	0.19	0.00**	0.25	0.01*
SGR	0.19	0.00**	0.31	0.00**
EGR	0.26	0.00**	0.34	0.00**
DE	0.17	0.00**	0.19	0.11
EBITI	0.32	0.00**	0.31	0.00**
** p < 0.05* *** p < 0.01*				

Source: INETBFA (2018) and SPSS 25

Table 6.5 illustrates the K-S test statistics with significance levels suggesting infringement of the normality assumption and thus the non-normal distribution of data (Field, 2018:188). The variables have been tested for normality in the SPSS program. The K-S test results suggest that the variables (failed and non-failed companies) are not normally distributed. Of the 18 variables (nine failed and nine non-failed) 16 variables were significant but at different significant levels. Of the nine non-failed, eight were found to be highly significant at level p <0.01 (ROA, TATO, QR, CFTD, SGR, EGR, DE, EBITI). The nine failed variables, five were highly significant at level p <0.01 (ROE, QR, SGR, EGR, EBITI) and three were significant at p<0.05 (ROA, TATO, CFTD) level. As only two out of the 18 values were not significant, 1 a failed (DE at p=0.11) and 1 a non-failed (ROE at p=0.20), it was deemed acceptable to include them in the non-parametric Mann-Whitney (U) test analyses.

In this study, two conditions were compared, with the appropriate non-parametric technique being either the Mann-Whitney (U) test or the Wilcoxon rank-sum test. Both

tests compare means, however, the Wilcoxon rank-sum test compares the difference between related samples (Field 2018:217). The Mann-Whitney (*U*) test is applied, it is a non-parametric version of the t-test, testing for differences between two different independent conditions (failed and non-failed group). Pallant (2016:227) and Le Roux (2014:54) echo the Mann-Whitney (*U*) test converts medians into ranks rather than comparing means and the ranks are eventually compared in order to indicate if significant difference exist. Mann-Whitney (*U*) test results were obtained for an overall period (1996─2016) as illustrated in Table 6.6 below.

Table 6.6: Independent samples Mann-Whitney (*U*) test results (1996─2016)

	Ratio	Mann-Whitney	Std. test statistic	Significance	Effect size
		U	z-score	p	r
1.	ROA	131,00	-3,91	0,00**	-0,50
2.	ROE	113,00	-4,20	0,00**	-0,54
3.	TATO	149,00	-3,32	0,00**	-0,46
4.	QR	407,00	0,53	0,60	0,07
5.	CFTD	120,00	-40,90	0,00**	-0,52
6.	SGR	466,00	1,48	0,14	0,19
7.	EGR	272,00	-1,64	0,10	-0,21
8.	DE	321,50	-0,85	0,40	-0,11
9.	EBITI	110,00	-4,25	0,00**	-0,54
** p < 0.05 = 95% confidence level ** p < 0.01 = 99% confidence level*					

Source: INETBFA (2018) and SPSS 25

Table 6.6 illustrated the Mann-Whitney results on "U" test, z-score, significance and the effective size (*r*). They are not isolated results but harmonising one component assist in better explaining another.

Tredoux and Durrheim (2019:391) supported Pallant (2016:232) explain that the Mann-Whitney (*U*) test, tests whether two independent samples have the same median (in this

study it will be referred to mean). The extent of the difference of scores is displayed in both failed and non-failed groups of companies is expressed as "*U*" value (Baarda, Van Dijkum and de Goede, 2019:116). The meaning to the Mann-Whitney (*U*) test is interpret i.e., which of the failed and non-failed group of companies were stronger/weaker by taking into consideration, the mean ranks, z-score, significance (*p*) and the effect size (*r*).

The mean ranks show the difference between two variables and which of the two means ranks higher than the other (Field, 2018:225). Adams and Lawrence (2018:458) explain in order to interpret significance the groups ratios are ranked from lowest to highest.

According to Adams and Lawrence (2018:175), the z-score is a standardised score based on the number of SD units, scores either lie above the mean (-) or below the mean (+). McLeod (2019:4) explains that the z-score gives an idea how far from mean a data point is by measuring how many SD below or above the population the means score is. The value of the z-score indicates:

- (=) 0, it is on the mean
- (+) positive, higher or above - z-score = +1 indicates 1 SD above the mean
- (-) negative, below or under - z-score = -2, indicates 2 SD below the mean

Statistical significance (p-value) helps to compute whether a result is likely due to chance (van Zyl 2014:398). When a finding is significant, it simply means the researcher can feel confident that it is real, not that the researcher got lucky in choosing the sample (Gallo, 2016). The study applied statistical significance at $p < 0.01$ being at a 99% confidence level and $p < 0.05$ at a 95% confidence level.

According to Pallant (2016:211), the effect size's (*r*) purpose is to determine the strength or difference between groups and whether the difference is statistically significant and did not occur by chance. Field (2018:113) explains an effect size measures the magnitude of the observed effect. The size of the difference is emphasised information not obtained from a p-value. Cohen suggests (cited by Field (2018:117) when $r = 0.10$ signifies a small effect size, $r = 0.30$ represents a medium effect size and when $r = 0.50$ it is considered to be a large effect size. According to Harmse (2017:125), the larger the *r* the stronger the relationship is between the variables. Effective size (r) was used to interpret the meaning of the significant differences found between the two groups of companies. Lachenicht

(2013:238) explains the effective size measures how strong the effect must be and the significance is linked to the effective size. Only the result on significant ratios is reported, variable with strong (large) significant difference is ROA, ROE, CFTD and EBITI, medium significant difference is TATO. The insignificant ratios with strong difference (QR) and insignificant with medium significant difference (SGR, EGR, DE) and were excluded.

The Mann-Whitney (*U*) test according to Table 6.6, has been conducted to determine whether a statistical significance difference exist between means scores as indicated in Table 6.7 below as the Mann-Whitney (*U*) test, tests whether there is a noticeable difference between the two independent groups (failed and non-failed) (Van der Colff, 2017:152). The statistical significant difference would be indicated by p-values (<0.01 or <0.05) and the effective size would reveal the magnitude of the difference (Pallant, 2016; Harmse 2017; Field, 2018). The “U” value is displayed in Table 6.6 above, the “U” value displayed indicated the four of the nine variables have found to have statistical insignificance. Four variables being QR with p=0.60 (407.00), SGR (466.00) with p=0.14, EGR (272.00) with p-value =0.10 and DE (321.50) with p=0.40 were at a high average even though all four ratios were not significant.

The findings also indicated five variables with a statistically significant difference at a level of p<0.01 and the magnitude of the difference is large for all five variables, ranking has also been indicated.

- ROE: *U* =113.00, z = -4.20 four SD below the mean, has a statistical significant (*p*<0.01) difference. The size of the effect is (-0.54) large. Rank 1
- EBITI: *U* =110.00, z = -4.25 four SD below the mean, has a statistical significant (*p*<0.01) difference. The size of the effect is (-0.54) large. Rank 2
- CFTD: *U* =120.00, z = -40.90 three SD below the mean, has a statistical significant (*p*<0.01) difference. The size of the effect is (-0.52) large. Rank 3
- ROA: *U* =131.00, z = -3,91 three SD below the mean, has a statistical significant (*p*<0.01) difference. The size of the effect is (-0.50) large. Rank 4
- TATO: *U* =149.00, z = -3.32 three SD below the mean, has a statistical significant (*p*<0.01) difference. The size of the effect is (-0.46) large. Rank 5

The mean ranking of the two independent groups, failed and non-failed group will be looked at as displayed in Table 6.7 below.

Table 6.7: Mean ranks of failed and non-failed companies

	Ratio	Failed	Non-failed
1.	ROA	16,71	36,52
2.	ROE	15,65	36,93
3.	TATO	17,76	36,11
4.	QR	32,94	30,25
5.	CFTD	16,06	36,77
6.	SGR	36,41	28,91
7.	EGR	25,00	33,32
8.	DE	27,91	32,19
9.	EBITI	15,47	37,00

Source: INETBFA (2018) and SPSS 25

Table 6.7 shows the mean rankings between failed (here on referred to as F) and non-failed (here on referred to as NF) groups of companies indicate that a non-failed group of companies. Numerically the non-financial group of companies ranked higher than the failed group of companies for most of the ratios except for the QR (NF=30.25 and F=32.94) and SGR (NF=28.91 and F=36.41). The means ranking for the non-significant variables (QR, SGR, EGR and DE) were not reported.

The NF and F means ranks are in order of their ranking. (ROE) NF=36.93 as to F=15.65, (EBITI) NF=37.00 as to F=15.47, (CFTD) NF=36.77 as to F=16.06, (ROA) NF=36.52 as to F=16.71 and (TATO) NF=36.11 as to F=17.76. Table 6.8 summarises the z-score for the failed and non-failed group of companies. The Mann-Whitney (*U*) test also conducted more in-depth testing with result obtained for over three 10-year periods (1996–2005), (2001–2010) and (2006–2015).

Mann-Whitney (*U*) test for three 10-year periods are reported in Table 6.8 The three 10-year periods represent different economic environments, 1996–2005 represents the normal economic environment, 2001–2010 the global crises economic environment and 2006–2015 representing the World cup economic environment. The Mann-Whitney (*U*) test was administered as follows and is interpreted accordingly.

Table 6.8: Independent samples Mann-Whitney (*U*) test results

Ratio		Time period	Mann-Whitney	Std. test statistic	Significance	Effect size
			U	z-score	p	r
1.	ROA	1996–2005	142,00	-2.36	0,02	-0.32
		2001–2010	127,00	-3,53	0,00	-0,46
		2006–2015	7,00	-3,73	0,00	-0,53
2.	ROE	1996–2005	126,00	-2.69	0,01	-0.36
		2001–2010	127,00	-3,53	0,00	-0,46
		2006–2015	46,00	-2,57	0,01	-0,36
3.	TATO	1996–2005	262,00	0,08	0,94	0,11
		2001–2010	311,00	-0,33	0,74	-0,04
		2006–2015	142,00	0,30	0,77	0,04
4.	QR	1996–2005	267,00	0,18	0,85	0,03
		2001–2010	337,00	0,12	0,90	0,02
		2006–2015	131,00	-0,03	0,98	-0.00
5.	CFTD	1996–2005	143,00	-2.34	0,02	-0.32
		2001–2010	151,00	-3,12	0,00	-0,41
		2006–2015	0,00	-3,94	0,00	-0,56
6.	SGR	1996–2005	288,00	0,61	0,54	0,08
		2001–2010	366,00	0,63	0,53	0,08
		2006–2015	225,00	2,78	0,00	0,39

Ratio		Time period	Mann-Whitney	Std. test statistic	Significance	Effect size
			U	z-score	p	r
7.	EGR	1996–2005	193,00	-1.33	0,19	-0.18
		2001–2010	157,00	-3,01	0,00	-0,39
		2006–2015	83,00	-1,46	0,14	-0,21
8.	DE	1996–2005	198,00	-1.22	0,22	-0.17
		2001–2010	232,00	-1,71	0,09	-0,22
		2006–2015	164,00	0,96	0,36	0,14
9.	EBITI	1996–2005	110,00	-3.02	0,00	-0.41
		2001–2010	114,00	-3,76	0,00	-0,49
		2006–2015	24,00	-3,22	0,00	-0,46
** p< 0.05 = 95% confidence level ** p< 0.01= 99% confidence level*						

Source: INETBFA (2018) and SPSS 25

An examination of the findings in Table 6.8 reveals that in interpreting the Mann-Whitney (*U*) test results differences occurred between non-financial and financial companies with regards to financial ratios.

1. Test revealed statistical significance $p<0.01$ and $p<0.05$ difference over total period (1996-2015) with regard to non-financial and financial company group for financial ratios.

- ROA:
  - 1996–2005: *U* =142.00, z = -2.36 (2SD below the mean), *r*= (-0.32) medium.
  - 2001–2010: *U* =127.00, z = -3.53 (2SD below the mean), *r*= (-0.46) medium
  - 2006–2015: *U* =7.00, z = -3.73 (2SD below the mean), *r*= (-0.53) large
- ROE:
  - 1996–2005: *U* =126.00, z = -2.69 (2SD below the mean), *r*= (-0.36) medium.
  - 2001–2010: *U* =127.00, z = -3.53 (2SD below the mean), *r*= (-0.46) medium
  - 2006–2015: *U* =46.00, z = -2.57 (2SD below the mean), *r*= (-0.36) medium

- CFTD:
  - 1996–2005: *U* =143.00, z = -2.34 (2SD below the mean), *r*= (-0.32) medium.
  - 2001–2010: *U* =151.00, z = -3.12 (2SD below the mean), *r*= (-0.41) medium
  - 2006–2015: *U* =0.00, z = -3.94 (2SD below the mean), *r*= (-0.56) large
- EBITI:
  - 1996–2005: *U* =110.00, z = -3.02 (2SD below the mean), *r*= (-0.41) medium.
  - 2001–2010: *U* =114.00, z = -3.76 (2SD below the mean), *r*= (-0.49) medium
  - 2006–2015: *U* =24.00, z = -3.22 (2SD below the mean), *r*= (-0.46) medium

2. Test revealed statistical insignificance ($p>0.05$) difference over total period (1996-2015) with regards to non-financial and financial company group for financial ratios.

- TATO:
  - 1996–2005: *U* =262.00, z = 0.08 (2SD below the mean), *r*= (0.11) small.
  - 2001–2010: *U* =311.00, z = -0.33 (2SD below the mean), *r*= (-0.04) small
  - 2006–2015: *U* =142.00, z = 0.30 (2SD below the mean), *r*= (0.04) small
- QR:
  - 1996–2005: *U* =267.00, z = 0.18 (2SD below the mean), *r*= (0.03) small.
  - 2001–2010: *U* =337.00, z = 0.12 (2SD below the mean), *r*= (0.02) small
  - 2006–2015: *U* =131.00, z = -0.03 (2SD below the mean), *r*= (-0.00) small
- DE:
  - 1996–2005: *U* =198.00, z = -1.22 (2SD below the mean), *r*= (-0.17) small.
  - 2001–2010: *U* =232.00, z = -1.71 (2SD below the mean), *r*= (-0.22) small
  - 2006–2015: *U* =164.00, z = 0.96 (2SD below the mean), *r*= (0.14) small

3. Test revealed statistical significance ($p<0.01$ and $p<0.05$) difference and statistical insignificance ($p>0.05$) difference over total period (1996-2015) with regard to non-financial and financial company group for financial ratios.

- SGR:
  - 1996–2005: *U* =288.00, z = 0.61 (2SD below the mean), *r*= (0.08) small.
  - 2001–2010: *U* =366.00, z = 0.63 (2SD below the mean), *r*= (0.08) small
  - 2006–2015: *U* =225.00, z = 2.78 (2SD below the mean), *r*= (0.39) medium
- EGR:
  - 1996–2005: *U* =193.00, z = -1.33 (2SD below the mean), *r*= (-0.18) small.

- 2001–2010: *U* =157.00, z = -3.01 (2SD below the mean), *r*= (-0.39) medium
- 2006–2015: *U* =83.00, z = -1.46 (2SD below the mean), *r*= (-0.21) small

An examination of the findings in Table 6.8 also reveals which of the failed or non-failed groups of companies showed the stronger/weaker ratio. The strongest CFTD at 0.56 (2002–2015) and the weakest QR at 0.00 (2002–2015). Next the mean rankings between failed and non-failed companies were determined and presented in Table 6.9.

Table 6.9: Mean ranks of failed and non-failed companies

Ratio		Time period	Failed	Non-failed
1.	ROA	1996–2005	18,33	30,70
		2001–2010	16,47	34,61
		2006–2015	4,67	28,34
2.	ROE	1996–2005	17,00	31,07
		2001–2010	16,47	34,61
		2006–2015	11,17	27,45
3.	TATO	1996–2005	28,33	27,91
		2001–2010	28,73	30,43
		2006–2015	27,17	25,27
4.	QR	1996–2005	28,75	27,79
		2001–2010	30,47	29,84
		2006–2015	25,33	25,52
5.	CFTD	1996–2005	18,42	30,67
		2001–2010	18,07	34,07
		2006–2015	3,50	28,50
6.	SGR	1996–2005	30,50	27,30
		2001–2010	32,40	29,18
		2006–2015	41,00	23,39
7.	EGR	1996–2005	22,58	29,51
		2001–2010	18,47	33,93

Ratio		Time period	Failed	Non-failed
		2006–2015	17,33	26,61
8.	DE	1996–2005	23,00	29,40
		2001–2010	23,47	32,23
		2006–2015	30,83	24,77
9.	EBITI	1996–2005	15,67	31,44
		2001–2010	15,60	34,91
		2006–2015	7,50	27,95

Source: INETBFA (2018) and SPSS 25

The results in Table 6.9 indicate a difference between the mean values of non-failed and failed company groups exist. It is evident from the results that non-failed companies ranked higher than the failed companies in all three 10-year periods (1996–2005, 2001–2010 and 2006–2015), ROA, ROE, CFTD and EBITI. The exception was highlighted in the interpretation below. The mean rank of the non-financial group was consistently higher than that of the failed group, except for the ratios indicated below. The test revealed a non-statistical significant (p>0.05) difference for the expectations for the periods indicated below apart from for SGR (2006–2015) was statistically significant at p<0.00.

- TATO:
  - 1996–2005: *Failed (F)* =28.33, Non-Failed (NF) = 27.91
  - 2006–2015: *Failed (F)* =27.17, Non-Failed (NF) = 25.27
- QR:
  - 1996–2005: *Failed (F)* =28.75, Non-Failed (NF) = 27.79
  - 2001–2010: *Failed (F)* =30.47, Non-Failed (NF) = 29.84
- SGR:
  - 1996–2005: *Failed (F)* =30.50, Non-Failed (NF) = 27.30
  - 2001–2010: *Failed (F)* =32.40, Non-Failed (NF) = 29.18
  - 2006–2015: *Failed (F)* =41.00, Non-Failed (NF) = 23.39
- DE:
  - 2006–2015: *Failed (F)* =30.83, Non-Failed (NF) = 24.77

It is interesting to note that the failed companies reported a higher growth in sales than the NF companies. If they increased sales by relaxing their credit policy, it would have increased its liquidity risk (Brigham & Erhardt, 2007). In summary the majority of the NF group means are higher than that of the failed group.

6.3.3 Third phase establishing the financial ratio to be included in BPIA

After statistical testing has been applied, five ratios were selected as doing the best overall job together in detecting financial distress. From the results in previous section it can be deduced as indicated in Table 6.10 below. Failed group of companies' means could be less due to the following:

Table 6.10: Reason for the failed group of companies' lower means

Ratio	Possible failure reason
ROE	Not acquiring sufficient returns on their investments.
ROA	Assets that are supposed to generate cash is not being utilised effectively.
TATO	Less investments resulting in less assets available to generate sustainable returns.
CFTD	Cash generated from operations is not enough to cover debt commitments.
EBITI	Inability to repay interest.

Source: Cassim (2015:76) and Smart and Graham (2012:41-46)

Table 6.10 indicated some of the possible reasons why failed companies' means could be less than that of the NF companies. Hlahla (2010:24-32) explain when companies are unable to meet their debt obligations because of their inability to generate significant revenue, it could lead to financial failure. South African companies need to be vigilant as low profitability, excessive borrowings, little investment in cash-generating and expensive sources of capital are just some of the reasons or causes for South African companies' financial distress. Companies should practice borrowing less and invest more. An overall summary would look as follows:

Level: Survival

- Profitability: Failed companies are unable to generate profits from their operations

- Financial stability: Lower profits as a result of the company being less liquid

Level: Thriving

- Growth: Ratio has been excluded from a set of validation ratios – ratios were insignificant
- Risk: Insufficient revenue from operations to cover debt and interest repayments become challenging

Table 6.11 gives a summary of the data obtained from the Mann-Whitney (*U*) test and its interpretation. In conclusion, the ROA, ROE, TATO, CFTD and EBITI, were used in the validation of the bankruptcy prediction indicators as the results of the statistical test applied have indicated that these ratios are significant, medium or have a large effect and have a correlation between them. The ratios that are not significant were eliminated from testing. The statistical results have also shown the above-mentioned ratio ranking and based on this the test was conducted. Descriptive statistics measuring the central tendency (the mean) and measure of the variability (SD) were used to summarise the data. Frequency and variable correlation was done in order to determine if a relationship exists between the variables (Dane, 2017:84; Van Zyl, 2014:393). Further the independent Mann-Whitney (*U*) test explained by Harmse (2017:125) is based on the means and SD was used to determine significance. Table 6.11 provides a summary of the results and how it is ranked.

Table 6.11: Ranking of selected ratios

Ratio	Mann-Whitney (*U*) test significance	Correlation	Ranked
ROA	p=<0.00	Highly with ROE	4
ROE	p=<0.00	Correlated with TATO	1
TATO	p=<0.00	Correlated with CF	5
CFTD	p=<0.00	Highly with EBITI	3
EBITI	p=<0.00	Highly with CF	2
* Eliminated from testing			

Source: INETBFA (2018) and SPSS 25

The outcome of the statistical test revealed the bankruptcy prediction indicators that were found to be statistically significant, correlated including the ranking thereof in Table 6.11 above. These were the results of the financial ratios that were selected as being the best predictors of bankruptcy for this study. The results were based on seminal studies by pioneers in the field of study. Financial ratios were placed in a pool of ratios based on a selection criteria discussed in Chapter 3. Financial ratios were divided into the four pillars of company health namely profitability, financial stability, growth and risk and the financial ratio that best measured each pillar were then selected based on previous performance in literature. The selected ratios were nine ratios that were put through statistical analysis and the results are five ratios indicating statistical significance in Table 6.12 below. Firstly, the statement of comprehensive income ratios followed by the statement of financial position ratios. Table 6.12 gives a rundown of the levels of testing.

Table 6.12: Levels of testing

	Ratio	Rank
Level 1: Statement of Comprehensive Income (Survival level)	ROE	1
	EBITI	2
	ROA	4
Level 2: Statement of Financial Position (Thriving level)	CFTD	3
	TATO	5

Source: INETBFA (2018)

Table 6.12 indicated the testing levels and the bankruptcy prediction indicators that were applied as an analytical tool within the newly developed BPIA. The bankruptcy prediction indicators were processed, and the results compared to benchmarks or standards with the aim of comparing or measuring company performance to the performance of their peers. These benchmarks are discussed in the next section.

Benchmarking

Sekhar (2010:882) explains benchmarking is crucial to a company to know their own norms and compare it against other companies within a competitive corporate environment. Krishnamoorthy and D'Lima (2014:1) concur and add that benchmarking is common practice companies use to gain an independent perspective regarding performance compared to companies. It can also be best applied as a tool to assist companies in assessing and prioritising opportunities and helping with marketplace positioning. The overall company competitiveness can be assessed through applying benchmarks in aiding companies to achieve continuous improvement (Sekhar (2010:883). Block, Hirt and Danielsen (2009:63) supported by Lucouw (2013:71) inform that without a benchmark a trend analysis will not provide a meaningful picture. The benchmarks were created by using the standard deviation (computed by statistical studies). These benchmarks are but only a guide and this method of calculating using SD has been done in the medical field. These guidelines will only gave some indication of the ratios' condition. Bland (2006:8) explains ranges can be calculated as either or:

1. **Range rule** – A normal distribution, based on the quantity of data that falls within a certain number of SD

    - ± 68% fall within 1 SD
    - ± 95% fall within 2 SD
    - ± 99% fall within 3 SD

2. **Mean ± 2SD baseline calculation** – When the limited value is two SDs from the estimate limit it is seen as a plausible limit (Tintle, Chance, Cobb, Rossman, Roy, Swanson and Van der Stoep, 2015:592). This method of calculating using SD has been done numerous times within the medical field. Britt (2015) argues the true baseline calculation is when the value is one SD lower than the mean and one SD above the mean as zero should not be included. In this study, we will apply the baseline according to Britt as these benchmarks are not set in stone but only guidelines. These guidelines will only give us some indication of the ratios condition.

Due to the high interest cover outliers the researcher needs to refer back to the literature to make use of a benchmark that makes more business sense than what the calculations indicated. According to Walsh (2010:126), research has shown the most successful companies are the companies operating at an interest cover of 5.5 times, so five times can be seen as a sensible benchmark and 2.5 times should be the minimum. Benchmark guideline were as follows as indicated in Table 6.13 below.

Table 6.13: Ratio guidelines (benchmarks)

Bankruptcy prediction indicators	Classification		
	Maximum (Safe)	Neutral (Neutral)	Minimum (Investigation)
ROE	33,18	18,76	4,34
EBITI – Current Study	198,21	62,56	-73,09
EBITI – Walsh		5	2.5x
ROA	21,77	13,91	6,05
CFTD	56,61	33,16	9,71
TATO	2,94	1,90	0,86

Source: Walsh (2010:126)

The benchmarks (ROE, EBITI, ROA, CFTD and TATO) in Table 6.13 were computed using the mean ±2 SD baseline as per Britt (2015) calculation was done as follows, neutral when equal to the mean, minimum equals the mean less one SD and maximum is when the mean equals mean plus one SD. The SD of the NF group of companies was used. The EBITI was also calculated applying the ±2 SD (SD) baseline but due to the high results the study referred back to literature. According to literature, when a company interest repayment can be covered 5.5 times by their earnings, the company is alluded to as being successful. The EBITI is at a minimum when the companies' earnings are only able to cover their interest repayments 2.5 times (Walsh, 2010:126). The table is used as a guide for financial health almost like zones applied by Altman (1968, 1977, 2006). The minimum level indicates possible financial difficulties and need a big safety net, neutral level is financially acceptable level, and the maximum level is where every company wants to be in a perfect world, financially safe. Because different industries have different guidelines or cut-off point this table has been created to do just that. guide. It is not set in stone but to only guide the analyst, to minimise bias and it is not industry-based. Next the testing and validation of the different samples in relation with the empirical objectives laid out in Chapter 1 (Section 1.5.3).

6.4 THE RESULTS OF THE BANKRUPTCY PREDICTION INDICATORS APPROACH (BPIA)

Table 6.13 indicates the guide used in order to give a clearer picture of the status of the ratios. This guide is not cast in stone and was computed for this research and the basis is the computed SD. The purpose of the guide is a benchmark. Kang, Zhao, Li and Horst (2016:6333) explain a benchmark is a tool that is applied to assess and compare performance with the purpose of enabling continuous improvement. The sample was tested with the aim to meet the empirical objectives in Chapter 1 (Section 1.5.3, (ii-iv). The reason for the sample being split is due to the different objective indicated below.

6.4.1 Matching failed with non-failed companies (Objective 1)

With this phase of testing, the aim is to fulfil the second empirical objective stated in Chapter 1 (Section 1.5.3, ii) being:

> Determine how BPIA performs during different economic conditions namely: pre-crisis (2002–2006), during crisis (2007–2011) and post-crisis (2012–2016). Through matching failed with NF companies to observe possible future failures.

The purpose of this testing is to compare the failed group of companies to their NF peers in the same sector. The rationale for using the JSE-listed companies is that as according to Rama (2012:5) it is unlikely for these companies to be exposed to financial distress. The goal is to determine whether the combination of bankruptcy prediction indicators have the ability to detect financial distress within a five-year period prior to failure. Five years prior to failure was indicated as Y1, four years prior Y2, three years prior Y3, two years prior to Y4 and one year prior to failure was indicated as Y5. The testing was done over the period of 2003 (first delisting) until 2016 (last delisting). The test was applied as if applied in practice (meaning if it where in practice this the route that would have been taken). In Table 6.15–6.21 the statement of comprehensive income ratios was tested and based on favourable results (no warning sign, red light or another other concern regarding ratios being tested) in Level 1 (survival level) the Level 2 (thriving level) statement of financial position ratio commenced. Where Level 1 yield unfavourable results testing need to pause, effected ratios need to be further investigated before testing continues to Level 2. Level 1 consists of ROE and measures the return shareholders/owners receive on their

investments followed by the interest cover EBITI. This ratio determines if the company is capable of meeting their interest payment obligations. Lastly Level 1 testing will evaluate the ROA, this is the ratio that indicates the amount of income produced for every rand tied up in assets (Smart & Graham, 2012:45-46).

The two-level testing applies two analytical tools to empirically test the collected the first sample phase of testing being:

- Seven failed companies matched to seven NF companies
- Data drawn of continuous five years before company has been failed from JSE due to bankruptcy, data drawn (1996–2016)
- BPIA applied – in order to determine whether the bankruptcy indicators are able to indicate potential failure before it actually occurs.
- This will be achieved by comparing the failed companies to the NF companies over the same period and within the same industry/sector
- A comparison was done to detect signs of weakness and trends of longstanding financial deficiencies.

When BPIA is able to detect financial weakness compared to the NF companies or consistent financial weakness before a company has been failed is an indication that the BPIA can be seen as a useful and effective tool in predicting bankruptcy of JSE-listed companies (Brigham & Ehrhardt, 2007; Palat, 2006; Merwin 1942; Beaver, 1966; Fitzpatrick, 1931). The period of study includes all three economic periods pre-crisis (2002–2006), during crisis (2007–2011) and post-crisis (2012–2016) and the failed companies included in this phase of testing has been included in all three periods. Data were drawn from five continuous periods prior to delisting in alignment with previous research (Beaver, 1966; Altman, 1968, Hamer, 1983; Hossari, 2006; Tuvadaratragool, 2013; Sabela *et al*., 2019). It is important to note that only interpretations of the levels tested are given. When testing is ceased at Level 1, only Level 1 is interpreted.

Table 6.14 below indicated the matched companies to be tested in first sample phase of testing.

Table 6.14: NF companies matched failed companies

NF companies		Failed companies	Industry Code	Sector	Availability of financial data
No	**Company name**	**Company name**			
YEAR: 2003					
1	Pick 'n Pay Stores	Homechoice Holding Ltd	CS	Food/Drugs	1997–2003
2	Woolworths Holdings	Ninian and Lester Holding Ltd	CS	General retail	1997–2001
3	Barloworld	Metje & Ziegler Ltd	Ind	General industry	1998–2003
YEAR: 2005					
4	Shoprite Holding	Fashion Africa Ltd Ltd	CS	Food/Drugs	1998–2002
5	Network Healthcare Holdings	Siltek Holdings Ltd	HC	Equipment	1996–2000
6	Clicks Group	Universal Growth Holdings Ltd	CS	Food/Drugs	1996–2000
YEAR: 2016					
7	Tiger Brands	Bioscience Brands Ltd	CG	Food/Producers	2008–2012

Source: INETBFA (2018)

Table 6.14 indicates the companies that have been matched continuous five years prior to their delisting on the JSE. Data collected were also matched based on the availability of data. Testing of the first phase now commences. Table 6.15 explains the financial condition of Home choice (HCH) failed in 2003 compared to Pick 'n Pay (PIK). Available financial statement data (1997–2003) as per collection of financial statement data (Section 4.3.3).

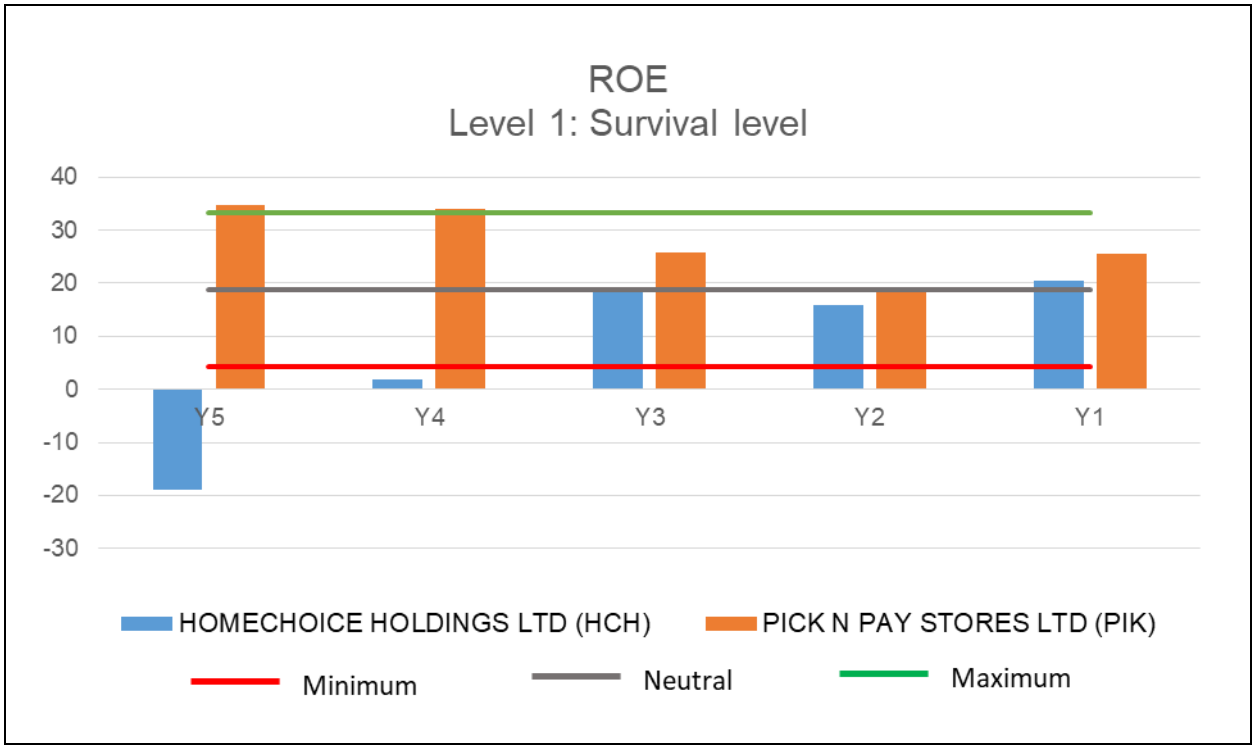
Table 6.15: Homechoice (HCH) vs. Pick 'n Pay (PIK)

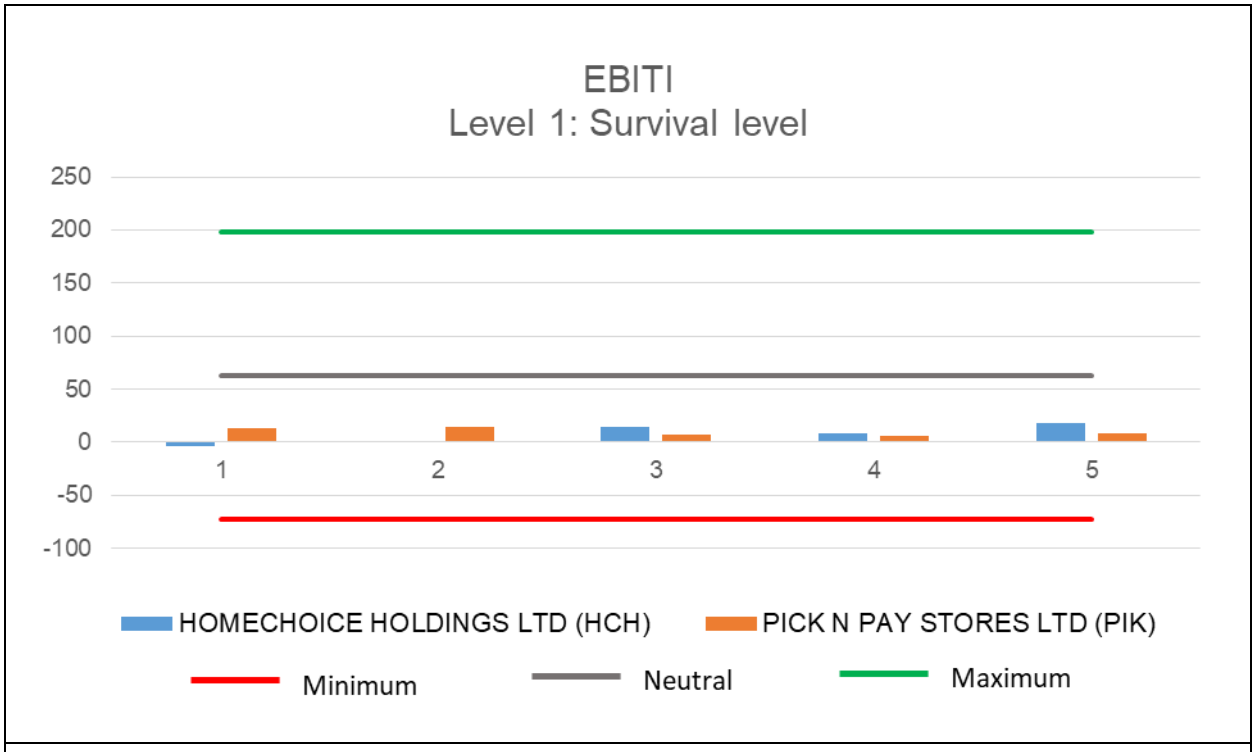
	HOMECHOICE HOLDINGS LTD (HCH)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	-18,86	1,77	18,65	15,8	20,51
	EBITI	-3,29	1,49	15,02	8,20	18,61
	ROA	-12,29	2,30	17,82	17,25	20,29
Level 2: SFP	CFTD	-12,03	-13,73	-47,33	-60,24	-85,11
	TATO	1,20	1,15	1,06	1,19	1,26
	PICK N PAY STORES LTD (PIK)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	34,73	33,92	25,87	19,03	25,43
	EBITI	13,80	14,99	7,28	6,43	8,79
	ROA	10,47	9,10	6,23	4,98	7,41
Level 2: SFP	CFTD	20,64	21,17	21,94	24,51	18,69
	TATO	4,00	4,02	4,25	4,40	4,64

Source: INETBFA (2018)

The level 1 ratios for PIK according to Table 6.15 is within the guidelines of Table 6.15 except for ROA, Y1 is above the minimum and Y2 below the minimum level. PIK within the consumer service industry according to Swart (2013:57) and Mudaly (2017:66) the primary business driver is cash. The ROA indicates how well companies' fixed assets are applied to generate income. Within consumer service assets are inventory, therefore, this not a sign of concern. In Y3 to Y5 ROA increased consistently. For HCH all the ratios are above the neutral level stated in the guidelines, except EBITI, which is below the neutral level. In Y2 the EBITI dropped from 18 to 8 times. ROE, EBITI and ROA are below the minimum zone in Y4. The general impression of a company's health is given when ROE and ROA are looked at concurrently. A low ratio means the company could be in bad shape. EBITI in Y4 indicates the company is only able to repay its interest once Y4 and in Y5 the company is unable to meet the interest repayment commitment. If a company

cannot even repay their interest, the repayment of their debt will be highly unlikely. In comparison with the peers in the industry (PIK), HCH indicates severe financial weakness in the Level 1 of testing, therefore, Level 2 testing will not proceed until further investigation has been done with regard to the Level 1. It is of concern as ROE, EBITI and ROA are negative in Y5 indicating with ROE the investors investment is not reaping any benefits, on EBITI the company owe on unpaid interest, meaning debts are also not paid. With ROA the company's assets are not generating profit, this could be that the assets are redundant. The indicators are of great importance the unfavourable results revealed the companies experiencing financial difficulties. With three indicators simultaneously negative could indicate the company's financial deficiencies is spread over more than one area. In this case, further testing of Level 2 will not be done. The information in Table 6.15 is presented graphically in Figure 6.4 below.




EBITI
Level 1: Survival level
250
200
150
100
50
0
-50
-100
1
2
3
4
5
HOMECHOICE HOLDINGS LTD (HCH)
PICK N PAY STORES LTD (PIK)
Minimum
Neutral
Maximum

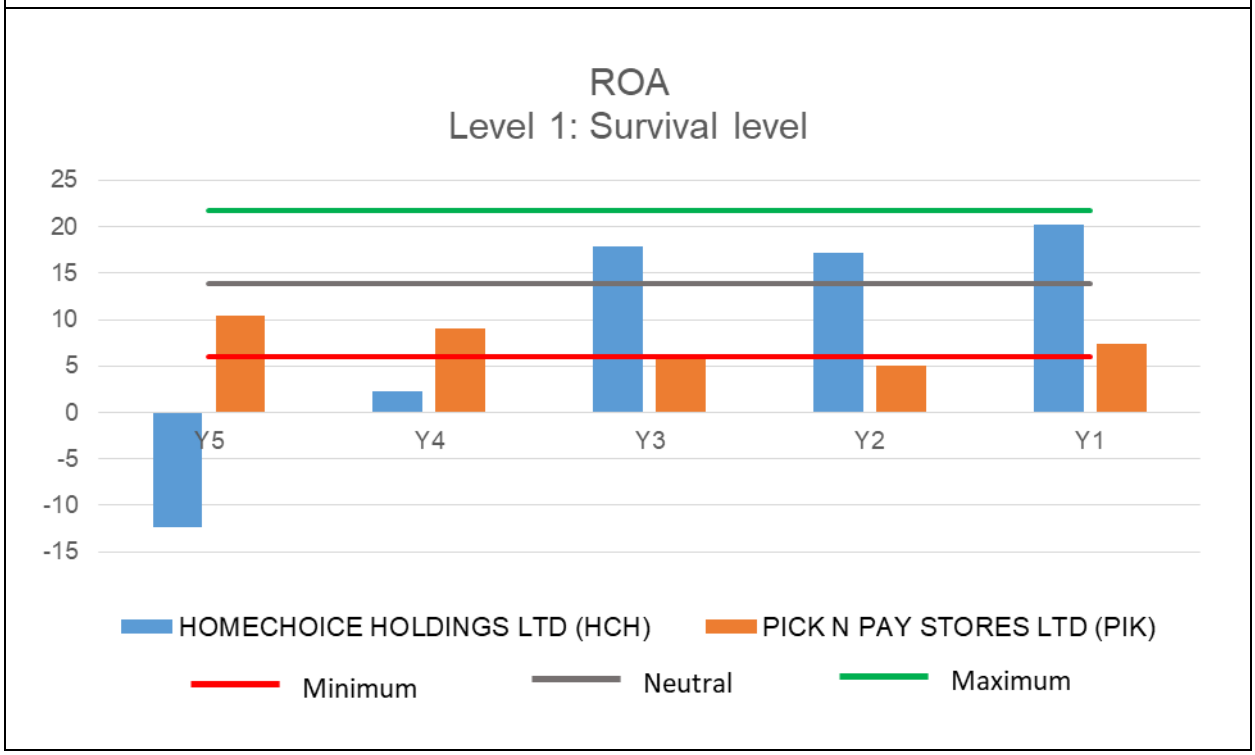

ROA
Level 1: Survival level
25
20
15
10
5
0
-5
-10
-15
Y5
Y4
Y3
Y2
Y1
HOMECHOICE HOLDINGS LTD (HCH)
PICK N PAY STORES LTD (PIK)
Minimum
Neutral
Maximum



Figure 6.4: Comparing ratios: Homechoice (HCH) vs. Pick 'n Pay (PIK)

Source: INETBFA (2018)

Figure 6.4 indicates both the graphical image of both levels, the survival and thriving. even though only Level 1 will be interpreted due to ceasing to test after Level 1 as an

investigation first need to be launched. ROE and ROA of HCH are way below the minimum zone of the guidelines in Y4 and Y5 presented in Table 6.15. In Y4 before delisting, the company had to do an investigation regarding ROE and ROA due to a decline in the indicators this could be caused by a significant decrease in profits. Investigations regarding EBITI should have started in Y2 already. Table 6.16 that follows analyses Level 1 testing of Ninian and Lester (NIN) who failed in 2003 in relation to Woolworths (WHL). Available financial statement data (1997–2001) as per collection of financial statement data (Section 4.3.3).

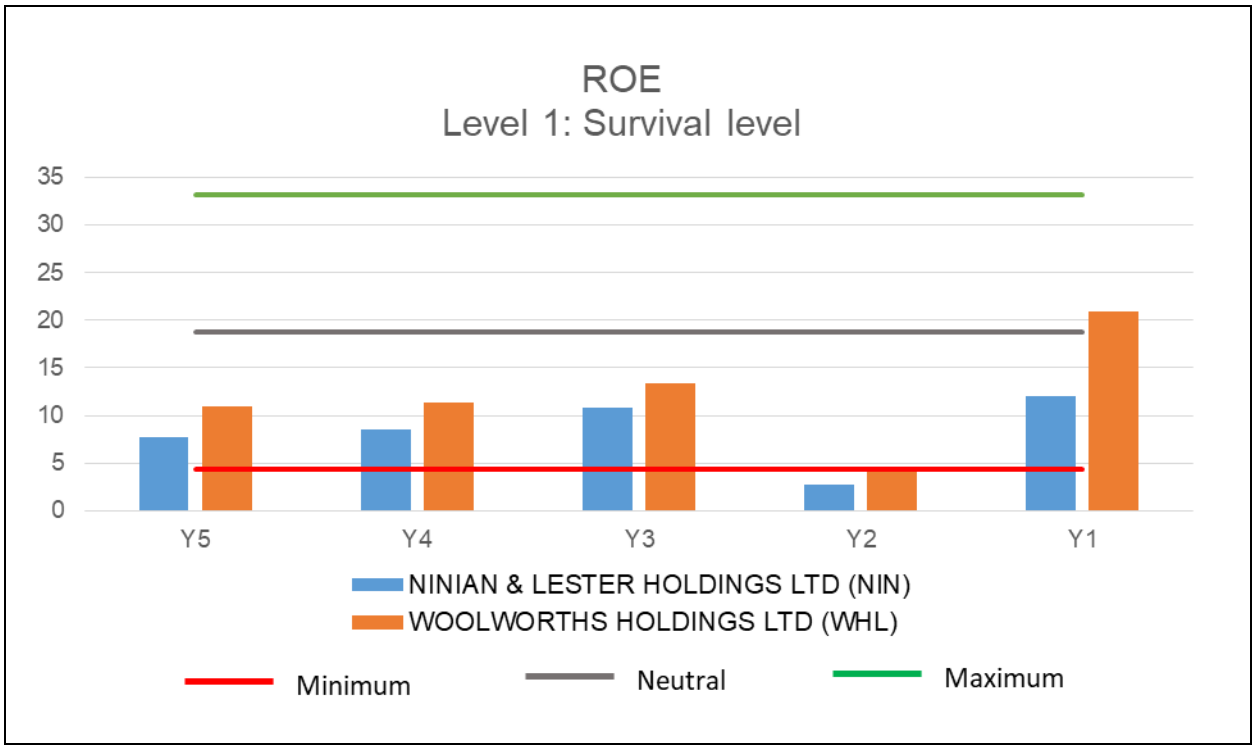
Table 6.16: Ninian & Lester holdings (NIN) vs. Woolworth's holdings (WHL)

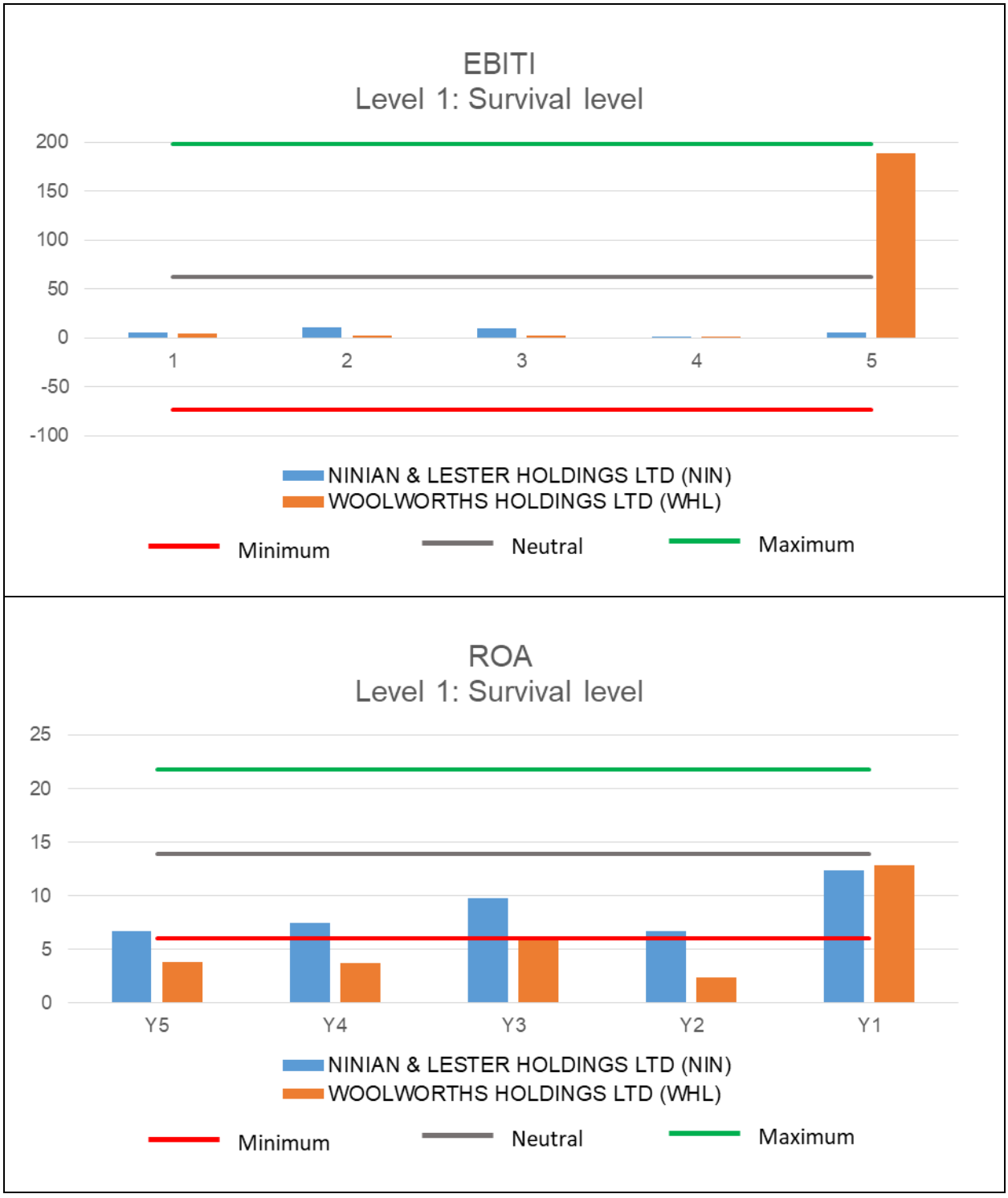
	NINIAN & LESTER HOLDINGS LTD (NIN)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	7,75	8,56	10,79	2,80	12,04
	EBITI	4,98	11,05	10,08	1,70	5,55
	ROA	6,72	7,50	9,82	6,72	12,40
Level 2: SFP	CFTD	20,67	-15,22	42,70	29,13	12,69
	TATO	2,06	2,19	1,99	2,21	2,10
	WOOLWORTHS HOLDINGS LTD (WHL)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	10,9	11,33	13,42	4,04	20,91
	EBITI	3,93	2,75	2,09	0,82	188,68
	ROA	3,86	3,76	6,03	2,39	12,89
Level 2: SFP	CFTD	31,24	24,91	39,30	40,57	36,20
	TATO	1,87	1,81	1,99	1,78	1,94

Source: INETBFA (2018)

WHL is a labour-intensive company, therefore, ratio concerning assets are low and fall either on or slightly below the guideline minimum zone as indicated in Table 6.16 Y1 and Y2 EBITI form a high then declined, this is not be too alarming. WHL have been around from 1931. With NIN all ratios being tested plummeted from Y1to Y2, ROA above

minimum guideline zone, EBITI and ROE fall below the minimum mark, thereafter increased only for all three indicators to decrease again in Y5. NIN indicated higher ROE and EBITI ratios than WHL. The areas of measuring shareholders' return and the company's ability to repay interest even though NIN reflects a higher ratio than WHL the fluctuations are concerning. A further testing of Level 2 was done. CFTD increased from Y1 to Y3 in Y4 decreased from 42.7 to 15.22 and thereafter increased to 20.67. CFTD ratio indicates that if the company can repay its debt and is able to take on more if need be, the negative ratio indicates the contrary. Companies are unable to repay debt and to take on more debt. The decreased ratio highlights that total debt has increased without an increase in the operating cash flows. At this point Y4 is an indication that NIN is experiencing cash flow problems. Cash is the life blood of any company. The question being how can a company without cashflow survive suddenly recover and generate cash to cover total debt in one year's time? TATO is between neutral and maximum marks through a period of analysis indicating the NIN assets are able to generate sale through the period of review. Regardless of TATO, performance BPIA still indicated concerns due to the inconsistencies if the indicators over the five-year period and the negative CFTD in Y4. Information in Table 6.16 is illustrated in Figure 6.5 below.




EBITI
Level 1: Survival level
200
150
100
50
0
-50
-100
1
2
3
4
5
NINIAN & LESTER HOLDINGS LTD (NIN)
WOOLWORTHS HOLDINGS LTD (WHL)
Minimum
Neutral
Maximum
ROA
Level 1: Survival level
25
20
15
10
5
0
Y5
Y4
Y3
Y2
Y1
NINIAN & LESTER HOLDINGS LTD (NIN)
WOOLWORTHS HOLDINGS LTD (WHL)
Minimum
Neutral
Maximum

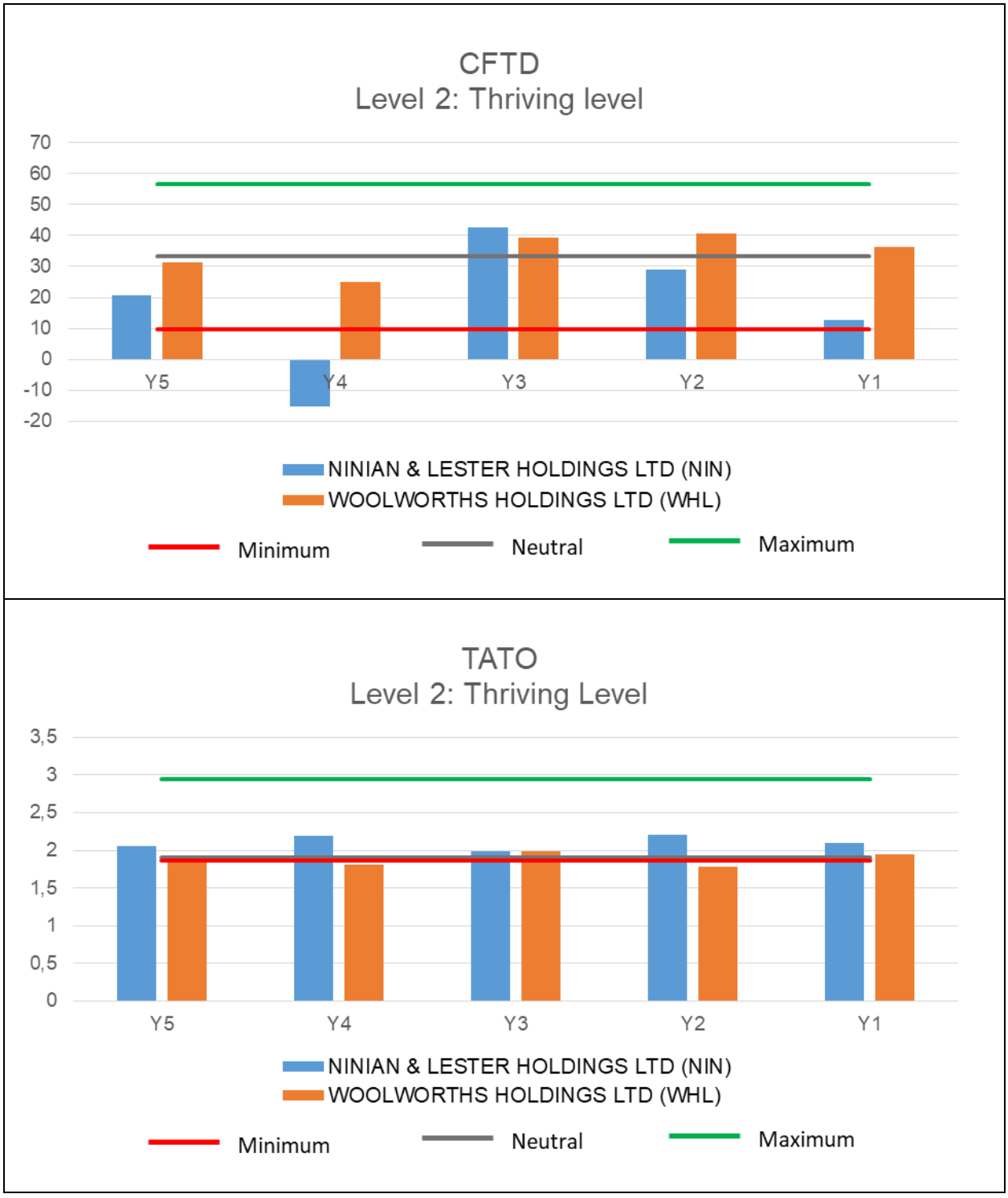


Figure 6.5: Comparing ratios: Ninian & Lester holdings (NIN) vs. Woolworth's holdings (WHL)

Source: INETBFA (2018)

Figure 6.5 reveals a great concern in Y2. The company should have investigated the EBITI and the CFTD of Y4 as this ratio gives a snapshot of companies' financial health. Table 6.17 below indicates the Level 1 testing of Metje & Ziegler (MZG) that failed in 2003 compared to Barloworld (BAW). Available financial statement data (1998–2003) as per collection of financial statement data (Section 4.3.3).

Table 6.17: Metje & Ziegler Ltd vs Barloworld Ltd

	METJE & ZIEGLER LTD (MZG)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	-8,51	-13,47	8,18	0,37	3,41
	EBITI	0,25	-0,28	2,82	1,03	1,19
	ROA	1,25	-1,21	7,58	8,09	7,45
Level 2: SFP	CFTD	-1,46	7,09	8,53	-0,19	37,45
	TATO	4,34	3,54	3,11	3,08	2,12
	BARLOWORLD LTD (BAW)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	13,52	6,81	17,84	24,43	15,37
	EBITI	5,95	3,68	7,36	8,14	2,12
	ROA	9,38	5,49	11,33	12,66	7,83
Level 2: SFP	CFTD	15,24	18,71	18,61	19,22	15,72
	TATO	1,42	1,37	1,39	1,48	1,43

Source: INETBFA (2018)

Table 6.17 illustrates that BAW Level 1 ratio is on par except for a decline in ROE and ROA in Y4. The total equity increased by 15% and with ROA the total assets increased by 19.6%, when the denominator of a ratio increases the effect will be a decrease in the ratio. With EBITI, the EBIT decreases by 28% (percentage and interest) resulting in a reduced ratio.

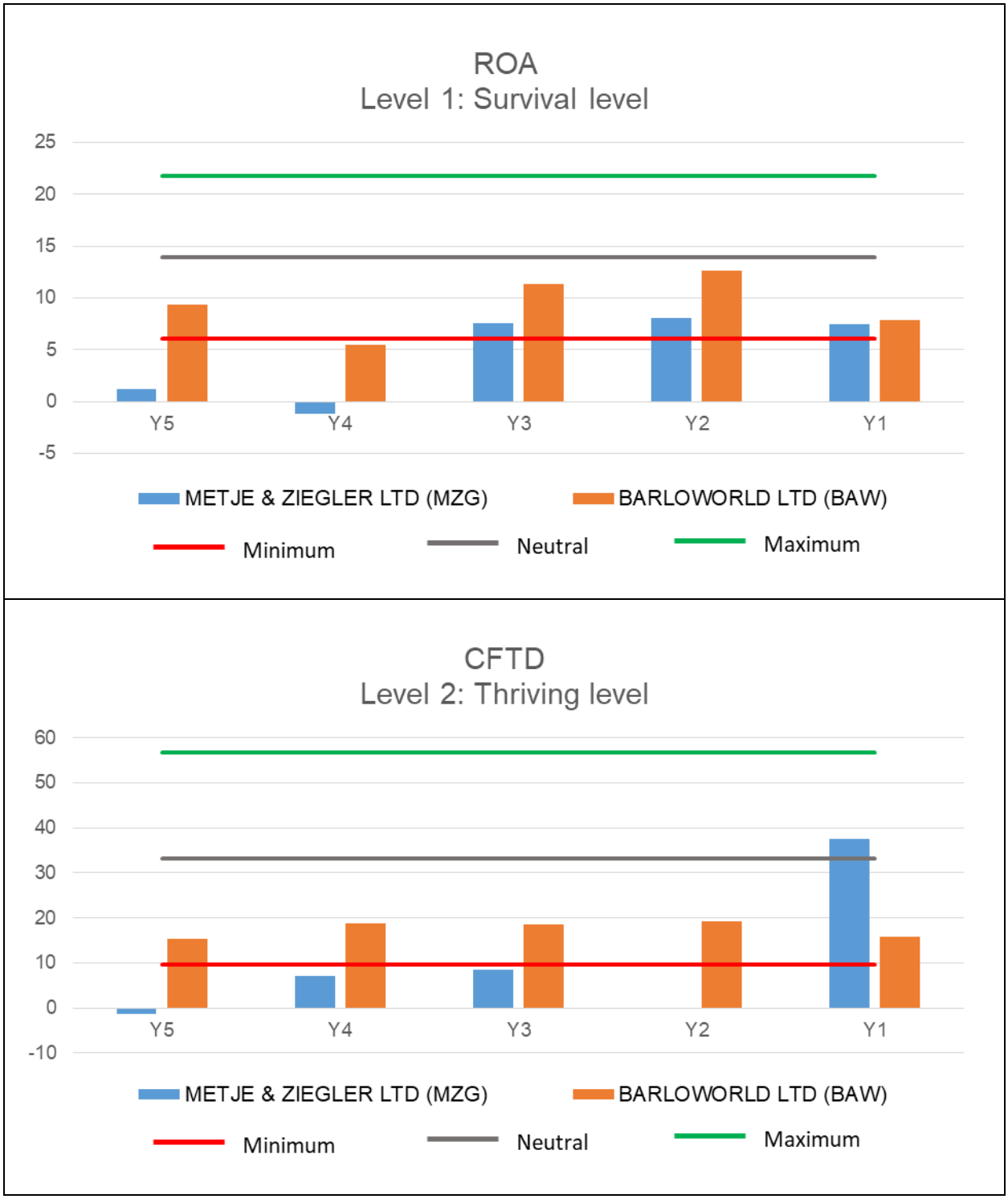
MZG ROE ratio is below minimum guideline mark in Y1=3.41, Y2=0.37, Y4= (13.47) and Y5= (8.51). ROE in Y3=8.18 was above the minimum level. ROE declined in Y2 and increased in Y3 to fall to (13.47) in Y4 and slight increase to (8.51) in Y5. This ratio points out how well shareholders' investments are doing at a negative amount. The increased cost could be one of the reasons for a decline in this ratio.

EBITI indicate company was able to cover interest repayment only once in Y1 and Y2, twice in Y3. In Y4 the ratio dropped to (0.28) thus the interest increases without an increase in EBITI in Y5 leaving ratio at 0.25.

ROA is above the minimum guideline in Y1 to Y3 and below in Y4 and Y5 with a 8% increase from Y1 to Y2 and a 6% decrease in Y3. A further drop to (1.27) in Y4 with a slight increase to 1.25 in Y5. This could indicate an increase in assets as the company may be overinvesting in assets which will affect the company growth. When the assets of a company are not being efficiently managed returns are not generated from those assets. In Y4 all three indicators are negative, therefore, grounds for Level 1 testing ceases and continue once sufficient reasons for the unfavourable results are identified as these results identify financial weakness compared to the industry peer BAW. ROE from Y3 to Y4 experienced a 62% decrease and an increase of 98%, respectively, the EBITI in Y3=50% increase and Y4= 62% increase. ROA decreased by 52% in Y3 and 71% increase in Y4.

Level 2 testing will not be conducted neither interpreted. A better explanation of the ratio is illustrated in Figure 6.6 below.


ROE
Level 1: Survival level
40
30
20
10
0
-10
-20
Y5
Y4
Y3
Y2
Y1
METJE & ZIEGLER LTD (MZG)
BARLOWORLD LTD (BAW)
Minimum
Neutral
Maximum
EBITI
Level 1: Survival level
200
150
100
50
0
-50
-100
1
2
3
4
5
METJE & ZIEGLER LTD (MZG)
BARLOWORLD LTD (BAW)
Minimum
Neutral
Maximum


ROA
Level 1: Survival level
25
20
15
10
5
0
-5
Y5
Y4
Y3
Y2
Y1
METJE & ZIEGLER LTD (MZG)
BARLOWORLD LTD (BAW)
Minimum
Neutral
Maximum
CFTD
Level 2: Thriving level
60
50
40
30
20
10
0
-10
Y5
Y4
Y3
Y2
Y1
METJE & ZIEGLER LTD (MZG)
BARLOWORLD LTD (BAW)
Minimum
Neutral
Maximum

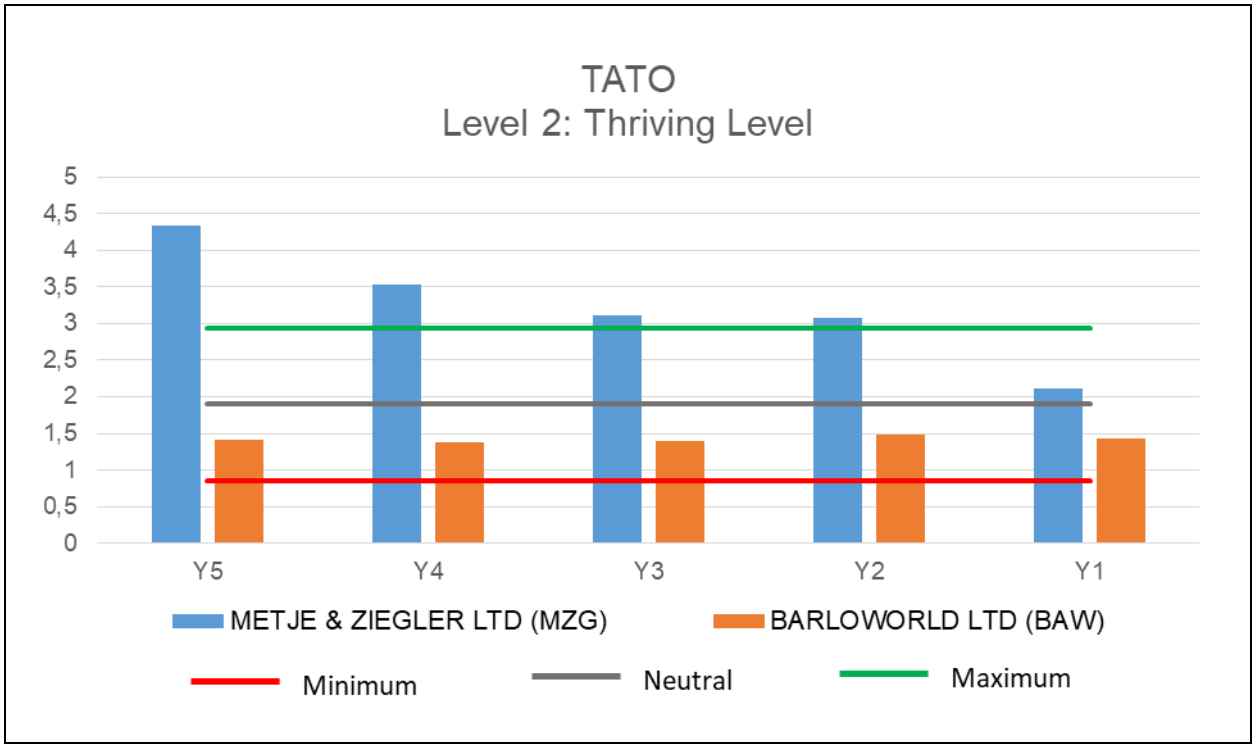


Figure 6.6: Comparing ratios: Metje & Ziegler Ltd vs Barloworld Ltd

Source: INETBFA (2018)

Figure 6.6 shows testing should be interrupted in Y4 and further investigation of ROE, EBITI and ROA should be conducted. If the management of MZG did not think the company's financial condition is too serious in Y2 to act upon. With ROE reflecting investors returns were not so lucrative and was only able to repay interest once. Y4 reveals financial trouble has arrived and would be of utmost importance. Therefore, that further investigation of all three Level 1 ratios should be done before testing is reinitiated at Level 2, in comparison to BAW the Level 1 testing applying BPIA, indicates no financial weakness was detected.

The upcoming Table 6.18 describes the trend of Fashion Africa (FSH) that failed in 2005 and Shoprite (SHP). Available financial statement data (1998–2002) as per collection of financial statement data (Section 4.3.3).

Table 6.18: Fashion Africa Ltd vs Shoprite Holding Ltd

	FASHION AFRICA LTD (FSH)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	118,99	249,91	-302,34	1,133.46	13,06
	EBITI	-5,80	-5,53	-11,04	0,00	4,36
	ROA	-19,01	-40,28	-35,73	545,99	10,82
Level 2: SFP	CFTD	-15,05	-6,64	-13,00	9,30	-2,15
	TATO	2,62	3,32	3,28	3,06	1,64
	SHOPRITE HOLDINGS LTD (SHP)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	27,74	16,92	22,73	10,47	22,91
	EBITI	11,86	13,67	4,93	1,22	5,05
	ROA	8,61	5,28	5,89	2,42	4,93
Level 2: SFP	CFTD	21,51	23,83	22,04	13,44	0,47
	TATO	3,39	3,04	3,58	3,35	3,04

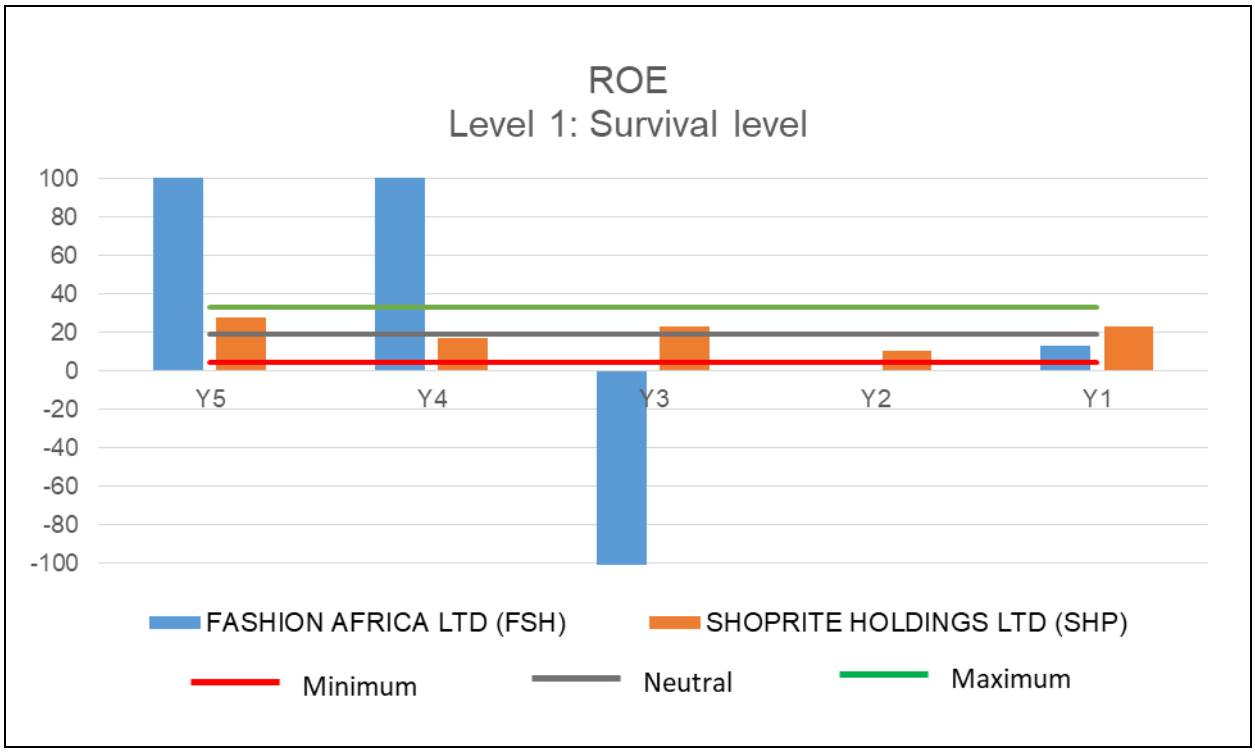
Source: INETBFA (2018)

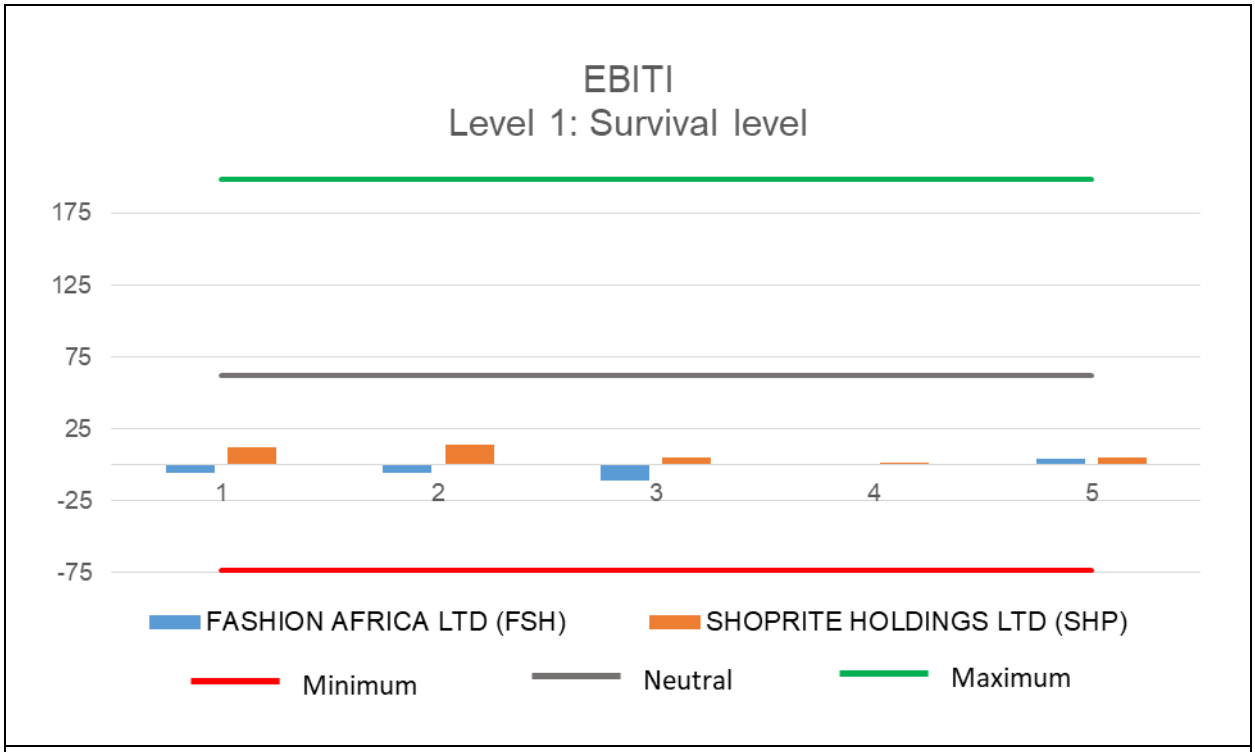
Table 6.18 clearly explains SHP had a slight decline in ratios in Y2. ROE decreased in Y2 and Y4 and yet remained between the neutral and minimum zones of the guidelines. ROA in Y1 was below the minimum guideline of 6.05 bearing in mind SHP is a labour-intensive company, thereafter from Y3 all ratios increased or were slightly decreased.

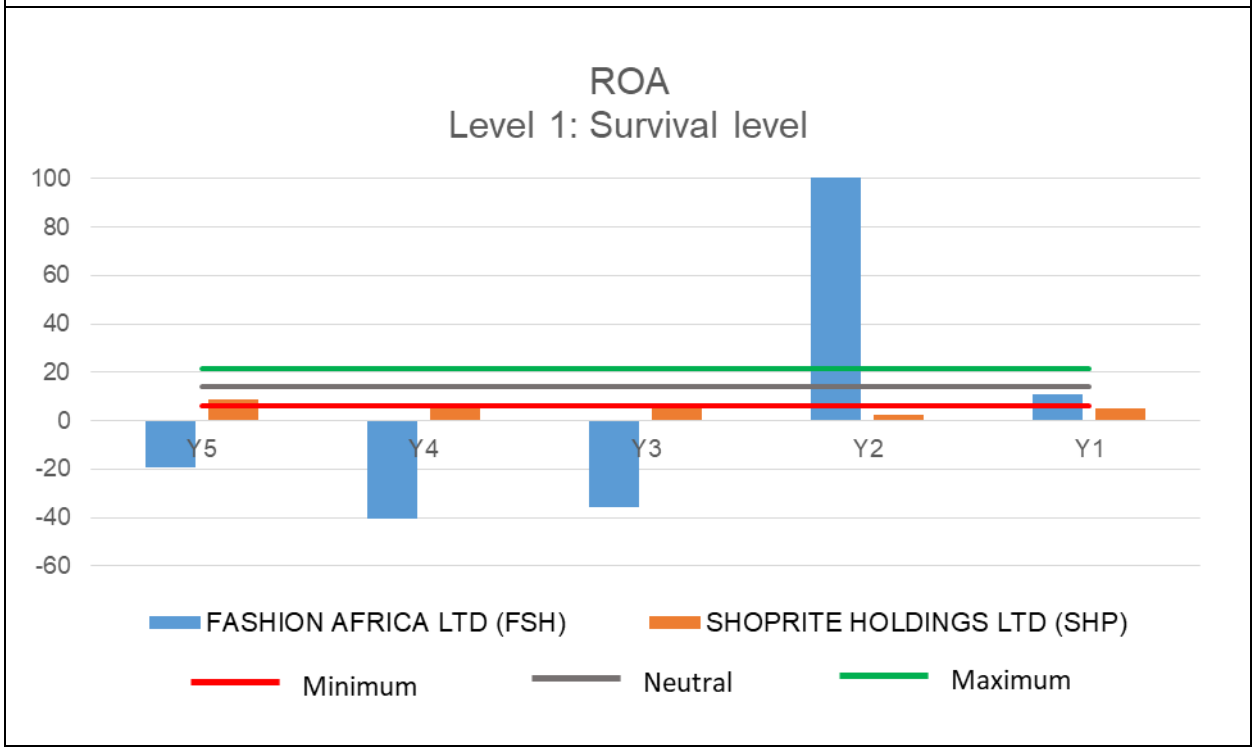
With FSH trouble was already lurking in Y2. ROE abnormally increased and decreased of the period of review. Y1=13.06, Y2=1133.46, Y3= (302.43), Y4=249.91 and slight decline in Y5=118.99.

With EBITI being 0, the company is unable to repay interest as there is no profit available. Mathematically zero divided by any amount is equal to zero, can be assumed EBITI in Y2 being 0, Y3= (11.04), Y4= (5.53) and Y5= (5.80) thus the earnings were zero or negative over those years.

While ROA increases from 10.82 to 545.99 from Y1 to Y2, this could indicate that income was inflated with a decrease from positive to negative ratios in Y3= (35.73), Y4= (40.28) and Y5= (19.01). In comparison with SHP there are severe financial deficiencies in FSH. In Y2 both ROE and ROA reflect abnormal ratios. Cassim (2015:104) explains when abnormal ratios or ratios higher that the rule of thumb (guidelines) it is a greater concern and warning sign. ROE will reflect investors' investments are not performing well and ROA reflects company assets are not managed effectively. Henceforth, Level 1 testing is terminated and further investigation conducted. Figure 6.7 on the next page gives an explicit view of the ratio changes as stated in Table 6.18 above.




EBITI
Level 1: Survival level
175
125
75
25
-25
-75
1
2
3
4
5
FASHION AFRICA LTD (FSH)
SHOPRITE HOLDINGS LTD (SHP)
Minimum
Neutral
Maximum


ROA
Level 1: Survival level
100
80
60
40
20
0
-20
-40
-60
Y5
Y4
Y3
Y2
Y1
FASHION AFRICA LTD (FSH)
SHOPRITE HOLDINGS LTD (SHP)
Minimum
Neutral
Maximum

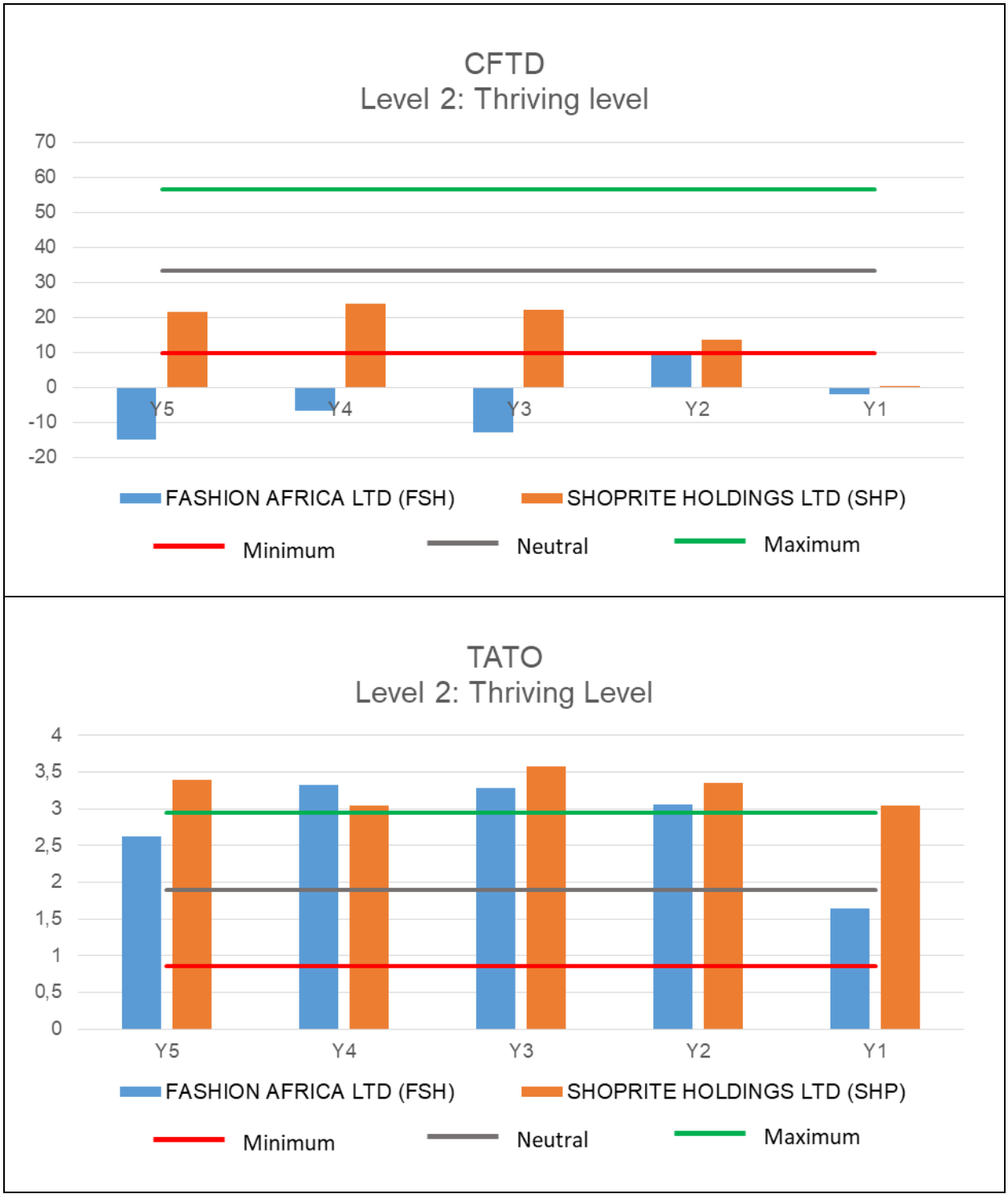


Figure 6.7: Comparing ratios: Fashion Africa Ltd vs Shoprite Holding Ltd

Source: INETBFA (2018)

Figure 6.7 clearly points towards testing that has to cease in Y2 and a further examination of these ratios should be executed before testing advances to Level 2. ROE fluctuation

was due to the Y2 toY4 decrease in equity 75% in Y2, 74% in Y3 and 40% in Y4 and decrease in net income at a much smaller percentage Y2 at 93%, Y3 at 17% and Y4 at 15% is the reason for the abnormal ratios. Same can be said of ROA decreases in EBIAT and Total assets. ROA declines from an abnormal ratio to negative ratio in Y3 (35.73, EBIAT 93% and Total assets 78%), Y4 (40.28, EBIAT 94% and Total assets 2%) and (19.01, EBIAT 39% and Total assets 6%) in Y5. By just glancing at the CFTD it is of concern that Y1 is already being negative and the trend continues on from Y3 to Y5. Almamy, Aston and Ngwa (2016:279) opine cash flow data are a good judge of business failure. Table 6.19 illustrates the testing for Siltek (STK) that failed in 2005 and Netcare (NTC) are discussed. Available financial statement data (1997–2000) for NTC as per collection of financial statement data (Section 4.3.3).

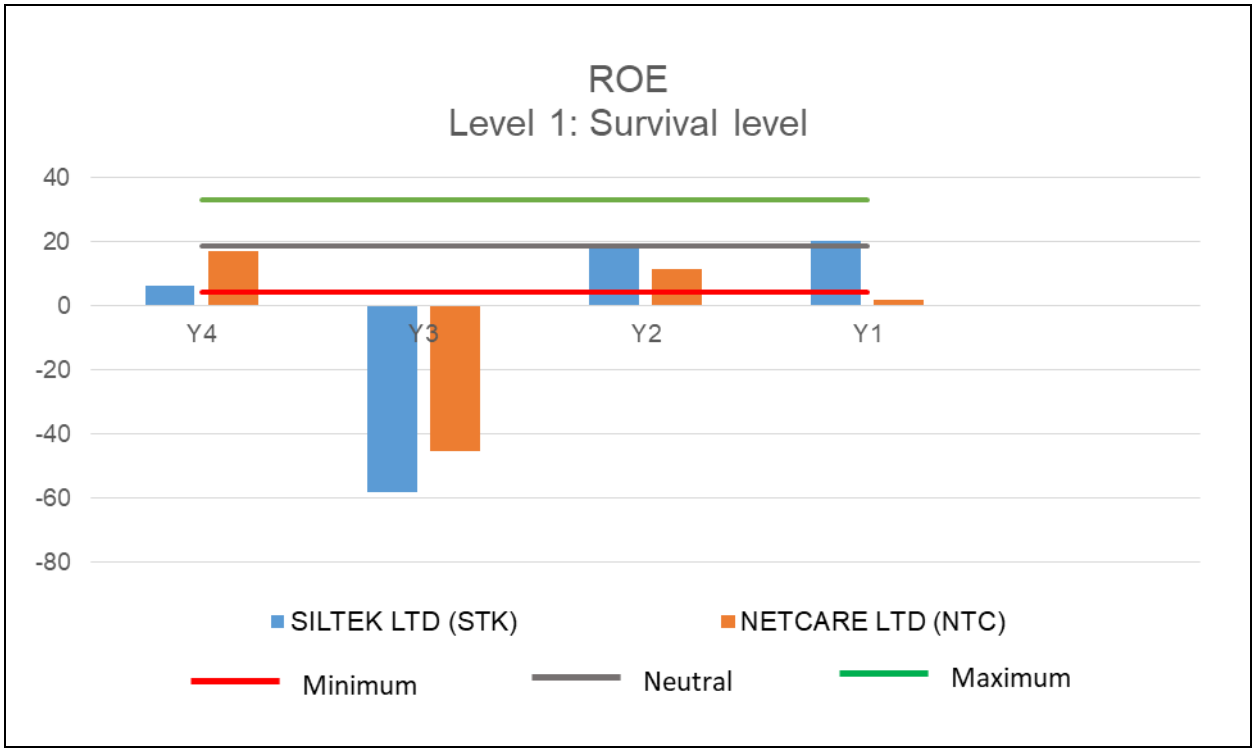
Table 6.19: Siltek Ltd vs Netcare Ltd

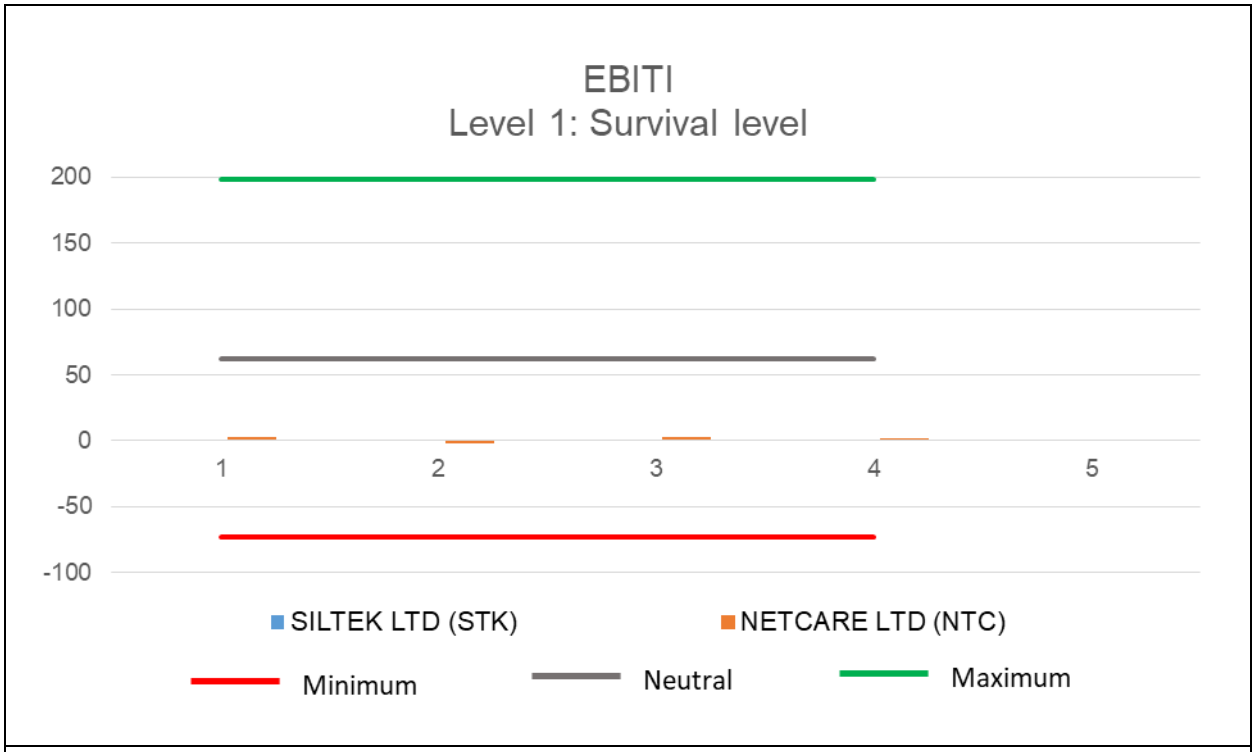
	SILTEK LTD (STK)				
	RATIO	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	6,34	-58,09	19,14	20,33
	EBITI	0,55	0,00	0,00	0,00
	ROA	2,05	-19,49	9,80	11,10
Level 2: SFP	CFTD	-3,33	-2,15	16,24	9,43
	TATO	2,75	3,02	2,73	2,18
	NETCARE LTD (NTC)				
	RATIO	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	17,01	-45,21	11,52	1,68
	EBITI	3,07	-1,98	2,51	1,84
	ROA	13,62	-11,01	12,23	4,11
Level 2: SFP	CFTD	22,43	20,33	16,64	10,85
	TATO	0,89	0,88	0,80	0,48

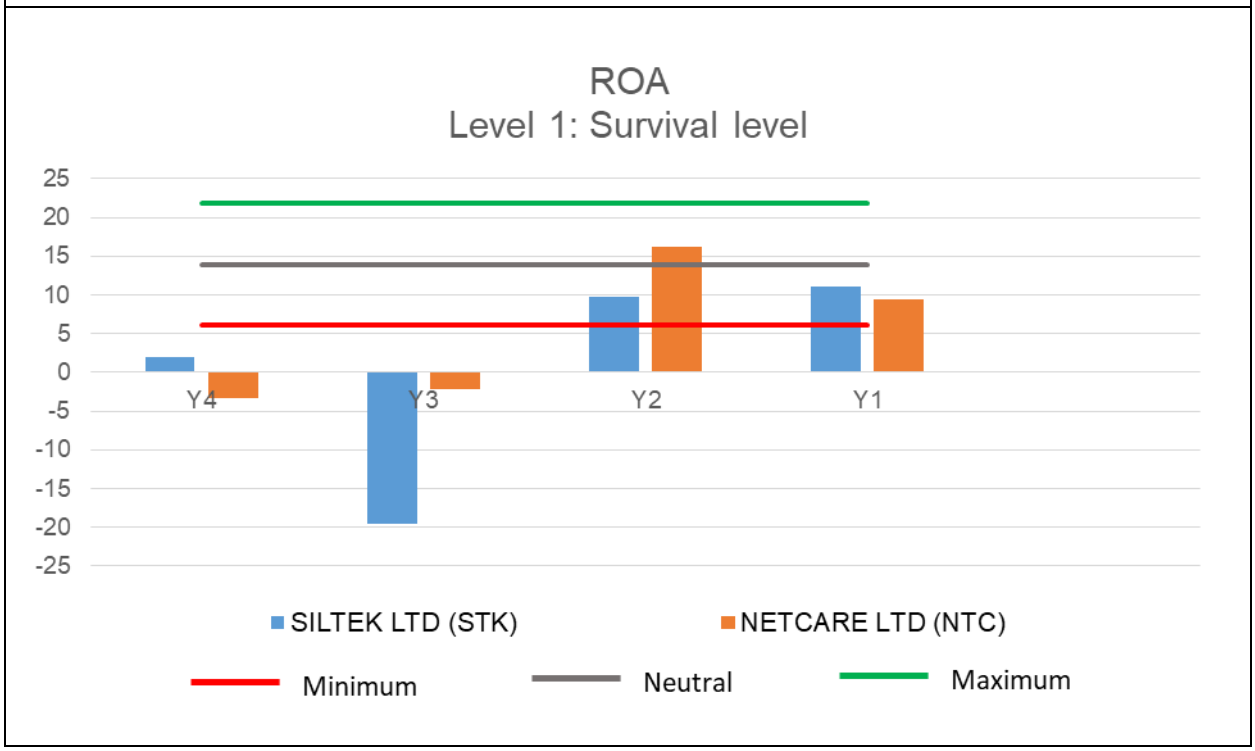
Source: INETBFA (2018)

Data for only four years were available as indicated in Table 6.19. The ROE, EBITI and ROA of NTC displayed concerns in Y3 (1999). All three ratios were negative from positive ratios in Y2. On further investigation Netcare states the company has been experiencing pressure and problems, one of the reasons being due to the increase in crime in 1999. In Y4 ratio stabilised between neutral and minimum in the guideline zone.

STK, ROE above the maximum guideline mark and ROA between neutral and minimum, both these two ratios fell to negative in Y3. There ratios signalling investor investment is not doing what it was entrusted to do and efficient management of resources for every R1 employed in assets show no profits have been made. EBITI indicated trouble in Y1 to Y3 and Y4 unable to cover the interest repayment. A further analysis of the interest cover (EBITITI) should have been made in Y1 as this ratio measures the number of times company earnings can decrease before the company is unable to pay the interest (Brigham and Ehrhardt, 2007:447). Another reason Y3 for both ROE and ROA were negative, ROA exhibiting fewer profits are generated from the assets the company employs. Figure 6.8 gives the graphic display of the ratios in Table 6.19 above.




EBITI
Level 1: Survival level
200
150
100
50
0
-50
-100
1
2
3
4
5
SILTEK LTD (STK)
NETCARE LTD (NTC)
Minimum
Neutral
Maximum


ROA
Level 1: Survival level
25
20
15
10
5
0
-5
-10
-15
-20
-25
Y4
Y3
Y2
Y1
SILTEK LTD (STK)
NETCARE LTD (NTC)
Minimum
Neutral
Maximum

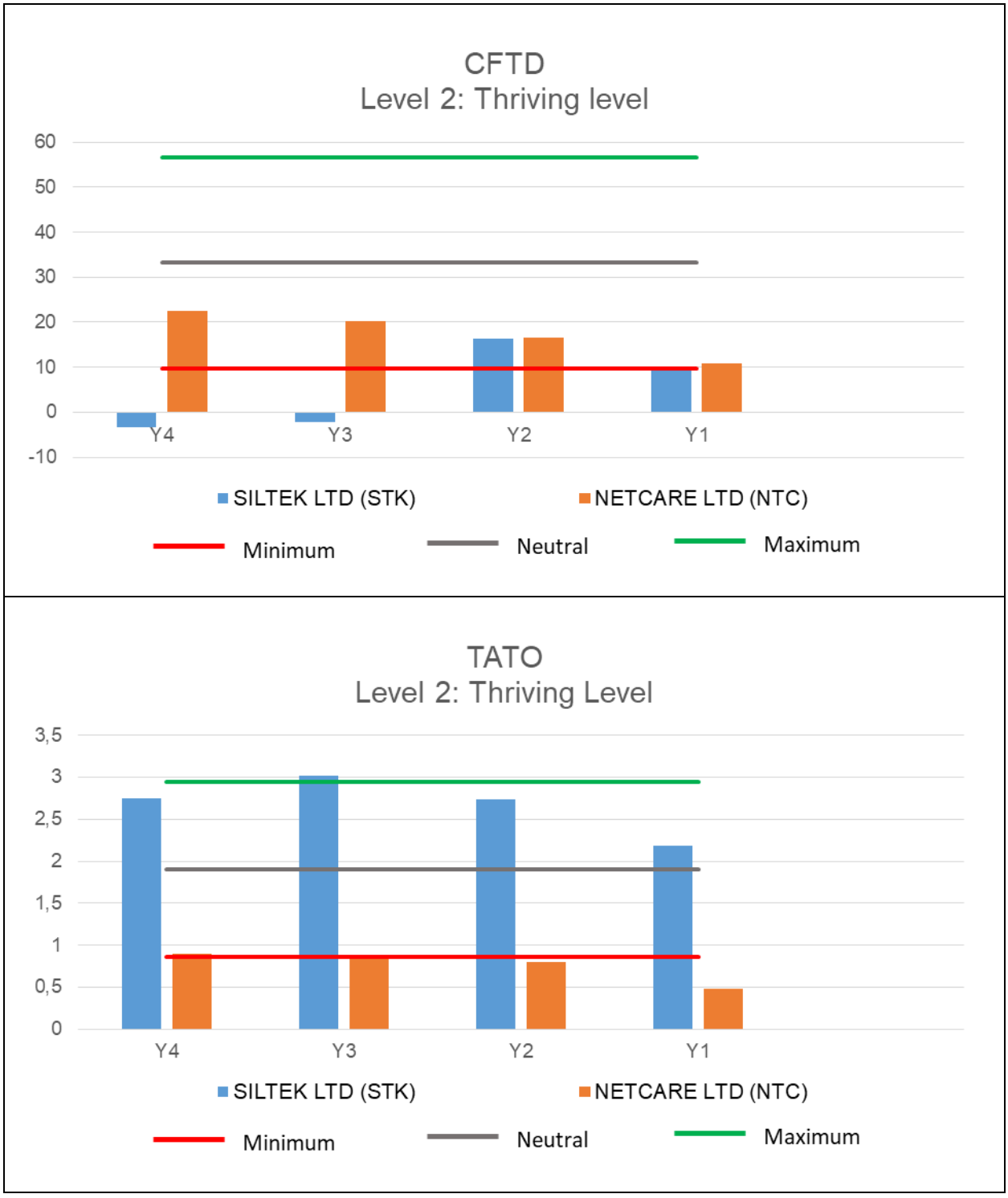


Figure 6.8: Comparing ratios: Siltek Ltd vs Netcare Ltd

Source: INETBFA (2018)

Figure 6.8 mirrors that Level 1 testing needs to be discontinued in Y1 due to the interest cover revelation but if the company is unsure of the seriousness clear indication of the

financial dilemma was given in Y3. Level 2 testing should only be progressed once in-depth scrutiny of the ratio of concern in Level 1 has been conducted for this reason no Level 2 testing and interpretation will be conducted. ROE for STK Y1 and Y2 ratio were above neutral. In Y3 the net income declined from positive to negative effecting the ROE and ROA in Y3 for STC, NTC. In Y3 net income also declined due to an abnormal high deduction was the reason for the negative ROE and ROA ratio in Y3 for NTC. There were no interest expenses recorded of the STC statement of profit and loss for Y1 to Y3, reflecting on the ratios as 0. Table 6.20 illustrate the analysis of Universal Growth Holdings (UNG) that was delisted (failed) in 2005 and Clicks Group (CLS) follows on the next page with available financial statement data (1996–2000) as per collection of financial statement data (Section 4.3.3).

Table 6.20: Universal Growth Holdings Ltd vs Clicks Group Ltd

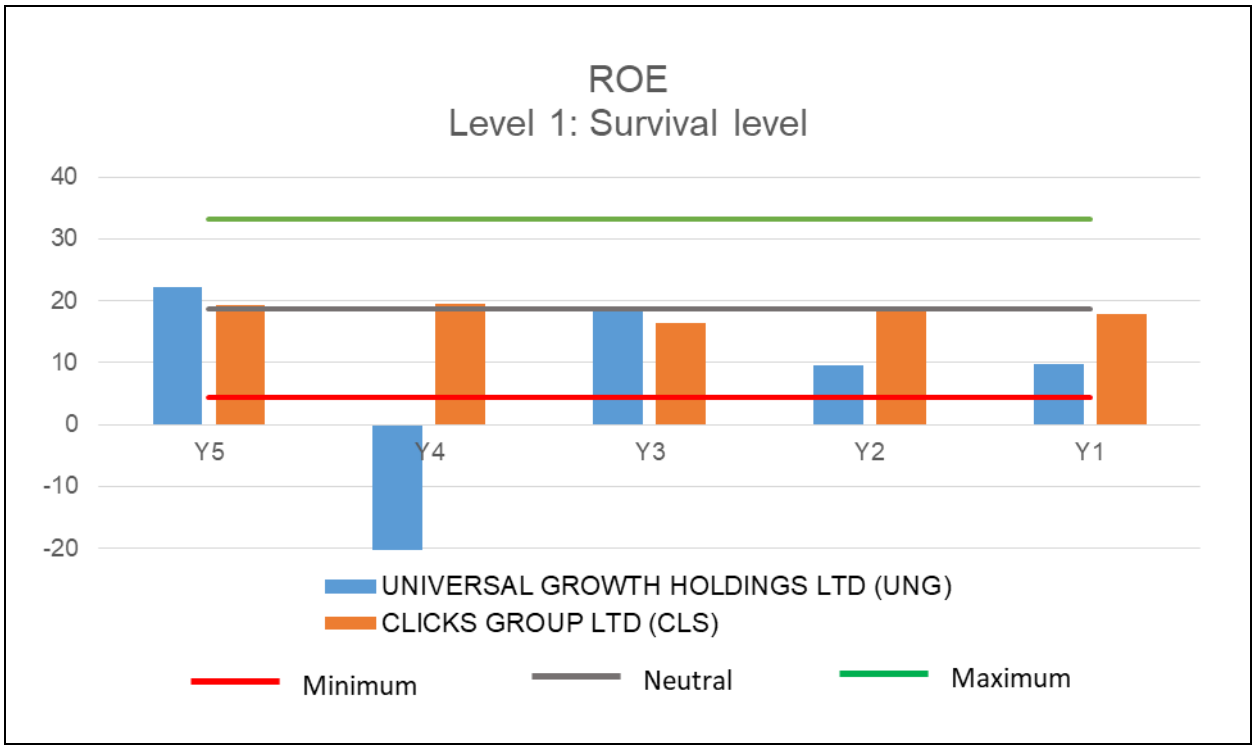
	UNIVERSAL GROWTH HOLDINGS LTD (UNG)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	22,21	-2,095.54	18,46	9,47	9,79
	EBITI	2,15	-29,01	6,41	9,51	19,78
	ROA	10,19	-160,76	9,69	11,15	8,75
Level 2: SFP	CFTD	21,58	14,01	-1,45	18,36	-30,06
	TATO	2,06	2,33	1,20	2,08	1,77
	CLICKS GROUP LTD (CLS)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	19,36	19,41	16,46	19,05	17,81
	EBITI	11,03	7,81	5,68	5,12	5,38
	ROA	13,39	12,16	11,47	11,94	12,15
Level 2: SFP	CFTD	10,16	34,09	8,53	20,11	48,00
	TATO	2,31	2,32	2,03	2,20	2,06

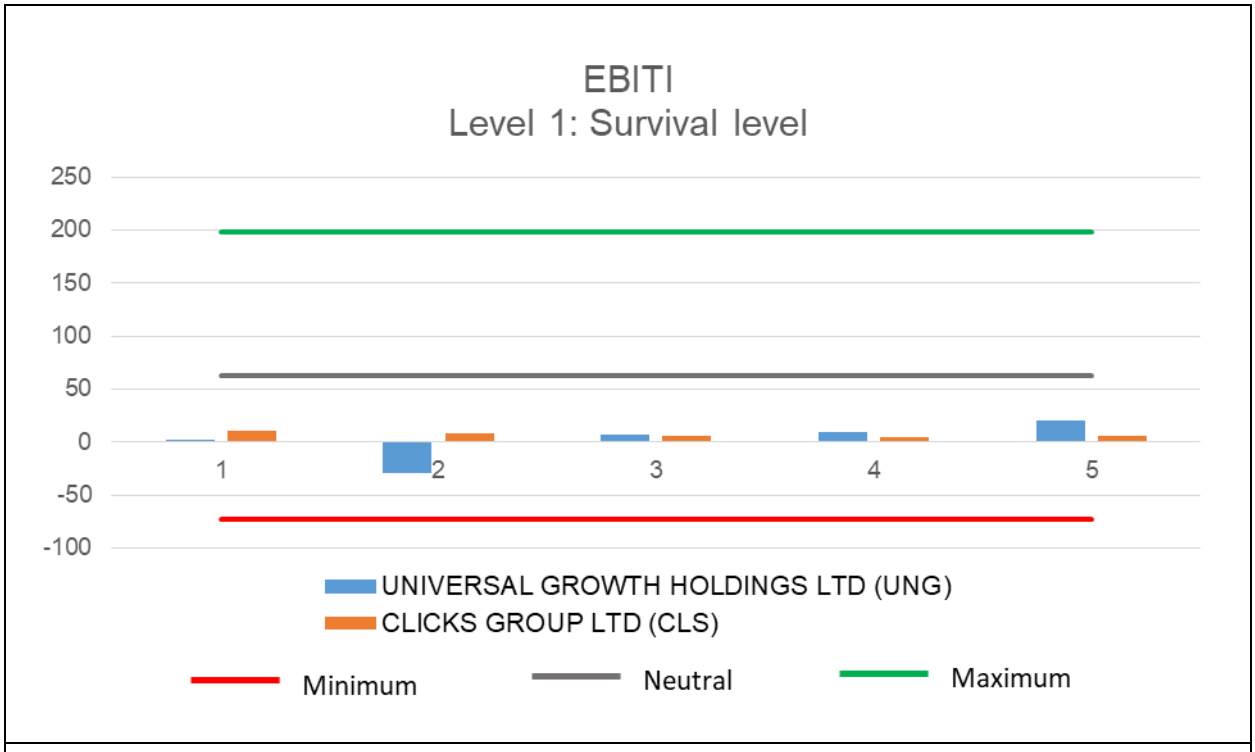
Source: INETBFA (2018)

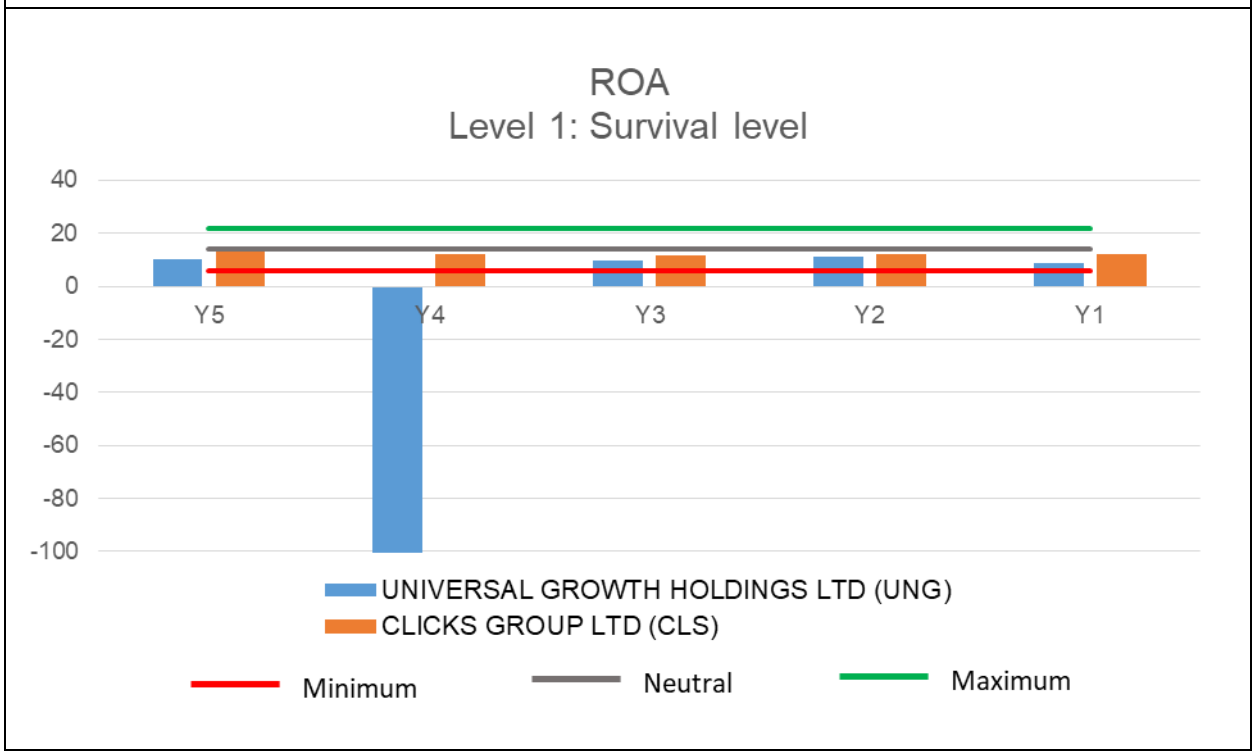
Table 6.20 showcases all the ratios in Level 1 testing for CLS is favourable and throughout the period under review, all the ratios for both Level 1 and 2 are slightly above the neutral guideline mark but never below the minimum level. UNG Level 1 testing ROE is a little below the neutral mark, Y1=9.79, Y2=9.51 and Y3=18.46 ratios dropped significantly in Y4= (2095.54) and Y5=22.21 above neutral level.

EBITI meets the 5times successful company mark as per Walsh for years Y1 to Y3 and Y4= (29.01) and indicated company was able to cover interest repayment n Y5=2 times.ROA is also a little lower than the neutral guideline zone for Y1=8.75, Y2=11.15, Y3=9.69, an abnormal decline Y4= (160.76), increasing in Y5=10.19.

Level 2 testing should only follow after reason for the negative ROE= (2095.54), EBITI= (29.01) and ROA= (160.76) has been determined. The same process is to be followed for Y3 and in Y4, financial distress is evident which are financial distress is evident which are graphically portrayed in Figure 6.9.




EBITI
Level 1: Survival level
250
200
150
100
50
0
-50
-100
1
2
3
4
5
UNIVERSAL GROWTH HOLDINGS LTD (UNG)
CLICKS GROUP LTD (CLS)
Minimum
Neutral
Maximum


ROA
Level 1: Survival level
40
20
0
-20
-40
-60
-80
-100
Y5
Y4
Y3
Y2
Y1
UNIVERSAL GROWTH HOLDINGS LTD (UNG)
CLICKS GROUP LTD (CLS)
Minimum
Neutral
Maximum

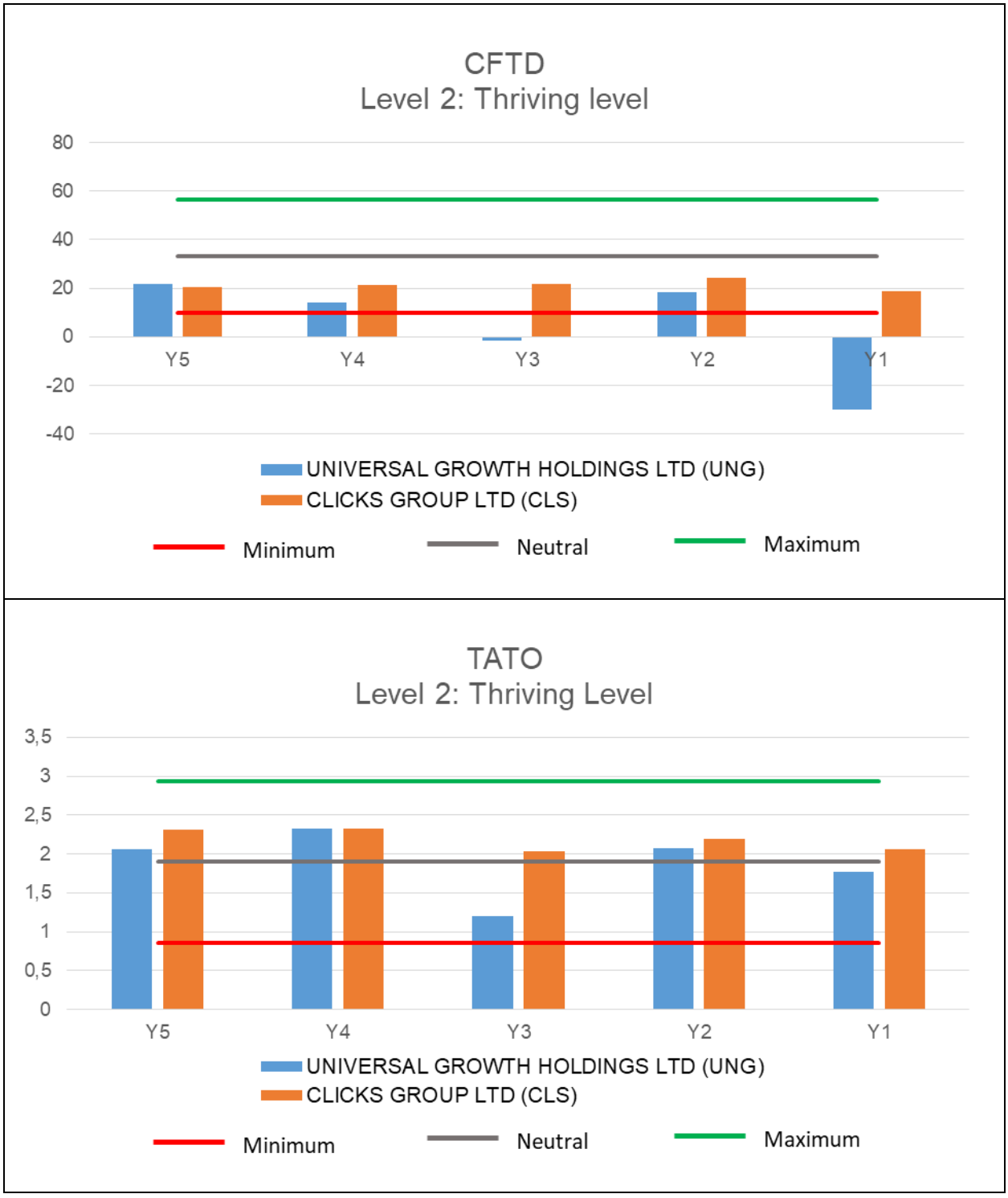


Figure 6.9: Comparing ratios: Universal Growth Holdings Ltd vs Clicks Group Ltd

Source: INETBFA (2018)

Figure 6.9 shows CLS constantly increase for the period under review for all BPIA. For UNG Y1toY3 also increased steadily ROE, EBITI and ROA but in Y4 UNG did not make a profit but a loss. The company's loss affected ROE, EBITI and ROA in Y4, the size of the decrease in the denominator will determine the size of the ratios' unfavorability. By comparing CLS with UNG it is evident that the unfavourable results obtained by UNG is a clear indication of UNG's financial weakness. In Y4, UNG's total cost increased by 49%, total assets decreased by 50% and equity by 74%. Every amount dividend by a negative amount results in a negative answer.

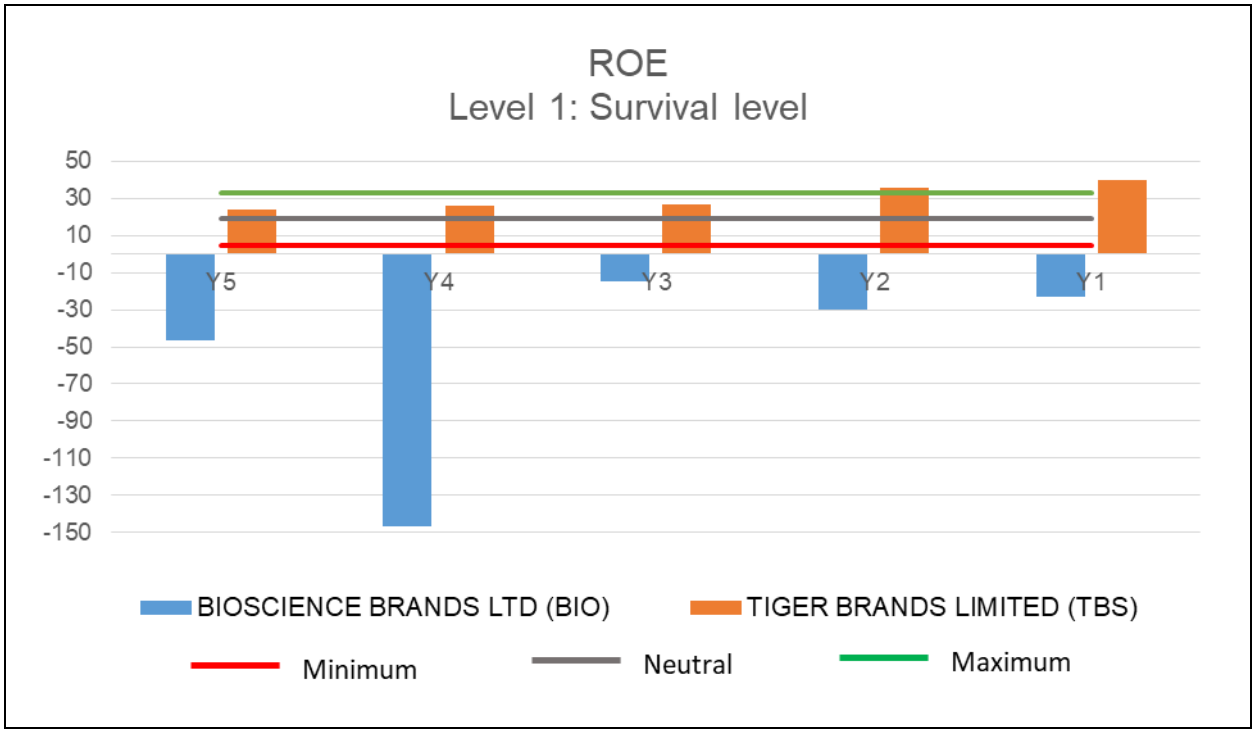
Level 2 testing was stopped and reasons for the huge shift in the ratios from positive to negative must first be determined before testing can begin. In Table 6.21 the financial stance to Bioscience (BIO) failed in 2016 is discussed as to the financial stance of Tiger Brands (TBS). Available financial statement data 2008─2012 discussed below.

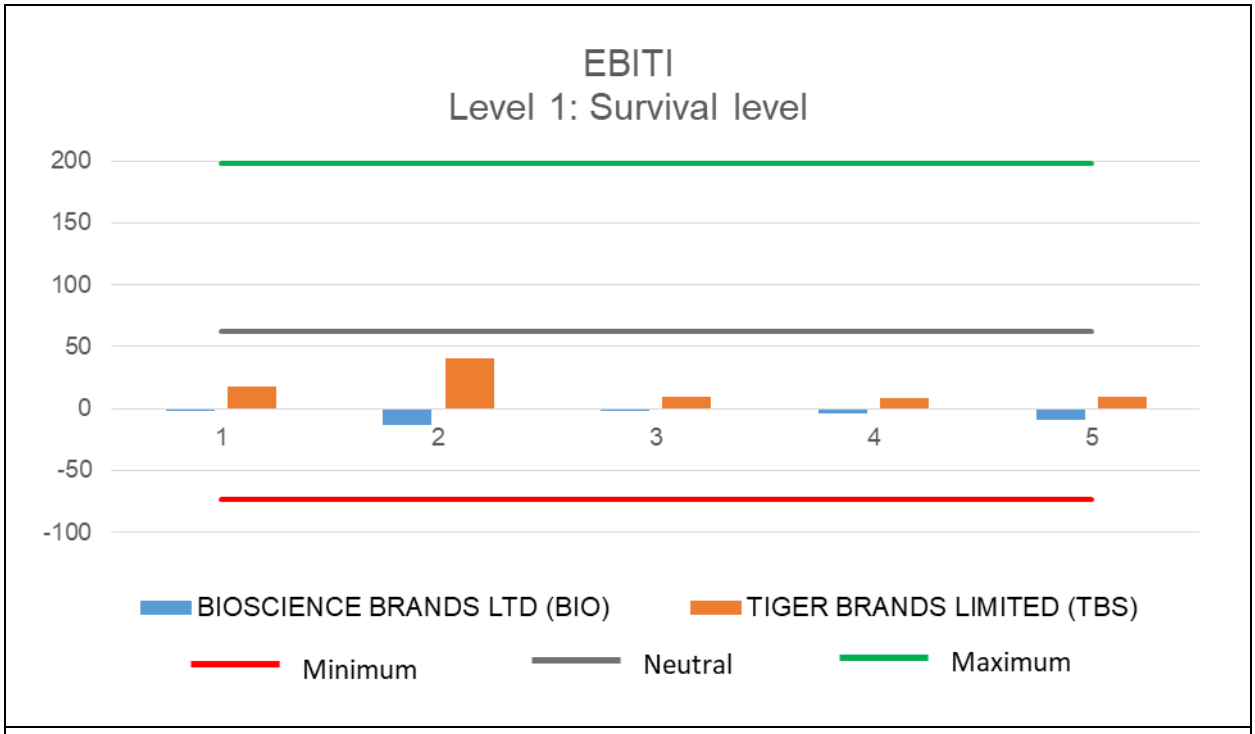
Table 6.21: Bioscience Brands Ltd vs Tiger Brands Ltd

	BIOSCIENCE BRANDS LTD (BIO)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	-46,34	-146,97	-14,56	-30,10	-23,25
	EBITI	-1,99	-13,52	-2,17	-3,46	-9,18
	ROA	-27,54	-170,35	-21,15	-33,58	-26,87
Level 2: SFP	CFTD	2,59	-24,95	0,48	-16,48	-35,26
	TATO	1,59	2,05	2,31	2,15	0,57
	TIGER BRANDS LIMITED (TBS)					
	RATIO	**Y5**	**Y4**	**Y3**	**Y2**	**Y1**
Level 1: SOCI	ROE	24,05	26,21	26,36	35,59	39,47
	EBITI	18,22	40,33	9,35	7,97	9,09
	ROA	25,14	27,25	25,71	34,71	24,09
Level 2: SFP	CFTD	48,23	50,53	67,18	49,69	32,58
	TATO	1,64	1,65	1,76	2,10	1,81

Source: INETBFA (2018)

The TBS ratio is either above the maximum guideline level but none are way below the neutral mark as illustrated in Table 6.21. With BIO it could be said its financial affliction started before the five years prior to failure. Level 1 testing of all three ratios is negative and the trend continues throughout the five years of analysis. The negative ratio could be an indication of negative profits if net income is negative and it is divided by positive equity denominators which result in a negative ratio. ROA measures the income that is generated by company assets. If the ratio is negative it is a sign of the inability of the company to generate income meaning the assets are incapable. This could be due to the age of the assets or asset being idle. That is one of the areas managers can explore before further testing. According to the guideline, a sensible interest cover is 5.5 times and should not be less than 2.5 times. In this case, interest cover is negative for the period under analysis. These concerns are clearly highlighted in Figure 6.10.




EBITI
Level 1: Survival level
200
150
100
50
0
-50
-100
1
2
3
4
5
BIOSCIENCE BRANDS LTD (BIO)
TIGER BRANDS LIMITED (TBS)
Minimum
Neutral
Maximum

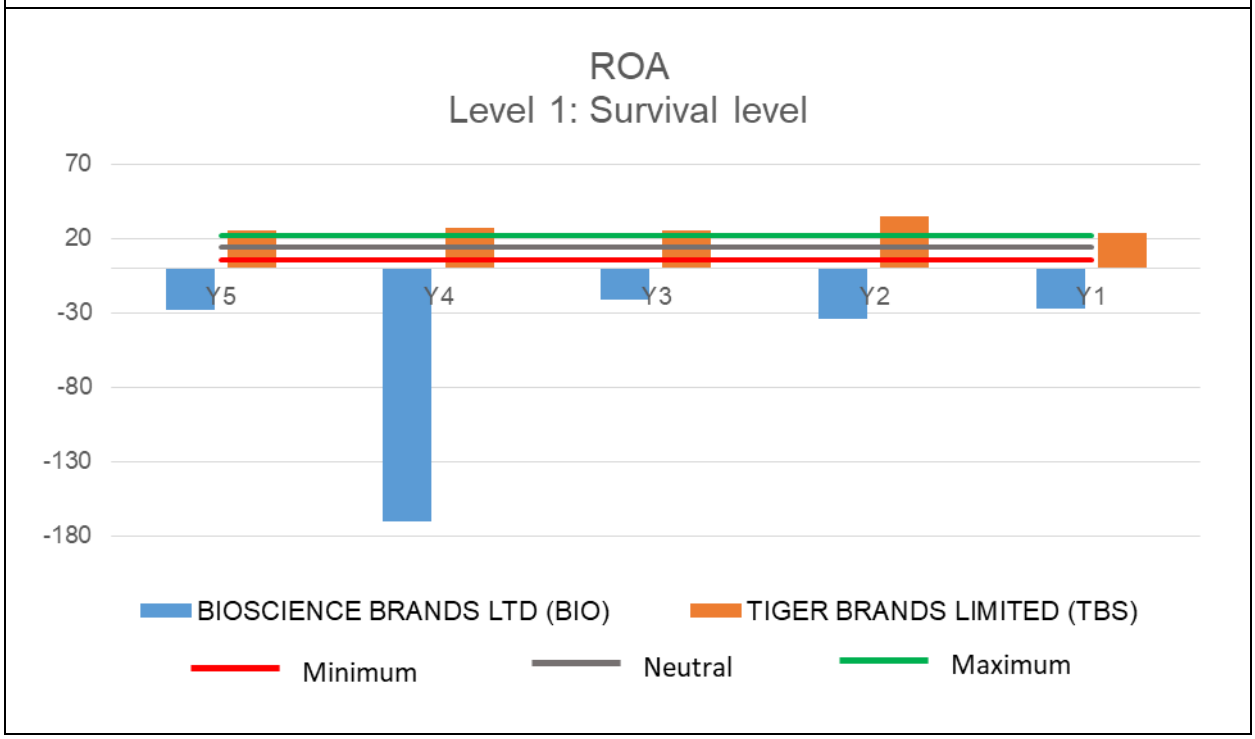

ROA
Level 1: Survival level
70
20
-30
-80
-130
-180
Y5
Y4
Y3
Y2
Y1
BIOSCIENCE BRANDS LTD (BIO)
TIGER BRANDS LIMITED (TBS)
Minimum
Neutral
Maximum



Figure 6.10: Comparing ratios: Bioscience Brands Ltd vs Tiger Brands Ltd

Source: INETBFA (2018)

A clear display of the financial predicament BIO finds itself in is shown in Figure 6.10. Testing Level 2 is futile as Level 1 already portrays that by the time testing was conducted BIO was already financially paralysed as graphically presented in Figure 6.9. In

comparison to TBS, ROE for the period under review Y1toY2, the ratio is above maximum level, Y3 toY5 was above the neutral level. For EBITI, TBS can repay their interest with ease, 9times Y1 and Y3, 7times Y2, 40times in Y4 and 18times in Y5. The ROA was above the maximum level in Y1 to Y5.

Having presented the first phase of testing whereby failed (F) companies were matched with non-failed (NF) companies with the aim of determining whether the bankruptcy indicators approach was able to detect financial distress of five years prior to failure. The test has been conducted and the study now embarks on the second phase of testing.

For the purpose of the second phase of testing the companies that were unable to be matched with the JSE NF companies were selected. BPIA and EMS were applied for testing whereafter the results were then compared. The study now presents the second phase of testing.

6.4.2 Using the EMS model to validate the results of the BPIA (Objective 3)

The second phase of testing was applied in the sections. The purpose is to meet the second empirical objective as stated in Chapter 1 (Section 1.5.3, iii), stated as:

> Evaluate whether the developed BPIA is a reliable tool for predicting bankruptcy or financial distress. Achieved through empirically testing the failed companied comparing BPIA results with EMS model results.

Altman and Hotchkiss (2006:280) confirm in emerging markets including Argentina, Brazil, Mexico, and many Asian countries this model (EMS) has been applied successfully. The bankruptcy prediction results were remarkable. Correia *et al.* (2015:5.24) endorse this model stating to compare to Altman's previous models, the EMS model level of accuracy is higher. The EMS score exceeding 2.60 is labelled as the safe zone. Less than 1.81 is described as the distress zone. Altman (2002:8-9) linked these z-score zones to S+P band rating, 5.85 is between 8.15 (A-rating = strong credit profile), between 5.85 and 4.15 (BBB rating = adequate credit profile). There is 1.75 (B-rating = vulnerable to future business and environmental shifts) lastly below 1.75 (CCC rating = extremely high risk). Emery (2020:6) brings clarity to the meaning of the bond ratings being the credit quality or the financial strength of the borrower.

- A-rating = strong credit profile
- BBB rating = adequate credit profile.
- B-rating = vulnerable to future business and environmental shifts
- CCC rating = extremely high risk
- D-rating = default

These ratings have been included within the study as a strengthening mechanism and were found to be very instrumental in the tests conducted of the fall of two industry giant Enron and WorldCom (Altman & Hotchkiss, 2006:267-268). According to Kim and Nabar (2007:1), credit ratings are responded to by fluctuations within the financial market. The rating agencies that determine the credit rating are more informative with regard to market upgrades and downgrades. The intent of the credit rating is to capture default risk and possible bankruptcy and assist the field of study by improving bankruptcy prediction methodology (Shumway,2001; Norden 2017). In Table 6.22 the original EMS score zone which this study had applied has been linked to the bond rating.

Table 6.22: EMS cut-off points linked to the bond rating

Altman's model including bond ratings	Classification		
	Safe	Grey	Distress
	Strong credit profile	Adequate credit profile	Extremely high risk
EMS	>5.85	>4.15< 5.85	<4.15

Source: Altman and Hotchkiss (2006:268)

Table 6.22 indicated the EMS score that have been linked to the US Bond Credit Scoring System. This study applied the original EMS model to validate the results of the newly developed BPIA. The second phase was the testing of the remainder of the sample, a total of ten failed group of companies that were unable to be matched to companies within the same sector. The selected companies are indicated in Table 6.23 below. These companies were tested firstly by applying the BPIA, thereafter the same companies will be tested applying the EMS. The results of the two analytical measurement tools are compared indicates the BPIA results were based on the applying the guidelines (Section 6.3) and EMS results based on scores placing companies into different zones. The EMS

score indicate companies will be classified as safe when score >2.60, in distress with score of <1.10 and uncertain (grey area) when score is >1.10 but <2.60. A comparison was conducted to determine if the BPIA is a useful tool that is able to effectively predict bankruptcy before it actually occurs. This is done by comparing the BPIA results to the EMS model. The model as referred to by Sabela *et al.* (2018:2) as the model that provides favourable results.

Table 6.23: Companies tested in the second phase of testing

YEAR	COMPANY	CODE	DATA AVAILABLE	INDUSTRY	SECTOR
2003	Softline Ltd	SFT	No match	Technology	Hardware
2003	The Laser Group Ltd	LSR	No match	Consumer Services	Travel & Leisure
2004	Net 1 Applied Technology Holdings Ltd	APL	No match	Technology	Hardware
2005	Global Technology Holdings Ltd	GLT	No match	Technology	Hardware
2006	Frontrange Ltd	FRO	No match	Technology	Software
2011	Beget Holdings Ltd	BEE	No match	Technology	Hardware
2016	Africa Cellular Towers Ltd	ATR	No match	Technology	Hardware
2016	Erbacon Investment Holdings Ltd	ERB	No match	Industry	Construction
2016	Sanyati Holdings Ltd	SAN	No match	Industry	Construction
2016	Sea Kay Holdings Ltd	SKY	No match	Industry	Construction

Source: INETBFA (2018)

Table 6.23 identifies the sample of companies that was used in the second phase of testing of the three testing phases. The failed companies are tested using the collective bankruptcy indicator and compared to the test conducted using Altman's prominent EMS model.

Companies that failed in 2003 (Softline Ltd and The Laser Group Ltd), 2004 (Net 1 Applied Technology Holdings Ltd). In 2005 (Global Technology Holdings Ltd), 2006 (Frontrange Ltd) and 2011 (Beget Holdings Ltd). Lastly 2016 (Africa Cellular Towers Ltd, Erbacon Investment Holdings Ltd, Sanyati Holdings Ltd and Sea Kay Holdings Ltd).

The BPIA and EMS model were the analytical tools utilised for testing. The ten companies were first tested by applying the BPIA with the aim of detecting potential bankruptcy before actual bankruptcy occurred. Results were obtained through identifying continuous trends of financial weakness, thereafter the same failed companies were tested by the EMS model, the results classified according to zones. EMS result >2.60 is classified as financially healthy, result <1.10 is classified as potentially bankrupt and when result is either >1.10 or <2.60 classified as area of concern and uncertainty.

The results are compared with the intention to determine if the BPIA is a useful and effective tool to detect financial distress or bankruptcy timeously as this was compared to an already successful EMS model. Table 6.24–6.43 illustrate the data to be compared. Testing commenced with the testing of Softline Limited (SFT) a technology hardware company.

Softline Limited (SFT)

Softline limited (SFT) operating in the technology hardware sector was founded in 1988 by Ivan Epstein and Alan Osvin with merely a R1 500 loan. They were later joined in the business by Steven Cohen a local entrepreneur in 1990. Softline is based in Sandton, South Africa and their core business was information technology. Their business also included software development and distribution, e-commerce, accounting software and services and education and training related to information technology. SFT was listed on the JSE in 1997 and failed in 2003. Table 6.24 illustrates the ratios of Softline for the period under investigating.

Table 6.24: Softline (SFT)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-0,04	0,05	0,39	0,34	0,19
X2	RE/TA	3,26	0,52	0,14	0,06	0,02	-0,32
X3	EBIT/TA	6,72	0,04	0,18	-0,22	-0,13	0,42
X4	BVE/TL	1,05	3,44	1,41	3,28	2,04	1,23
Z-score			8,56	6,72	7,97	6,81	7,57
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

According to Table 6.24, the EMS model indicates SFT appears within the safe zone for all five years under review, indicating the possibility of SFT going bankrupt is very low. This demonstrates SFT has a strong credit profile up to five years prior to failure. A better indication of SFT is graphically below in Figure 6.11.

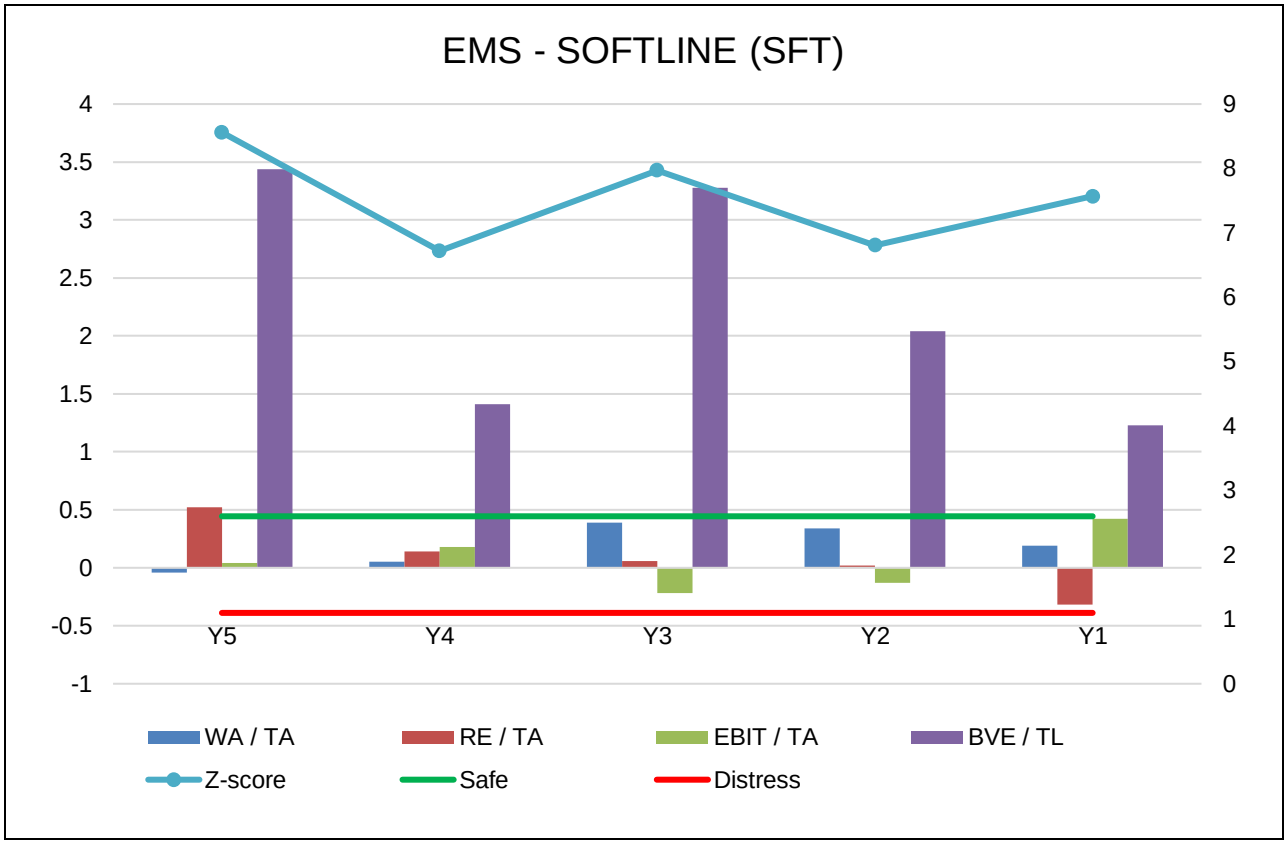


Figure 6.11: EMS: Softline (SFT)

Source: INETBFA (2018)

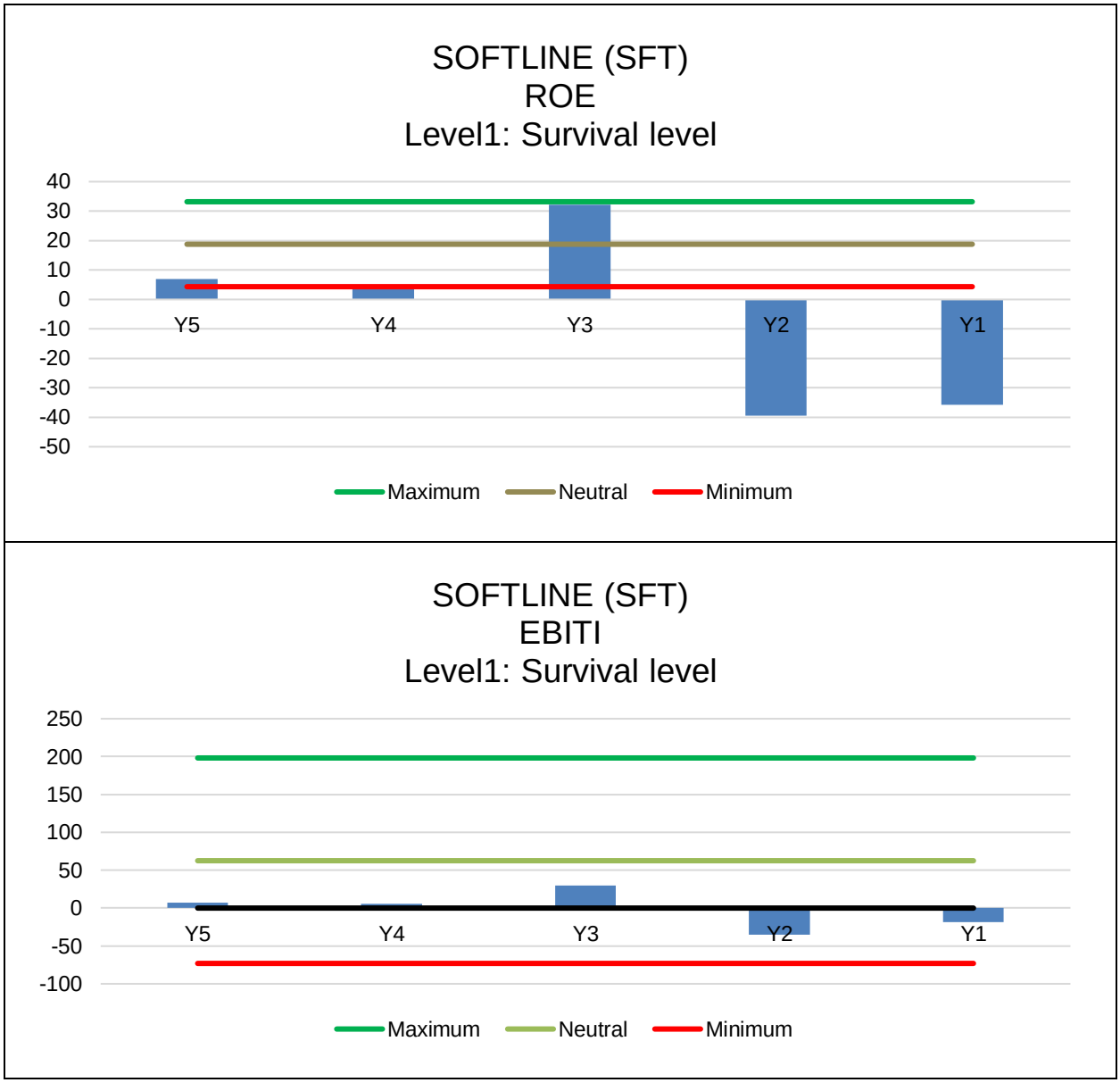
Figure 6.11 illustrates the five-year period being evaluated is within the safe zone. Showing that according to the EMS model there is no sign of concern for the five years as a whole. In Table 6.25 SFT was tested applying the bankruptcy prediction indicators.

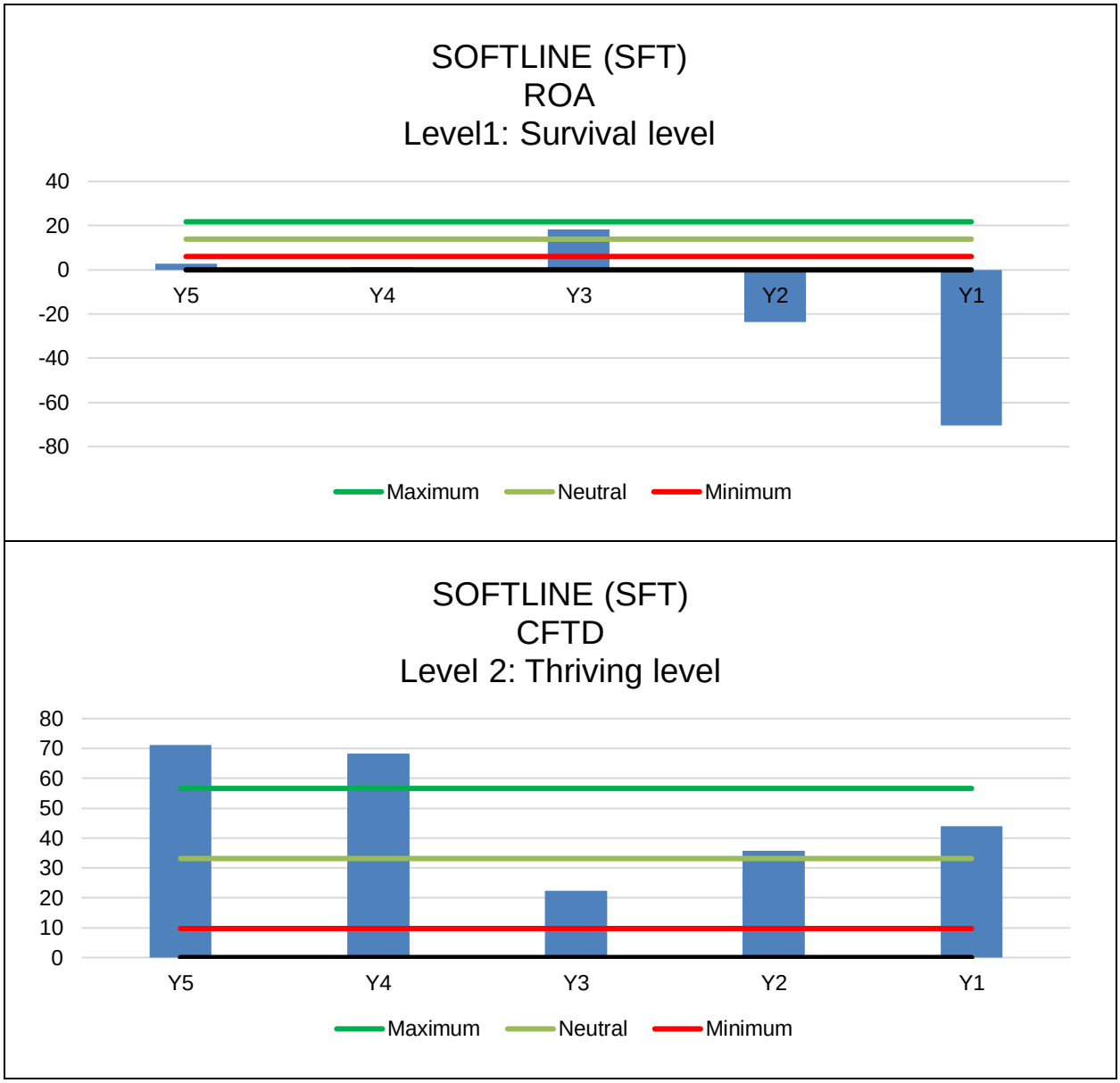
Table 6.25: Softline (SFT)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	6,94	4,89	32,25	-39,41	-35,68
	EBITI	2,92	1,28	18,29	-23,56	-70,47
	ROA	7,39	5,74	29,72	-35,02	-18,16
Level 2: SFP	CFTD	71,14	68,2	22,39	35,82	43,92
	TATO	0,90	1,20	1,04	1,17	1,98

Source: INETBFA (2018)

The BPIA give a totally different picture of SFT's financial condition. In Y1 (being five years prior to failure) the Level 1 ratio ROE, interest cover EBITI and ROA were negative, and the trend followed into the next year as shown in Table 6.25. ROE in Y1= (35,68) and Y2= (39.41), an increase in negative ratio could be due to a further decline in the company's net income. Interest cover in Y1= (70,47) and Y2= (23,56) signify for a ratio to increase negatively that a loss has already occurred and the next year this loss was even greater than the former (Correia *et al*., 2015; Wadhwa 2019). ROA, in Y1= (18,16) in Y2= (35.02) when this ratio decreases it is an indication of trouble hiding as it is a symptom of unprofitable results and inefficient operations. Figure 6.12 reveals financial distress was evident five years prior to failure.




SOFTLINE (SFT)
ROA
Level1: Survival level
40
20
0
-20
-40
-60
-80
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
SOFTLINE (SFT)
CFTD
Level 2: Thriving level
80
70
60
50
40
30
20
10
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

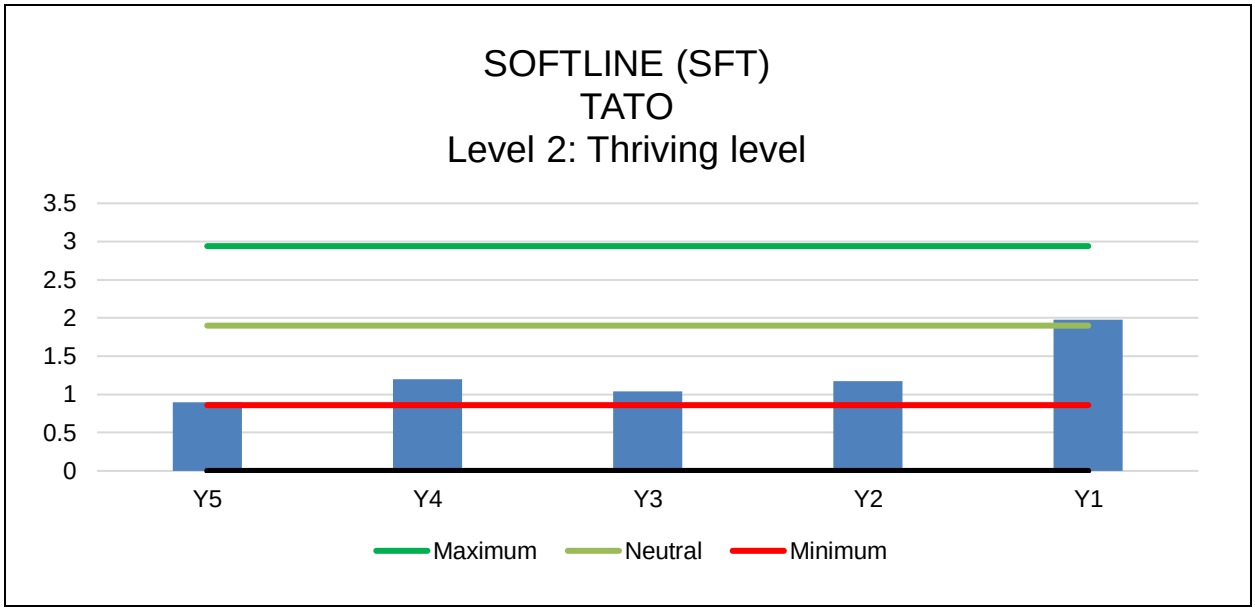


Figure 6.12: Level test: Softline (SFT)

Source: INETBFA (2018)

Level 1 testing should have been terminated in Y2, the cause of the negative ratio is identified as revealed in Figure 6.12. The reason for the immediate termination of testing is due to a cause for concern being identified. This concern is to be probed in order to take preventive action where possible. Thereafter testing of Level 1 could continue after corrective action has been taken.

The EMS model classifies SFT as safe for the five years prior to the year of failure. According to Correia *et al*. (2015:5.29), the Altman's safe zone indicated that the company is almost certain to succeed. In comparison to the BPIA, Level 1 testing indicates SFT was already experiencing financial distress five years prior to the company's failure. This shows that the BPIA is a more efficient financial distress indicating tool. The testing of the Lazer Group (LSR) is discussed next.

The Lazer Group (LSR)

The Lazer Group (LSR) is a domestic company operating within the consumer services travel sectors that were established in 1971 and based in Cape Town, South Africa. They provided logistic solutions locally and internationally. The Lazer Group offered courier, collection and delivery services. Also providing supply chain solutions and facilitates

international trading in imports and exports via sea and air. The Lazer Group was failed from the JSE in 2003. In Table 6.26 a year-to-year indication of the EMS scores of The Lazer Group Ltd (LSR) is given. LSR is a company that operated in the consumer services within the travel and leisure sector.

Table 6.26: The Lazer Group Ltd (LSR)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-0,03	-0,08	-0,11	-0,14	-0,09
X2	RE/TA	3,26	0,23	0,20	0,12	0,10	0,10
X3	EBIT/TA	6,72	0,11	-0,15	0,12	0,12	0,09
X4	BVE/TL	1,05	0,92	0,81	1,10	0,77	0,51
Z-score			5,51	3,22	4,88	4,27	4,13
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

Table 6.26 exhibits that LSR's EMS is way above the 2.60 safe zone mark. Y1= 4.13, Y2=4.27, Y3=4.88, Y4=3.22 and Y5=5.51 being one year prior to failure. Figure 6.13 on the below graphically highlights the EMS scores.

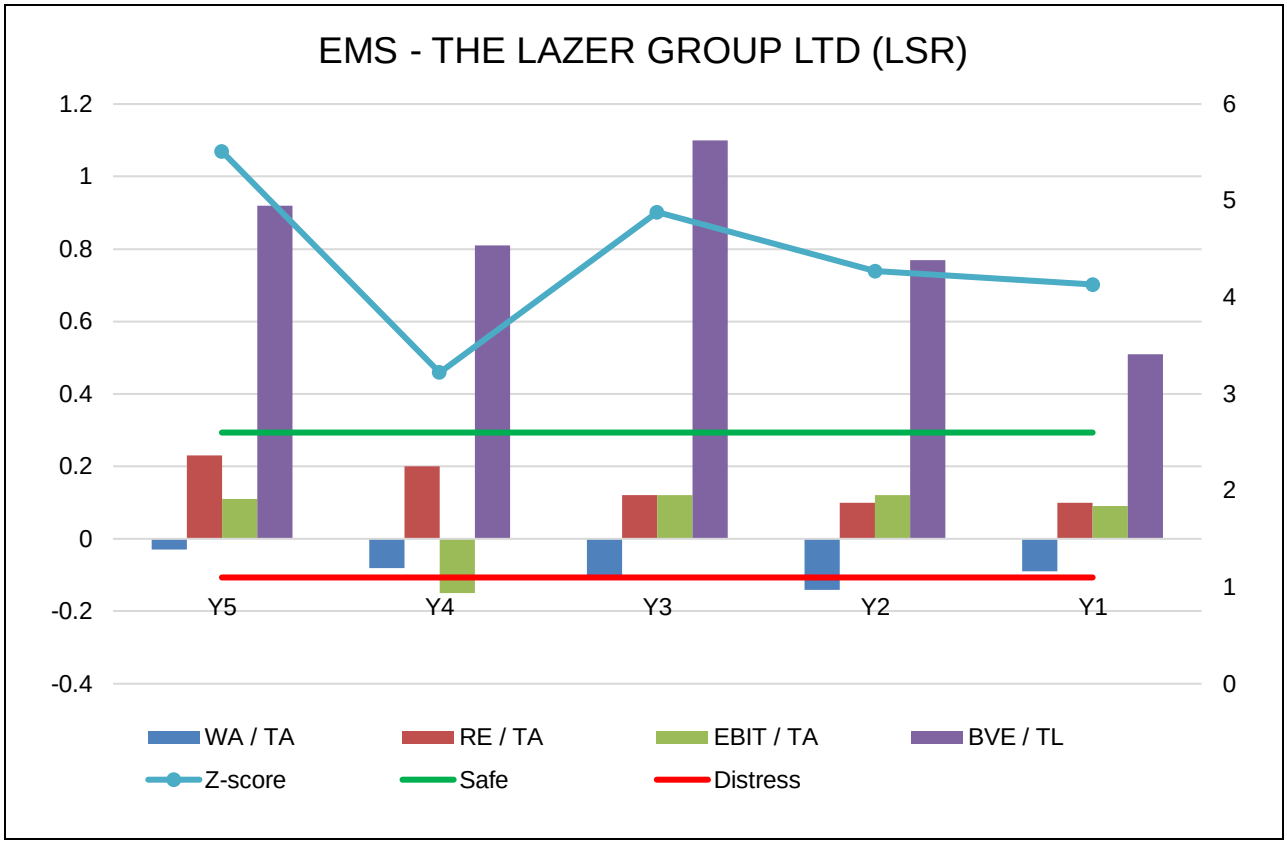


Figure 6.13: EMS: The Lazer Group Ltd (LSR)

Source: INETBFA (2018)

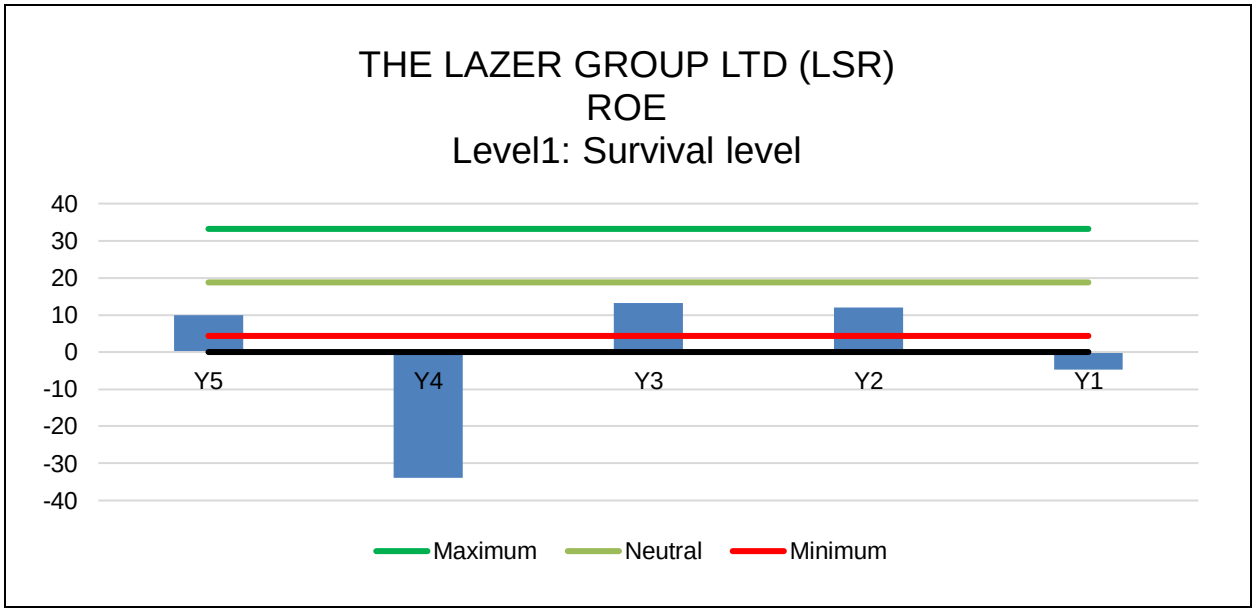
The safe zone being the robust zone recommended in the literature (Altman and Hotchkiss 2006:280) has been indicated as being the zone within which LSR is for the period being reviewed. Table 6.27 that follows discusses the Level 1 testing of LSR, utilising the bankruptcy prediction indicators.

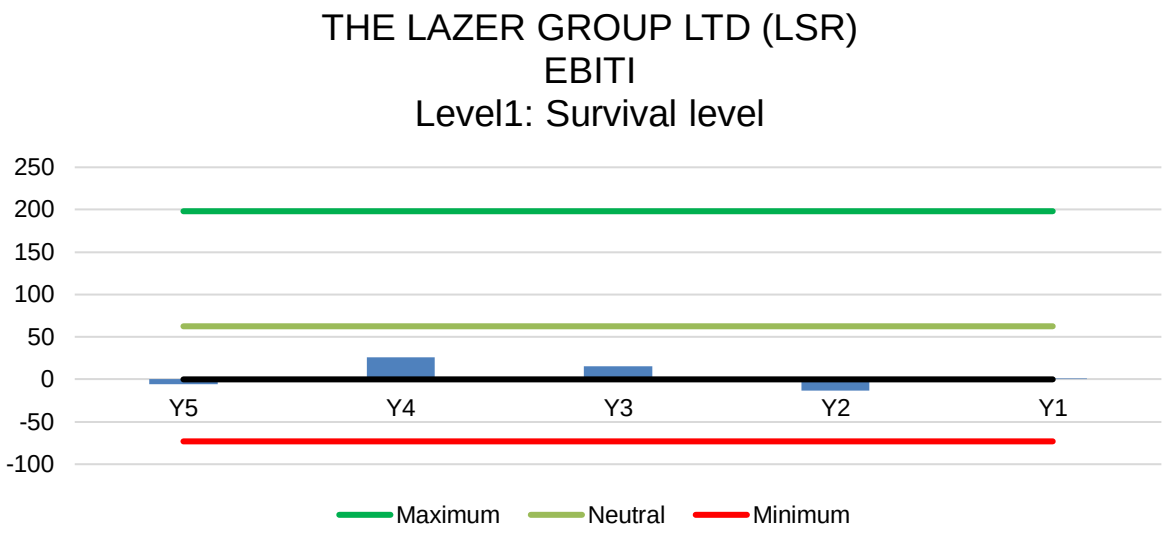
Table 6.27: The Lazer Group Ltd (LSR)

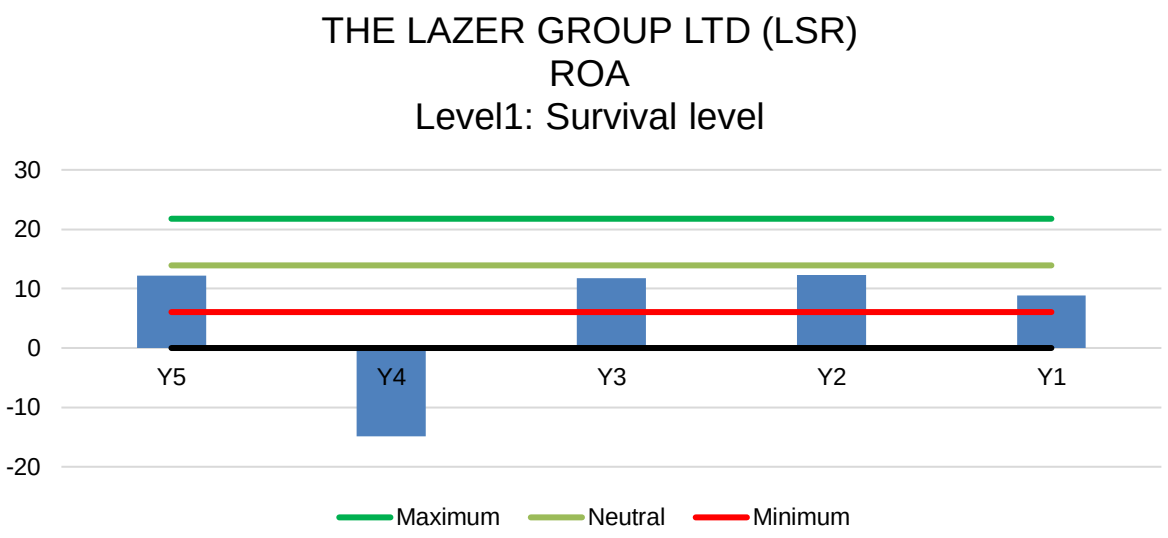
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	9,99	-33,91	13,28	11,99	-4,78
	EBITI	-5,55	26,29	15,72	-13,19	0,08
	ROA	12,17	-14,85	11,73	12,31	8,81
Level 2: SFP	CFTD	25,75	-8,45	25,11	33,99	5,65
	TATO	1,12	1,43	1,05	1,21	1,28

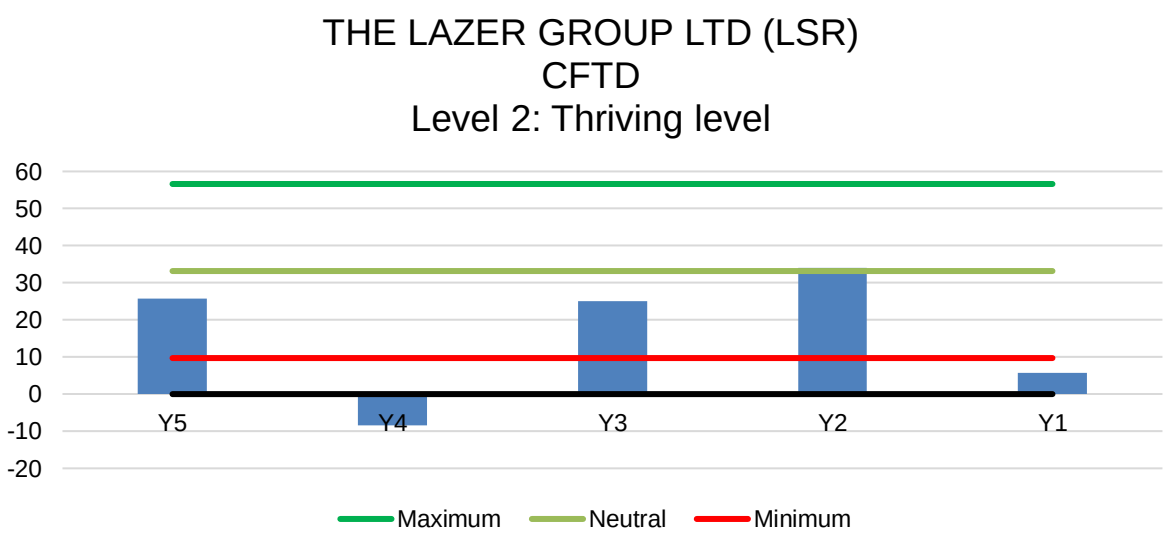
Source: INETBFA (2018)

According to the BPIA displayed in Table 6.27, ROE in Y1 was negative, which is never a positive indicator. Hagstrom (2013:1) says Warren Buffet defines the success of Bershire Hathaway investors as an increase in the book value of equity. Y2 increased to a positive 11.99 and continued to increase in Y3 to 13.28, but in Y4 had added to 14.85. These two ratios looked at together is a good measure of management's operational performance whether management is efficiently using company assets to generate profits. The ROE is whether management is efficiently utilising the capital they have been entrusted with to make profits. Graphical demonstration of Level 1 testing is shown in Figure 6.14 below.




THE LAZER GROUP LTD (LSR)
EBITI
Level1: Survival level
250
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


THE LAZER GROUP LTD (LSR)
ROA
Level1: Survival level
30
20
10
0
-10
-20
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


THE LAZER GROUP LTD (LSR)
CFTD
Level 2: Thriving level
60
50
40
30
20
10
0
-10
-20
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

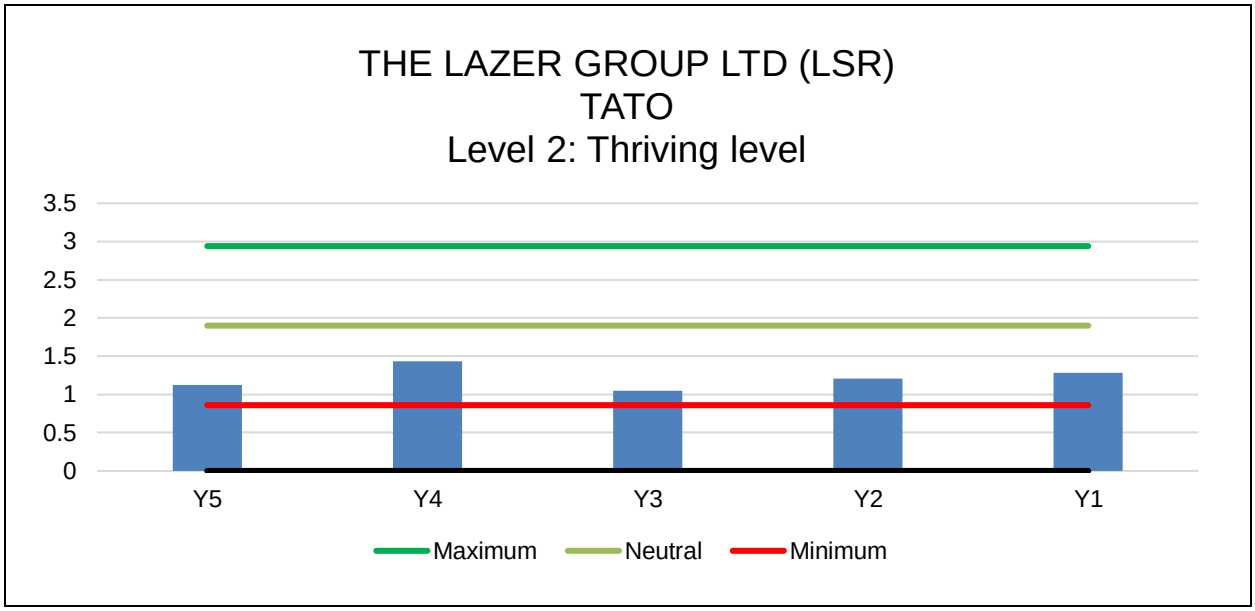


Figure 6.14: Level test: The Lazer Group Ltd (LSR)

Source: INETBFA (2018)

Figure 6.14 shows testing Level 1 should cease in Y4 as in Y5 interest cover shows a negative ratio (5.55) after recovering from the negative ratio in Y2 of (13.19). For the five years of testing before failure, the EMS model indicates LSR has no reason to be concerned as the company is classified as being safe (almost certain to succeed). Unlike the BPIA, in Y1 it already indicated a negative ROE and an extremely low EBITI meaning LSR is not even able to repay their interest once with their earnings. In Y2 EBITI is negative being a clear sign of distress. Because LSR is unable to cover their interest repayment it causes an increase in its financial risk. The BPIA has proven to be a better distress indication tool. The testing of the Net 1 Applied Technology Holdings Limited (APL) follows.

Net 1 Applied Technology (APL)

Net 1 Applied Technology (APL) operates in the hardware sector within the technology industry on the JSE. Net 1 Applied Technology is a consultancy service company founded in 1989 and is headquartered in Johannesburg, South Africa. Net 1 Applied Technology provides hardware for short-term loans, smart cards, other hardware and software products. They also offered administrative, management and payment of social welfare

grants and pensions on behalf of government. Net 1 Applied Technology failed in 2004 and the period under review is expressed in Table 6.28 below.

Table 6.28: Net 1 Applied Technology Holdings Ltd (APL)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,63	0,70	0,60	0,28	0,33
X2	RE/TA	3,26	0,42	0,36	0,23	0,08	0,02
X3	EBIT/TA	6,72	0,26	0,26	0,32	0,20	0,10
X4	BVE/TL	1,05	3,31	4,74	3,81	2,72	2,55
Z-score			13,97	15,74	14,09	9,55	8,83
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

For the period under review, five years prior to failure, the EMS model portrayed APL falls within the safe zone indicating a strong credit profile according to the bond rate as shown in Table 6.28. Figure 6.15 give a visual view of the above.

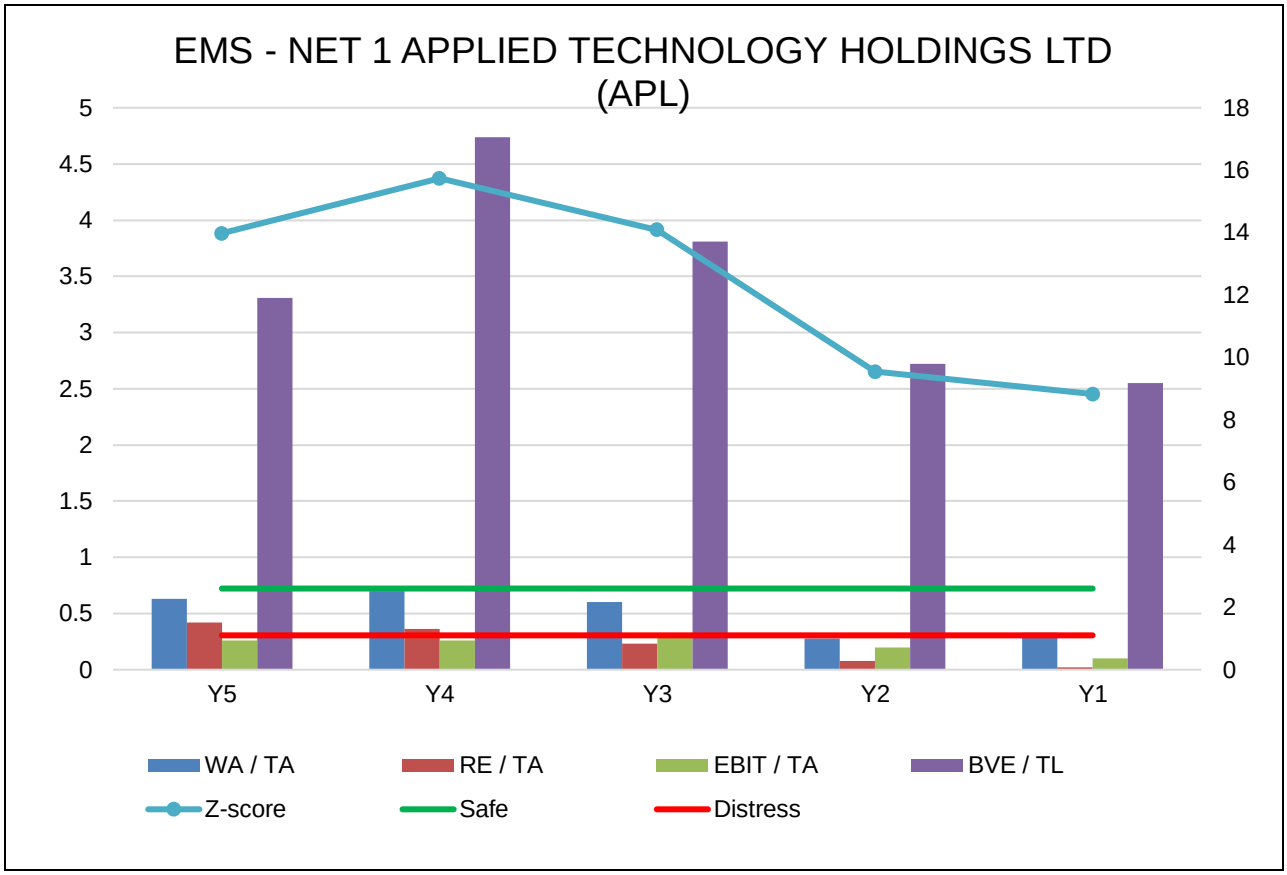


Figure 6.15: EMS: Net 1 Applied Technology Holdings Ltd (APL)

Source: INETBFA (2018)

The safe zone is the welcomed zone by companies as it indicated companies are financially sound (Ngwenya, 2018:664). Table 6.29 shows the testing for APL for the period analysed, applied the BPIA.

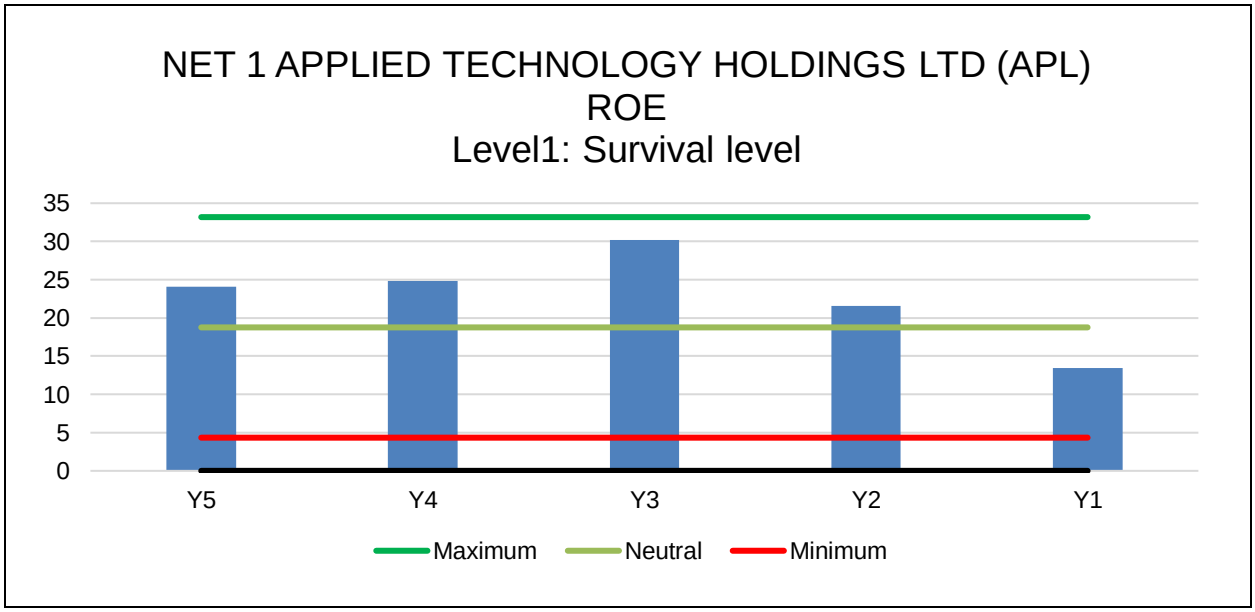
Table 6.29: Net 1 Applied Technology Holdings Ltd (APL)

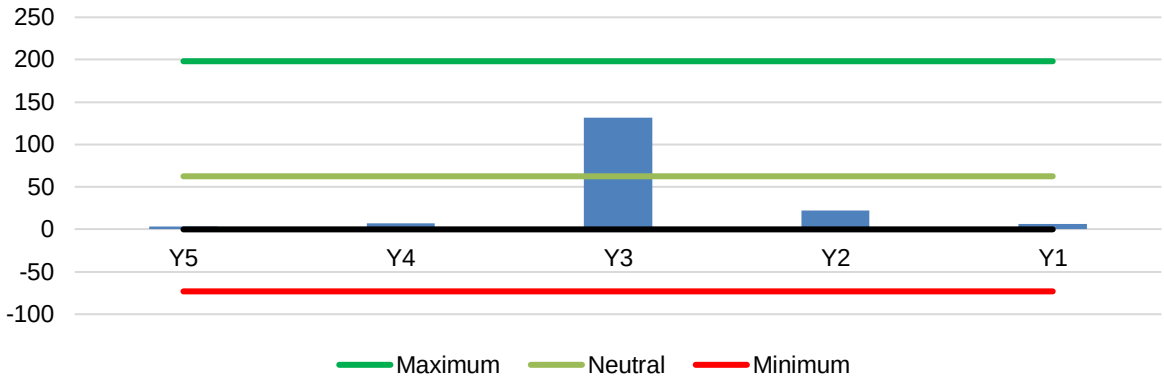
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	24,08	24,86	30,15	21,53	13,45
	EBITI	3,55	7,08	131,82	22,58	6,61
	ROA	26,23	27,41	34,18	31,14	15,47
Level 2: SFP	CFTD	14,77	139,92	167,24	72,39	66,23
	TATO	1,03	1,07	1,52	1,72	1,14

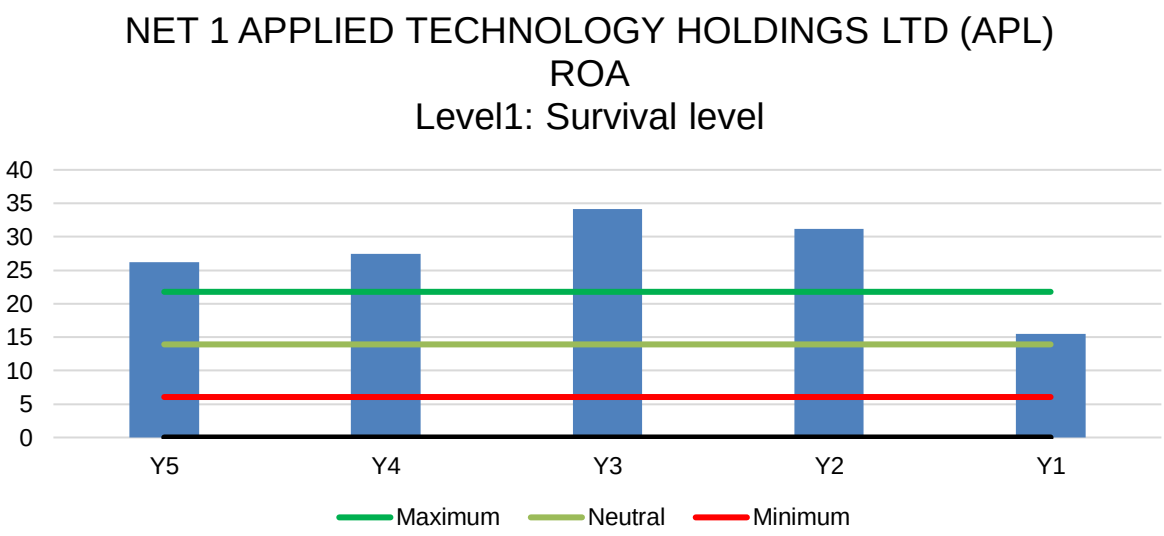
Source: INETBFA (2018)

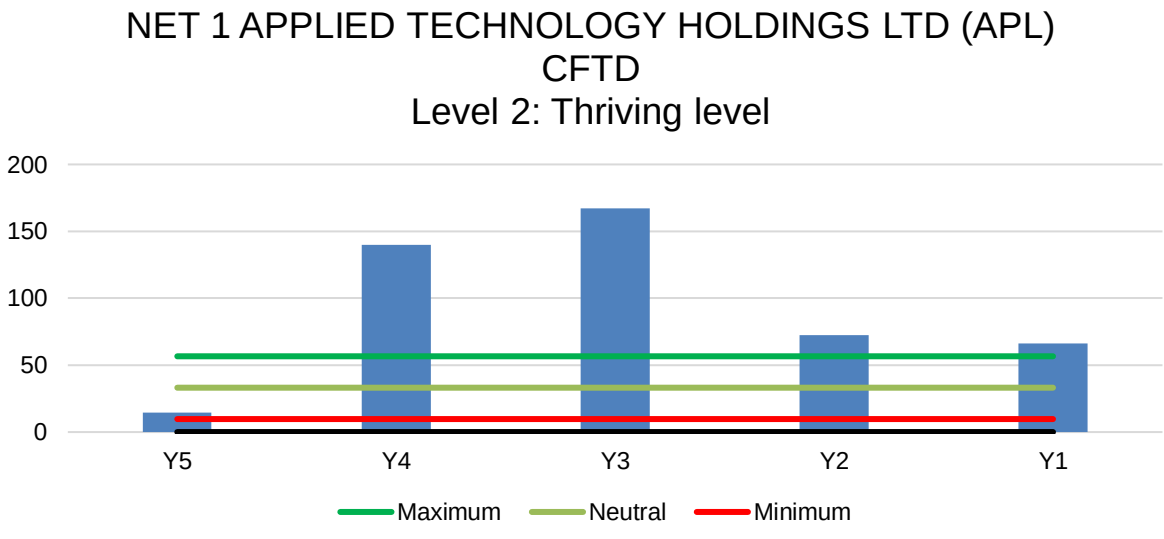
Table 6.29 displays that the bankruptcy prediction indicators for APL ratio Level 1 test highlight ROE in Y1 are above the minimum guidelines mark thereafter above the neutral level in Y2 to Y5. EBITI also indicates health ability to make timely interest repayments, Y1=6 times, Y2=22 times, Y3=131 times, Y4=7 times and in Y5=3 times. According to Walsh (2010:126), when interest cover is above 5 times the company is classified as a successful company. ROA follows the same trend like that of ROE, the only difference in Y1 it is above the guidelines minimum level and from Y2 to Y5 it is above the maximum level guideline mark.

With Level 2 testing an in-depth analysis was conducted of CFTD investigating the reason for the increase in the ratio, Y1 increased by 35%, Y2 toY3 increased with 81%, Y3 toY4 increased with 8% and 38% in Y4 toY5. While total debt also increases in Y1 to Y2 with only 18% compared to the 35% increase in cash flow resulting in a ratio increase from Y1 to Y2. In Y2 to Y3 the total debt decreased by 22% resulting in an increase in the ratio as the increase in the cash flow was greater than that of the total debt. In Y3 to Y4 total debt increased by 9% causing the ratio to decline as the decrease in the total debt was 1% bigger than the 8%. In Y4 to Y5 a 78% increase in total debt compared to 38% increase in cash flow. This resulted in a decrease in the ratio. A better explanation is given in Figure 6.16.




NET 1 APPLIED TECHNOLOGY HOLDINGS LTD (APL)
EBITI
Level1: Survival level
250
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


NET 1 APPLIED TECHNOLOGY HOLDINGS LTD (APL)
ROA
Level1: Survival level
40
35
30
25
20
15
10
5
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


NET 1 APPLIED TECHNOLOGY HOLDINGS LTD (APL)
CFTD
Level 2: Thriving level
200
150
100
50
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

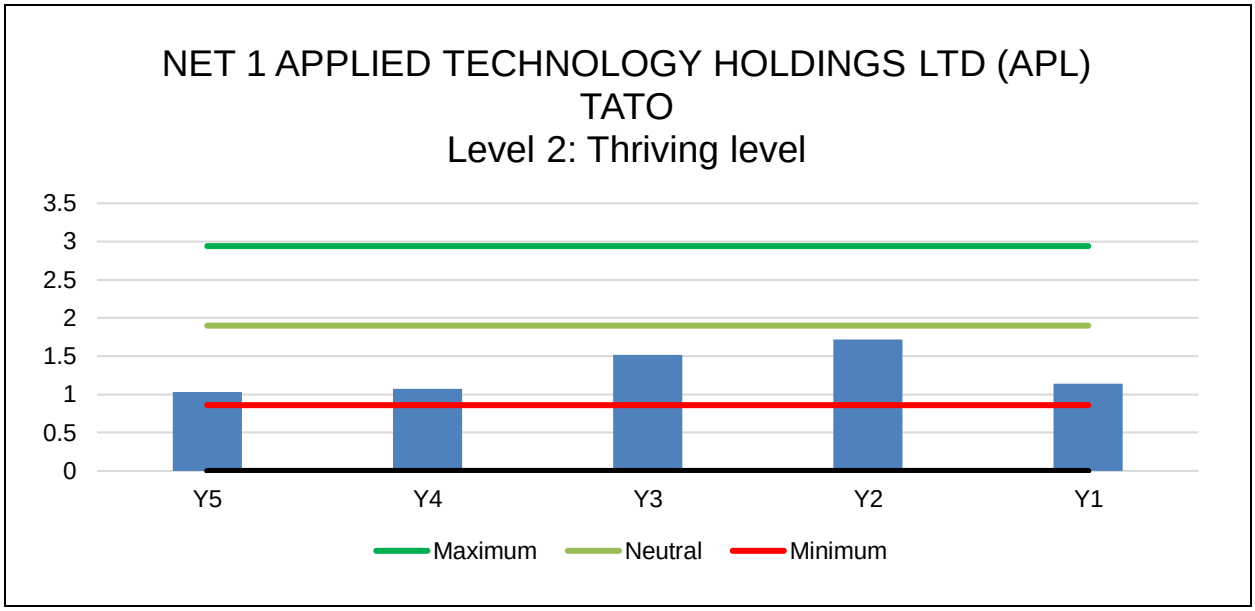


Figure 6.16: Level test: Net 1 Applied Technology Holdings Ltd (APL)

Source: INETBFA (2018)

No financial distress could be detected as graphically indicated in Figure 6.16. According to the EMS, APL is safe meaning there is no sign of concern for the five years prior to being failed. The BPIA also indicates favourable ratios over the five years of testing preceding delisting for both levels of testing. Due to the BPIA inability to predict bankruptcy this stirred up the inspiration for further investigation. According to Bloomberg (2020) Net 1 Applied (APL) misstated their financial statements specifically their profits. APL had a contract with the South African government to pay welfare grants, but they would pay out the grants and later claim the funds back from government. This continued for five (5) years with APL honouring the agreement while the government did not. This forced APL to submit an application with the South African high court that ruled in the governments favour statingthe contracted entered into by APL and the government was invalid as the proper tender procedures where not followed. Judgement was APL has no case and the money they have received should be returned with interest. Next the Global Technology Limited (GLT) is tested.

Global Technology (GLT)

Global Technology (GLT) a domestic information technology company based in Pretoria, South Africa that was established in 1998. The company provides information technology

solutions to the financial division of commercial, industrial and insurance companies also including banking institutions. Global Technology operated in the hardware sector within the technology industry was failed from the JSE in 2005**,** their EMS score are illustrated for five years under review in Table 6.30.

Table 6.30: Global Technology Ltd (GLT)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-1,16	-0,42	0,05	0,13	0,33
X2	RE/TA	3,26	-2,72	0,61	0,07	0,14	-0,01
X3	EBIT/TA	6,72	-0,36	-0,74	0,05	-0,30	0,24
X4	BVE/TL	1,05	-0,39	0,17	2,24	0,83	0,88
Z-score			-16,06	-2,31	6,49	3,41	7,92
Classification			**DISTRESS**	**DISTRESS**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

In Table 6.30 the EMS model indicated GLT is in the distress zone for Y4 and Y5 (>1.81). When categorised with the bond rating rate it indicates in Y4 and Y5 that GLT is an extremely high risk. Figure 6.17 is a better picture of the financial position of GLT according to the EMS model.

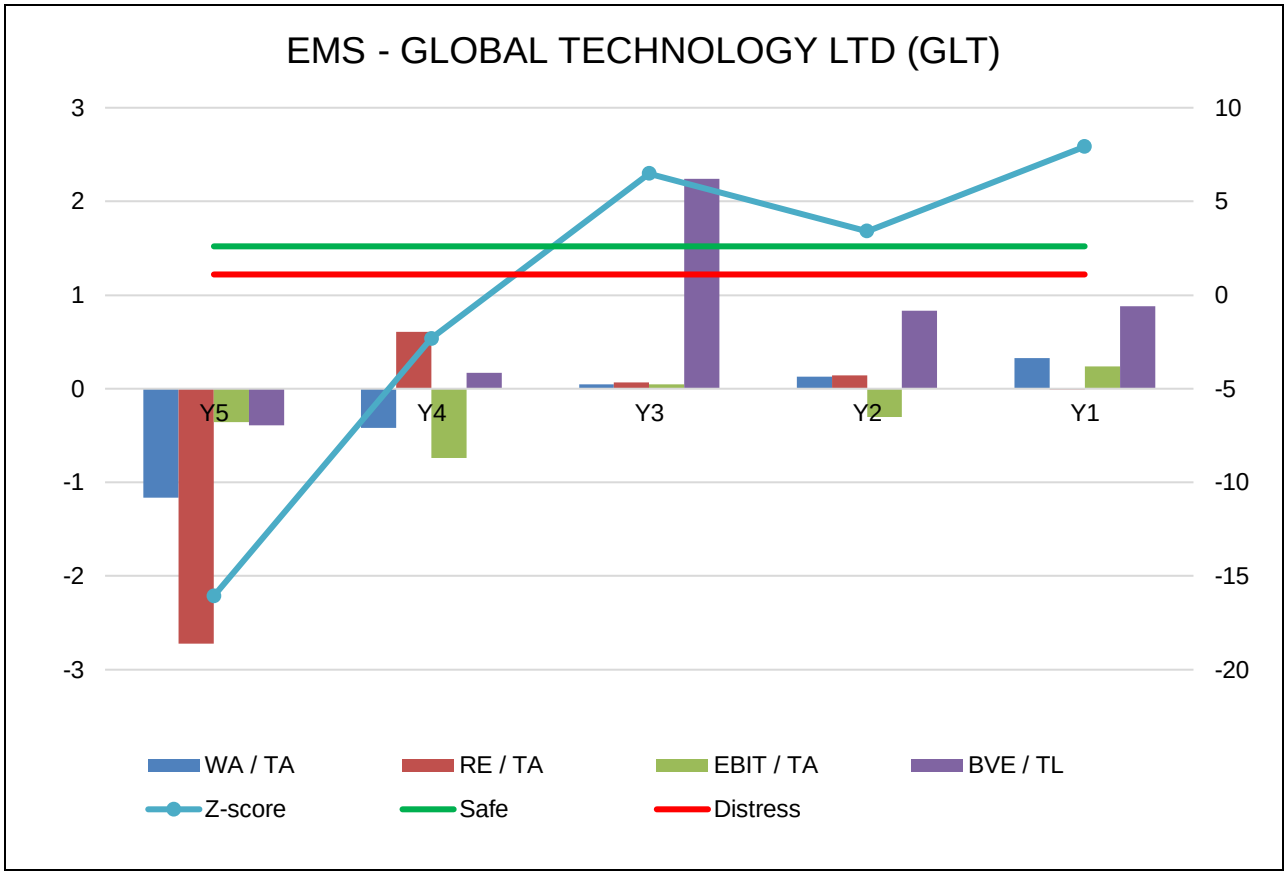


Figure 6.17: EMS: Global Technology Ltd (GLT)

Source: INETBFA (2018)

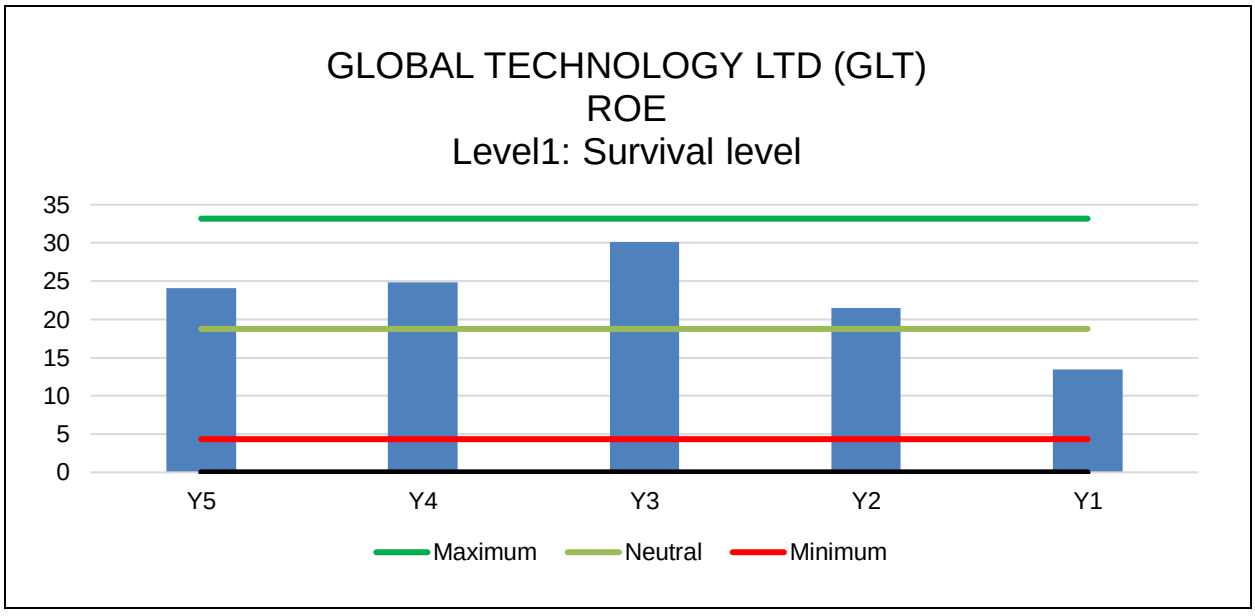
A warning sign of financial trouble is indicated in Figure 6.16 and is clearly shown to be in Y4 and Y5, while Y1 to Y3 GLT was within the safe zone. Table 6.31 reports whether there is any financial concern with regard to GLT that failed in 2005 for the period under review using the bankruptcy prediction bankruptcy. This display is done in Table 6.31 below.

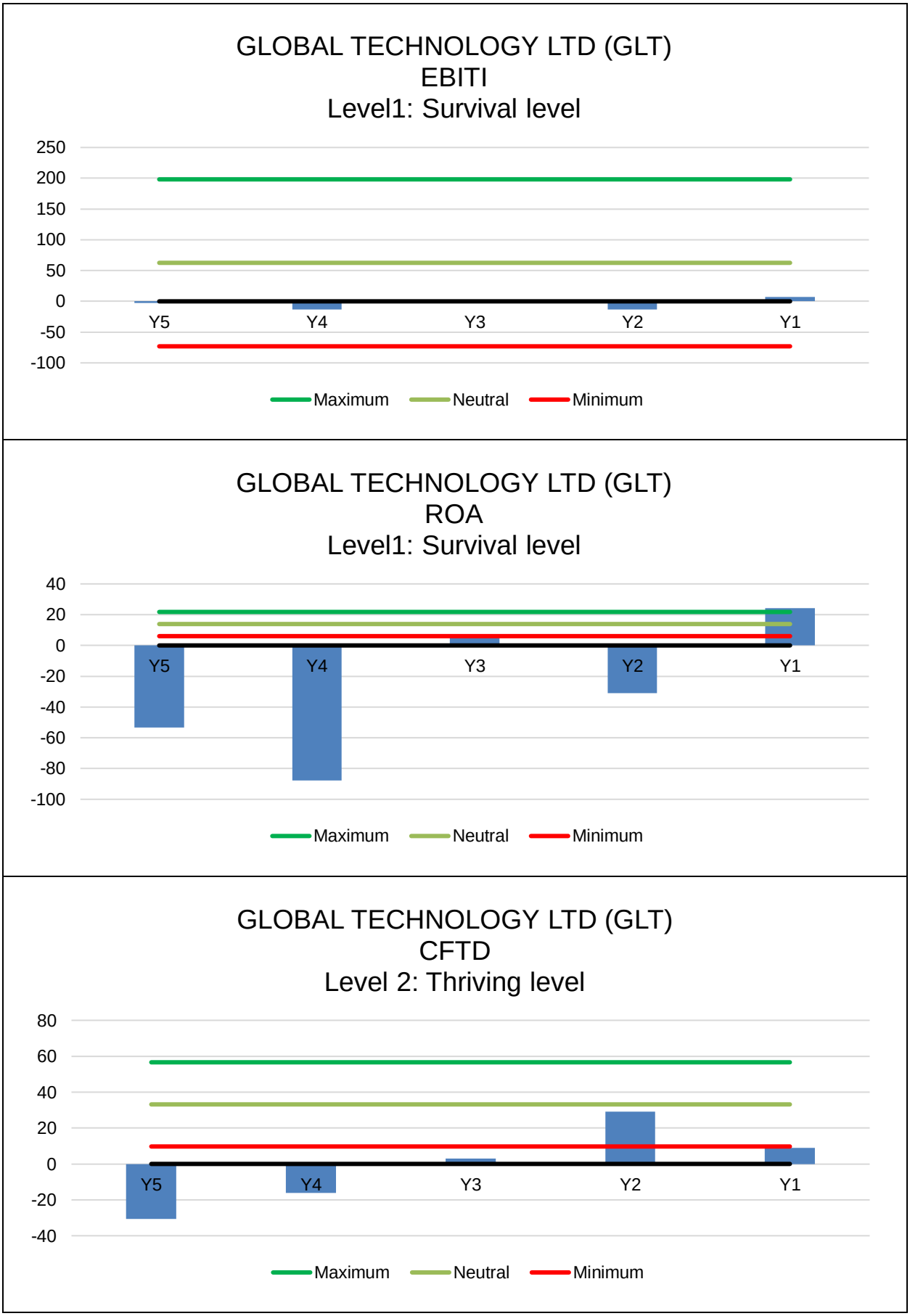
Table 6.31: Global Technology Ltd (GLT)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	111,67	-1035,01	29,66	-83,78	20,92
	EBITI	-2,73	-13,14	2,78	-13,6	7,20
	ROA	-53,32	-87,78	5,83	-31,07	24,13
Level 2: SFP	CFTD	-30,72	-16,18	2,86	29,05	8,91
	TATO	3,98	1,42	1,11	1,70	2,47

Source: INETBFA (2018)

Table 6.31 reveals the bankruptcy prediction indicators for GLT indicate the ROE, EBITI and ROA ratios are concerning in Y2 as they are all three negatives. The ratios did improve in Y3 to worse off financially in Y4 with significant negative ratios ROE= (1035.01), EBITI = (13.14) and ROA= (87.78). A visual illustration is given in Figure 6.18 below.




GLOBAL TECHNOLOGY LTD (GLT)
EBITI
Level1: Survival level
250
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
GLOBAL TECHNOLOGY LTD (GLT)
ROA
Level1: Survival level
40
20
0
-20
-40
-60
-80
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
GLOBAL TECHNOLOGY LTD (GLT)
CFTD
Level 2: Thriving level
80
60
40
20
0
-20
-40
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

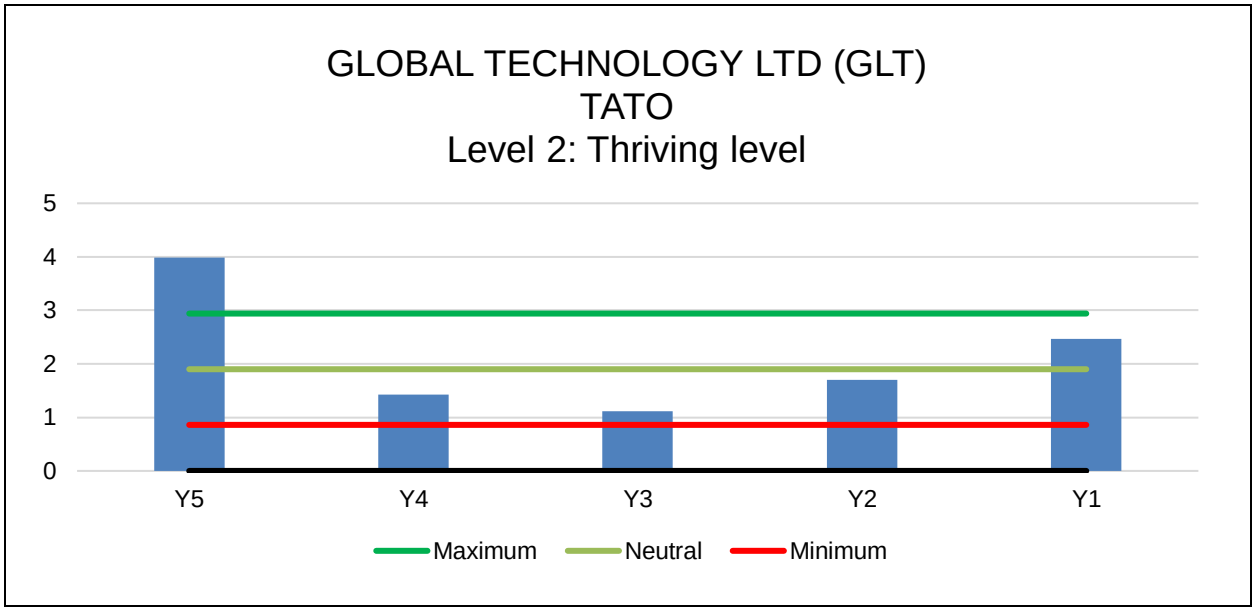


Figure 6.18: Level test: Global Technology (GLT)

Source: INETBFA (2018)

The discontinuing of Level 1 testing in Y2 is underlined in Figure 6.18. Inspection of the negative ratios need to be done, to indicate if a timely solution can be obtained if so, apply and move on to the Level 2 testing. For Y1toY3 GLT is within the safe zone and in Y4 and Y5 it is classified as being in distress. Correia *et al.* (2015:5.30) note that distress is indicated by the EMS model as the company is almost certain to fail. Contrary to the EMS model the BPIA already indicated financial distress concerns in Y2 with abnormally high negative ROE of 83,78) ROA of 31,07 and negative EBIT of 13,6. The BPIA also indicates with CFTD Y2─Y3 declined and in Y4, GLT was unable to cover their debts with cash meaning there was no cash to cover company debts and the financial situation worsened by 90% in Y5. There is a further increase in the negativity and abnormality of the ratios. When ratios are abnormally high, the door is open to possible financial statement manipulation (Albrecht, Albrecht, Albrecht & Zimbelman, 2019:157). This shows that the BPIA was able to detect financial distress two years before the EMS model was able to. This indicates that the BPIA is an adequate bankruptcy prediction or financial distress indication instrument. The Frontrange Limited (FRO) is the next company that was tested.

Frontrange Limited (FRO)

Frontrange Limited (FRO) functioned in the software sector in the technology industry. FRO offered client-service software developed for internet applications as well as providing related products and services. FRO is based in Johannesburg, South Africa and founded in 1989 and failed in 2006. The EMS is presented in Table 6.32.

Table 6.32: Frontrange Limited (FRO)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,13	0,05	0,07	0,08	0,28
X2	RE/TA	3,26	-0,1	-0,17	-0,72	0,00	0,72
X3	EBIT/TA	6,72	0,07	-0,01	0,00	-0,55	-0,77
X4	BVE/TL	1,05	0,92	0,65	0,66	0,74	1,58
Z-score			5,21	3,64	2,06	0,86	3,92
Classification			**SAFE**	**SAFE**	**GREY**	**DISTRESS**	**SAFE**

Source: INETBFA (2018)

Table 6.32 suggests the EMS for FRO falls within the safe zone representing a strong credit profile in Y1, Y4 and Y5. In Y2 the distress zone being extremely high risk and in Y3 adequate credit profile representing the grey zone is revealed. The layout of the ratios can be shown within the diagram in Figure 6.19

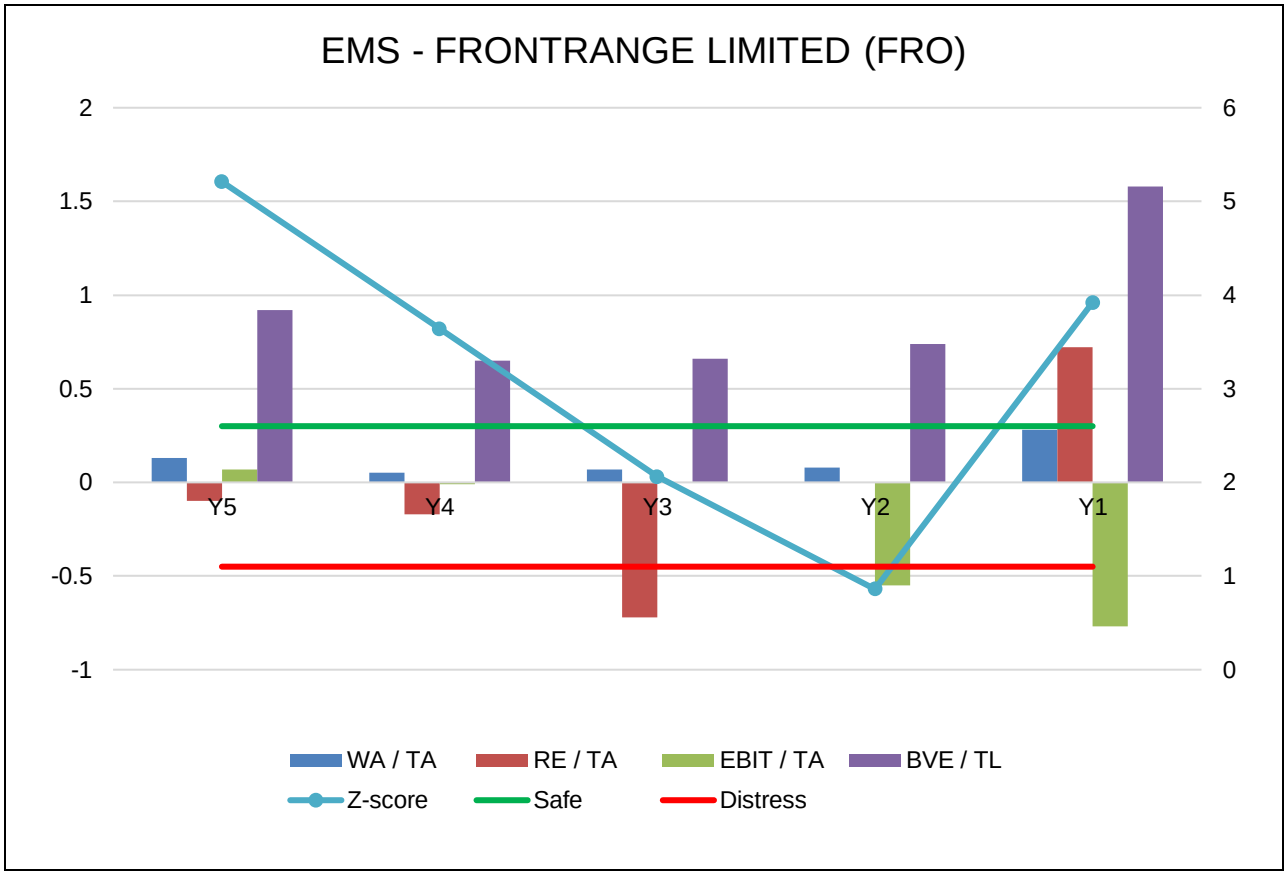


Figure 6.19: EMS: Frontrange Limited (FRO)

Source: INETBFA (2018)

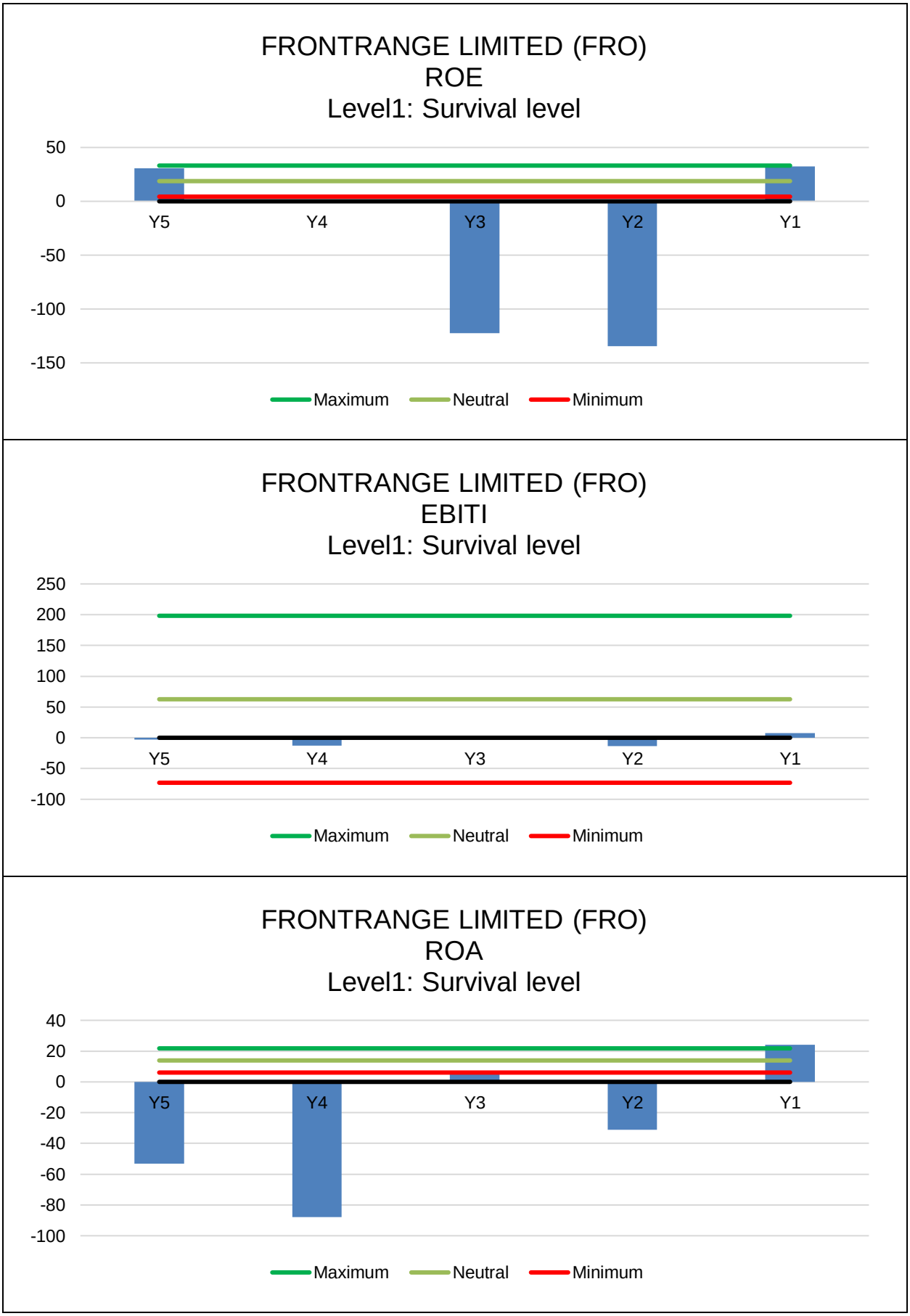
As presented in Table 6.32, the EMS indicated FRO moved from safe to distress to grey and back to safe zone showing in Y4 and Y5 thus FRO have no concerns regarding their financial position. The bankruptcy prediction indicators are applied for testing in Table 6.33 to determine if the same or a similar interpretation can be derived from the BPIA compared to the EMS results.

Table 6.33: Frontrange Limited (FRO)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	30,56	0,92	-122,42	-134,32	32,41
	EBITI	82,05	0,19	-22,70	-47,96	22,14
	ROA	8,68	0,60	-65,26	-91,97	16,98
Level 2: SFP	CFTD	14,60	28,66	-26,23	-86,79	152,03
	TATO	1,68	2,74	2,00	1,38	0,46

Source: INETBFA (2018)

All ratios in Table 6.33 in Y1 demonstrate strength, ROE and ROA fall above the neutral guideline zone and EBITI is r above the 5times successful company mark. Y2 the warning signs were emphasised for all three Level 1 ratios, ROE= (134.32), EBITI= (47,96) and ROA= (91.97) and this trend continued in Y3. In Y2 FRO also experience significant cash flow problems that improved in Y3 but still negative. TATO shows no signs of concern below minimum Level in Y1 and above minimum is Y2 and % and above neutral level in Y3 and Y4. TATO indicates that the company is using the current company assets whereas ROA indicates that those same assets are generating profit. TATO indicates that the assets are being used, being the reason for the positive ratio. Figure 6.20 below reveals at this point Level 1 testing should cease and investigation into the ratios should begin.


FRONTRANGE LIMITED (FRO)
ROE
Level1: Survival level
50
0
-50
-100
-150
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
FRONTRANGE LIMITED (FRO)
EBITI
Level1: Survival level
250
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
FRONTRANGE LIMITED (FRO)
ROA
Level1: Survival level
40
20
0
-20
-40
-60
-80
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

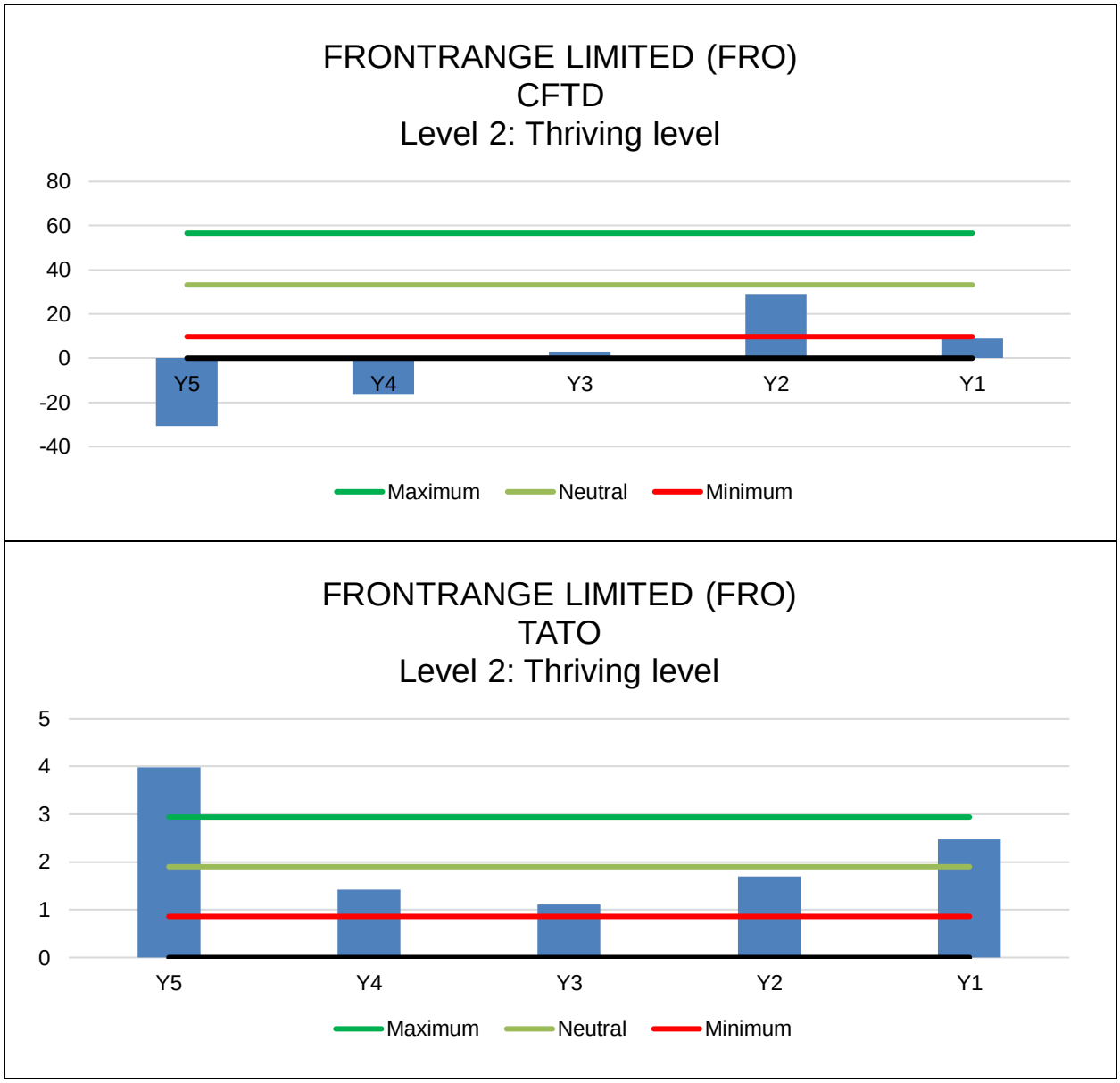


Figure 6.20: Level test: Frontrange Limited (FRO)

Source: INETBFA (2018)

Figure 6.20 a graphical layout depicts testing should stop to investigate the areas of concern. FRO revealed in Y1 and Y2 that the net income was negative. ROE in Y2 toY3 the equity (being the denominator) decreases by 41% causing the ratio to decrease.

EBITI decreased with 16% followed by an 89% further decline. The decrease in EBITI effects ROE and ROA. Total assets declined by 58%, resulting in the ratio decreasing. FRO's cash flow from operations was at a loss in Y2 and Y3. A cause of concern and

signalling distress as both the company's assets and equity decrease by 85% in Y3 and Y4. The decline is clearly displayed in Figure 6.20 above.

The EMS for FRO demonstrated the company's financial condition is healthy (safe) in Y1. While Y2 indicates the company is in distress. The company's financial condition bettered in Y3 to the grey zone. According to Correia *et al*. (2015:5.30) it is the zone of uncertainty. Y4 and Y5 shows that FRO is in the safe zone again. However, BPIA reveals that in Y1 FRO has an abnormal CFTD ratio and dropped significantly to a negative ratio. In Y2 both levels of testing indicate financial distress with high negative ratios and Y3 still on a negative trend. In Y4 the ratio is positive but still concerning as it does not mean because the ratio is positive it does not signal distress. In Y4 the ROE shows that the shareholders obtain a very low return from their investment, 92c for every R1 they invested. The ROA indicates that FRO is unable to generate returns from their available assets and EBITI demonstrates FRO's inability to repay their interest with their earnings. Beget Holdings was tested next.

Beget Holdings (BEE)

Beget Holdings (BEE) was founded in 2001 and specialised in the development and the marketing of GSM (Global system for mobile communications) communication technology software, applications, solutions, cellular technology applications including e-commerce and mobile commerce solutions. Beget located in Centurion operated within the hardware technology industry in South Africa and failed in 2011. The trend of the EMS is monitored in Table 6.34 below.

Table 6.34 Beget Holding Limited (BEE)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-0,09	-0,37	-3,11	-0,54	-0,48
X2	RE/TA	3,26	-1,50	-1,73	-5,89	-0,61	-1,97
X3	EBIT/TA	6,72	0,12	0,32	-4,57	-0,26	-0,48
X4	BVE/TL	1,05	0,10	0,16	-0,80	0,10	-0,13
Z-score			5,21	-2,50	-67,90	-3,92	-9,68
Classification			**SAFE**	**DISTRESS**	**DISTRESS**	**DISTRESS**	**DISTRESS**

Source: INETBFA (2018)

From Y1 to Y4 as shown in Table 6.34, the EMS model implies that BEE falls within the distress zone, which suggests the company is extremely high risk. In Y5 BEE's EMS moves to the safe zone meaning BEE moved to an extremely high risk for four years and suddenly moves to a strong credit profile without first moving to the adequate credit profile. Figure 6.21 clearly displays the movement from one year to another of BEE.

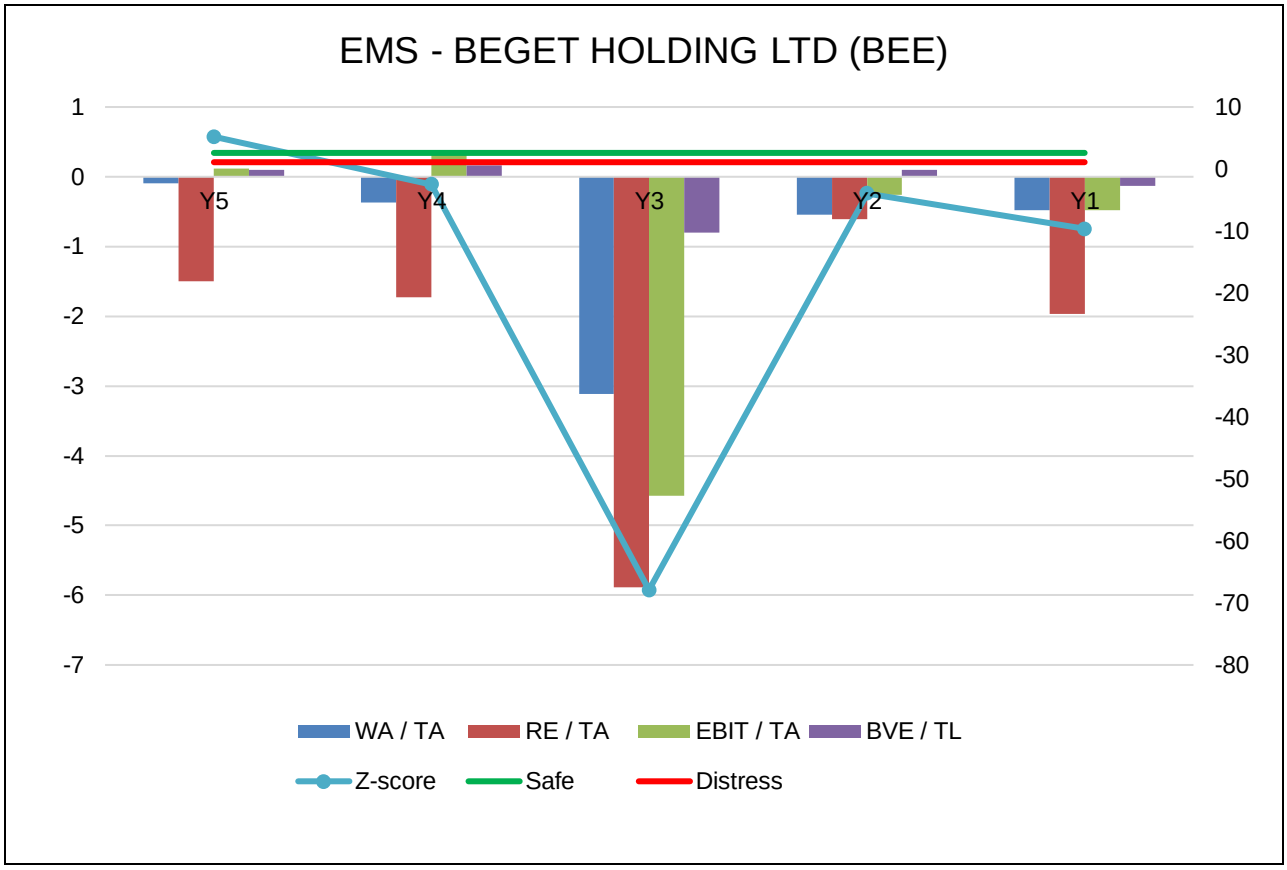


Figure 6.21: EMS: Beget Holding Limited (BEE)

Source: INETBFA (2018)

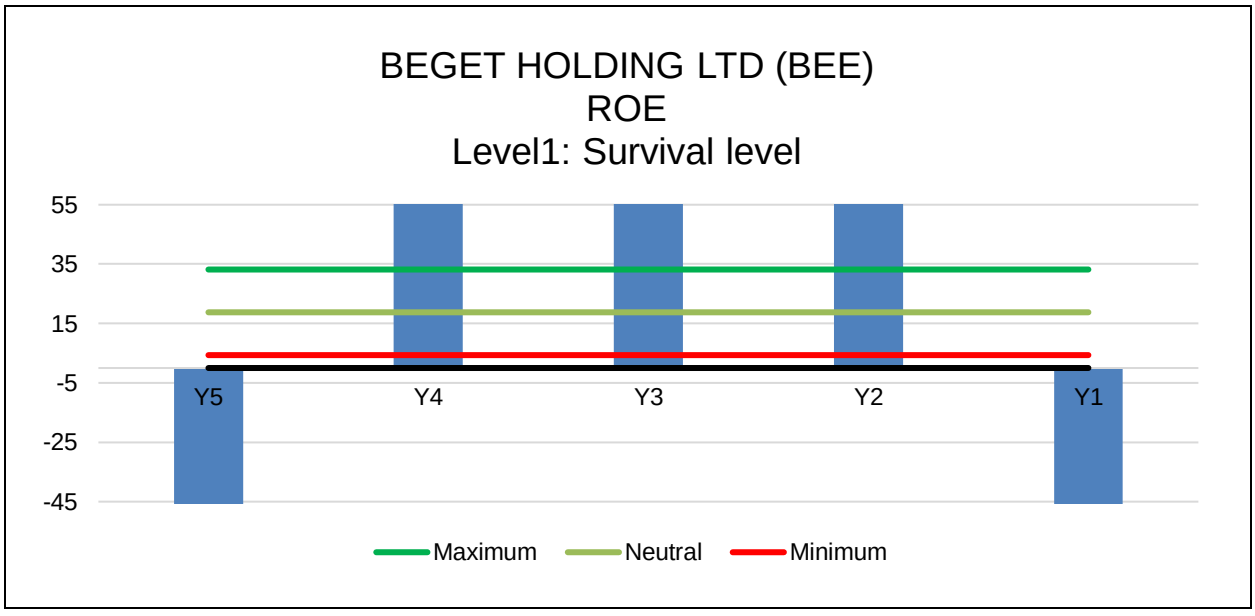
As indicated in Figure 6.21 BEE's financial trouble could have started before the five years prior to failure as the Y1 being five years prior to failure BEE was already in the distress zone, the extremely high-risk zone. These results are mirrored within the BPIA testing in Table 6.35.

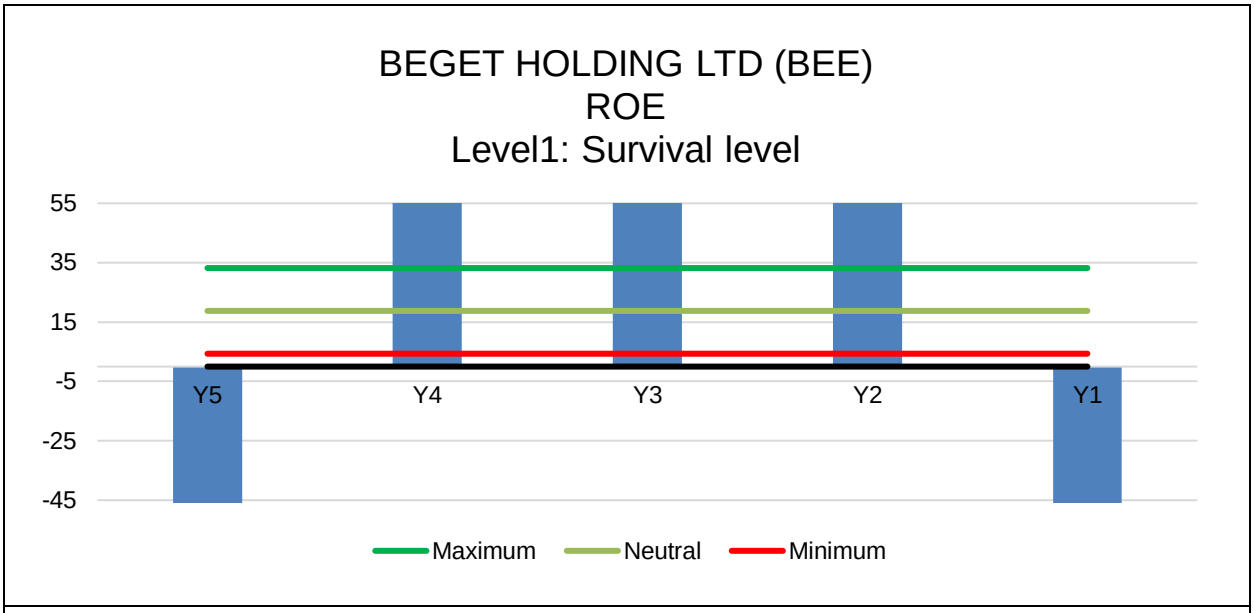
Table 6.35: Beget Holding Ltd

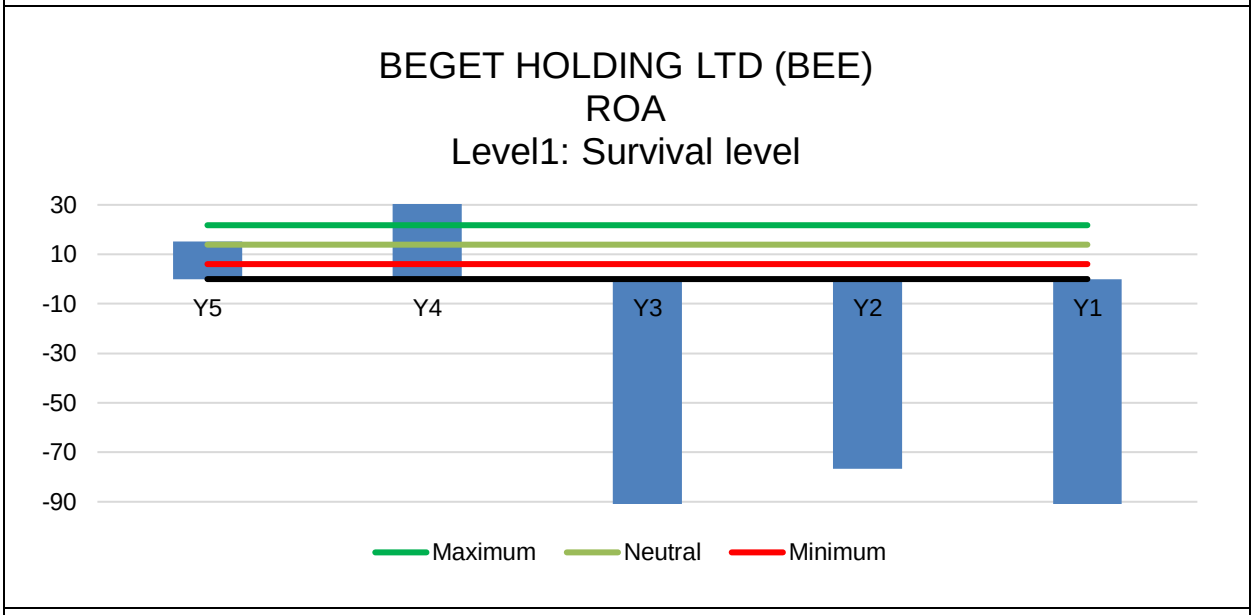
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	-63,81	305,39	132,44	277,62	-668,87
	EBITI	1,63	4,00	-7,84	-24,66	-354,63
	ROA	15,29	62,26	-660,70	-76,65	-233,65
Level 2: SFP	CFTD	-1,70	3,56	-5,74	-41,79	105,11
	TATO	2,38	1,28	4,97	1,80	0,70

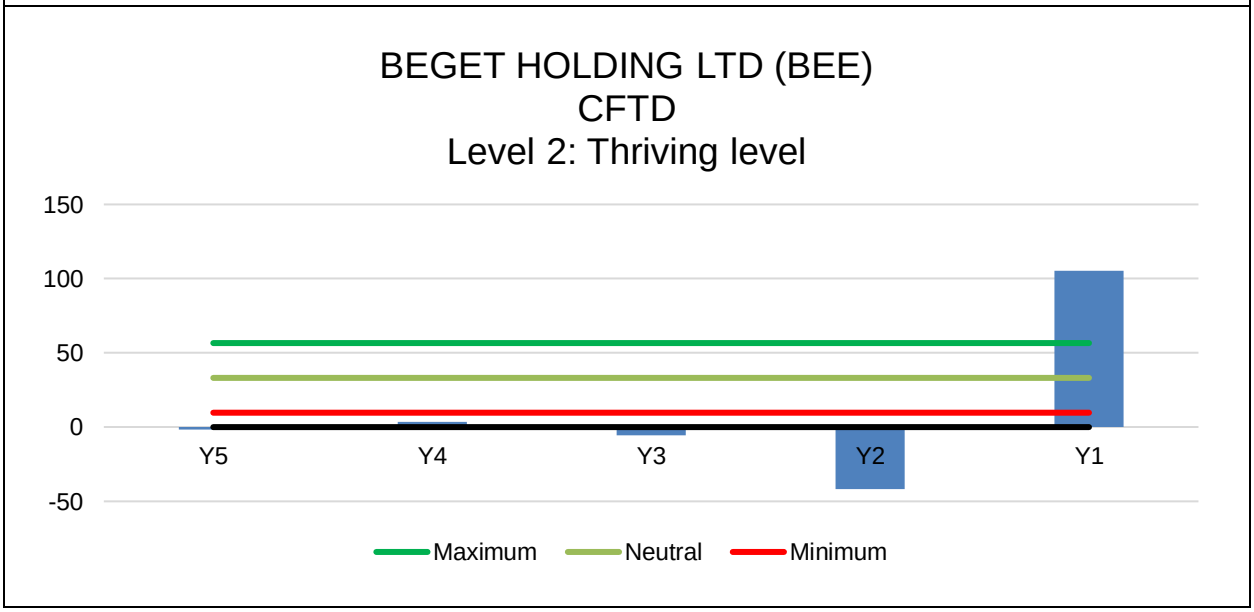
Source: INETBFA (2018)

In Y1 of Level 1 testing, Table 6.35 portrays that financial distress was evident, testing will pause with the aim of embarking on an inquiry as to what is the cause of the high negative ratio. By only analysing financial statements of BEE the following is revealed: Y1 held a decline total equity had 53% and total assets of 37%. A graphical display is shown in Figure 6.22.




BEGET HOLDING LTD (BEE)
ROE
Level1: Survival level
55
35
15
-5
-25
-45
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


BEGET HOLDING LTD (BEE)
ROA
Level1: Survival level
30
10
-10
-30
-50
-70
-90
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


BEGET HOLDING LTD (BEE)
CFTD
Level 2: Thriving level
150
100
50
0
-50
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

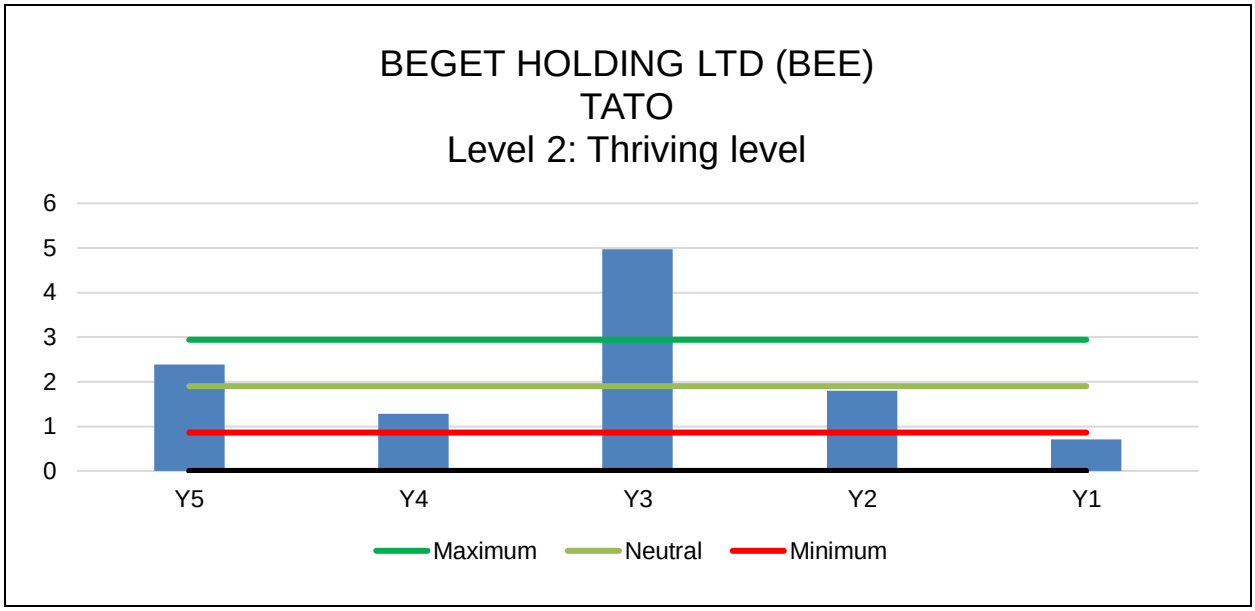


Figure 6.22: Level test: Beget Holding Ltd (BEE)

Source: INETBFA (2018)

Figure 6.22 illustrates BEE has been experiencing financial difficulty four years prior to failure. Who knows if the company acted immediately could this situation have been saved? According to EMS, BEE is in distress for the four years prior to failure (Y1 to Y4) and within the safe zone, in one year before failure. Contra to the EMS the BPIA signals distress warning signs five years prior to delisting. As the ratio for both levels of testing is negative and abnormal, Cassim (2015:198) posits it is a serious warning sign that the ratio is found to be abnormally high or higher than the norm as indicated in Figure 6.22 above. In Y5 the BPIA compared to EMS indicates BEE's financial condition is safe (success being almost certain). Therefore, BPIA is a better tool to indicate financial distress than the renowned EMS. The African Cellular Tower's (ATR) testing follows.

Africa Cellular Towers (ATR)

Africa Cellular Towers (ATR) installs towers and power lines primarily in South Africa. They also have other business units that comprise cellular towers, power lines and equipment shelters and is a specialist in these business units. Africa Cellular Towers were established in 1999 and headquartered in Johannesburg in South Africa and functioned within the technology software sector. Africa Cellular Towers Ltd (ATR) failed in 2016 and an EMS score is demonstrated in Table 6.36 further down.

Table 6.36: Africa Cellular Towers Ltd (ATR)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,50	0,67	0,66	0,51	0,72
X2	RE/TA	3,26	0,41	0,52	0,25	0,26	0,28
X3	EBIT/TA	6,72	-0,62	-0,32	0,12	0,21	0,25
X4	BVE/TL	1,05	2,34	4,53	3,69	2,15	3,01
Z-score			6,16	11,95	13,08	11,11	13,73
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

ATR's EMS score in Table 6.36 is displayed as within the safe zone throughout the period under review, having a strong credit policy. The EMS score results are presented in Figure 6.23 on the next page.

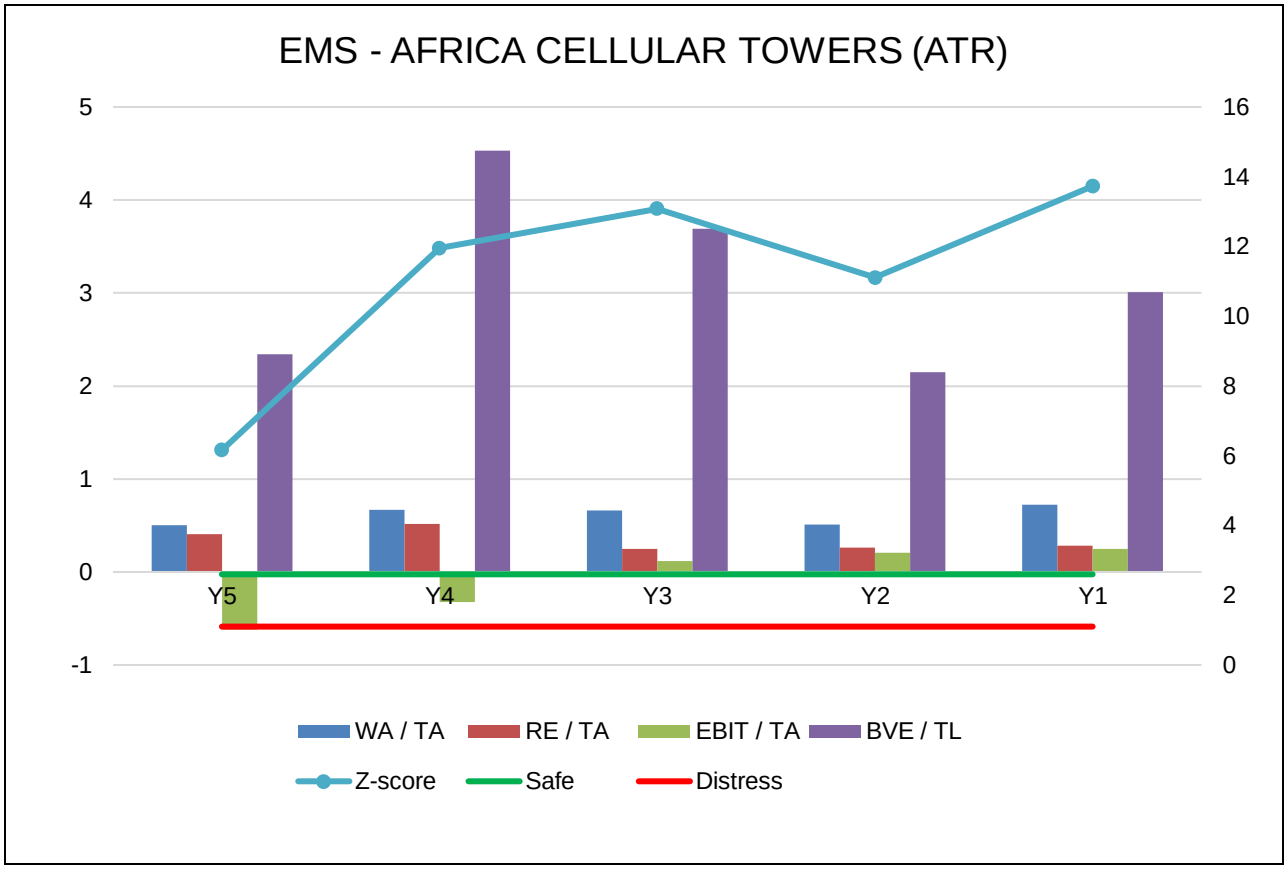


Figure 6.23: EMS: Africa Cellular Towers Ltd (ATR)

Source: INETBFA (2018)

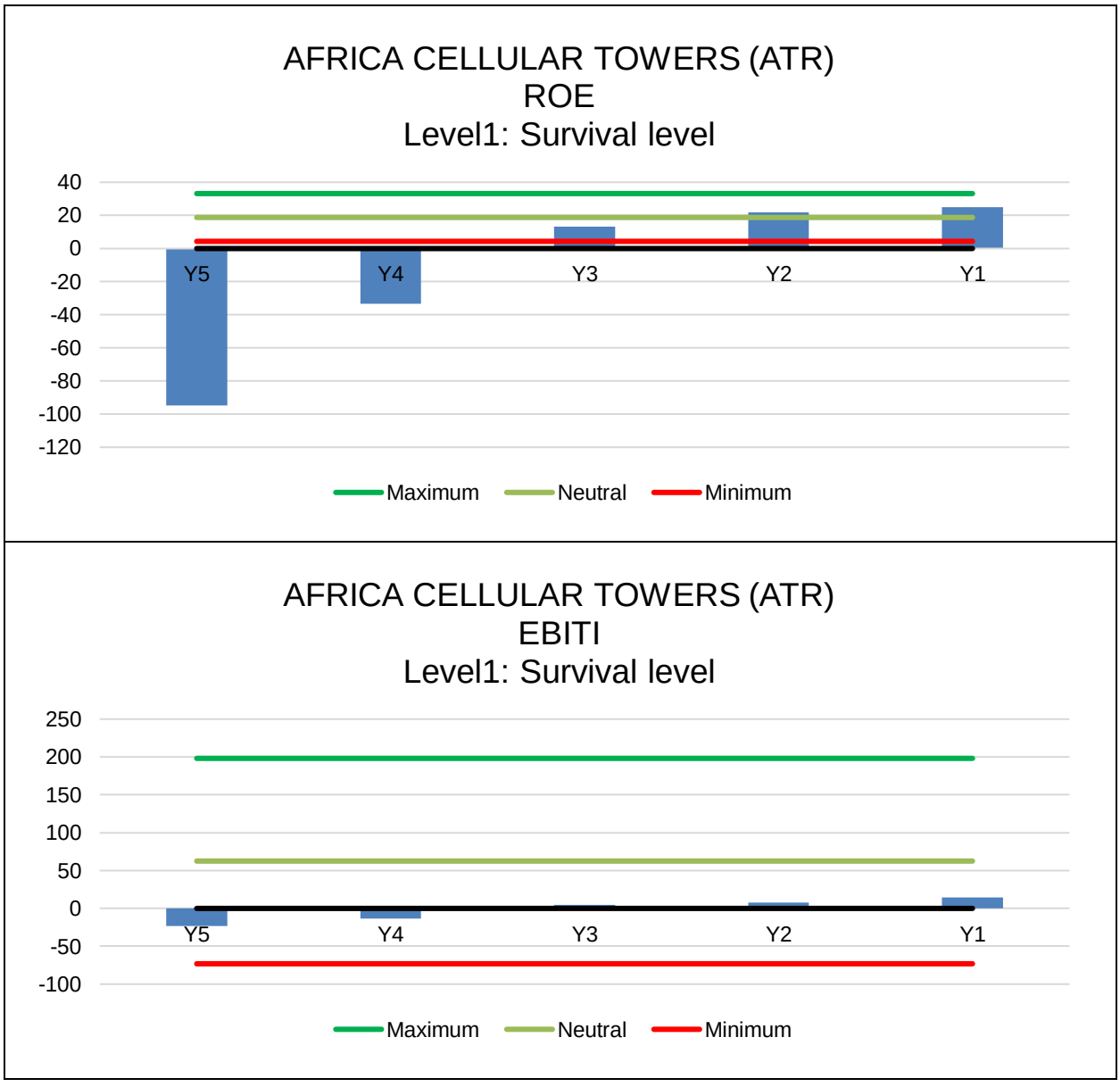
Itis apparent in Figure 6.23 that ATR has no reason to be concerned regarding their financial stance according to the EMS. Whether possible warning signs are on the cards are revealed in Table 6.37 below.

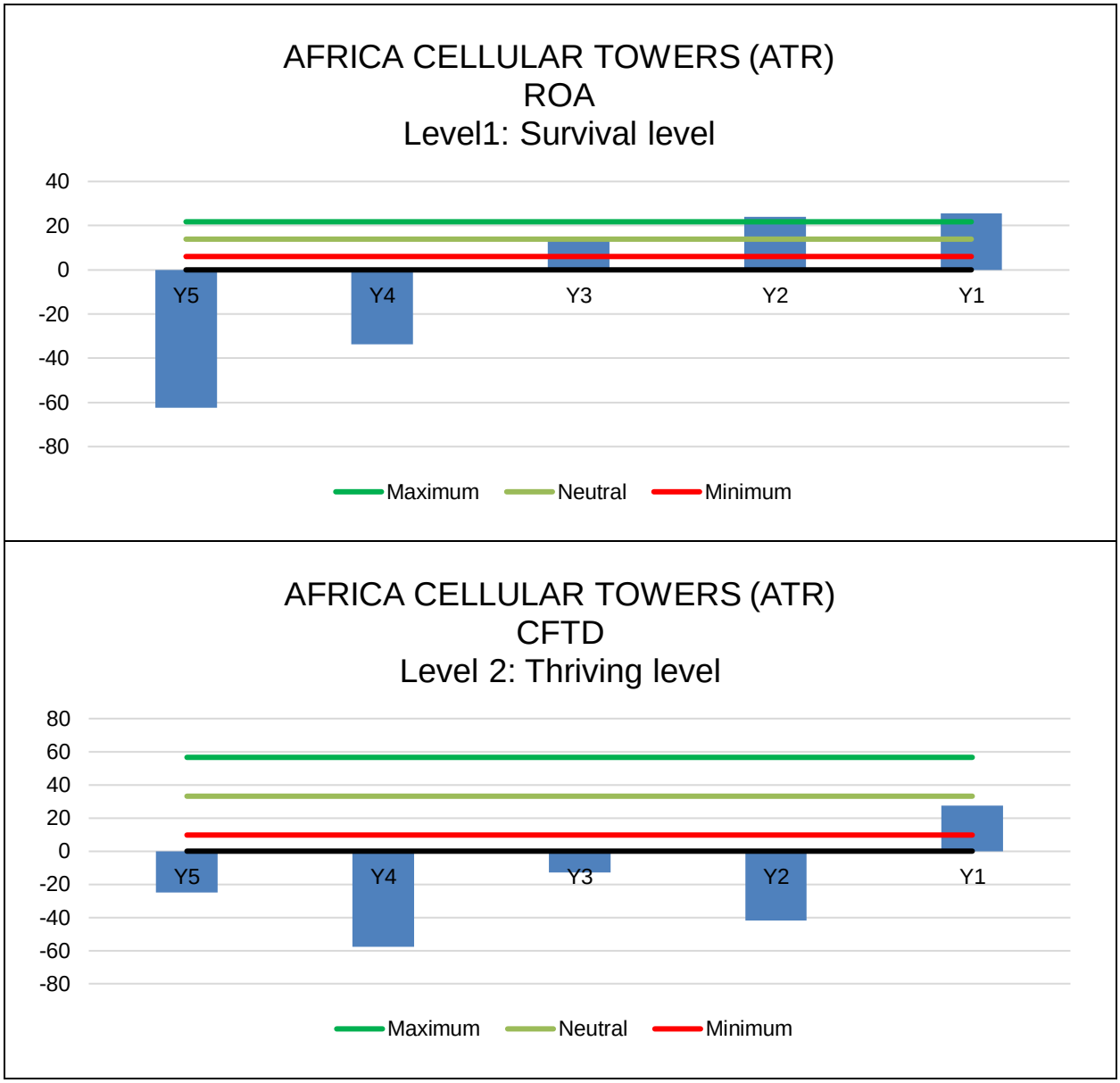
Table 6.37: Africa Cellular Towers (ATR)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	-94,74	-33,31	13,34	21,91	24,99
	EBITI	-23,36	-13,25	4,69	7,84	14,77
	ROA	-62,36	-33,76	13,21	24,00	25,45
Level 2: SFP	CFTD	-25,08	-57,87	-12,77	-41,90	27,35
	TATO	1,01	0,72	1,11	1,32	1,20

Source: INETBFA (2018)

In Y1 the ratio for Level 1 testing are on par as shown in Table 6.37. The ROE is above the neutral level according to the guideline, the interest cover indicates the company is able to repay their interest obligations 14x before no longer able to pay and ROA is above the maximum guideline. Therefore, Level 2 testing was done of which CFTD indicates the company is able to pay off 27.35% of each debt year. Repayment will take approximately 3,6 years (1/,2735). For Y2 Level 1 testing ratio shows no sign of concern to move to Level 2 testing indicate the CFTD is negative, ATR is unable to generate cash from the company's activities relative to their debts. The ratio is higher than neutral guidelines indicated in Figure 6.24.




AFRICA CELLULAR TOWERS (ATR)
ROA
Level1: Survival level
40
20
0
-20
-40
-60
-80
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
AFRICA CELLULAR TOWERS (ATR)
CFTD
Level 2: Thriving level
80
60
40
20
0
-20
-40
-60
-80
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

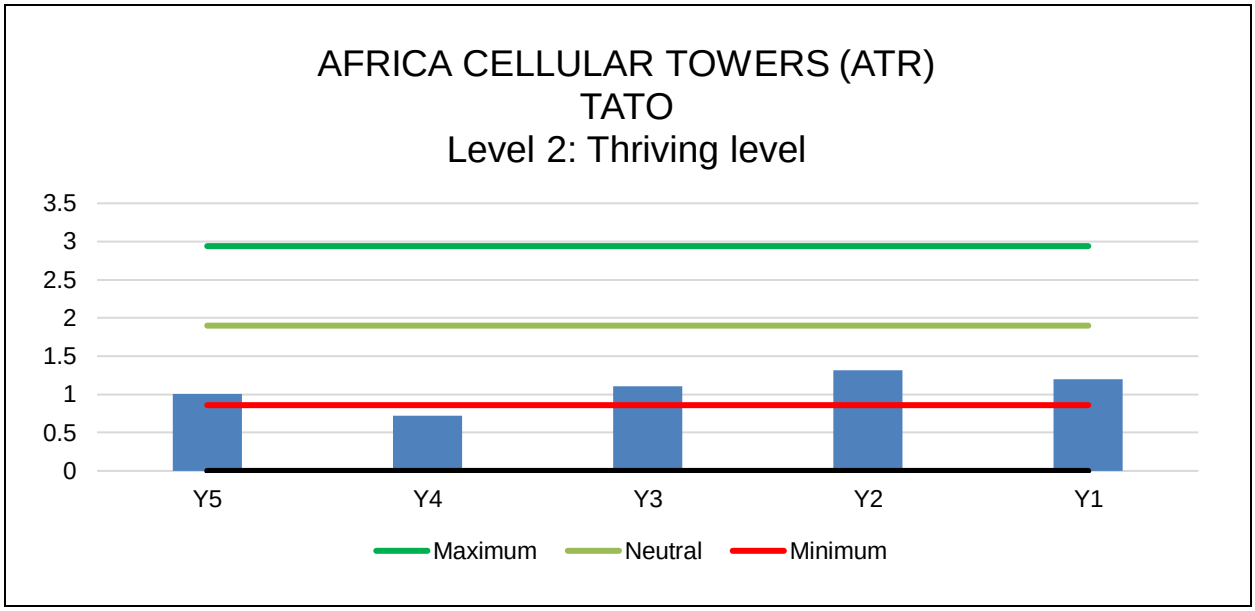


Figure 6.24: Level test: Africa Cellular Towers Ltd (ATR)

Source: INETBFA (2018)

Smart and Graham (2012:35) reasons that the quickest way the company will fail is due to lack of cash. Without enough cash a company will collapse as it needs to be able to meet their payment commitments timeously, growth and operations need to funded and owners to compensated. As displayed in Table 6.38 the negative cash flow in Y2 is a sign of concern and needs to be addressed before further testing. EMS reveals ATR is safe for all five years before failure. Contrary to the BPIA in Y2 it already indicates ATR does not have sufficient cash flow to cover their total debt. The graphical illustration clearly indicates cash or profit could be the root cause of ATR unfavourable financial condition as EBITI influence or affect ROE, ROA EBITI and CFTD when the numerator decreases the ratio will decrease. Suggesting investigating ATR cash flow will be a good start point. The trend for insufficient cash flow continues for the five years being tested. Both levels of testing in Y4 ratios were negatively unfavourable even though TATO indicates ATR generates 72 cents in sales for every R1 of total assets. BPIA exhibits to be a better measure of early financial distress warning signs. Erbacon Investments Holdings (ERB) in the industrial construction sector, failed 2016. The EMS for ERB is looked at in Table 6.38.

Erbacon Investment (ERB)

Erbacon Investment (ERB) was established by Mr Dave Erskine in 1987 and located in Sandton, South Africa. Erbacon Investment initially started as a concrete repair specialist and later progressed into full-service civil engineering contracting operations. In 1996 Mr Dave Erskine and Frans Boraine established Erbacon Plant Hire that primarily serviced the increasing needs of Erbacon construction. The plant hire quickly evolved in a standalone operation and a major player in the plant hire business. Erbacon operated in construction in the industrial industry.

Table 6.38: Erbacon Investments Holdings (ERB)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-0,09	0,08	0,28	0,19	0,20
X2	RE/TA	3,26	0,04	0,19	0,15	0,11	0,03
X3	EBIT/TA	6,72	-0,20	-0,13	0,15	0,19	0,17
X4	BVE/TL	1,05	0,44	1,16	2,09	1,30	1,35
Z-score			1,91	4,74	8,78	7,50	7,22
Classification			**GREY**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

Table 6.38's EMS computation indicates ERB falls within the safe zone (string credit policy) in Y1 to Y4 and in Y5 in the grey zone (adequate financial strength). In Figure 6.25 the zones ERB fall within can be clearly seen.

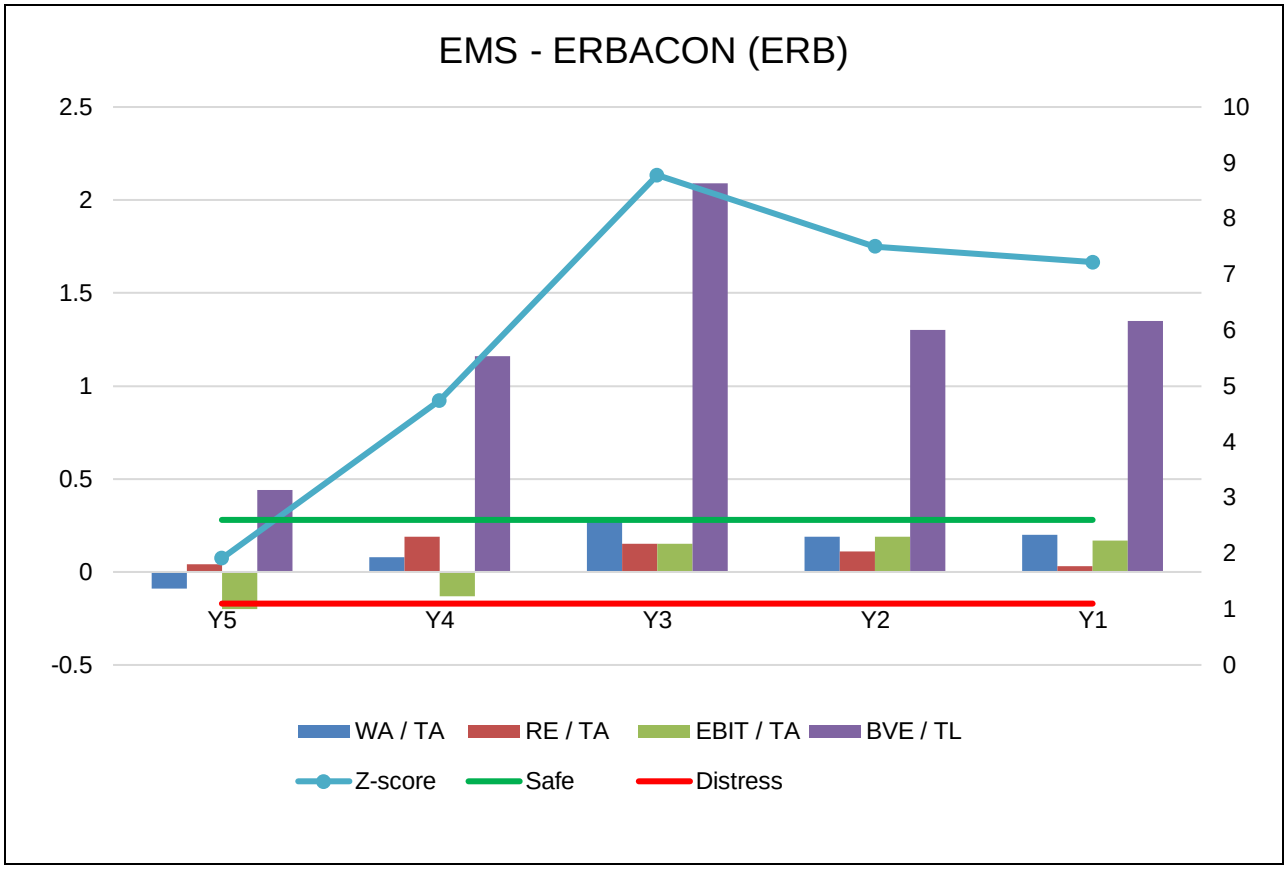


Figure 6.25: EMS: Erbacon Investments Holdings (ERB)

Source: INETBFA (2018)

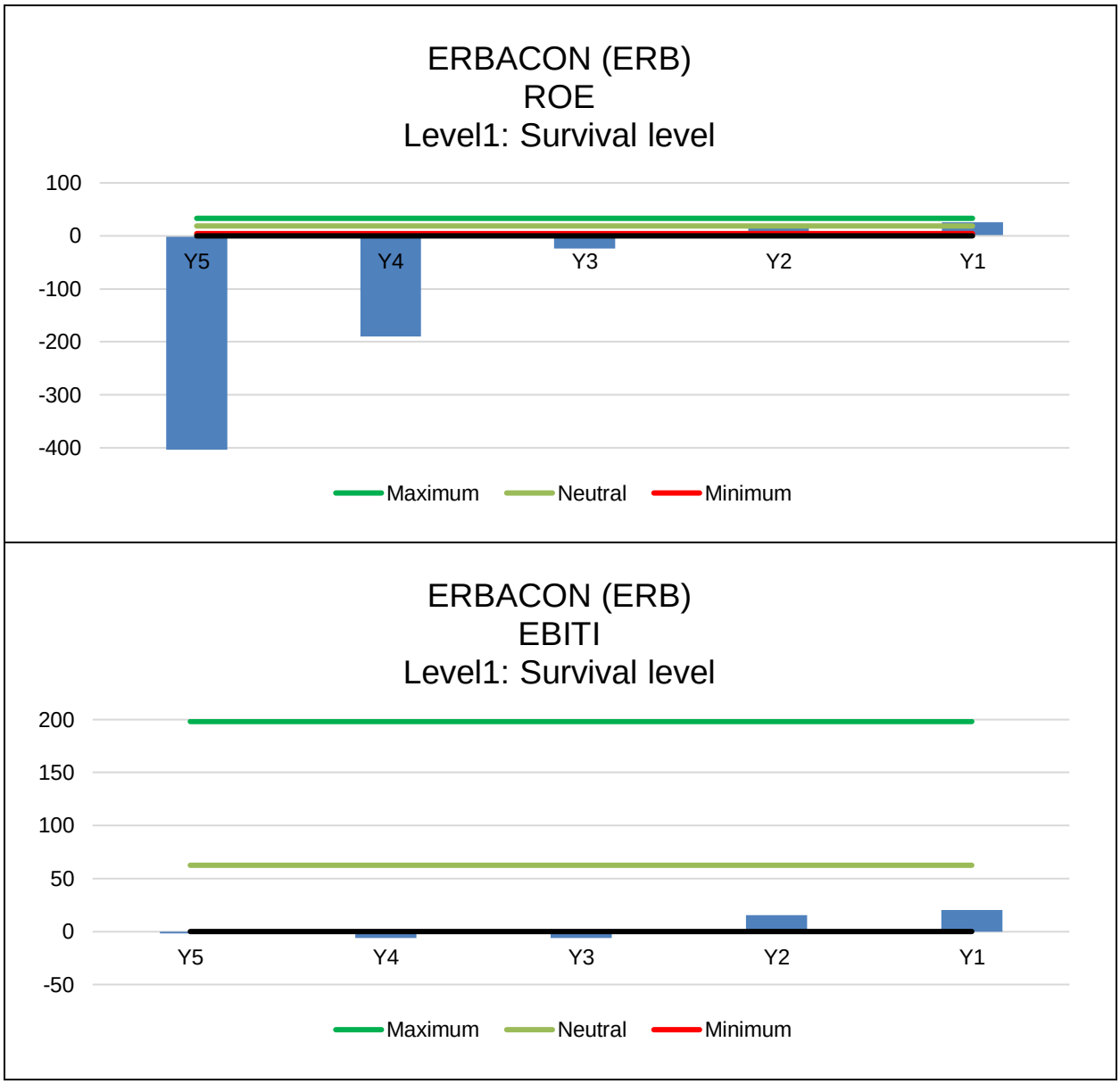
According to Figure 6.25, further investigation for the reason why ERB moved from the safe zone in Y1 to Y4 then to the grey zone in Y5 is recommended. Table 6.39 displays the bankruptcy prediction indicators results for the period being investigated.

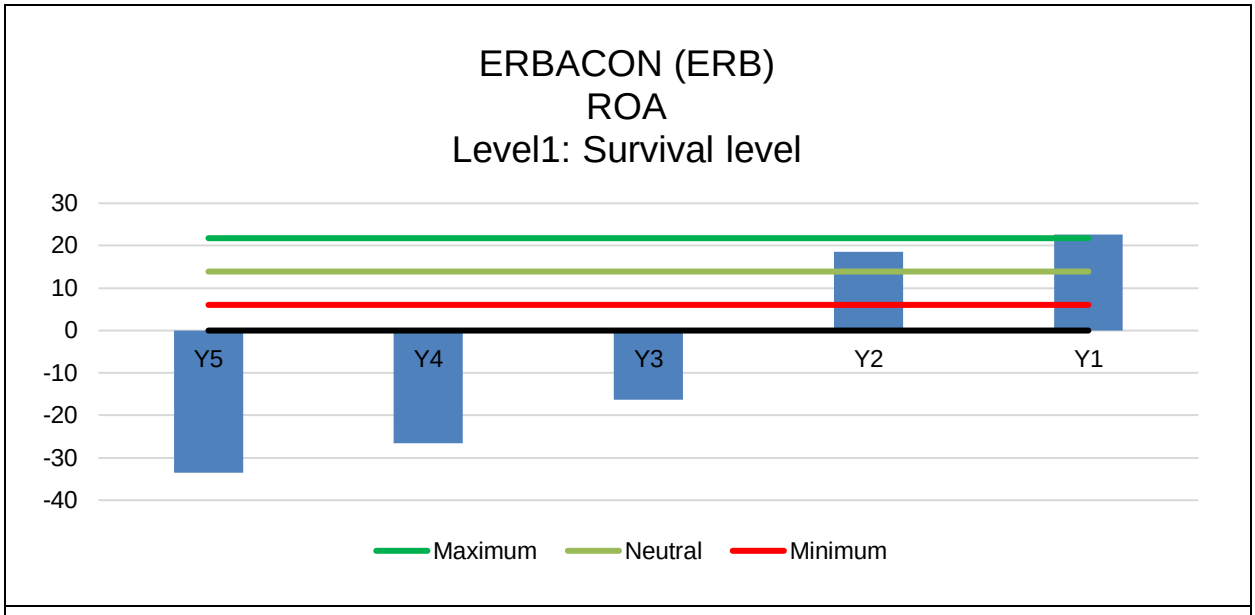
Table 6.39: Erbacon Investment Holdings (ERB)

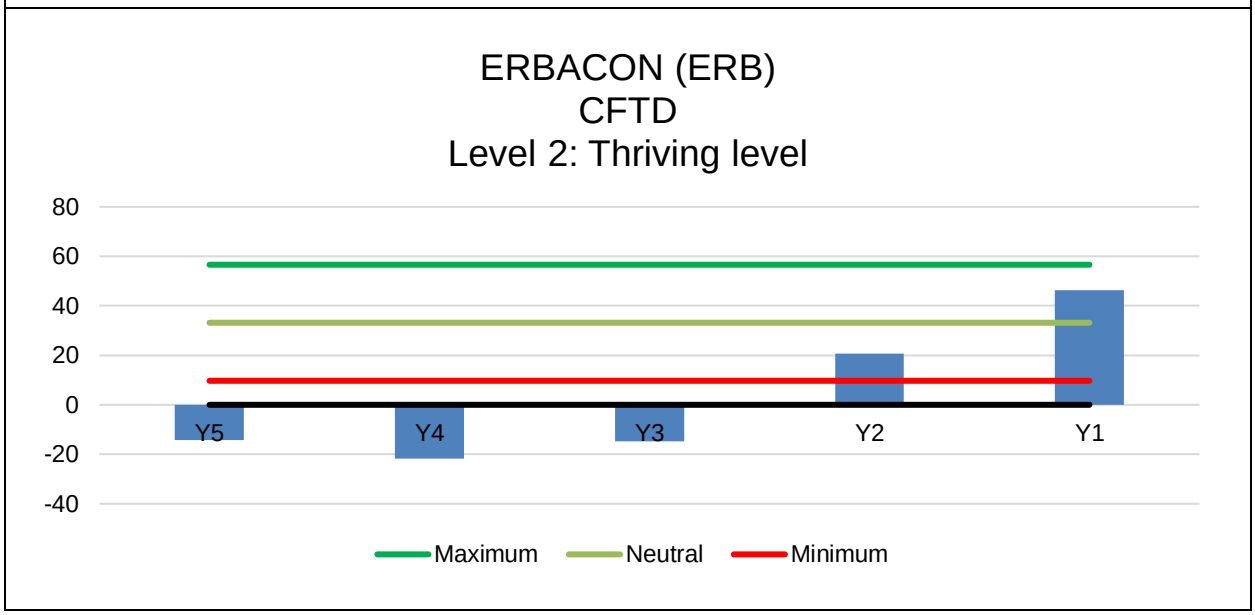
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	-720,33	-189,51	-24,13	17,47	25,29
	EBITI	-2,03	-5,97	-5,97	15,44	20,22
	ROA	-33,50	-26,55	-16,27	18,59	22,66
Level 2: SFP	CFTD	-14,29	-21,74	-14,86	20,61	46,31
	TATO	4,55	2,70	2,04	1,64	2,25

Source: INETBFA (2018)

Concerns emerge in Y3 as Y1 and Y2 are within the guidelines presented in Table 6.39, ROE is above the minimum guideline zone while the ROA is above the maximum guideline zone. In Y3, the ROE is negative, the rationale for the negative ratio could be the decline from net profit to loss or ERB did not make a profit but a loss. The ROE of ERB indicates the company is not utilising the owner's money/investment very wisely as it is not generating profits rather losses. Interest cover EBITI shows the company is unable to repay their interest. How will they repay their principal debt? The ROA is also negative meaning they are extracting maximum value from their assets invested in.




ERBACON (ERB)
ROA
Level1: Survival level
30
20
10
0
-10
-20
-30
-40
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


ERBACON (ERB)
CFTD
Level 2: Thriving level
80
60
40
20
0
-20
-40
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

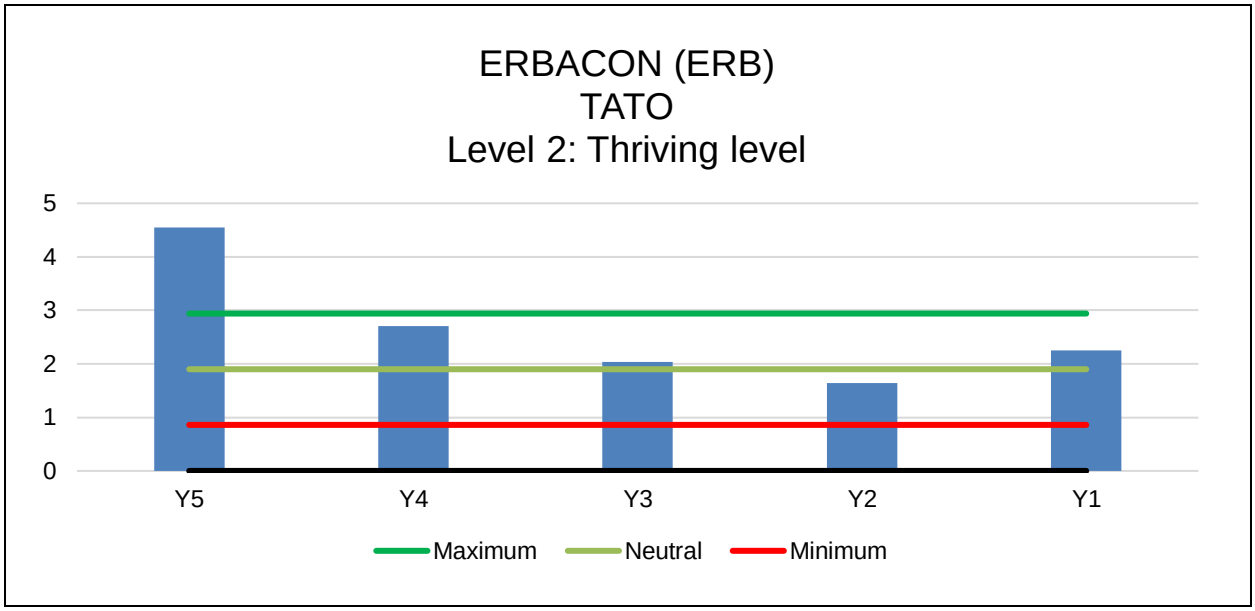


Figure 6.26: Level test: Erbacon Investments Holdings (ERB)

Source: INETBFA (2018)

In Figure 6.26, suspension of the Level 1 testing pending the investigation of the financial distress ratio has been identified. The BPIA shows that ERB's financial condition for Y1 and Y2 is healthy for all three Level 1 indicators (ROE, EBITI and ROA). A change in Y3 to financial concern as the majority of the ratios for both levels of testing are negative. The common indicator within all four indicators (including CFTD) is EBIT (earnings) and it continues for the remaining period under review (Y3─Y5). Suggestion scrutiny of companies' unfavourable financial results should be put into motion from a cash flow perspective. TATO indicated the performance of the assets, whether assets are being used (Marx 2019:39). While EMS displays Y1toY4, the company's financial condition is safe and grey in Y5. According to Correia *et al*. (2015:5.30), when a company is classified in the grey zone there is no certainty that the company will succeed/fail. Yet BPIA clearly indicates financial distress in Y5 as all the ratio are negative except for TATO. The question arises, how is it possible that the ROA indicates that the company is unable to produce any profits using the company's available assets and yet TATO shows sales were double the total assets. All this being said, the BPIA is still a better indicator of financial distress. Next is the testing of Sanyati (SAN).

Sanyati (SAN)

Sanyati (SAN) was one of the largest BEE (Black economic empowered) engineering and construction companies in Kwa-Zulu Natal even though they originated in Bryanston, South Africa in 1988 and operated in the industrial construction sector. In 2005, Sanyati proposed to be listed on the JSE and approved in 2006 (Sanayati, 2006). Sanyati clients are both private and government. They execute low-cost housing and large infrastructure projects in construction and civil engineering services. Sanyati failed in 2016. The trend analysis of the EMS and BPIA for Sanayati Holding Ltd (SAN) are presented in Table 6.40.

Table 6.40: Sanayati Holding Ltd (SAN)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,17	0,11	0,07	0,09	0,17
X2	RE/TA	3,26	0,19	0,10	0,08	0,04	0,08
X3	EBIT/TA	6,72	-0,09	0,07	0,07	0,08	0,15
X4	BVE/TL	1,05	1,45	1,05	1,31	1,39	0,73
Z-score			5,90	5,87	5,82	5,97	6,40
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

The EMS calculation has classified SAN in the safe zone for Y1 to Y5 according to Table 6.40. Interpreted by bond rating as a strong credit profile or financial strength. A graphic version is demonstrated in Figure 6.27.

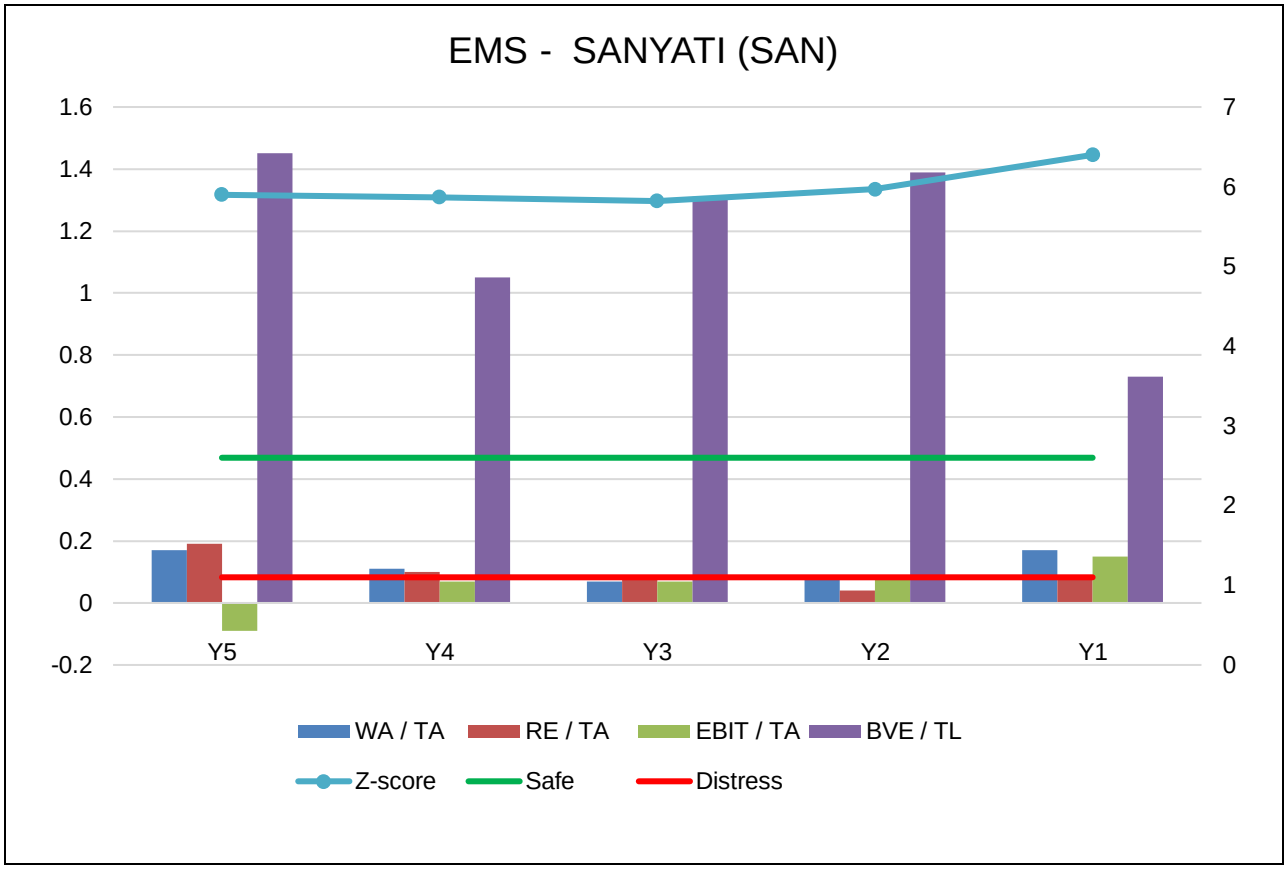


Figure 6.27: EMS: Sanayati Holding Ltd (SAN)

Source: INETBFA (2018)

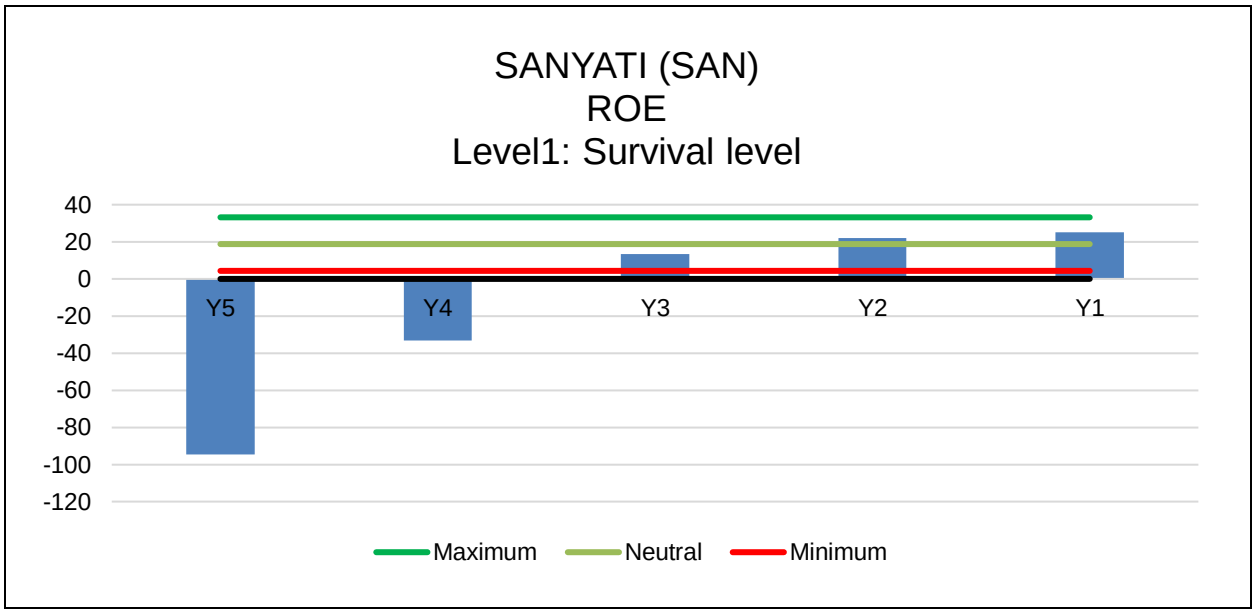
With the safe zone computed by the EMS score and visual display, the bankruptcy indicator testing follows in Table 6.41.

Table 6.41: Sanyati Holding Ltd (SAN)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	-18,58	6,91	6,71	9,30	24,19
	EBITI	-4,59	6,92	4,56	15,85	23,63
	ROA	-13,54	10,28	11,28	13,81	17,35
Level 2: SFP	CFTD	-10,71	5,94	25,99	-15,03	4,30
	TATO	2,06	2,20	1,97	1,67	1,89

Source: INETBFA (2018)

Table 6.41 results indicate the bankruptcy prediction indicators in Y1 affirm the ratio is favourable both in Level 1 and 2. In Y2 Level 1 testing indicates ROE has declined by 62% from Y1 to Y2. Ratio decline is due to an increase in total equity. Interest cover EBITI displays the company can honour debt payments up to 15times. ROA also declined slightly due to the increase in total assets. Mathematically when the denominator increase the ratio will decrease and the ratio will increase when the numerator increases. As reasons for the decline in ratio have been identified, Level 2 testing can continue. The CFTD negative ratio in Y2 due to cash flow from operations declined from R5 552 to negative (R65 680). Reasons for this massive decline needs to be identified before testing can continue for Y3. In Y5 all three Level 1 ratios are negative, the timeous analysis need to done.




SANYATI (SAN)
EBITI
Level1: Survival level
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
SANYATI (SAN)
ROA
Level1: Survival level
25
20
15
10
5
0
-5
-10
-15
-20
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
SANYATI (SAN)
CFTD
Level 2: Thriving level
70
60
50
40
30
20
10
0
-10
-20
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

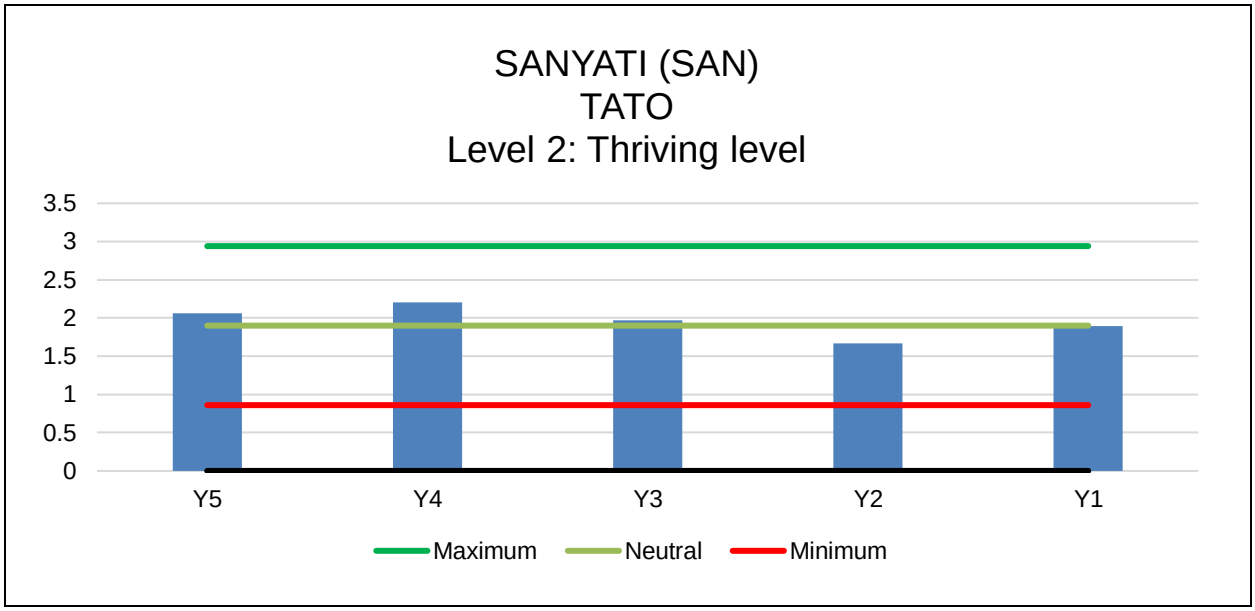


Figure 6.28: Level test: Sanayati Holding Ltd (SAN)

Source: INETBFA (2018)

Figure 6.28 above demonstrate the EMS displays SAN is safe for the overall five years prior to failure. Unlike the BPIA mirrors that Y2 of SAN already had cash flow problems and cash flow is the lifeblood of a company's existence (Cassim, 2015:157). The ratios improved for both levels of testing in Y2 to Y3 from a negative to a positive ratio followed by a decline in Y4 and a further decline to a negative ratio in Y5. This shows the BPIA is a more enhanced tool as it indicates early warning signs of financial distress. Sea Kay (SKY) is tested next.

Sea Kay (SKY)

Sea Kay (SKY) was incorporated in South Africa in 2006. Sea Kay was involved in the reconstruction development programme for government, banks, mines, property developers and private clients. Building low-cost, affordable and subsidised housing to their clients. Sea Kay operations originated in the Sedibeng areas in the Vaal Triangle expanding to Mpumalanga, North West, Western Cape, Free State and Gauteng. Sea Kay operated in the industrial construction sector and failed from the JSE in 2016. Sea Kay Holdings Ltd (SKY) in the industrial construction sector are evaluated in Table 6.42.

Table 6.42: Sea Kay Holdings Ltd (SKY)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-0,24	0,08	0,08	0,11	0,32
X2	RE/TA	3,26	-0,48	0,25	0,13	0,04	0,00
X3	EBIT/TA	6,72	-0,13	-0,31	0,11	0,15	0,20
X4	BVE/TL	1,05	0,17	0,22	0,53	0,45	1,60
Z-score			-0.58	2.74	5.49	5.58	8.37
Classification			**DISTRESS**	**GREY**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

EMS displayed in Table 6.42 of SKY in Y1 to Y3 is in a safe zone, Y4 was within the grey zone (adequate financial strength) and in Y5 in the distress zone (extremely high risk). The graphical representation is displayed in Figure 6.29 below.

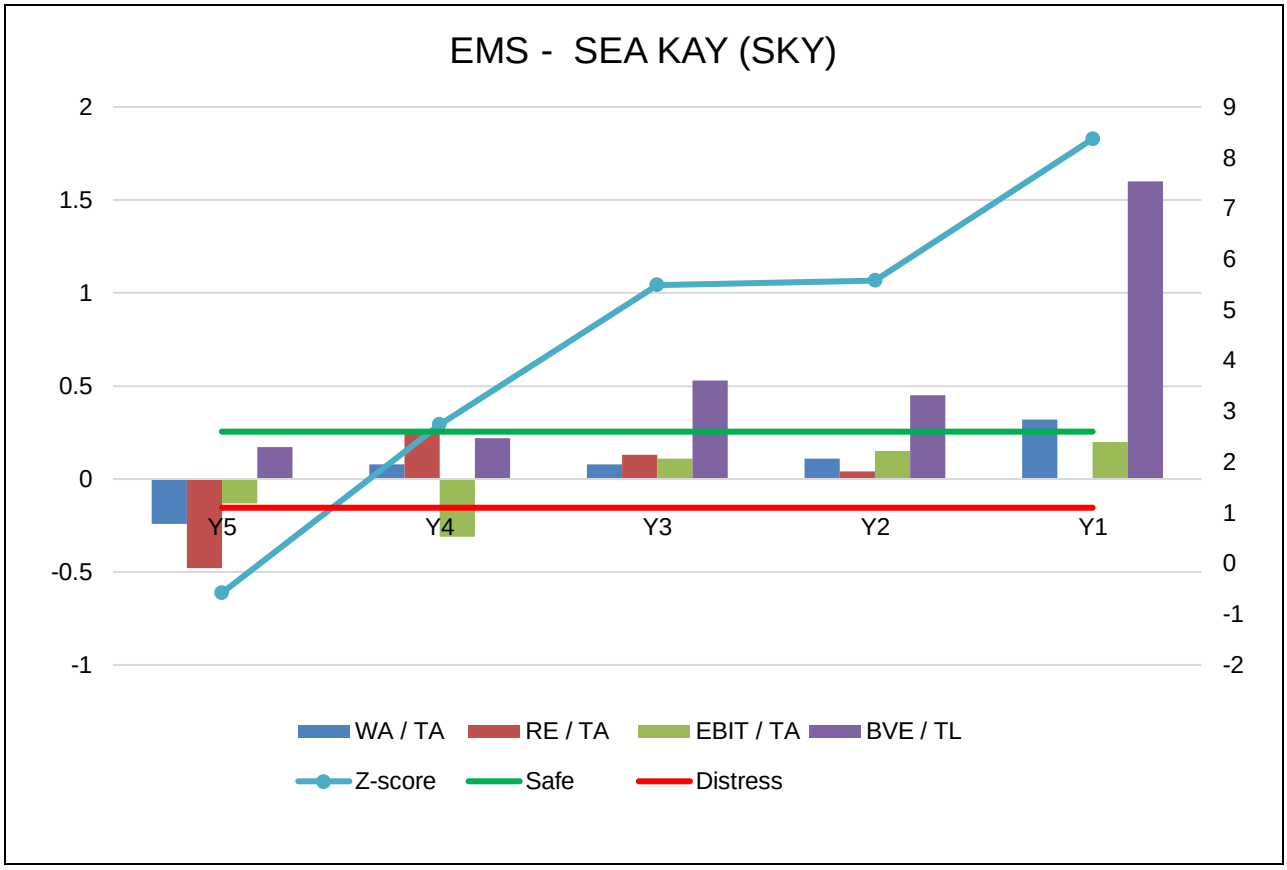


Figure 6.29: EMS: Sea Kay Holdings Ltd (SKY)

Source: INETBFA (2018)

From Figure 6.29 it can clearly be seen the writing was on the wall with SKY in Y3 to Y4 as the company gradually moved from being financially healthy to financial trouble. As shown in Y1 to Y3 the company was financially safe or financially healthy, in Y4 when there was uncertainty surrounding the SKY financial condition it was a sign that management had to intervene to determine the cause of the financial uncertainty. The bankruptcy prediction indicators revelation follows in Table 6.43.

Table 6.43: Sea Kay Holdings Ltd (SKY)

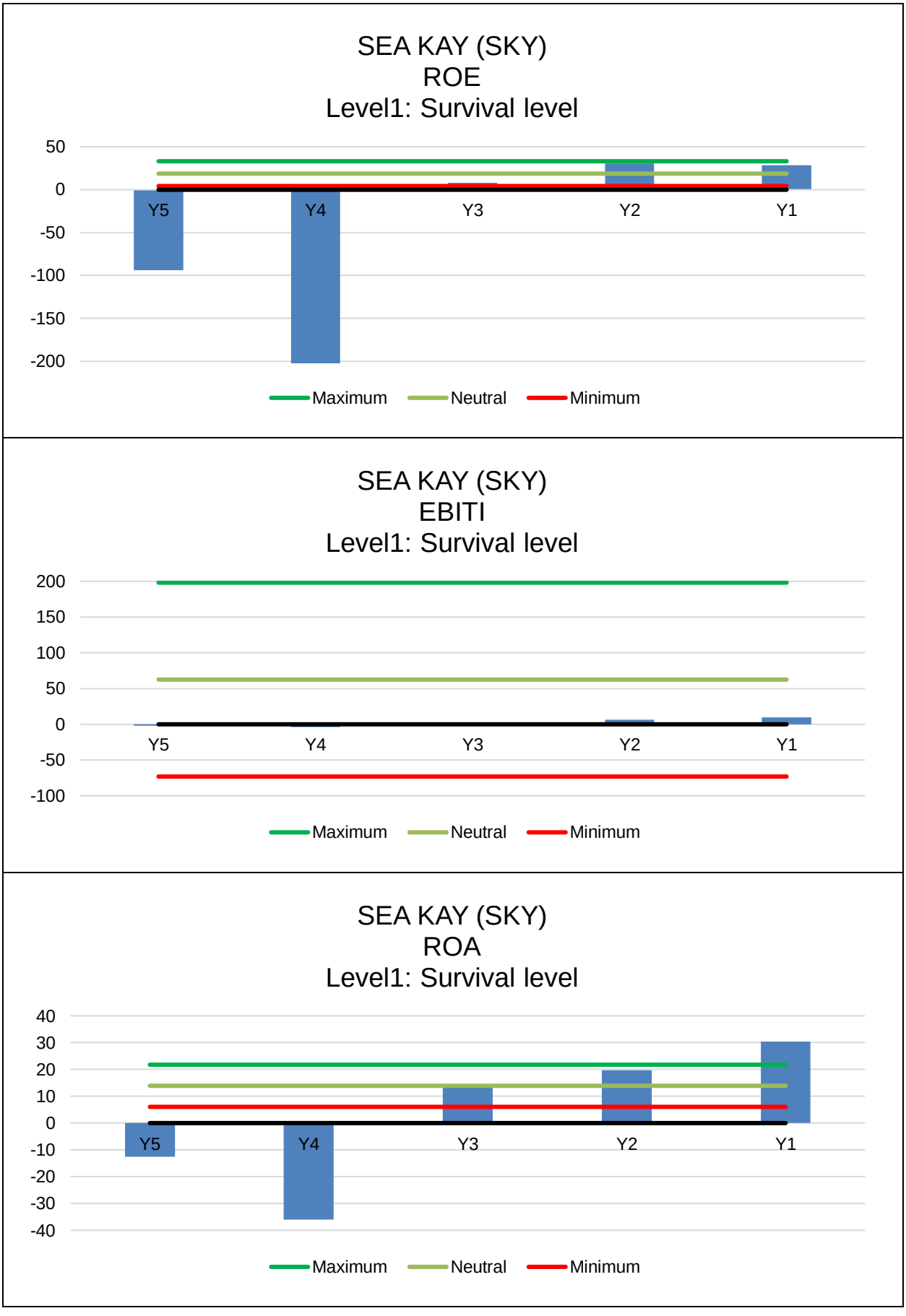
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	-93,8	-375,47	7,89	30,95	28,39
	EBITI	-1,71	-4,23	1,92	6,72	9,82
	ROA	-12,59	-36,01	13,72	19,64	30,42
Level 2: SFP	CFTD	8,28	4,12	1,87	-9,16	-62,28
	TATO	0,83	1,29	1,14	0,96	1,59

Source: INETBFA (2018)

Table 6.43 displays no financial concerns with the Level 1 testing. ROE, EBITI and ROA within BPIA Level 1 testing display ROE above the neutral level according to the guideline for Y1 and Y2, declining in Y3=7.89 above the minimum level and negative Y4= (375.47) and Y5= (93.80),

EBITI in Y1= 9 times, Y2=6 times, Y3=1 time, Y4= (4 times) with slight increase in Y5= (1.71). ROA above maximum level in Y1=30.42 and above neutral level in Y2=19.64 and Y3=13.72 dropping to negative ratio in Y4= (36.01) and Y= (12.59).

Before moving to Level 2 testing reason for the negative ratio for all three Level 1 ratios for Y1 to Y3 needs to be investigated. As negative EBITI could due SKY's insufficient earnings resulting in the inability to cover their interest repayment obligations. Table 6.43 above indicates it can be said the assets are able to generate revenue but not at a satisfactory capacity for Y1 to Y2 and not at all in Y3 to Y5. It is management's responsibility to investigate why the assets being used to generate profits are not used to their full capacity. If the assets are not generating profits a further investigation needs to be done to determine why not and how the hurdle can be overcome. SKY portrays for Y3 to Y5 remaining below the minimum satisfactory level benchmark and is clearly displayed in Figure 6.30 below.


SEA KAY (SKY)
ROE
Level1: Survival level
50
0
-50
-100
-150
-200
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
SEA KAY (SKY)
EBITI
Level1: Survival level
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
SEA KAY (SKY)
ROA
Level1: Survival level
40
30
20
10
0
-10
-20
-30
-40
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

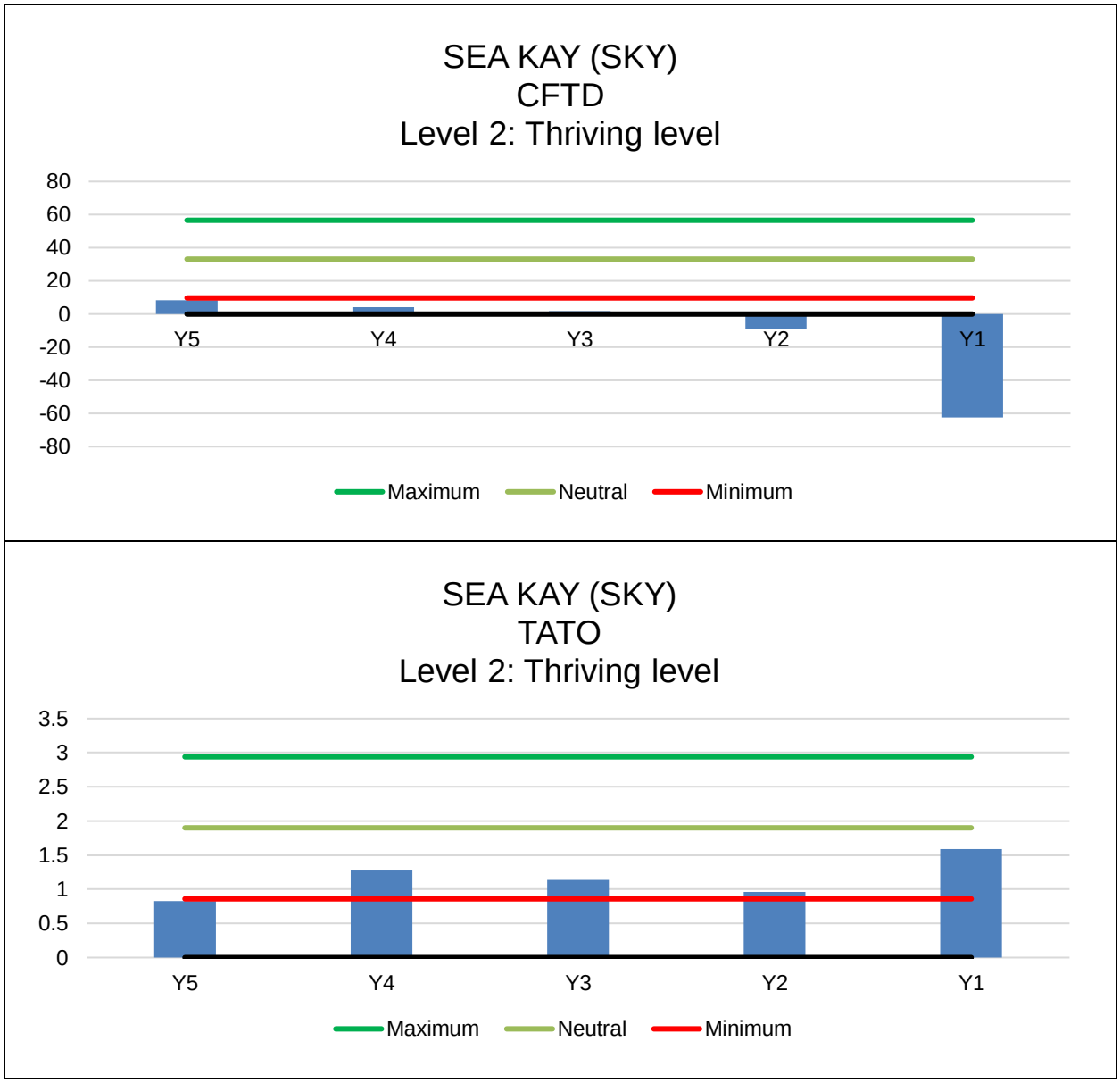


Figure 6.30: Level test: Sea Kay Holdings Ltd (SKY)

Source: INETBFA (2018)

In Figure 6.30 it is clearly indicated that Level 2 testing needs to be ceased, reasons for the negative ratio need to be determined before testing can commence. The EMS results for SKY show in Y1toY3 the company is safe, grey in Y4 then followed by distress in Y5 indicating the company is either already bankrupt or the possibility of going bankrupt is very high.

Figure 6.30 indicates for Level 1 testing, SKY portrays an abnormal negative ROE ratio in Y4 and Cassim (2015:104) states it is a sign of concern when there is an abnormal

increase or decrease in ratio, the ratio was reducing but still negative in Y5. Other Level 1 ratios were also negative in Y4 and Y5, EBITI (Y4 =-4.23, Y5=-1.71) and ROA (Y4 =-36.01, Y5=-12.59). This is being a clear indication of financial distress, therefore, Level 2 testing will only commence once Level 1 has been investigated. As a result, the BPIA is an effective financial distress indicating tool.

Having successfully presented the second phase of testing by testing ten of the already failed companies for the period 2002─2016 within the sample. The following has been found, the EMS model was able to detect/indicate financial distress five years prior to failure for four of the ten companies, which accounts for 40%. Out of the same ten already failed companies the BPIA financial distress ability was nine of the ten companies, which accounts for 90%. Therefore, it has been determined that the use of the BPIA has been established as a reliable analytical tool to predict financial distress. The next task is the application of the third phase of testing.

Applying both the collective BPIA and the EMS model testing to the out-of-sample companies that are from different sectors. The results were compared in order to determine effectiveness.

6.4.3 Determine the reliability of the Third phase testing and results: validation of indicators with testing group (Objective 4)

This test is conducted in order to determine whether the BPIA is a reliable tool for testing out-of-sample data. The intention is to meet the third empirical objective as stated in Chapter 1 (Section 1.5.3, iv):

> Examine whether the developed bankruptcy prediction indicators are a reliable tool for predicting bankruptcy outside of the sample period. Out-of-sample data empirically test and results to be compared to the EMS model.

These out-of-sample companies are companies within different sectors. The same four stage elimination criteria were applied in (Section 4.3.3). Stage 1 with the only difference being the period, for the out-of-sample companies is from 2017─2018. The second stage of the four stages remains the same but the financial industry and mining sectors were excluded. In the third stage companies failed due to bankruptcy and in the fourth stage

data are available five years prior to delisting. The economic environment covered within the study testing in sample data was over the period 2002–2016. The out-of-sample data cover the period outside of the study period. The same testing method of testing applied in the second sample phase of testing is applied in this phase. The BPIA is applied to test companies followed by the EMS where after the data were compared. Testing was on data available on INET McGregor BFA. The testing is displayed in Table 6.44 below. Howden Africa Holding Ltd's (HWN) EMS scores have been computed and the results are discussed.

Table 6.44: Howden Africa Holding Ltd (HWN)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,67	0,63	0,6	0,52	0,35
X2	RE/TA	3,26	0,59	0,56	0,52	0,39	0,22
X3	EBIT/TA	6,72	0,15	0,13	0,17	0,23	0,34
X4	BVE/TL	1,05	2,57	2,07	1,91	1,35	0,75
Z-score			5,90	13,28	12,26	12,03	10,90
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

The EMS score for five consecutive years are applied and is exemplified as safe attesting to a strong credit profile as per bond rate according to Table 6.44. Companies are smiled upon when within this zone as it indicates companies are not exposed to financial distress. The above amounts are graphically displayed in Figure 6. 31 below.

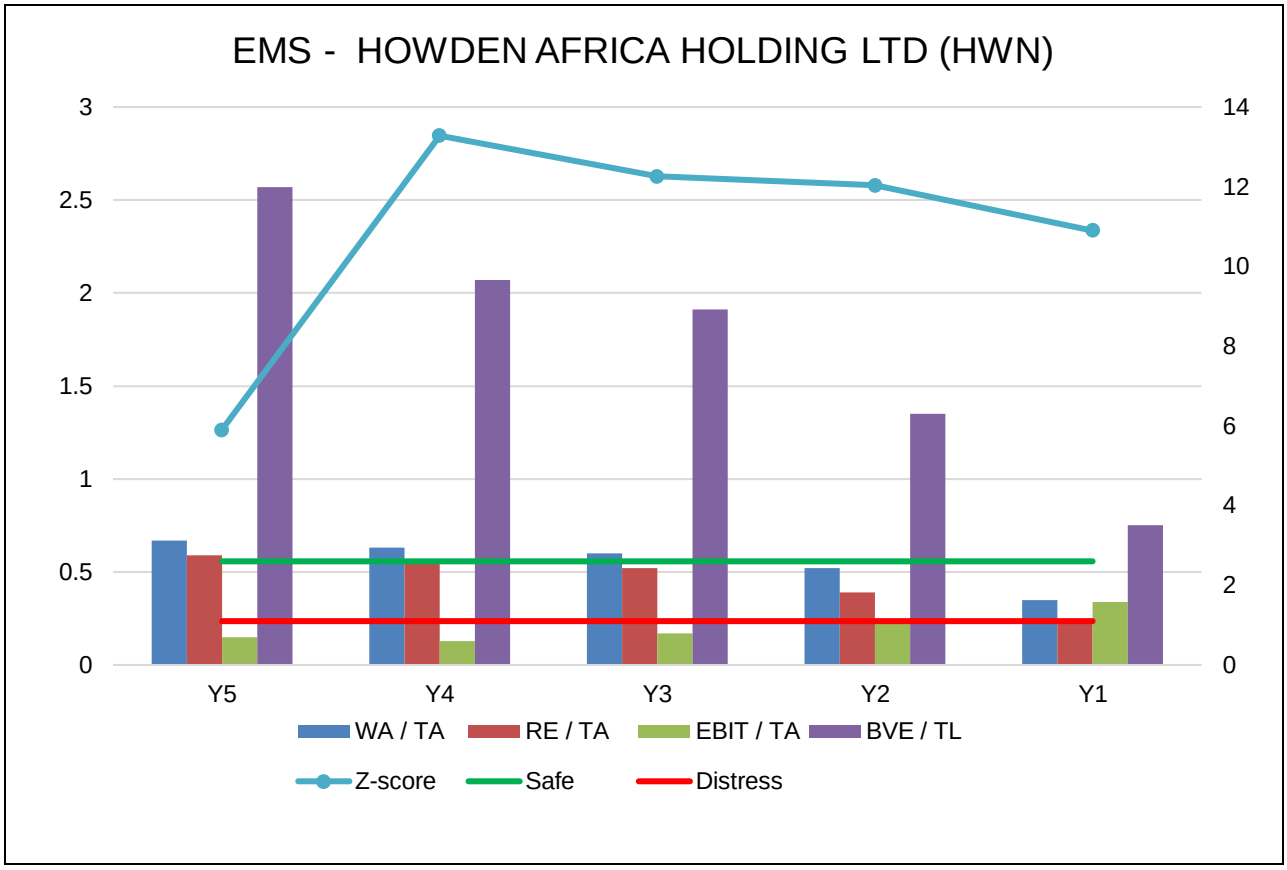


Figure 6.31: EMS: Howden Africa Holding Ltd (HWN)

Source: INETBFA (2018)

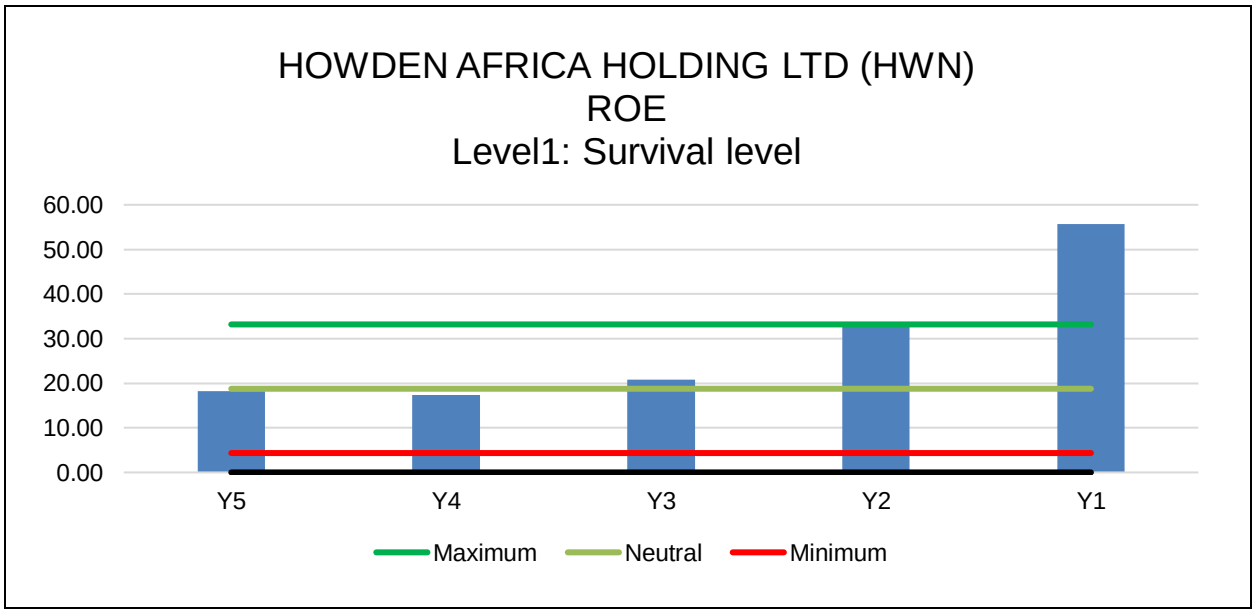
Figure 6.31 exhibits the score is not slightly above the 2.60 mark but much higher. The highest score is at 13,28 in Y4, which is 4.4 times higher and the lowest in Y5=5,90 and is 1.9 times higher than the 2.60 mark. The bankruptcy indicator test conducted for HWN is looked at in Table 6.45 below.

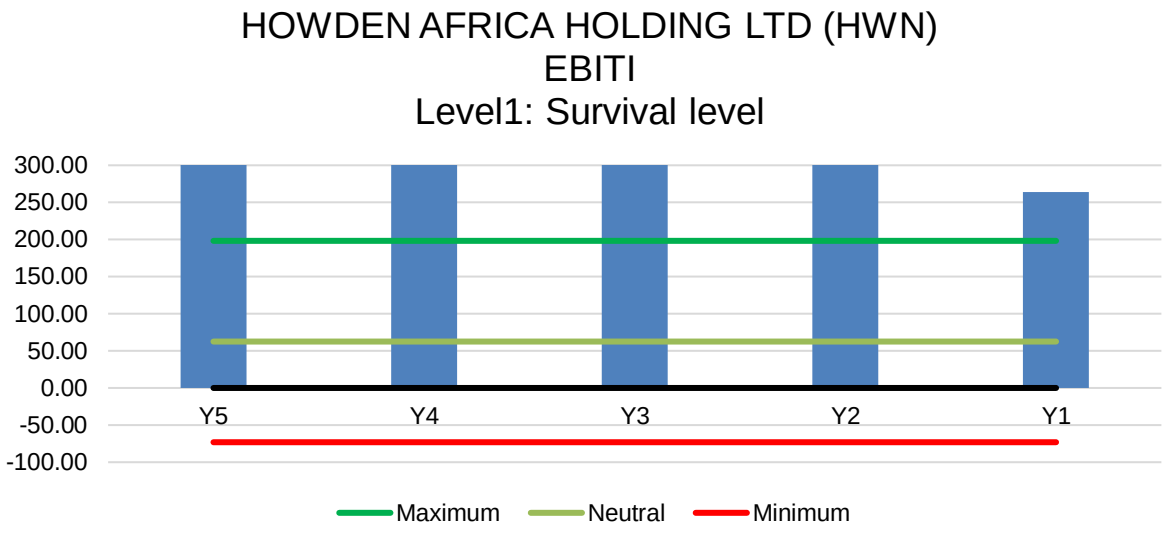
Table 6.45: Howden Africa Holding Ltd (HWN)

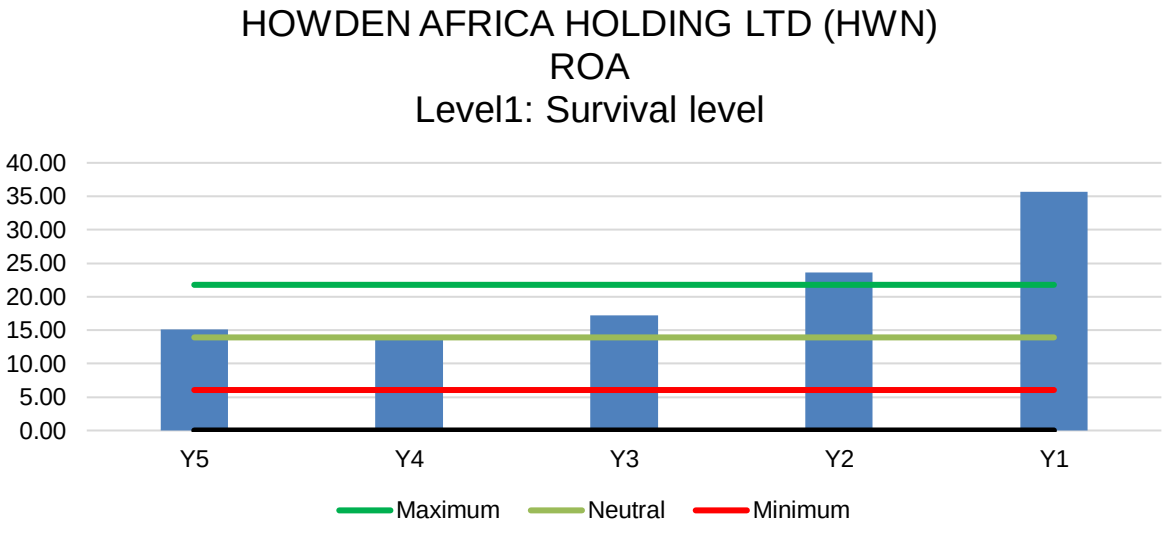
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	18,28	17,41	20,74	32,76	55,71
	EBITI	2 180,41	3 439,04	9 814,30	14 210,74	264,05
	ROA	15,14	13,63	17,23	23,66	35,70
Level 2: SFP	CFTD	55,71	39,33	25,84	60,66	44,49
	TATO	0,83	0,88	0,96	1,15	1,34

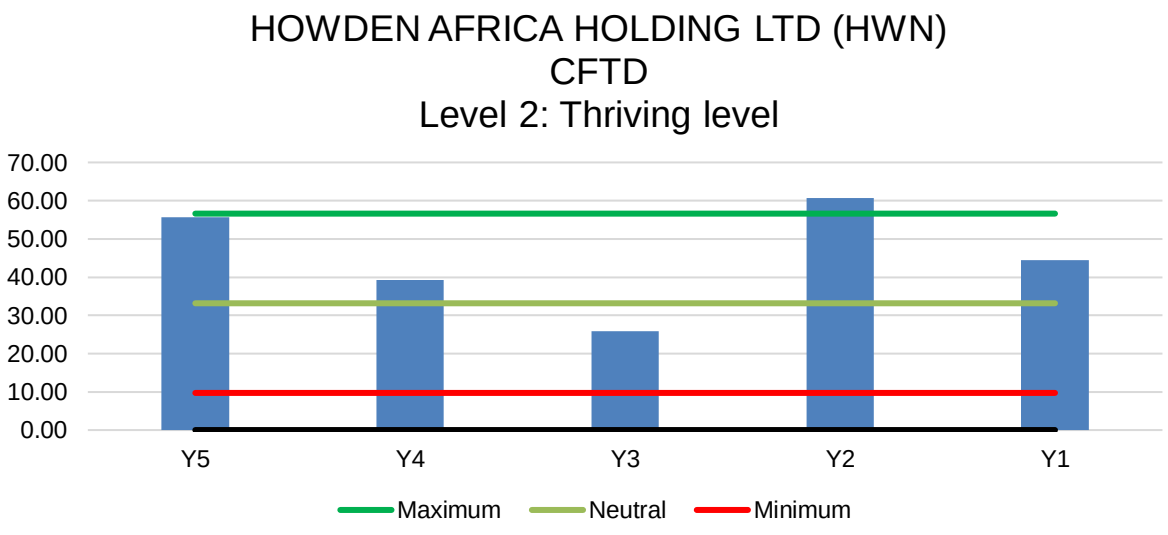
Source: INETBFA (2018)

According to Table 6.45, the bankruptcy prediction indicators for HWN highlights no concerns at first glance but in Y2 of the Level 1 testing the interest cover EBITI increase from a ratio in Y1=264 to Y2=14210. Consistency is always good, abnormal decreases and increases should draw attention especially if it is way above the norm or standard. The norm or standard in this study has been indicated as five times. The ratio in Y1=58 times higher while in Y2=2842 times higher. Upon further investigation it was revealed from Y1 to Y2 sales decreased by 5.6%, the cost of sales decreased by 4.6% and the total cost increase by 36%. The following increases, EBIT increase 38% and interest of 30% are caused by the 33% increase in long-term interest-bearing loans. In Figure 6.32 the increases are graphically displayed.




HOWDEN AFRICA HOLDING LTD (HWN)
EBITI
Level1: Survival level
300.00
250.00
200.00
150.00
100.00
50.00
0.00
-50.00
-100.00
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


HOWDEN AFRICA HOLDING LTD (HWN)
ROA
Level1: Survival level
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum


HOWDEN AFRICA HOLDING LTD (HWN)
CFTD
Level 2: Thriving level
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

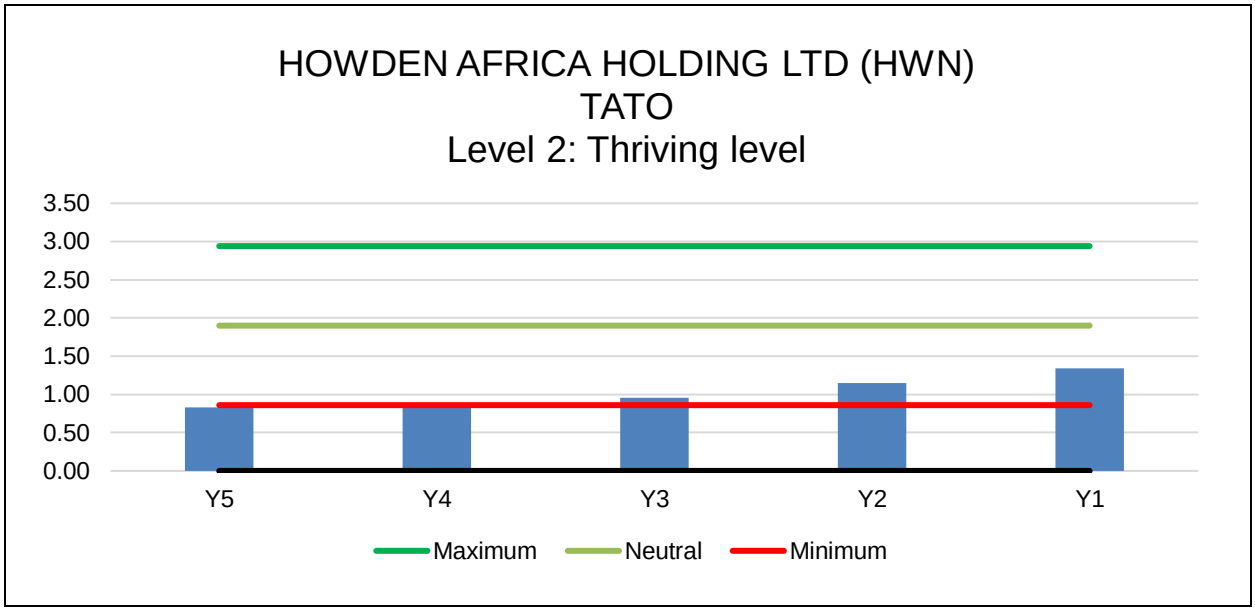


Figure 6.32: Level test: Howden Africa Holding Ltd (HWN)

Source: INETBFA (2018)

Figure 6.32 displays an in-depth view of the financial information that has been found. Form Y1 to Y5 EBITI fluctuated, Y1toY2 saw an increase of 38%, while Y2toY3 decreased with 29%, a further 26% decrease followed in Y3 toY4 and Y4 toY5 increased with 65%. The interest of 30% followed by 6.7%, 9.8% and a massive 89% in Y4 toY5. The interest-bearing loan increases were 33%, 23%, 1.37% and 95% for Y4 to Y5. There is also a write off of intangible assets and leases increased was 2.4 times from Y4 toY5. This is concerning, if this trend continues it means the company is borrowing more as shown in the continuous increase in interest. The problem is the EBIT does not increase in alignment with the interest, therefore, the level of income does not match the expense level. When income is continually less than the expense losses are on the horizon. With the income being less than the expenses and yet the director's emoluments increased by 94% in Y4 to Y5. Edgars Consolidated Stores Ltd (ECO) EMS scores is exhibited in Table 6.46 below.

Table 6.46: Edgars Consolidated Stores Ltd (ECO)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,23	0,29	0,30	0,22	0,42
X2	RE/TA	3,26	0,37	0,38	0,40	0,42	0,40
X3	EBIT/TA	6,72	0,26	0,27	0,21	0,14	0,08
X4	BVE/TL	1,05	1,02	1,09	1,08	1,05	1,24
Z-score			8,78	9,35	9,07	8,11	9,15
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

The EMS indicated in Table 6.46 above echoes the safe zone from Y1 to Y5, this means ECO has had a strong credit profile for the consecutive five years under review. Figure 6.33 gives a better view of the EMS score zones.

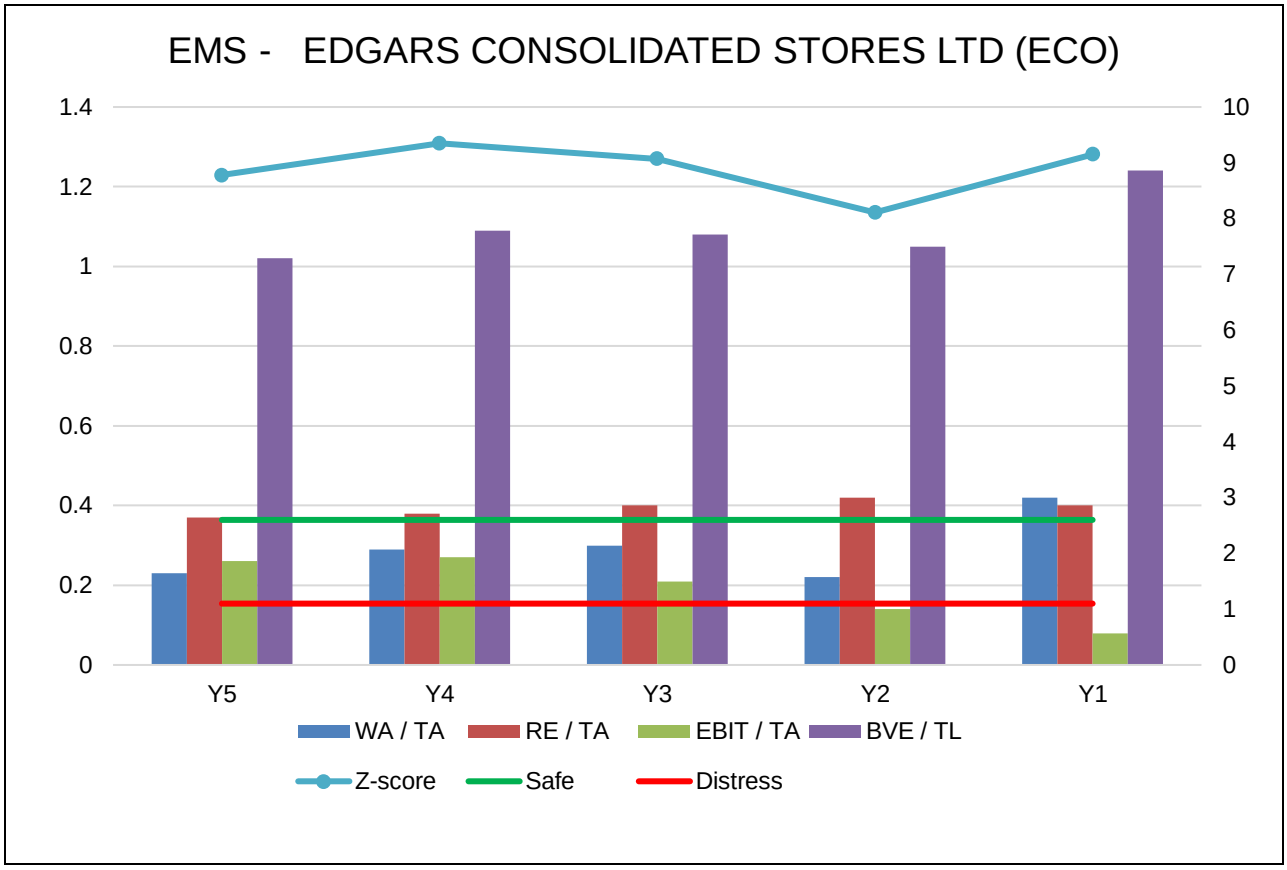


Figure 6.33: EMS: Edgars Consolidated Stores Ltd (ECO)

Source: INETBFA (2018)

Figure 6.33 clearly displays Edcon is way above the 2.60 safe zone mark. It is three times higher in Y1, 2.7 times in Y2, 3 times higher again in Y3 and Y4 and 2.9 times higher in Y5. The BPIA testing is looked at in Table 6.47.

Table 6.47: Edgars Consolidated Stores Ltd (ECO)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	37,44	35,89	25,52	15,88	7,48
	EBITI	52,67	67,67	23,07	7,34	4,50
	ROA	25,94	27,81	21,05	14,61	7,83
Level 2: SFP	CFTD	33,57	49,79	8,53	35,59	36,46
	TATO	2,06	2,07	2,28	2,21	1,78

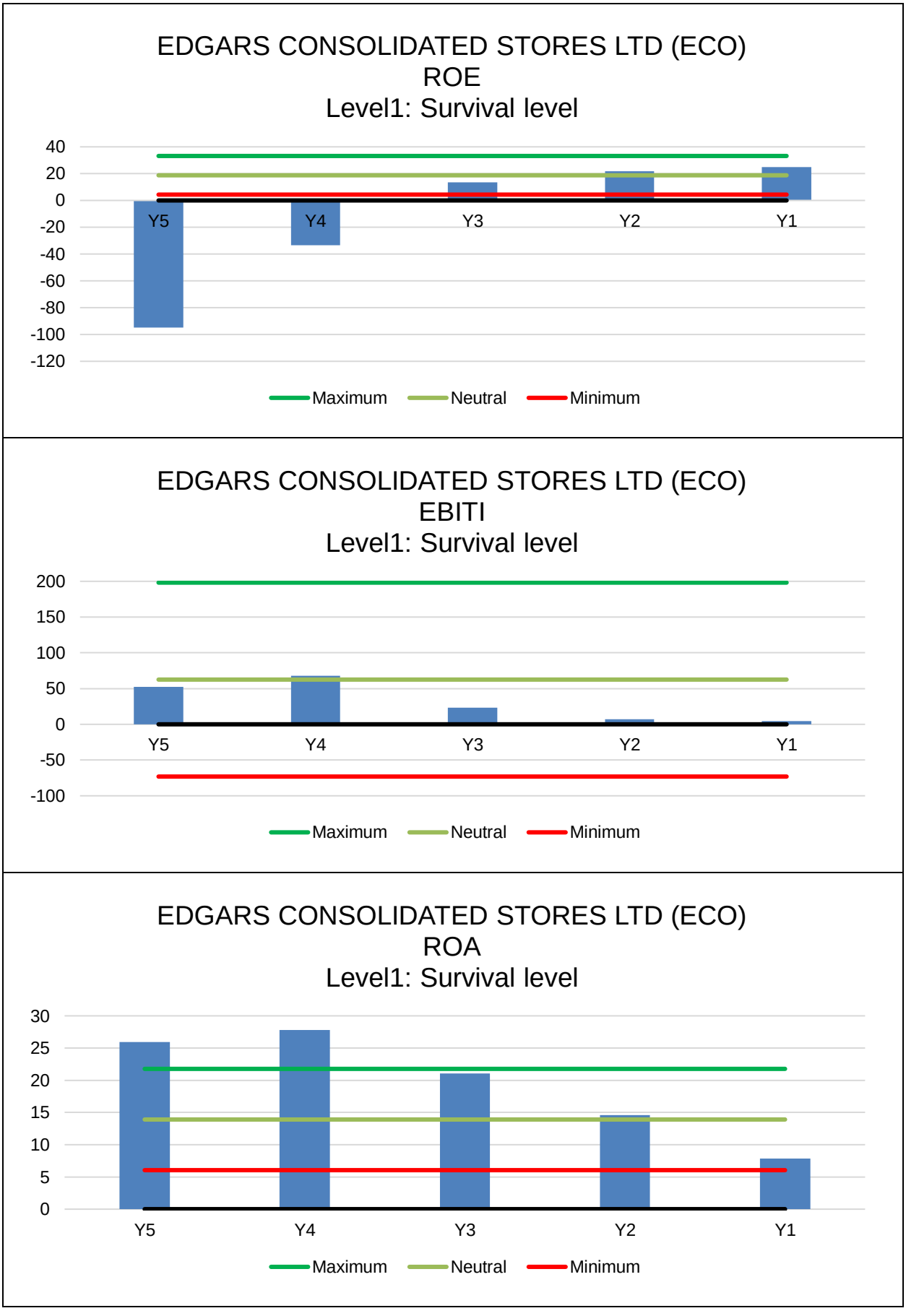
Source: INETBFA (2018)

Table 6.47 illustrates with Level 1 testing ECO is displayed as financially fit throughout the period under review (2002–2006) as this is the only financial statement data available on INET McGregor BFA. ROE according to guidelines is present as follows: Y1 and Y2 are above the minimum level at 7,48 and 15,88 respectively. In Y3 it is above the neutral level at 25,52 and above the maximum mark in both Y4= 35,89 and Y5= 37,44.

EBITI is 5 times referred to as being a successful company according to literature. ECO is, based on literature as successful for Y2 to Y5. In Y1 the EBITI was above the minimum of 2,5 times, Y2 to Y5, lowest at 7,3=5 times in Y2 and highest at 67 times in Y5.

ROA is above the minimum guideline level at 7.83 in Y1 and therefore above neutral at 14.61 in Y2 and 21.05 in Y3 going forward. ECO's ROA level was above the maximum mark of the guidelines.

Level 2 testing commences as there were no interruptions caused by financial distress detected. The CFTD's cash flow from operations had a 21% increase Y1 to Y2. From Y2 toY3 ratio declined by 25%, Y3 to Y4 the cash flow from operation increased three times more than in Y3 cash flow from operation and in Y5 a 70% drop. The total debt continually increased from Y1toY5 even though the ratio in Y3 was positive and it was below the minimum guideline level and cash flow declined by 25%. The CFTD ratio indicates the company's ability to cover total debt using cash flow. Testing should be suspended and only continued once the reason for the fluctuation in Y3 toY5 has been determined. A clear indication of the ratio differences given in Figure 6.34.


EDGARS CONSOLIDATED STORES LTD (ECO)
ROE
Level1: Survival level
40
20
0
-20
-40
-60
-80
-100
-120
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
EDGARS CONSOLIDATED STORES LTD (ECO)
EBITI
Level1: Survival level
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
EDGARS CONSOLIDATED STORES LTD (ECO)
ROA
Level1: Survival level
30
25
20
15
10
5
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

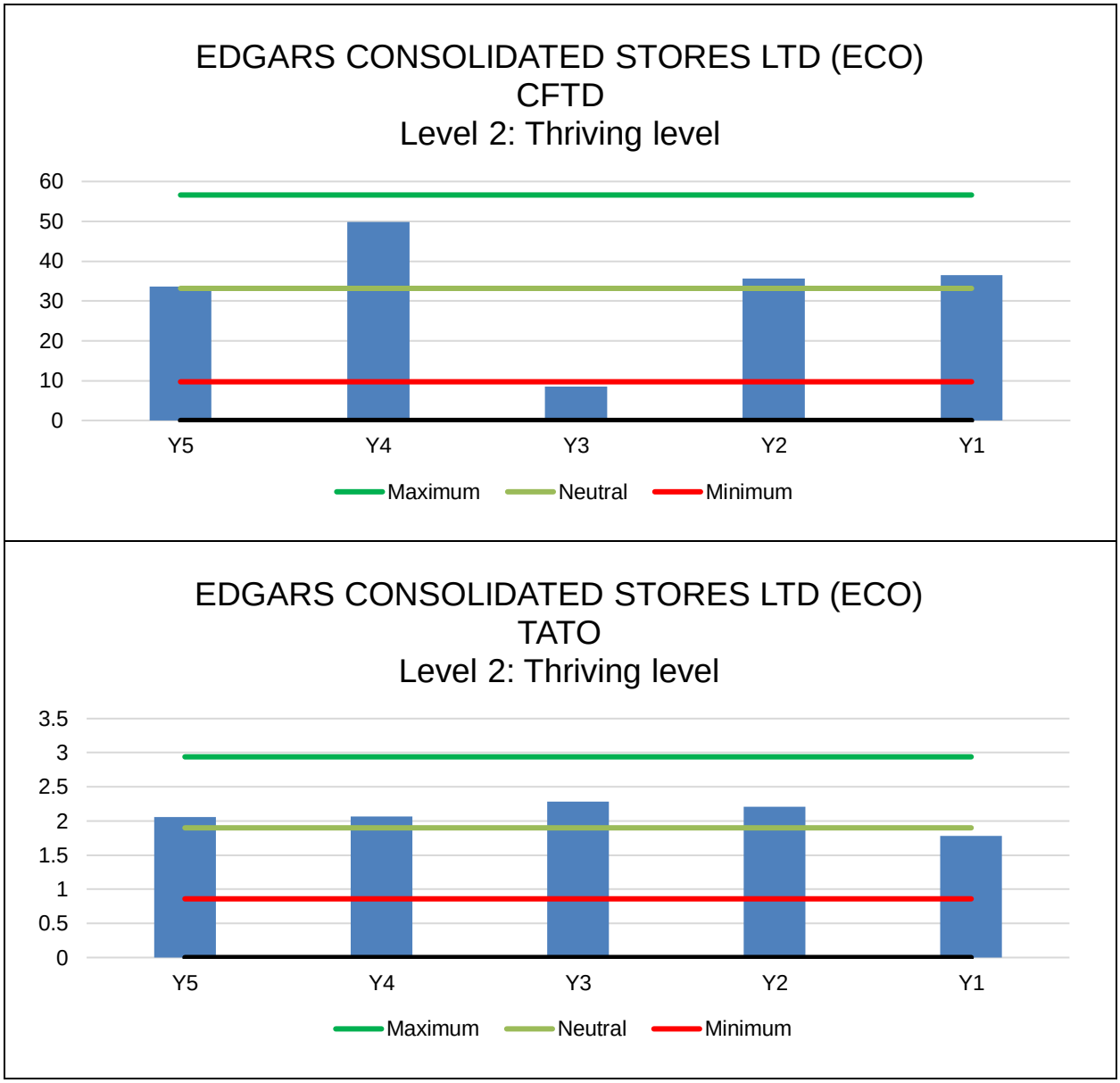


Figure 6.34: Level test: Edgars Consolidated Stores Ltd (ECO)

Source: INETBFA (2018)

Figure 6.34 illustrated the ratio difference but the difference does not merit a great sign of concern. It is good to know what the cause of a specific problem is to enable a solution to be found in case the problem is not as innocent as it appears. The trend of the EMS score of Basil Read Holdings Ltd (BSR) over the review period is set out in Table 6.48.

Table 6.48: Basil Read Holding Ltd (BSR)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	-0,26	0,03	-0,04	-0,1	0,06
X2	RE/TA	3,26	0,03	0,05	0,02	0,20	0,16
X3	EBIT/TA	6,72	-0,27	0,02	0,06	-0,21	0,02
X4	BVE/TL	1,05	0,04	0,53	0,51	0,32	0,66
Z-score			-0,13	4,30	3,99	2,17	4,99
Classification			**DISTRESS**	**SAFE**	**SAFE**	**GREY**	**SAFE**

Source: INETBFA (2018)

Table 6.48 shows BSR's EMS indicated in Y1, Y3 and Y4 to be in the safe zone (strong credit profile) while the grey zone indicates adequate credit policy in Y2. The distress zone followed (extremely high risk) in Y5, which point towards concern is how within a year BSR's financial status is able to move from grey to safe for two years then suddenly within the distress zone being an extremely high risk. In Y2 variable x1 and x3 was negative, x1 (0.1) and x3 (0.21). x1 being WC/TA and x3 is EBITTA, in Y2 working capital decreased by 82% and total debt by 9% while EBIT declined by 17%. In Y5 when BSR's EMS score was within the distress zone further investigation pointed to x1 variable (0.21) and x3 (0.27). The decline was due to both negative working capital and EBIT. A graphic illustration of the EMS results of BSR is displayed in Figure 6.35.

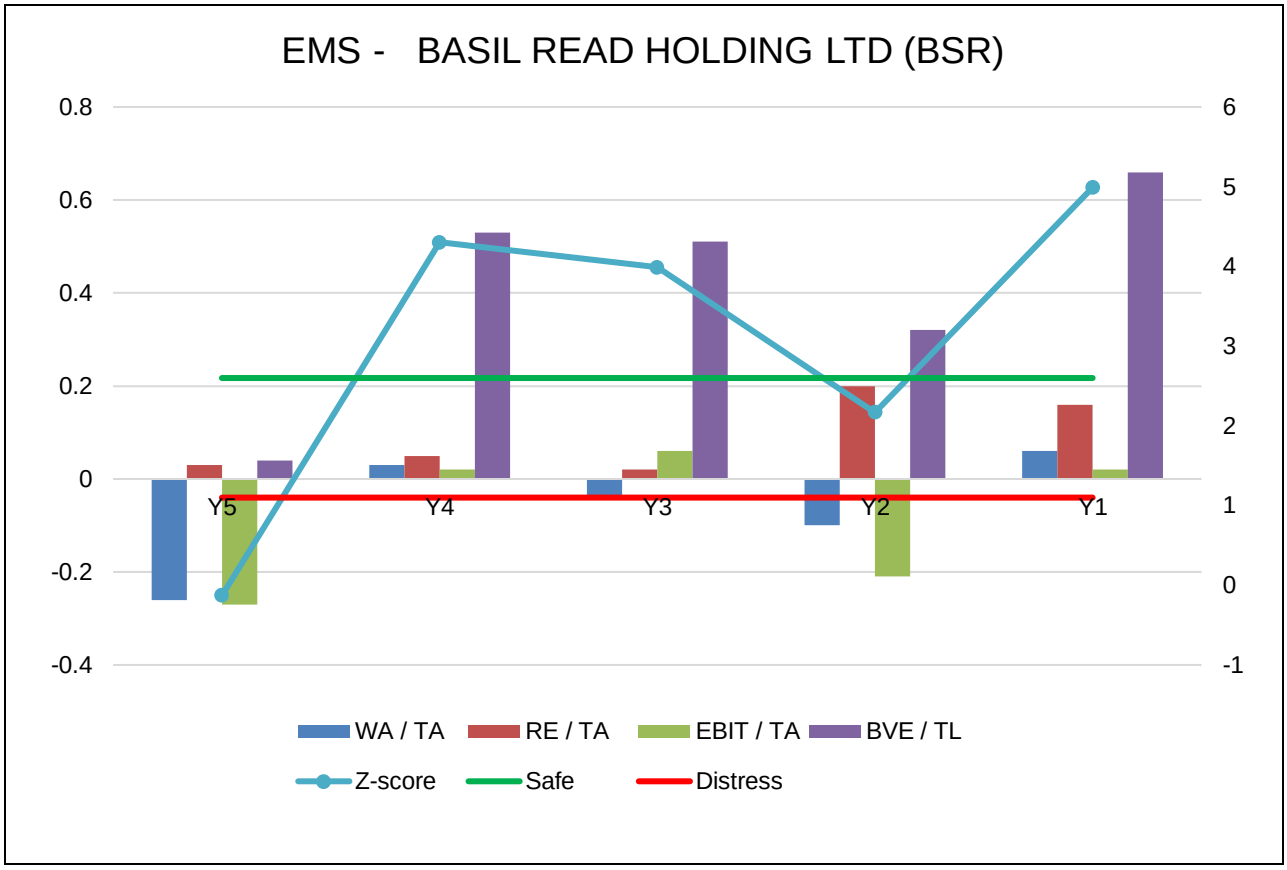


Figure 6.35: EMS: Basil Read Holding Ltd (BSR)

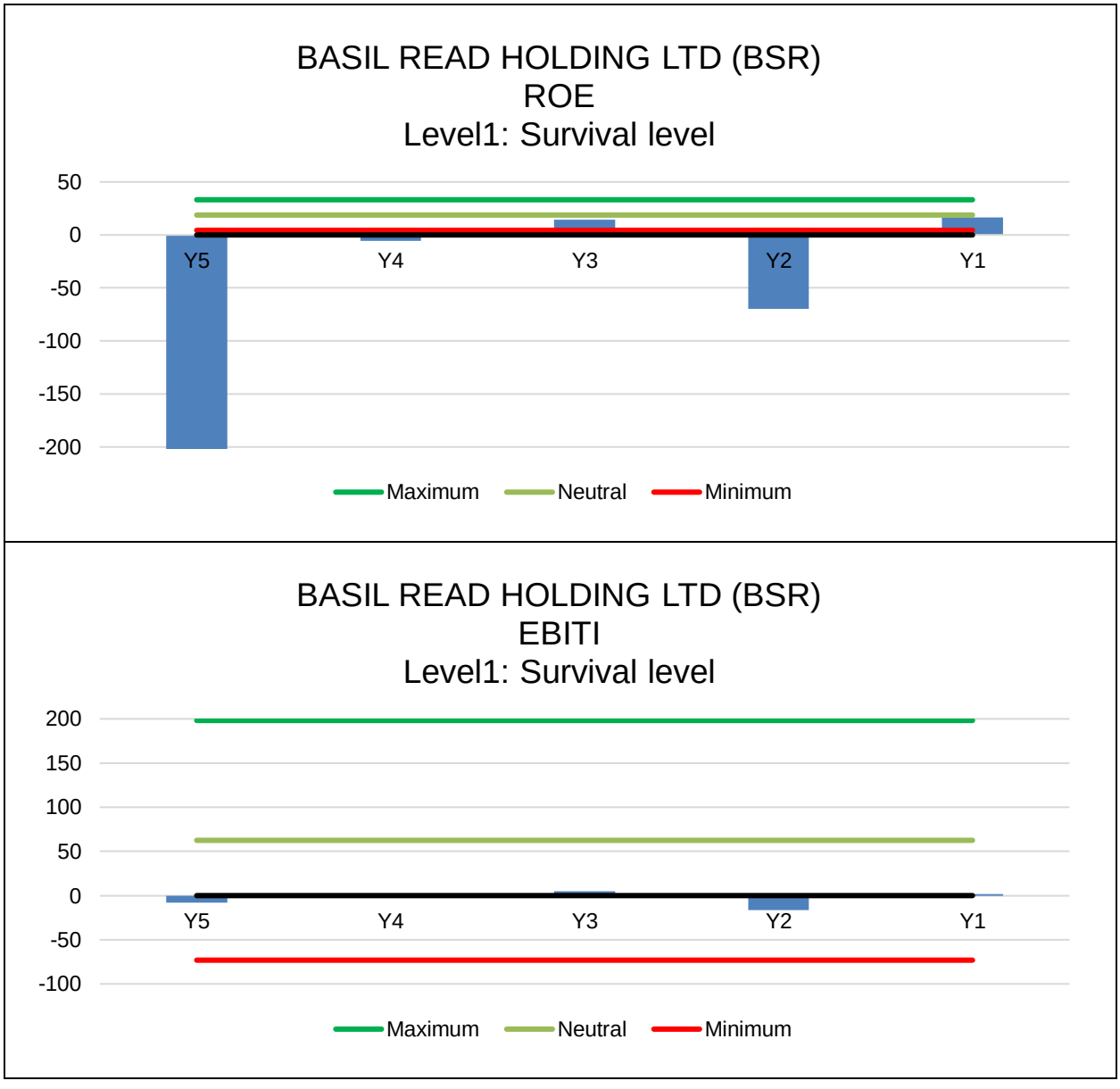
The diagram exemplifies the zones in which BSR lies. Below in Table 6.49 the bankruptcy indicator testing is looked at to determine if the financial condition could be mirrored using the different methods of testing.

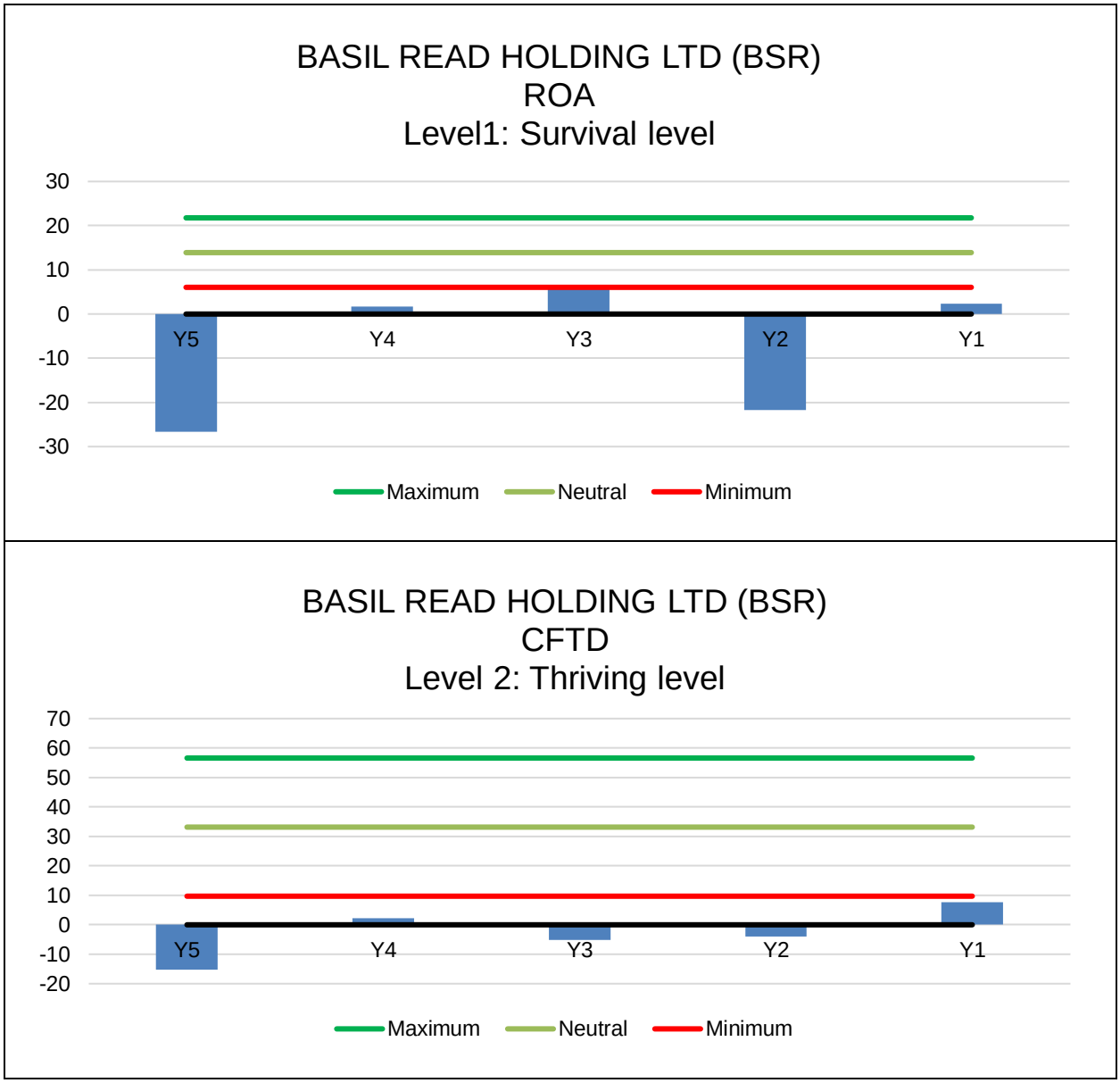
Table 6.49: Basil Read Holding Ltd (BSR)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	-908,20	-5,62	14,51	-69,69	16,27
	EBITI	-7,92	1,09	4,63	-16,45	1,54
	ROA	-26,59	1,72	6,13	-21,72	2,33
Level 2: SFP	CFTD	-15,21	2,16	-5,21	-4,06	7,61
	TATO	1,67	1,61	1,59	1,58	1,46

Source: INETBFA (2018)

The bankruptcy prediction indicators in Table 6.49 give a clear sign of financial distress in Y2 as the ROA on the Level 1 test have a high negative of 69.69. This is a revelation that the company does use the shareholders/owners funds to generates profits but instead this negative could indicate losses, therefore, the ratio is negative. The interest cover is also negative (16.45) reflecting the company's inability to repay their interest obligations. Lastly on the Level 1 testing ROA is also at a negative high of 21.72. The graphical display of Table 6.49 is presented in Figure 6.36.




BASIL READ HOLDING LTD (BSR)
ROA
Level1: Survival level
30
20
10
0
-10
-20
-30
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
BASIL READ HOLDING LTD (BSR)
CFTD
Level 2: Thriving level
70
60
50
40
30
20
10
0
-10
-20
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

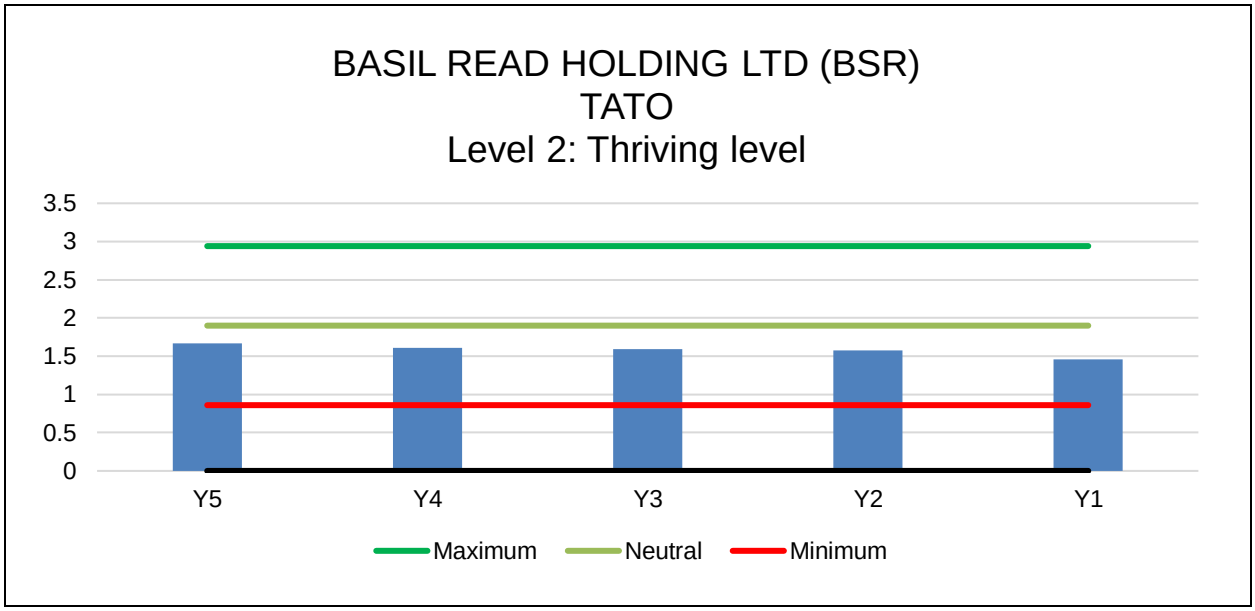


Figure 6.36: Level test: Basil Read Holding Ltd (BSR)

Source: INETBFA (2018)

Testing of Level 1 is suspended until reasons have been identified of the losses and possible solutions to rectify. Interpretation for a graphical perspective is indicated in Figure 6.36 above. Steinhoff International Holding EMS score is now set out in Table 6.50 below.

Table 6.50: Steinhoff International Holding (SNH)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,06	0,11	0,07	0,06	0,06
X2	RE/TA	3,26	0,16	0,15	0,18	0,18	0,18
X3	EBIT/TA	6,72	0,06	0,06	0,07	0,07	0,06
X4	BVE/TL	1,05	0,98	1,39	0,77	0,68	0,68
Z-score			5,90	5,60	6,32	5,57	5,41
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

SNH's EMS model classification as per Table 6.50 is safe over the five-year period under review. The z-score increase from Y1 to Y3 followed by a slight decline in Y4 and another increase from Y4 to Y5. The results of the EMS scores Y4 to Y5. The results of the EMS scores in Table 6.50 is better explained in Figure 6.37.

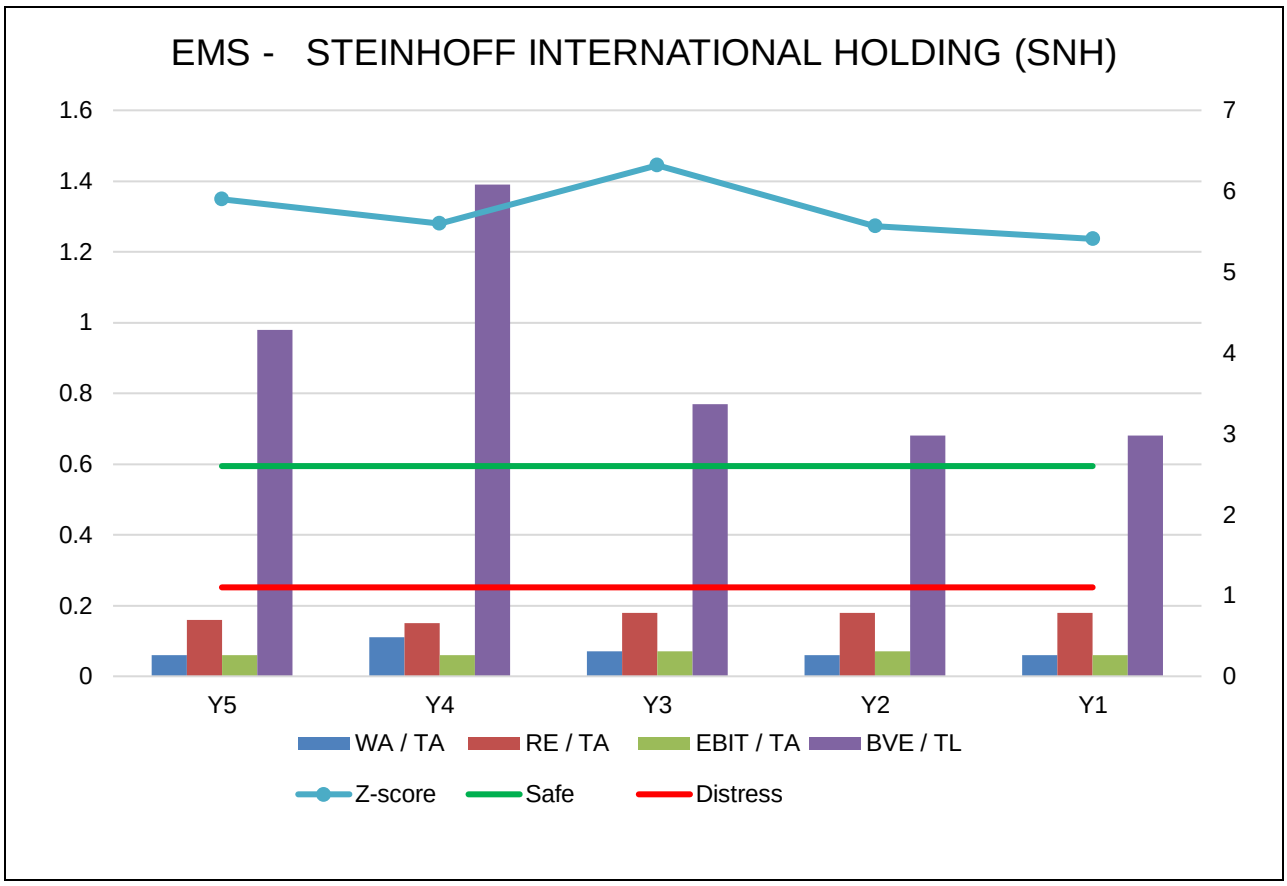


Figure 6.37: EMS: Steinhoff International Holding (SNH)

Source: INETBFA (2018)

Figure 6.37 clearly exhibits SNH scoring is above the 2.60 zone indicating the safe zone emphasis is placed on the fact that SNH has a strong credit profile for the period under review. Table 6.51 gives a year-to-year indication of the bankruptcy indicator testing.

Table 6.51: Steinhoff International Holding (SNH)

	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	9,75	7,41	11,99	12,39	12,26
	EBITI	4,05	4,65	4,05	3,36	3,15
	ROA	12,18	9,99	10,37	10,52	9,46
Level 2: SFP	CFTD	12,10	22,05	18,27	13,26	12,04
	TATO	1,12	0,77	1,00	1,11	0,96

Source: INETBFA (2018)

Table 6.51 shows that bankruptcy prediction indicators ROE fluctuated from Y1toY5. A slight increase in Y1 followed by a slight (3%) decline in Y3, a further decline in Y4 of 3.8% and a 3% increase in Y5. The interest cover EBITI remained below the smiled upon 5 times throughout the period under review but did not decline to below 2,5 times minimum level. ROA remained between neutral and minimum level but did not move below minimum level according to the guidelines.

Level 2 testing revealed that CFTD increases every year with 45% followed by a decrease in the ratio from Y4 to Y5. The TATO ratio indicates how efficient the company uses assets, a low ratio indicates the company assets are not used efficiently and could have an effect on company productivity. Y4 indicated concern as it was below the guideline minimum mark. Visual display of the above-mentioned results is set out on Figure 6.38.


STEINHOFF INTERNATIONAL HOLDING (SNH)
ROE
Level1: Survival level
35
30
25
20
15
10
5
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
STEINHOFF INTERNATIONAL HOLDING (SNH)
EBITI
Level1: Survival level
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
STEINHOFF INTERNATIONAL HOLDING (SNH)
ROA
Level1: Survival level
25
20
15
10
5
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

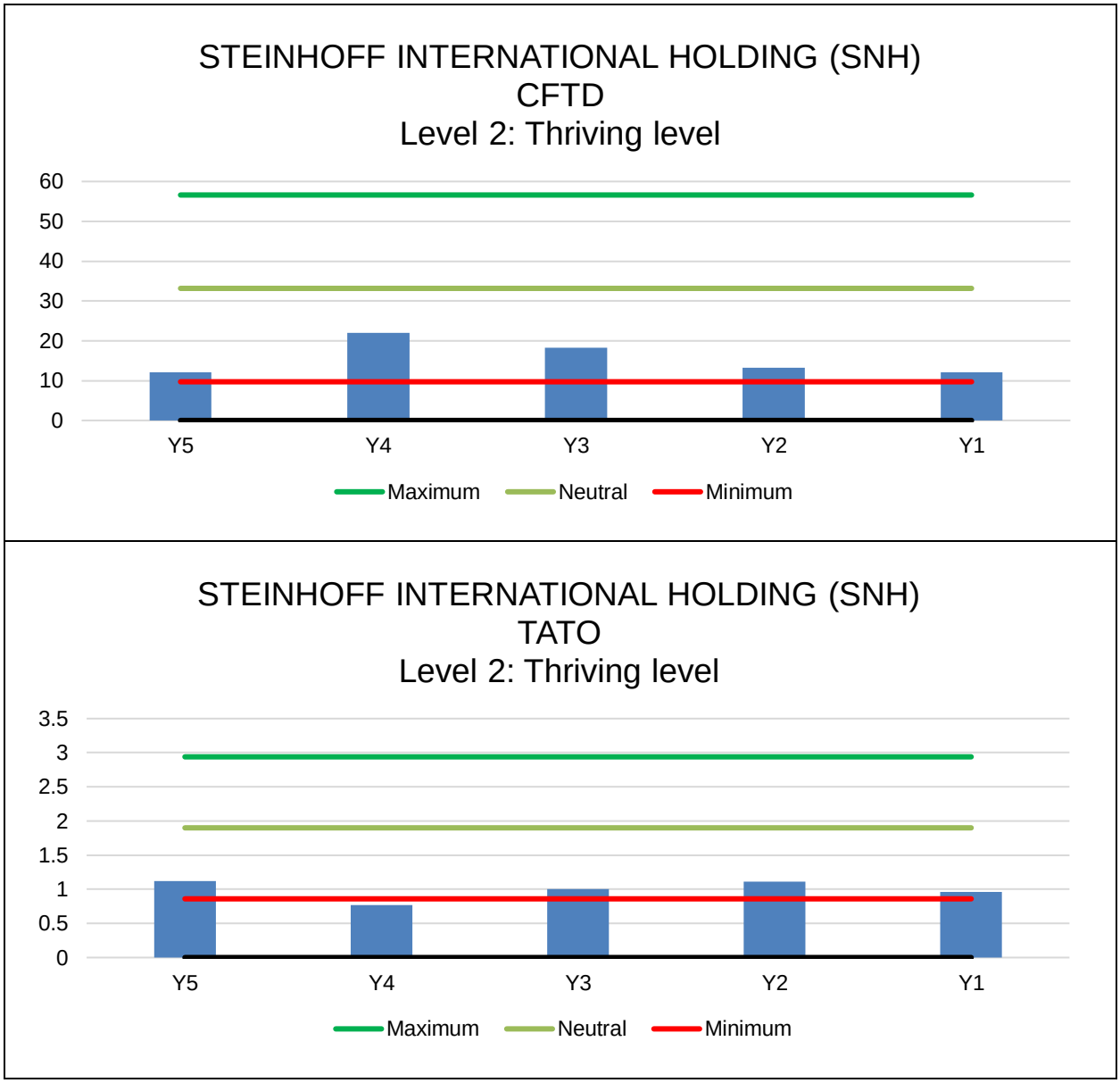


Figure 6.38: Level test: Steinhoff International Holding (SNH)

Source: INETBFA (2018)

Figure 6.38 reveals that both Level 1 and Level 2 testing are conducted throughout the five-year period under analysis. This is followed by the EMS computation of Group Five Holding (GHO) in Table 6.52.

Table 6.52: Group Five Holding Ltd (GHO)

Ratio	Definition	Coefficient	Y5	Y4	Y3	Y2	Y1
		3,25					
X1	WA/TA	6,56	0,01	0,03	0,01	0,03	0,07
X2	RE/TA	3,26	0,03	0,02	0,02	0,03	0,03
X3	EBIT/TA	6,72	0,03	0,05	0,06	0,04	0,07
X4	BVE/TL	1,05	0,41	0,45	0,37	0,38	0,40
Z-score			4,05	4,32	4,17	4,21	4,70
Classification			**SAFE**	**SAFE**	**SAFE**	**SAFE**	**SAFE**

Source: INETBFA (2018)

The EMS according to Table 6.52 are situated within the safe zone successively for five years under review. A year-to-year indication of the EMS movement is given indicating the likelihood of the company going bankrupt is very low. The EMS model is only used to validate the BPIA results and the motive for selecting the EMS model is due to the EMS outstanding performance in previous studies and literature (Alfaro *et al*.,2019:5). Figure 6.39 below.

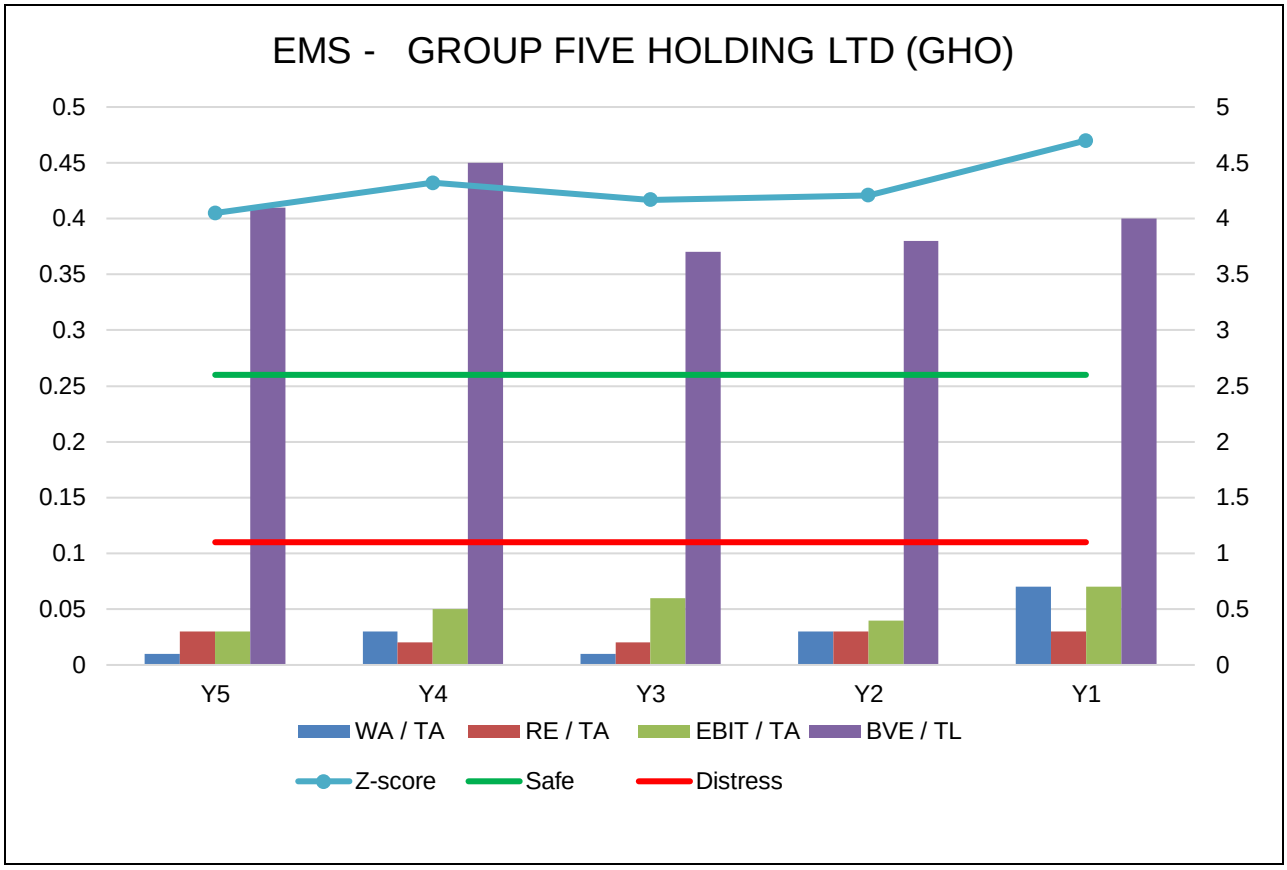


Figure 6.39: EMS: Group Five Holding Ltd (GHO)

Source: INETBFA (2018)

In Figure 6.39 clearly shown GHO is within the zone not frowned upon by companies which is the safe, the testing of the BPIA for GHO are discussed according to the results revealed in Table 6.53.

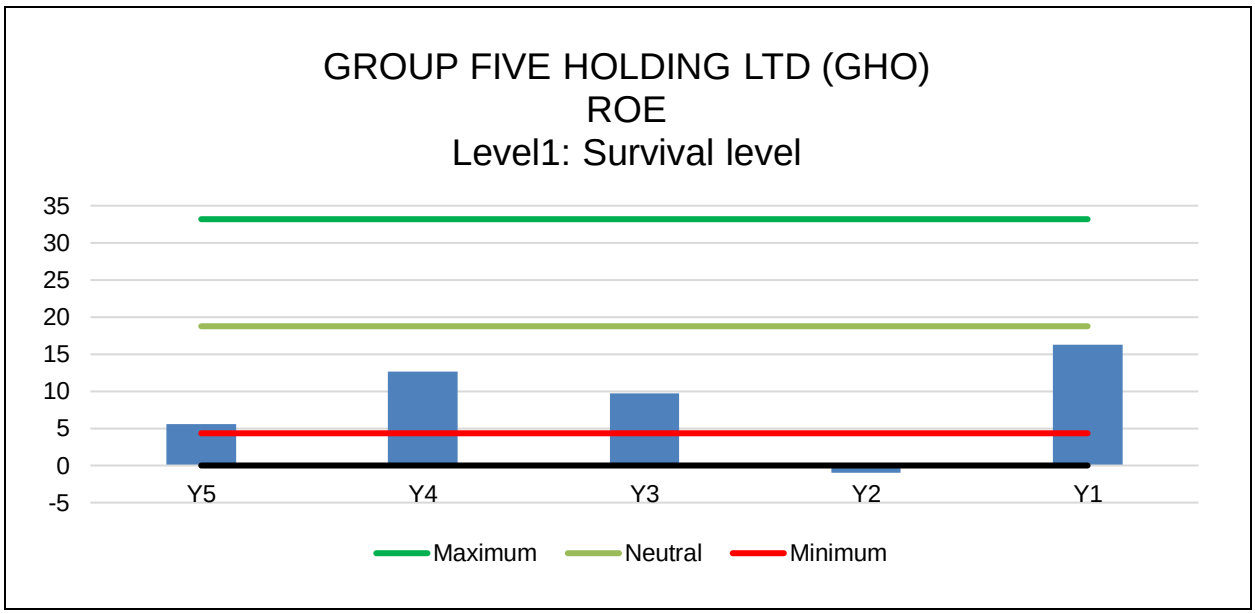
Table 6.53: Group Five Holding Ltd (GHO)

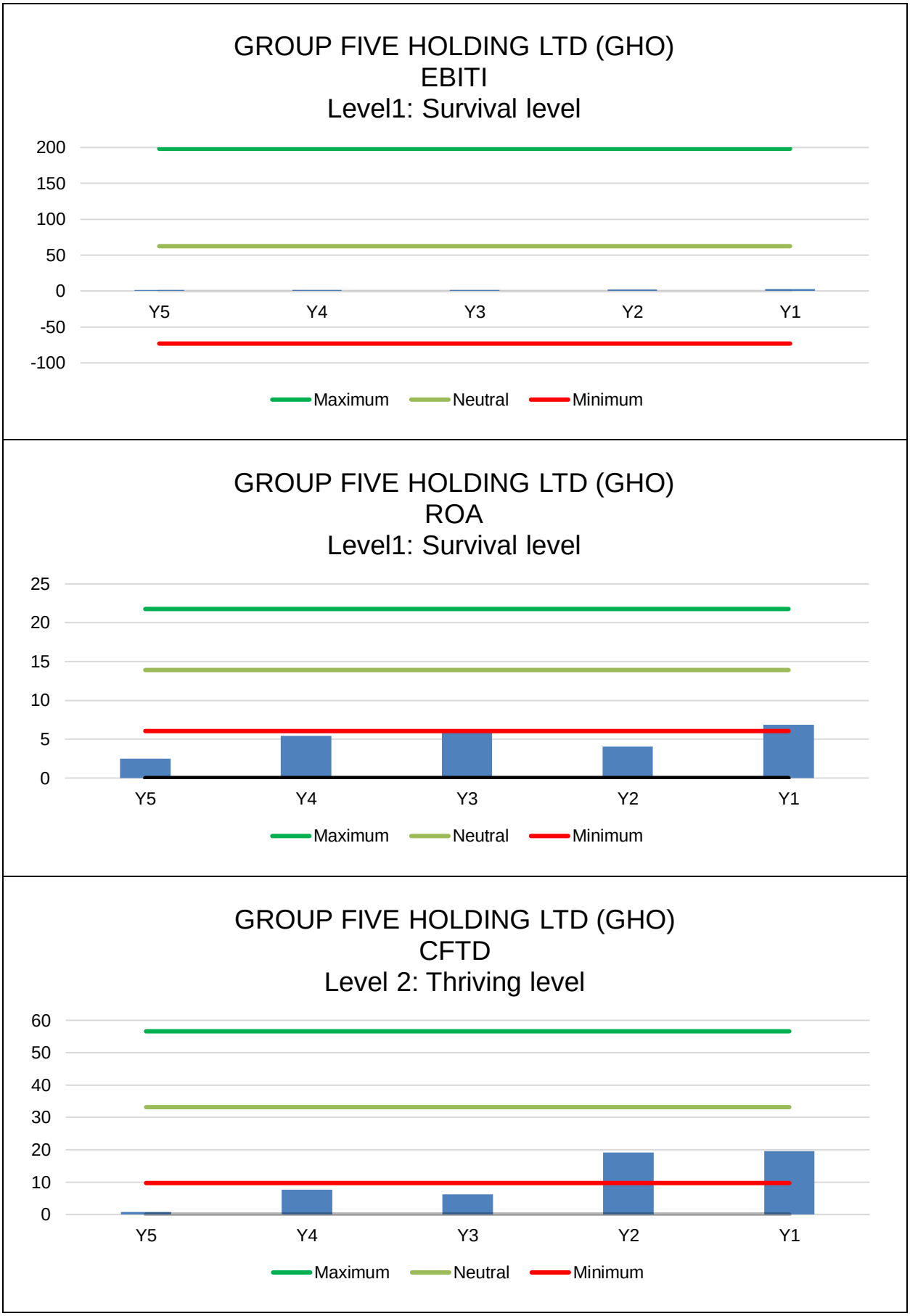
	Ratios	Y5	Y4	Y3	Y2	Y1
Level 1: SOCI	ROE	5,59	12,61	9,70	-0,94	16,27
	EBITI	1,25	1,71	1,81	2,18	3,00
	ROA	2,51	5,42	6,09	4,05	6,85
Level 2: SFP	CFTD	0,77	7,70	6,20	19,17	19,58
	TATO	1,78	1,81	1,92	1,73	1,95

Source: INETBFA (2018)

The BPIA in Y1 for GHO Level 1 testing indicated no alarm as indicated in Table 6.53. ROE in Y2= (0.94) from Y1=16.27, ROE being an important ratio, the outcome of this negative ratio is an indication the company is not generating profit from shareholder/owner funds. Shareholders/owners could become impatient if this trend continues and withdraw their investment, therefore, it is important that investigation is done to ensure that this is not a trend. ROE further increased to, in Y3=9.70, Y4=12.61 with decline to 5.59 in Y5. EBITI indicates consistent decline in GHO ability to repay interest over period under review, Y=3 times, Y2=2 times, Y3to Y5 = 1 time each per year.

In Level 2 testing the CFTD was at 0.77 indicating cash flow from the operation in Y5 was not able to cover total debt. The graphic outline of the Table 6.53 results is expressed in Figure 6.40.




GROUP FIVE HOLDING LTD (GHO)
EBITI
Level1: Survival level
200
150
100
50
0
-50
-100
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
GROUP FIVE HOLDING LTD (GHO)
ROA
Level1: Survival level
25
20
15
10
5
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum
GROUP FIVE HOLDING LTD (GHO)
CFTD
Level 2: Thriving level
60
50
40
30
20
10
0
Y5
Y4
Y3
Y2
Y1
Maximum
Neutral
Minimum

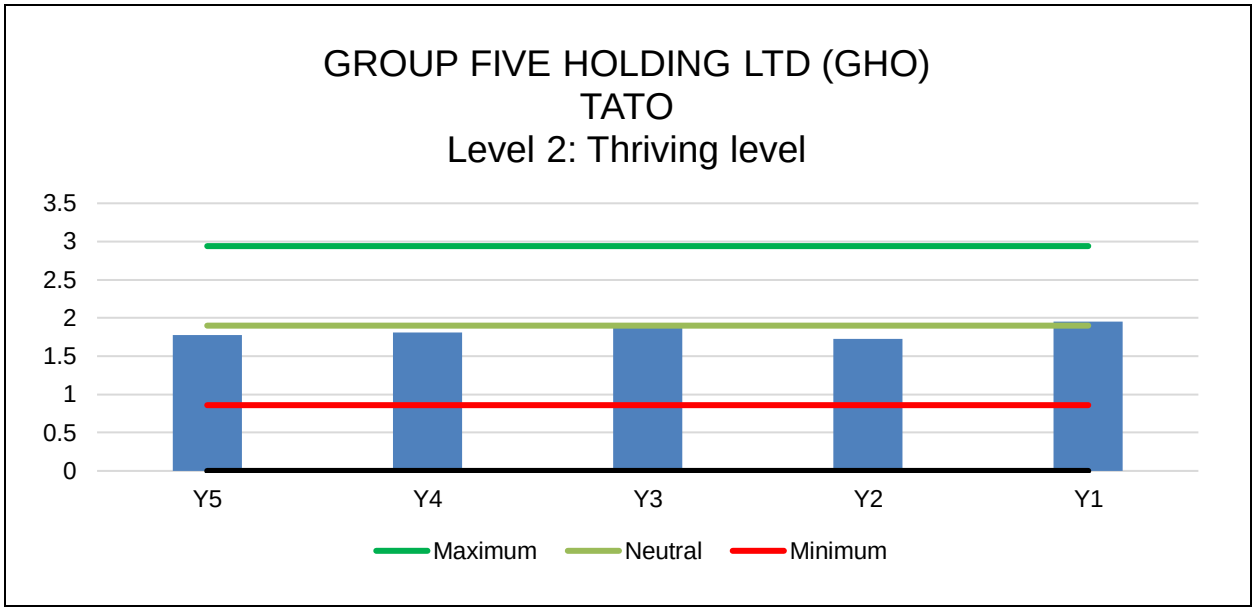


Figure 6.40: Level test: Group Five Holding Ltd (GHO)

Source: INETBFA (2018)

Figure 6.40 mirrors that in Y2 the testing should have stopped and an in-depth analysis should have been conducted due to the negative ROE ratio indicating investors are not obtaining a return from their investment. This this could be because of a decrease in profits due to an increase in cost or it could also be that the company is no longer profitable. EBITI indicates in Y1 GHO was able to cover their interest obligation 3times, declining to 2times below the minimum level in Y2 and a further decline to 1times in Y3 to Y5. If GHO is only able to cover their interest repayments once, how are they going to repay their debts? The EBITI and ROA is below the guidelines minimum level. The CFTD shows a steady decline every year. The CFTD indicated whether the company has sufficient cash flow. Correia *et al* (2015:5.25) explain when a company's cash flow is inadequate the future financial commitments will not be met by the company and this could lead to company ceasing operations. The TATO ratio fluctuated annually from Y1 to Y2, ratio decrease from above neutral benchmark line to above the minimum benchmark line. An increasing to above neutral benchmark line in Y3 and consistent decline below above neutral benchmark line but above minimum benchmark line from Y4 to Y5.

6.5 SUMMARY

As mentioned at the beginning of the chapter the main objectives were to validate the developed bankruptcy prediction indicators (ROE, EBITI, ROA, CFTD and TATO) through testing and comparing the results to the results of the test done by a legendary bankruptcy prediction model. The chapter began by discussing the interpretation of the different descriptive statistics used being frequency, descriptive and correlation and results obtained. This led to the discussion of the Mann-Whitney (*U*) test. The route taken that led to the rationale of choosing the non-parametric test.

According to the findings of the nine ratios initially selected as the bankruptcy prediction indicators for the testing to determine financial distress, only five remained that were tested in two-level testing (statement of comprehensive income ratios and statement of financial position ratios). The testing of the bankruptcy prediction indicators begun with Phase 1 to determine whether the economic climate has an effect on the ratios and bankruptcy. The economic climates that were covered over the testing period were pre-crisis (2002–2006), during crisis (2007–2011) and post-crisis (2012–2016). This period included financial highlights being the global crisis in 2007–2008 and 2010 FIFA World Cup. Results were that only two companies were failed due to bankruptcy in 2011. While the seconding testing phase's objective was to determine if the bankruptcy prediction indicators are a reliable tool to detect financial distress. Results revealed it could be said the collective BPIA is a reliable tool. A total of 90% of the companies tested financial distress were an indicator in comparison to the renowned EMS bankruptcy prediction model that identified 30%. Lastly, the third phase of testing was done and applied to out-of-sample data, which resulted in 60% detection using the BPIA as a testing tool compared to 20% detection when the EMS was used as a testing tool. The BPIA two level testing was applied and compared with EMS. The results indicated the BPIA to be a reliable analytical tool in predicting bankruptcy or financial distress over three different economic conditions.

Although this is a recommended model for bankruptcy prediction, there is an awareness that there are other factors within the macroeconomic environment that also effect bankruptcy. These factors play an important role in timely bankruptcy prediction, some of

the macroeconomic factors are government policies, business rescue, BEE and corporate government according to the King V report.

Having presented the results on the data analysis conducted study will now reflect holistically on the study in the next chapter.

CHAPTER 7
CONCLUSION AND IMPLICATIONS

7.1 INTRODUCTION

Data analysis, interpretation and the findings were reported in the preceding chapter. The results included the BPIA. It is important that the purpose of the study be restated. This study's purpose is to investigate the ability to combine different indicators (bankruptcy prediction indicator approach) with the aim of validating whether these indicators are able to detect timely financial distress. The motive for this study is there has not been an empirical study to explore the ability of the BPIA to detect financial distress among different sectors in a South African context as the studies within literature is normally sector-based. The investigation was over the period 2002–2016. As this period includes the financial downscale in 2007 due to financial global crises (Ashman, Fine & Newman, 2011:174) and the 2010 financial influx as a result of the 2010 FIFA World Cup (Desai & Vahed, 2010:154) held in SA.

The chapter consists of seven sections as identified in Figure 7.1. The study's introduction is laid out in Section 7.1. Followed by Section 7.2 that provides an overview of the study. The research objectives and research problem developed in Chapter 1 is revisited in Section 7.3. In Section 7.4 the research implications were presented followed by the study's contributions in Section 7.5. The study's limitation was provided in Section 7.6. Further research suggestions are made in Section 7.7. Lastly, the chapter's conclusion is drawn 7.8. Figure 7.1 present the schematic plan outline of the final chapter.

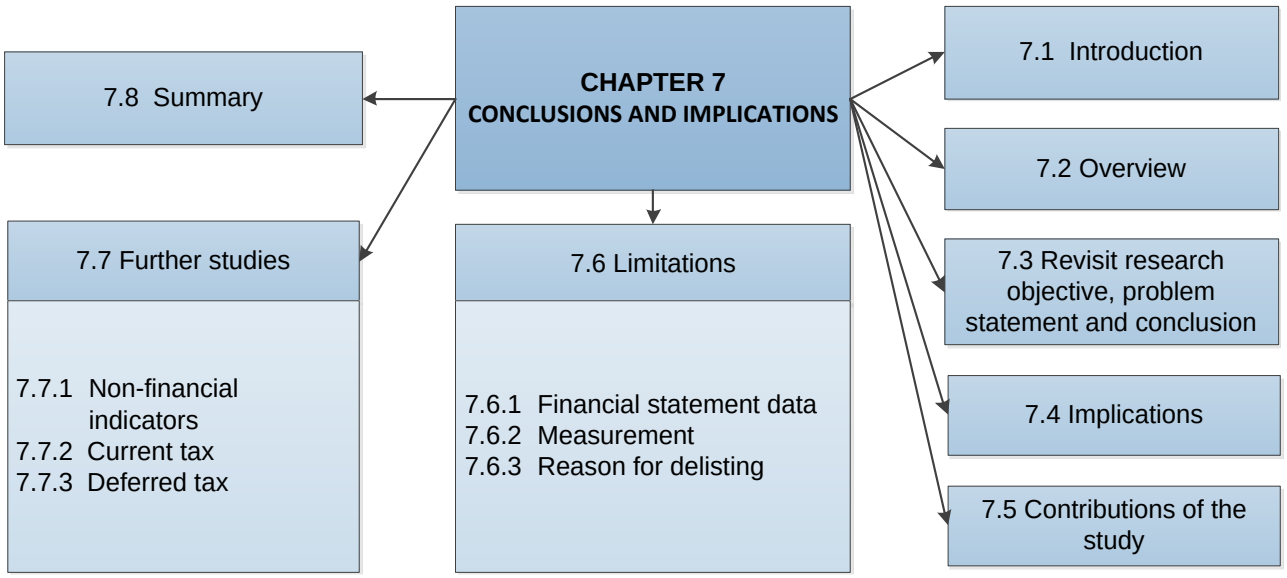


Figure 7.1: Overview of Chapter 7

7.2 OVERVIEW

The aim of this study is to investigate whether the developed indicators are able to detected failure timeously. The validation is applied through testing the indicators of the JSE-listed companies. A synopsis of the study is outlined by commencing from Chapter 1 where the research gap was identified and the research problem statement was formulised and the research objectives developed.

In Chapter 2 a literature review was conducted to gain insight and create a better understanding of global crises. In Section 2.2 the formal definition and the different types of global crises were provided. Light was also shed on the different global crisis's eras, the causes, and early warning signs thereof. The chapter continues in Section 2.3 with the build-up of global crises to bankruptcy, evolution and cause of bankruptcy.

The objective of Chapter 3 is to obtain an in-depth understanding of financial ratios, their origins and the bankruptcy prediction model financial ratios used on both international and within SA studies. The study's research gap was identified through the assistance of the literature review finding, which led to the development of the research problem and objective.

The description of the research methodology applied in this study is presented in Chapter 4. The study used a qualitative research method, applied research type, exploratory

research design, collected secondary data and non-probability quota sampling were applied. The chapter also covers the rationale of adopting the sample group selected, pairing sample technique, the investigating period as well as the financial ratio selected, which started off at 94 ratios. The financial ratio was considered as useful indicators were identified.

Chapter 5 of the study discusses the research data that were analysed. One of the important issues in this section is the profiling of companies that were used. Companies were selected based on certain criteria being failed due to bankruptcy over the period 2002–2016. Followed by the selected financial ratio, 94 potential ratios that have been identified as useful failure predictors. Of the 94 ratios, 19 ratios were selected and defined in Section 4.3.3. A total of nine ratios were selected and divided into the identified four pillars of a companies' financial health. Thereafter the statistical testing applied was discussed followed by the discussion of the three measures that were used in the study. The measures include the prominent EMS failure prediction model, the traditional trend analysis and the comparative analysis, all three these measures are ratio-based. The presentation of the developed bankruptcy indicator approach together with the rationalisation follows.

In order to address the three empirical objectives (Section 1.5.3) set out in Chapter 1, descriptive statistics were calculated in Chapter 6. The frequencies, descriptive statistics being the mean and SD were discussed. Correlation analysis was undertaken with the primary purpose of establishing a relationship among the financial ratios selected. The correlation analysis produces a significant positive correlation between six of the nine financial ratios. The K–S test was performed to address the normality of the distribution results from K–S test showed the distribution as being non-parametric and therefore the Mann-Whitney (*U*) test was applied. The Mann-Whitney (*U*) test indicated the significant financial ratios as the ROE, EBITI, ROA, CFTD, and TATO, their effective size and the mean ranks presenting that the NF companies' means ranks are higher than that of the failed companies. Thereafter the three samples were tested based on the BPIA and the EMS as indicated in Section 6.4.

Chapter 7 provides a logical conclusion from the data interpreted in the previous chapter. This chapter also evaluates if the research objectives have been met and the research problem solved. The study's contribution, implications and shortcomings are discussed and

further research recommendations are made. The discussion now turns to revisit the problem statement and the three empirical objectives and whether they have been met.

7.3 REVISIT RESEARCH OBJECTIVE, PROBLEM STATEMENT AND CONCLUSION

In this section, the study's problem statement and objectives developed in Chapter 1 are revisited. The findings from Chapter 2and 3 are discussed in the context of the theoretical objectives and the empirical objective are deliberated based on the findings in Chapter 6. The financial ratios used within the BPIA were tested and testing uncovered the following as indicated in Table 7.1 on the next page.

Table 7.1: Revisiting the Problem statement, primary, theoretical and empirical objectives

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
7.3.1	**Problem Statement (Section 1.4)**	
	A need for the development and validation of a generic bankruptcy prediction indicator within a South African context that is easy to understand and apply. Only financial indicators that are able to detect early warning signs of bankruptcy or financial distress of JSE-listed companies that can be integrated into monthly or quarterly financial reporting and may have an impact on the decision making of management.	The study identified possible generic (not sector-specific) bankruptcy prediction indicators that will be tested within a BPI. These indicators can be used in the testing of financial distress of companies within different sectors. In literature to test the model's power of prediction the correct classification before failure notion is used (Beaver, 1966; Altman, 1968; Blum,1974; Hossari,2006; Tuvadaratragool 2013). Hlahla (2010:30) explains when a model's predictive ability is above the 50% benchmark it provides evidence of the accuracy of the model predictive ability. In line with previous studies this study adopted correct classification before failure at 50%. Indicating BPIA as an effective tool for predicting bankruptcy. Findings revealed out of 22 failed companies 20 were correctly classified as failed, accounting for 91% (20 out of 22 companies).

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
7.3.2	**PRIMARY OBJECTIVE (Section 1.5.1):** The primary objective develops and examines whether BPIA can be used to identify potential bankruptcy	
	The primary objective of the study is to develop bankruptcy prediction indicators into a BPIA and tested to detect or predict warning signs of bankruptcy or financial distress. The BPIA was be applied and tested over different economic conditions being pre- (2002–2006), during (2007–2011) and post (2012–2016)-global financial crisis, testing JSE companies within similar and different sectors by applying a combination of a cross-sectional and longitudinal analysis approach within a South African context.	Of the nine selected indicators (financial ratios) 5 were found to be statistically significant as per Section 6.3**.** These bankruptcy prediction indicators have been used in the testing of the samples. All the companies tested within a period was found the BPIA correctly classified them as failed. For pre- (2002–2006) 10 were tested and correctly classified as failed, during 200 –2011 two companies were tested and correctly classified as failed and post (2012–2016) 5 companies were tested and correctly classified as failed. Of the five out-of-sample BPIA was applied to, three was found to be correctly classified as failed.

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
7.3.3	**THEORETICAL OBJECTIVE (Section 1.5.2):** The development of the theoretical objectives was motivated by the gap identified in theiterature through investigation of objectives listed below	
I.	In order to analyse the history, different crises included the global crises and the eras of a global crisis as a contributing factor of bankruptcy.	This objective was achieved in Section 2.2.1-Section 2.2.3 (page 24) by way of defining and describing the different crises and the different crises that took place over the four main eras. It was found that one single crisis does not lead to a global crisis but a combination of the different crises. The most common combination is a currency crisis plus a banking crisis which adds up to a twin crisis. McKenna (2013:1) explains a twin crisis is a painful reminder of the 2007 global financial crises being on the scale of the Great depression.
II.	Analysis causes, warning signs and the build-up to a bankruptcy	The objective was gratified in Section 2.2.4-Section 2.2.6 (page 40) as global crises do not just happen there are causes that distort the market and other vulnerability indicators within different sectors. The third-generation model focussed on market distortions and they lead to currency crises and vigilance that need to be applied to the warning signs known as vulnerability. It has been proven over in literature that bankruptcy does not come out of nowhere, it builds up over time. This is when warning signs are not identified timeously (Naidoo, 2006:2).

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
III.	Examine the generic terms and evolution of bankruptcy	The objective was met as different researchers define bankruptcy differently. The most common definitions were identified in Section 2.3.1–Section 2.3.2 (page 50) as a background of where bankruptcy started. The definition of bankruptcy normally bounces between generic terms that may not mean the same thing and not all the terms mean the company should cease operation or is unable to continue with operations. It also does not imply that companies that are financially frail generally turn out to be legally bankrupt. Failure means there not enough income to cover cost, insolvency indicates there is more liabilities than assets. Default refers to the relationship between debtors and credits and bankruptcy is a process which starts financially and is completed legally (Altman & Hotchkiss, 2006:4 and Sarfo, 2019:556).
IV.	Identify possible causes of bankruptcy	The objective was accomplished in Section 2.3.3 (page 53), which demonstrated not all bankruptcy has uniform causes but there are also non-financial causes that also need to be considered. Also bearing in mind bankruptcy can occur at different staged within the life cycle of a business.

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
V.	Assess the different categories of bankruptcy within United States of America (USA), United Kingdom (UK) and South Africa (SA) legal provision.	The achievement of the objective was obtained in Section 2.3.4 (page 56) by looking at jurisdiction similarity, different categories of bankruptcy from a continental perspective within the three countries that built their legal system on the same foundation. This foundation being the English Common Law following the same process and only the wording differs, the countries are USA, UK and SA (Nagel *et al*., 2015:4-10).
VI.	Explore the origins of bankruptcy predictions	The objective was reached in Section 3.2.(page 70). The foundation of bankruptcy modelling was laid in 1966 by Beaver. Different models have since been established. Over periods determined by literature it has been revealed that different financial ratios have been applied through bankruptcy prediction models, yet the aim is similar, to predict bankruptcy
VII.	Analysis of financial ratios as fundamental factors in predicting bankruptcy	The objective was realised in Section 3.3-Section 3.4 (page 71). Many scholars have attempted to predict the possibility of bankruptcy of many companies by using financial ratios as a basis of many bankruptcy prediction models for the purposes of revealing more insight into the subject matter. Financial ratios are the foundation on which many bankruptcy models have been constructed. These foundations give the layout and the strength required by the bankruptcy models require (Nadart & Wahar, 2019:3)

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
VIII.	Examine financial ratios as part of international and local bankruptcy prediction modelling	This objective was completed in Section 3.5 (page 78) as it clarifies financial ratios have played a vital role in bankruptcy modelling and seminal studies both internationally and within South Africa. The sophisticated ratio-based models selected were Altman (1968,1977,2006) Hossari (2006); Fülbier *et al*. (2008); De la Rey (1981), Naidoo (2006); Hlahla (2010); Rama (2012) and Cassim (2015).
IX.	Previous South African studies shortcomings	Fulfilment of the objective was acquired in Section 3.6 (page 90), as some South African bankruptcy prediction model studies have been identified as efficient, yet they are not free from shortcomings. Model shortcomings being too complexed, too flexible, the exclusion of cash flow ratios and models based on international studies applied to South African companies

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
	EMPIRICAL OBJECTIVE (Section 1.5.3): Objectives findings will also be addressed through the developing and validating of bankruptcy prediction indicators on JSE listed companies. Most empirical work in South Africa has been focused on periods with normal economic conditions rather than three different economic periods, pre-crisis (2002 – 2006), during crisis (2007 – 2011) and post crisis (2012 – 2016).	
I.	Examining the development and validation of generic BPIA. **(Objective 1, Section 1.5.3, i)**	A two-level BPIA was developed, achieving objective in Section 5.4 (page 192). The first level is the statement of comprehensive income ratios level being the survival level (Ratios: ROE, EBITI, ROA). The second level testing, this level consists of statement of financial position ratios being the thriving level (Ratios: CFTD, TATO). Validation process, in the case where the BPIA predict signs of financial distress in Level 1 testing (survival level) investigation for the root cause of the financial distress should be identified, corrected where possible before Level 2 (thriving level) testing can continue.

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
II.	**Matching failed with non-failed (Objective 2, Section 1.5.3, ii)** Determine how BPIA performs during different economic conditions namely: pre-crisis (2002–2006), during crisis (2007–2011) and post-crisis (2012–2016). Through matching failed with non-failed JSE companies to observe possible future failures.	Over the different economic conditions seven failed companies met the sampling criteria (Section 4.3.3) and seven NF companies were matched with the seven failed companies applying the matching criteria (Section 4.3.3). The findings revealed of the 14 companies (seven failed and seven NF) all the companies were correctly classified thus the failed as failed and the NF as NF by the BPIA, representing 100%, successfully achieving the objective in Section 6.4.1 (page 235). Therefore, the BPIA could be an effective bankruptcy prediction tool.

III.	**Using the EMS model to validate the (Objective 3, Section 1.5.3, iii)** Evaluate whether the developed BPIA is a reliable tool for predicting bankruptcy or financial distress. This was achieved through empirically testing the failed JSE companied comparing BPIA results with EMS model results.	The objective has been gratified in Section 6.4.2 (page 268). The BPIA has been compared to the renowned EMS model. The EMS model was selected to substantiate the results of the BPIA. Of the ten companies that were tested using both the EMS model and bankrupt indicators. Of the ten companies, 3 companies (30%) were in the distress zone. Financial distress was detected, prior to failure: • 5 years – 1 company = 10% • 4 years – 1 company = 10% • 2 years – 1 company = 10% • No detection – seven companies = 70 % BPIA applied to the ten companies, 9 (90%) were indicated as being financially distressed. It could be confirmed the BPIA can be regarded as a reliable tool to detect business failure due to the predictability power, able to correctly classify more than 50% of the companies tested. Bankruptcy or financial distress was detected, prior to failure: • 5 years – 4 companies = 40% • 4 years – 4 companies = 30% • 3 years – 1 company = 10% • 1 year – 1 company = 10% • No detection – 1 company = 10 % (2 years prior to failure)

SECTION	DESCRIPTION	OUTCOME / CONCLUSION
IV.	**Determine the realiability of BPIA Testing out-of-sample data set (Objective 4, Section 1.5.3, iv)** Examine whether the developed bankruptcy prediction indicators are a reliable tool for predicting bankruptcy outside of the sample period to validate it's use on JSE companies. Out-of-sample data were empirically tested, and results were compared to the EMS model	Testing was applied using the BPIA on the out-of-sample data have revealed the BPI's ability to detect financial distress within different economic environments and for companies within diverse sectors. The objectivewas met in Section 6.4.3 (page 323). The out-of-sample was applied to determine the BPIA's effective predictive ability within another period (Beaver *et al.*, 2005:105). The results of the BPIA have been compared to the popular EMS model with the aim to corroborate the results of the BPIA. Of the five companies from different sectors that were tested using both the EMS model and BPIA. The investigation manifested for the EMS model, four of the five (80%) indicated that the companies were in the safe zone meaning financially healthy and 20% indicated either grey or distress zones or both one year prior to failure. Meaning not one company was correctly classified as failed, all the out-of-sample companies selected were misclassified by the EMS model. For the BPIA, 60% financial distress was detected and 40% no detection was made. Meaning the BPIA was able to correctly classify 60% of the selected out-of-sample companies and 40% was misclassified as failed.

Source: Author

The empirical test applied over the 21-year period (1996–2016), included in these 21 years was the global crises and shows South Africa has been sheltered by the National Credit Act 34 of 2005 (NCA), indicating over the period 2007–2008 no companies were failed due to bankruptcy. The NCA came into effect 1 June 2007 due to this strict financial regulation many consumers were protected through disallowing credit and credit-granting, which was irresponsible and reckless. The global crises did not have as many casualties in South Africa compared to other parts of the world (Cassim, 2015:12). This period also included the 2010 FIFA World Cup, a lot of businesses entered into debt transactions in order to cash into the cash influx the world cup would bring raising the expectation for huge debt default, yet only two companies were failed due to bankruptcy in 2011. The testing applied over three phases of testing using the BPIA has demonstrated the bankrupt indicators' ability of the BPIA to detect bankruptcy or financial distress timely to be a reliable tool in predicting bankruptcy or financial distress.

With reference to the BPIA's out of total sample of 22 failed companies (17 + 5 out-of-sample) used for testing the BPIA was able to correctly classify failure at 91% (20 out of 22 companies) before it actually failed and 9% (2 out of 22) was misclassified. All the NF companies were correctly classified by the BPIA.

With regard to the EMS model of a total of 15 (10 + 5 out-of-sample) companies able to correctly classify 4 (27%) as failed and 73% EMS model misclassified the companies. Bearing in mind the EMS model is an international based model. Having portrayed the problem statement, primary, theoretical and empirical objectives and their outcomes. Based on the findings, it can be concluded that the objective of the study has been met. It is reasonable to conclude that the BPIA can be adequately used to predict bankruptcy or financial distress for South African companies within different industries in different periods. The implications of this study are discussed next.

7.4 IMPLICATIONS

Business failure or distress implies that companies are experiencing financial trouble, but it does not mean the companies will always go bankrupt (Hill *et al*., 1996; Hamer, 1983). The other possible outcomes could be restricting, liquidation, take-overs, merges etc. Bankruptcy has many implications, as bankruptcy leaves many casualties some being

the economy in general, regulatory bodies and stakeholders. Hossari (2006:6-11) explains when failed companies are compared to the total number of failed companies the figure seems small and insignificant. Hossari's statement is illustrated by using the Tsunami as an example. Despite the fact that the Tsunami occurred once it did not stop precautionary measures to be taken. Therefore, it is important that precautionary measure is also taken with regard to business failure. Business failure should not be taken lightly because of the number of companies that fail being a small and seemingly an inconsequential percentage of the total companies that fail based on frequent occurrence. Therefore, in the same way that the Tsunami had extensive destructive measures on different counties, so do occurrences of business failure have on not only to the stakeholder of a company but also the economy.

Bankruptcy or business failure of one company especially corporate giants have the ability to greatly affect any economy. Like the failure of corporate giants such as HIH in Australia, Parmalat in Europe, Enron and WorldCom in USA and their demise were allegedly due financial fraud (Gumbel,2004; Reinstein & Weirich, 2002). Howard (2003:21-23) and Veysey (2003:37) enlighten in 2002 it was found that there was no segregation of duties in the maintaining of HIH financial statements as the same individual prepared and approved the financial statements without a director auditing the financial statement. Betta (2016:79) states Goldman Sachs valued HIH book value of AUD220 million as a true value of AUD20 million. Furthermore, suggesting a write down of the assets within range of between AUD44 million and AUD196 million. Rega, Leonard, Brooker and Lama (2012:1) note the HIH Insurance company collapse had AUD5.3 billion collapses on the Australian economy.

Parmalat Food Company's fail in 2003, in the same years the primary disclosures of Parmalat alleged fraud was an USD5 billion non-existent bank account followed by assets to the value of USD8.5 billion to USD12 billion that supposedly disappeared in 2004 (Junaid, 2013:2927). Apparently, Parmalat has been falsifying accounts for over 15 years. Furthermore, Gumbel (2004:20) reveal auditors Grant Thornton and Deloitte were suspected to be in cohorts with Parmalat's scheming to deceive investors of the true value of Parmalat by producing false documentation revealing balance on the balance sheet of USD5 billion in assets. According to Business Week, dated 12 January 2004 found the

management of Parmalat invented non-existent assets to the value USD16.2 billion to offset their liabilities. Parmalat Food Company's failure resulted in a USD16.2 billion loss to the European economy (Edmondson and Cohn, 2004:46-49)

According to Reinsten and Weirich (2002:20-26) the collapse of Enron and WorldCom in the USA had serious consequences on diverse stakeholders, governing bodies as well as the economy.

Huu Cuong (2011:585) and Betta (2016:79) share a notion that Enron's motivation for misrepresentation was profits, being accused cooking the books by overvaluing assets and creating fake profits. Enron management allegedly conspired with Merrill Lynch, Merrill Lynch granted a loan to Enron to reflected as a USD12 million pre-tax profits on Enron financial statements.

WorldCom came under investigation after notifying the Securities and Exchange Commission (SEC) in the USA the research-related charges will be cut from USD7 billion down to USD3.1 billion. According to Business Week, dated 8 July 2002, WorldCom everyday expenses of USD3.8 billion were classified as capital investments in early 2002. Furthermore, in 2004 WorldCom overstated pre-tax profits as USD74.4 billion and assets as USD60 billion (O'Shea, 2019:5).

In addition to affecting an economy in general, bankruptcy also could have implications for regulatory bodies. When big corporate companies collapse it has a ripple effect on not only the economy but also on financial reporting consequences of the legal and regulatory environment. Hossari (2006:301-302) clarifies by explaining this gives rise to re-evaluating the accounting standard and auditing practices. It also raises questions regarding how suitable the models used by regulatory bodies are to indicate an approaching corporate collapse, how truthful reporting of companies are or the reporting standard adequacy. Studies like these would enable or allow counteractive measures to be taken as it could be most helpful to regulatory bodies. This could be done by providing superior preventive tools when financial fraud is being resolved, re-evaluate reporting standards or the ability to indicate approaching corporate collapse before it occurs. Corporate collapse implications are not felt only by the economy or regulatory bodies, stakeholders are also largely affected.

Stakeholders being customers, employees, suppliers, creditors, management and shareholders are affected and incur financial loses as a result of corporate collapse. Hossari (2006:301) explains when companies fold the pyramid of payment is firstly creditors with security, followed by creditors without. Then the suppliers, management including employees lastly shareholders and shareholders stand to lose the most as they are at the bottom of the payment hierarchy. Hosking (2004:23) explains with corporate collapse shareholders are bamboozled, customers are swindled and the workforce is cheated.

The implication of the study has been addressed, the next task to be discussed is the contribution of the study.

7.5 CONTRIBUTIONS OF THE STUDY

In the area of bankruptcy, various contributions have been made namely to the body of knowledge in this field of study. Various authors have been contributing as early as 1966 and have made valuable contributions with regard to bankruptcy predictions. According to Van der Colff (2017:13-14), the historical evolution on bankruptcy prediction modelling both academically and practically is in its early stages in South Africa. This resulted from the survey conducted by Van der Colff (2017:30) based on the development of financial distress prediction models. Of the 219 published academic articles applied in the survey, Van der Colff (2017) categorised the models as follows, 28.8% applies to assessing existing models, 27.9% is the comparison of two or more existing models. This is followed by 22.8% that identifies to models resulting from existing models and cannot be viewed as a new model development. Next, 15.5% being categorised as a mixture of one or more models that can be viewed as a development towards a new model. Further 3% fall within the new model development category and 1.4% is unable to be categorised.

Within the academic community the study was able to add and expand on the existing knowledge of bankruptcy prediction modelling. The study included the studies of De la Rey's, the k-score model with complicated formulations based on rating system and Naidoo's too flexible FRAM based on a multi-stage model (Ngwenya,2018). According to Mosalakae (2007:6), these studies have contributed greatly to South African research in the field of business failure prediction modelling. The current study's contribution is an

easy to use and understand South African-based bankruptcy prediction indictors approach based on financial indicators (financial ratios).

This empirical model is able to timeously identify failure concerns that could ultimately lead to bankruptcy or financial distress enabling appropriate corrective action to be taken to either avoid bankruptcy or act as a financial buffer for early detected financial distress. This was achieved by applying the BPIA to three different phases of testing.

The three-phase testing overall purpose was to determine the BPIA potential in predicting bankruptcy of three difference scenarios. The first phase failed companies were matched with NF companies, both these groups were tested to examine whether the BPIA's predictive ability over different economic periods, pre-global crisis (normal economic conditions), during global crises (unfavourable economic conditions) and post global crisis over the period of influx from the FIFA World Cup (favourable economic conditions). The results of the first phase of testing indicated the BPIA was able to correctly detect bankruptcy or financial distress five years prior to failure at 71% and 29%, four years prior to failure. Therefore, it could be concluded that the BPIA was able to accurately classify companies as failed or NF within all three different economic periods.

The second phase of testing assessed whether the BPIA was a reliable bankruptcy predicting tool. Ten failed companies were tested applying the BPIA and then the EMS. The newly developed BPIA results were compared to internationally recognised EMS model. The second phase testing outcomes indicated the BPIA compared to the EMS model had the ability to correctly classify companies as failed (prior to date delisted from JSE) as 40% five years prior, 30% four years prior, 20% three to one years prior and 10% was misclassified. Compared to the EMS model that is able to correctly classify 10% each, five years prior, four years prior and two years prior and 70% was misclassified. In conclusion the second testing phase revealed the EMS compared to the BPIA, the ability to predict bankruptcy or financial distress prior for failure was 30% for EMS 90% for the BPIA and the inability to predict bankruptcy or financial distress prior for failure was 70% for the EMS model and the BPIA was at 10%.

The purpose of third phase testing was to determine whether the BPIA is a reliable tool with consistent results by testing out-of-sample group of companies. Companies that met

the studies criteria but were outside of the sample period and were testing using the BPIA and compared to EMS like in the second phase testing. The obtained testing results revealed the BPIA, 40% financial distress was only detected part of the five years period under review and 60% financial distress was detected correctly classified for all five years under review. Whereas the EMS model testing resulted in 20% detected financial distress in two of the five years under assessment and 80% misclassified sample as being safe.

This study is based on a generic bankruptcy prediction model. Studies have proven that there is still room for a generic bankruptcy prediction model as the majority of the current models are industry/sector-based (Tuvadaratragool, 2013; Cassim, 2015; Dempsey, 2017). All stakeholder could easily and successfully apply and understand this model as the model is tested in two levels. Level 1 consists of three financial indicators and if results are unfavourable testing need to be ceased and an investigation of the adverse results need to be done and reason needs to be given or corrective action needs to be taken. This is done before commencing with further testing in Level 2 consisting of two financial indicators. This BPIA can be applied on a biannual or quarterly reporting basis. It can be concluded from the above that the study made some contributions that are high lightened below.

Contributions to this study are as follows:

i. Most studies within this field have been conducted in a Western setting like the United States of America (USA), the focus of this study is within a South African context. As those models within a Western environment cannot fully be successfully applied to companies South African environment due to South Africa's diversity in different areas. This study has developed the BPIA particularly in a South African context that is easy to understand and apply. Unlike current models available in South Africa that is either too complex or too flexible.

ii. A comparison done between failed and NF companies within the same sector, easy to use and an effective general BPIA was developed that can allow the comparison of companies among and within different sectors. In literature, the current models are sector-based, and this study contributed a generic BPIA that is able to predict bankruptcy within different sectors.

iii. Naidoo (2006:2) shares there are many factors involved in predicting bankruptcy, it does not strike like a lightning bolt. Models created in prior studies objective to predict failure or bankruptcy, the current study's aim is not only to predict bankruptcy but rather develop a BPIA with the ability to give warning signs on the approaching financial dangers over a five-year period prior to actual failure. With all the studies conducted no study to date have been identified as accurate. This study aims to allow management to take corrective action once the failure is detect meaning it has not occurred yet.

iv. This study will contribute or assist in the following areas:

Government – detect corporate failure as corporate failure has a ripple effect on the economy.

Banks and creditors – detect future solvency and failure issue in preventing reckless lending.

Stakeholders and investors are able to make informed decisions before investing and employers and management are able to prevent or curb the loss of key workers.

v. The decision-making needs of the different stakeholders differs and their financial skills level. This BPIA through the integrating of five financial ratios representing all the financial ratio categories can easily be applied by all stakeholders.

The study will also contribute to ensure internal management monitoring systems are in place and to keeping track records of company performance. Due to the BPIA consisting of only five variables testing can be done more regularly and it is easy to use.

The contributions have been discussed concluding the BPIA could also be used by other stakeholders not limited to management. In the next section the study's limitations are discussed

7.6 LIMITATIONS

As any research study, throughout the research process, it is not without limitations, limitations are outlined and summarised as follows:

7.6.1 Financial Statement data

Obtaining financial statement data were with great difficulty due to availability as research is restricted to companies within SA only. The focus of the development and validation of the BPIA is on financial data yet it excludes the non-financial factors ‘such as but not limited to; meeting legislation requirements, determine whether industry standards can be matched to good practices, enhancing staff morals, expanding staff retention, taking into account internal and external conditions (like *Coronaviruses*) and whether the company is up-to-date with changing government guidelines. Also considering that the asset values are not always accurate, different approaches are applied when valuing inventory or calculating depreciation and information is confined to the information appearing on the annual reports. Literature has proven that a predictive ability approach depending on financial statement data are more significant than the approach that includes non-financial factors.

7.6.2 Measurement

Measurement is primarily based on financial ratios, the limitation is there are many available ratios and the study results are drawn from a number of ratios. The limitations were overcome by applying specific ratios over the major financial ratio categories being liquidity, profitability, solvency (debt management), asset management (market performance), market value (growth) and operating cash flow. This was based on prior studies consisting of 44 (Section 3.5) ratios from which a representation of the pool of ratios consisting of 19 ratios (Section 4.3.3) from which ratios were selected. Statistical techniques were also applied to further reduce the number potential ratios with predictive ability.

7.6.3 Reason for delisting

It is probable that companies may delist with strategic intentions and this may cause the companies to misrepresent the results. Companies delist for various reasons (Section 4.3.3). This limitation has been restricted by the criteria applied (Section 4.3.3) in this study to ensure only companies that were failed due to bankruptcy were utilised.

Despite the fact that responsible consideration was taken in identification, documentation and describing of the limitation to guarantee precise and accurate reporting omission could have been overlooked. Due to this, the following suggestion for further studies has been put forward.

7.7 FURTHER STUDIES

Opportunities for follow-up research have emerged from this study. As a result, this future research could assist in endorsing further knowledge in this field of study.

In terms of the follow-up research, the following could be considered in the area of:

- Integrating financial, non-financial indicators and state of the economy in an easy to understand and apply model in the timely prediction of financial distress or bankruptcy
- Taxation, income or expenses being current or in future. Taxation could be included as a business failure indicator or a level of testing by signalling of financial distress, financial danger or bankruptcy.

7.7.1 Non-financial indicators

According to Specht (2019:41) identifying and avoiding potential financial distress or bankruptcy has become a critical matter of interest to shareholders. Even more important is timeliness in which the financial distress or bankruptcy signs are identified or detected as early as possible. Being conscious that both quantitative (financial indicators) and qualitative (non-financial indicators) are of importance to detect early warning signs of financial distress or bankruptcy (Swanepoel, 2018:139). According to Maher and Andersson (2000:3), a survey suggests between shareholders, CEO and accountants, CEO and accountants have been perceived as the most likely qualified persons able to identify potential financial distress or bankruptcy. Sori, Hamid and Nassir (2006:9) explain not all perceived signs by stakeholders are viewed as being timely enough to be used effectively. Their findings suggest financial indicators can signal immediate signs of financial distress or bankruptcy compared to that of non-financial indicators. Non-financial indicators can signal financial distress, however, the timeliness compared to financial indicators suggests financial indicators are better equipped to identify signs of financial distress or bankruptcy earlier and contributes not only to financial but also business

environment stability (Morris, 2018:3-4). In summary both financial indicators (quantitative) and non-financial indicators (qualitative) are crucial through integration, which will be a good foundation for further studies. Hence this study only focussed on financial indicators and do not suggest the non-financial indicators is of non-importance.

7.7.2 Current tax

The current tax is one of the major components of income tax expense. According to Service (2017:200), current tax expense represents the amount attributable to or by tax authorities, which is an estimation that is based on tax legislation. Service (2017:206) explains all countries levy taxes and as the countries differ so does their levied tax rates also differ. If a company does not have a current expense it means that a specific company has not been making a taxable profit, which most probably would mean accounting profit. Current tax expense is the tax amount a company needs to pay on the profit the company has made. The higher a company's current tax is, it is most likely that the company's profit is high, if not the case, the company will have an assessed loss meaning their expenses exceeded their income (Service, 2017:212).

The income tax is an expense that is derived from adding the current tax plus the deferred tax movement. The higher the profits, the more tax we expect one to pay. The high deferred tax movement could be caused by an increase in deferred tax liability or (very rarely) a decrease in deferred tax asset, this could be a loophole to defraud the South African Revenue Service (SARS).

7.7.3 Deferred tax

The purpose of deferred tax is to give a clear portrait of current tax and future tax. Service (2017:195-200) explains deferred tax is created when differences exist between accounting tax based (accounting profit) on international accounting standards (IAS12) and income tax based (taxable income) on the Income Tax Act of 58 of 1962. This is called a temporary difference, as timing differences exist as a result of income and expenses that appear within one accounting period the tax is payable in another accounting period, creating a timing differences (Stainbank, Oakes & Razak, 2011:25). According to Hytis, Thanou and Kyritsis (2011:4), temporary differences are attributable to the difference in tax rules and accounting standard rules, which arise not only for

differences in calculations rules but also difference how assets, liabilities and equity are measured.

Hytis (2011:5) supported by Mear, Bradbury and Hooks (2019:22) states that when a company has overdue taxes not yet paid within the current year, in future more tax would need to be paid therefore creating a deferred tax liability. Deferred tax assets occur when more tax is paid in the current year. This could be either an overpayment of tax (too much tax paid) or an advance tax payment (tax paid to early before due) resulting in a tax relief meaning in future tax will be deductible from the tax authorities.

According to IAS (12) deferred tax has an effect on a company's future operations, it indicates the direction in which future trend balances are moving. If accounting profit is greater than the taxable profit a deferred tax liability exists as the temporary difference results in a future taxable amount. A growing deferred tax liability indicates a higher tax obligation towards SARS (tax authority) by the company.

On the other hand, Mears *et al.* (2019:22+23) explain that there is a direct impact on future tax when accounting profit is less than taxable profit or accounting has a loss while there is a taxable profit, due to the temporary difference consequences or when there is a carry forward of prior year tax losses to a future period, a deferred tax asset is recognised. When deferred tax asset increases it directly impacts future tax, therefore, effecting the tax cash flow (De Pamphilis, 2019:177).

Signs to look out for when a company has a deferred tax or tax loss:

- Deferred tax liability indicates that the company is making a profit and therefore it is not a sign of concern.
- Deferred tax asset signal that either company's profit is less than taxable profit or company is making a loss. Deferred tax assets can only be applied if: (IAS 12.24 & IAS 12.34)
    - probable taxable profits are available against which the deductible temporary difference can be used and;
    - probable that there is sufficient future taxable temporary difference against which the unused tax losses and tax credits can be utilised.

Mear (2019:11) and IAS 12.34 explain tax loss is created when a company has a negative profit for tax purposes. This tax loss can be used for creating future tax relief by reducing the company's future taxable amount to be levied. The presence of unused tax losses when an entity has a background of recurring losses, the entity perceives a deferred tax asset emerging from unused tax losses. The deferred tax asset could be used just to the degree that the entity has adequate taxable temporary differences or there is persuading other proof that adequate taxable profit will be available (Everingham, Kleynhans & Posthumus, 2007:63). According to Service (2017:319), a company can only recognise deferred tax asset "if it is probable that future taxable profits will be big enough to allow the tax saving" to be used.

When a company has a deferred tax liability it means the company will pay more income tax in the future as it has underpaid tax in the current period.

When a company calculated their solvency ratio also known as debt management ratios it must ensure the deferred tax liability is reversed as it is not an actual debt but only a temporary difference. This liability will not be repaid in cash but will eventually be redeemed in the future. If not reverse, it will overstate total liabilities and in turn, it will increase the ratio (Fourie 2016:57).

The suggestive area for further research has been presented and future investigation will be profitable. It could lead to a more progressive financial distress detection model.

7.8 SUMMARY

The research problem identified was "*A need for the development and validation of a generic bankruptcy prediction indicator within a South African context that is easy to understand and apply*". Indicators that are able to detect early warning signs of bankruptcy or financial distress of JSE-listed companies that can be integrated in to monthly or quarterly financial reporting and may have an impact on the decision-making of management". Therefore, a fusion of financial ratios were applied within the development and validation of generic BPIA with the aim to forecast business failure within the South African context has been studied. An exploratory mixed-method research design was embraced as the study needed light to be shed on the situation studied as testing of different sectors in South Africa has not been done simultaneously, ratios or

models have always been sector- or industry-specific. A non-probability sampling technique specifically the quota convenience sampling was applied as the secondary data obtained from the INET McGregor BFA used in the study were not randomly selected.

Studies revealed bankruptcy or financial distress occurs at any period of time or an economic period not only during economic crises. This gave way to identifying the research problem creating the BPIA that is able to timely predict bankruptcy or financial distress. Finally, the findings conclude that the BPIA presented and tested in this study were found to be able to predict bankruptcy or financial distress adequately and at a higher rate than that of the prominent EMS model in normal and other economic environments. Based on the results it is reasonable to conclude the problem statement has been addressed and all the study's objectives (primary, theoretical and empirical) have been met. The findings have indicated that the BPIA is an effective tool and can be used to predict bankruptcy or financial distress over different periods, within different companies that are within different sectors listed on the JSE within a South African context.

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ANNEXURES

Annexures induled the following:

Annexture A: - Failed companies sectors

Annexture B: - Non - Failed companies sectors

Annexture C: - Annual bankruptcies

Annexture D: - Total delisted (failed) companies period

Annexture E: - Published article

Annexture F: - Declaration of language editing

ANNEXURE A
FAILED COMPANIES

Failed companies (sectors) included in Annexture A include the following:

Technology Hardware

Consumer Services Food and Retail

Consumer Services General

Consumer Services Travel

Industrial General

Health Care Equipment

Consumer Goods Food

Industrial Construction

FAILED COMPANIES				Year Failed	ROA						ROE					
					1996	1997	1998	1999	2000	2001	2002	1996	1997	1998	1999	2000
5	Tech	HW	Softline	2003			-18,16	-35,02	29,72	5,74	7,39			-35,68	-39,41	32,25
	CS	Food + Retail	Homechoice	2003		20,29	17,25	17,82	2,30	-12,29			20,51	15,80	18,65	1,77
	CS	Gen	Ninian & Lester Holding	2003		12,40	6,72	9,82	7,50	6,72			12,04	2,80	10,79	8,56
	CS	Travel	The Lazer	2003	8,81	12,31	11,73	-14,85			12,17	-4,78	11,99	13,28	-33,91	
	Ind	Gen	Metje & Ziegler	2003			7,45	8,09	7,58	-1,21	1,25			3,41	0,37	8,18
					ROA						ROE				TA T/over	
					1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000
1	Tech	HW	Net 1 Applied	2004	15,47	31,14	34,18	27,41	26,23	13,45	21,53	30,15	24,86	24,08	1,14	1,72
					ROA						ROE					
					1996	1997	1998	1999	2000	2001	2002	2003	1996	1997	1998	1999
4	CS	Food + Retail	Fashion Africa	2005			10,82	546	-35,73	-40,28	-19,01				13,06	1133
	HC	Equip	Siltek	2005	27,07	11,10	9,80	-19,49	2,05				47,34	20,33	19,14	-58,09
	CS	Food	Universal Growth	2005	8,75	11,15	9,69	-160,8	10,19				9,79	9,47	18,46	-2096
	Tech	HW	Global Tech	2005				24,13	-31,07	5,83	-87,78	-53,32				20,92
					ROA				ROE				TA T/over			
					2001	2002	2003	2004	2005	2001	2002	2003	2004	2005	2001	2002
1	Tech	HW	Frontrange	2006	16,98	-91,97	-65,26	0,60	8,68	32,41	-134,3	-122,4	0,92	30,56	0,46	1,38
					ROA						ROE					
					2003	2004	2005	2006	2007	2008	2009	2003	2004	2005	2006	2007
1	Tech	HW	Beget	2011	-233,7	-76,65		-660,7	62,26	15,29		-668,9	277,60		132,4	305,4
					ROA						ROE					
					2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011
5	Tech	HW	Africa Cellular	2016	25,45	24,00	13,21	-33,76	-62,36			24,99	21,91	13,34	-33,31	-94,74
	CG	Food	Bioscience	2016		-26,87	-33,58	-21,15	-170,40	-27,54			-23,25	-30,10	-14,56	-147
	Ind	Constr	Erbacon Investment	2016			22,66	18,59	-16,27	-26,55	-33,50			25,29	17,47	-24,13
	Ind	Constr	Sanyati Holding	2016	17,35	13,81	11,28	10,28	-13,54			24,19	9,30	6,71	6,91	-18,58
	Ind	Constr	Sea - Kay	2016	30,42	19,64	13,72	-36,01	-12,59			28,39	30,95	7,89	-375,50	-93,80

	Year Failed	ROE					TA T/over				QUICK				
		2001	2002	1996	1997	1998	1999	2000	2001	2002	1996	1997	1998	1999	2000
Softline	2003	4,89	6,94			1,98	1,17	1,04	1,20	0,90			1,86	2,85	1,12
Homechoice	2003	-18,86			1,26	1,19	1,06	1,15	1,20			3,14	2,66	6,04	2,97
Ninian & Lester Holding	2003	7,75			2,10	2,21	1,99	2,19	2,06			1,05	1,14	1,34	1,79
The Lazer	2003		9,99	1,28	1,21	1,05	1,43			1,12	0,75	0,80	0,63	0,74	
Metje & Ziegler	2003	-13,47	-8,51			2,12	3,08	3,11	3,54	4,34			0,63	0,92	0,64
		TA T/over			Quick				CF:DT			Sales Growth			
		2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003	1999
Net 1 Applied	2004	1,52	1,07	1,03	2,54	1,92	3,69	4,86	3,66	66,23	72,39	167,20	139,90	14,80	1046,20
		ROE							TA T/over			QUICK			
		2000	2001	2002	2003	1996	1997	1998	1999	2000	2001	2002	2003	1996	1997
Fashion Africa	2005	-302,30	249,91	118,99				1,64	3,06	3,28	3,32	2,62			
Siltek	2005	6,34				2,26	2,18	2,73	3,02	2,75				1,10	1,23
Universal Growth	2005	22,21				1,77	2,08	1,20	2,33	2,06				1,18	1,38
Global Tech	2005	-83,78	29,66	-1035,00	111,70				2,47	1,70	1,11	1,42	3,98		
		TA T/over			QUICK				CF:DT			Sales Growth			
		2003	2004	2005	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005	2001
Frontrange	2006	2,00	2,74	1,68	4,06	1,68	1,12	1,11	1,24	152,00	-86,8	-26,23	28,66	14,60	92,72
		ROE					TA T/over				QUICK				
		2008	2009	2003	2004	2005	2006	2007	2008	2009	2003	2004	2005	2006	2007
Beget	2011	-63,81		0,70	1,80		4,97	1,28	2,38		0,37	0,14		0,07	0,38
		ROE					TA T/over				QUICK				
		2012	2013	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011
Africa Cellular	2016			1,20	1,32	1,11	0,72	1,01			3,34	1,94	4,59	5,87	2,55
Bioscience	2016	-46,34			0,57	2,15	2,31	2,05	1,59			0,51	0,45	0,32	0,25
Erbacon Investment	2016	-189,50	-720,30			2,25	1,64	2,04	2,70	4,55			1,28	1,91	1,06
Sanyati Holding	2016			1,89	1,67	1,97	2,20	2,06			1,21	1,16	1,04	1,12	1,35
Sea - Kay	2016			1,59	0,96	1,14	1,29	0,83			1,92	1,15	1,11	1,10	0,55

	Year Failed	QUICK	CF:DT	CF:DT							Sales Growth				
		2001	2002	1996	1997	1998	1999	2000	2001	2002	1996	1997	1998	1999	2000
Softline	2003	0,75	1,46			43,92	35,82	22,39	68,20	71,14			190,10	18,67	1,91
Homechoice	2003	2,43			-85,10	-60,24	-47,33	-13,70	-12,03			47,27	79,91	37,14	27,01
Ninian & Lester Holding	2003	1,04			12,69	29,13	42,70	-15,20	20,67			12,34	-6,55	-2,37	-3,38
The Lazer	2003		0,92	5,65	33,99	25,11	-8,45			2575	0,08	-13,19	15,72	26,29	
Metje & Ziegler	2003	0,52	0,48			37,45	-0,19	8,53	7,09	-1,46			3,75	15,10	52,72
				Sales Growth			Earnings Growth			Debt:Equity			Debt Equity		
		2000	2001	2002	2003	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
Net 1 Applied	2004	80,80	27,60	-5,72	31,56	520,55	100,03	56,46	11,64	21,30	0,40	0,38	0,26	0,21	0,30
						QUICK					CF : DT				
		1998	1999	2000	2001	2002	2003	1996	1997	1998	1999	2000	2001	2002	2003
Fashion Africa	2005	1,00	0,37	0,25	0,05	0,20				-2,15	9,30	-13,00	-6,64	-15,10	
Siltek	2005	1,36	0,92	0,99				22,62	9,43	16,24	-2,15	-3,33			
Universal Growth	2005	0,71	0,72	0,57				-30,10	18,36	-1,45	14,01	21,58			
Global Tech	2005		1,61	1,15	1,23	0,51	0,29				8,91	29,05	2,86	-16,2	-30,72
				Sales Growth			Earnings Growth			Debt:Equity			Debt Equity		
		2002	2003	2004	2005	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Frontrange	2006	38,60	9,16	-15,83	-9,78	-132,80	-299,20	-52,50	-100,50	106,80	0,35	0,72	1,56	1,52	1,09
				QUICK			CF:DT			CF:DT			Sales Growth		
		2008	2009	2003	2004	2005	2006	2007	2008	2009	2003	2004	2005	2006	2007
Beget	2011	0,81		105,11	-41,80		-5,74	3,56	-1,70		-10,30	61,68		-36,40	22,33
				QUICK			CF:DT			CF:DT			Sales Growth		
		2012	2013	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010	2011
Africa Cellular	2016			27,35	-41,90	-12,77	-57,87	-25,10			0,55	75,71	43,34	-55,00	-11,11
Bioscience	2016	0,24			-35,30	-16,48	0,48	-25.00	2,59			64,86	137,60	-22,8	-42,06
Erbacon Investment	2016	0,86	0,95			46,31	20,61	-14,90	-21,74	-14,29			220,80	15,75	21,19
Sanyati Holding	2016			4,30	-15,00	25,99	5,94	-10,70			0,55	164,10	53,93	42,01	-30,04
Sea - Kay	2016			4,30	-15,00	25,99	5,94	-10,70			-0,29	159,60	29,48	-23,10	-71,22

	Year Failed	Sales Growth		Earnings Growth							Debt: Equity			
		2001	2002	1996	1997	1998	1999	2000	2001	2002	1996	1997	1998	1999
Softline	2003	-12,00	-8,35			-260,50	224,24	-163,54	-82,51	66,83			0,63	0,35
Homechoice	2003	-7,88			405,20	42,83	122,40	-90,33	-980,00			0,44	0,50	0,23
Ninian & Lester Holding	2003	12,67			7,48	-74,12	310,15	-15,93	-24,11			0,87	0,62	0,65
The Lazer	2003		-5,55	-16825	-396,00	77,96	-302,35			-259,50	1,96	1,30	0,89	1,22
Metje & Ziegler	2003	21,21	-0,67			-49,62	-85,61	2287,40	-241,7	-44,45			1,84	0,72

		Interest cover				
		1999	2000	2001	2002	2003
Net 1 Applied	2004	6,61	22,58	131,82	7,08	3,55

		Sales Growth							Earnings Growth					
		1996	1997	1998	1999	2000	2001	2002	2003	1996	1997	1998	1999	2000
Fashion Africa	2005			21,17	-58,88	4,90	-36,95	55,25				-15,33	2035,00	-106,9
Siltek	2005	9,40	0,40	0,86	36,71	32,04				217,43	-52,00	-31,81	-343,73	-111,50
Universal Growth	2005	17,49	8,17	72,63	86,50	-67,20				19,43	6,80	139,10	-3012,6	-101,40
Global Tech	2005				0,00	20,37	121,42	-43,07	-44,64				0,00	-872,30

		Interest cover				
		2001	2002	2003	2004	2005
Frontrange	2006	22,14	-48,00	-22,7	0,19	82,05

				Earnings Growth							Debt:Equity			
		2008	2009	2003	2004	2005	2006	2007	2008	2009	2003	2004	2005	2006
Beget	2011	155,20		-741,00	-81,05		142,25	-151,25	-112,80		1,92	-7,49		-1,14

		Sales Growth		Earnings Growth							Debt:Equity			
		2012	2013	2007	2008	2009	2010	2011	2012	2013	2007	2008	2009	2010
Africa Cellular	2016			2,80	43,10	13,85	-279,99	44,26			0,33	0,47	0,27	0,22
Bioscience	2016	-17,63			-64,06	17,85	-56,22	308,63	-76,48			0,96	0,75	0,74
Erbacon Investment	2016	12,43	10,42			68,70	22,26	-201,8	169,11	52,36			0,76	0,48
Sanyati Holding	2016			2,80	145,81	-19,91	11,35	-327,27			1,29	0,68	0,73	0,88
Sea - Kay	2016			0,53	108,68	-70,65	-1049,7	-87,11			0,60	2,12	1,81	7,43

	Year Failed	Debt Equity					Interest cover				
		2000	2001	2002	1996	1997	1998	1999	2000	2001	2002
Softline	2003	0,86	0,29	0,23			-70,50	-23,60	18,29	1,28	2,92
Homechoice	2003	0,44	0,60			18,61	8,20	15,02	1,49	-3,30	
Ninian & Lester Holding	2003	0,37	0,94			5,55	1,70	10,08	11,05	4,98	
The Lazer	2003			1,09	0,87	1,55	2,59	-2,56			1,36
Metje & Ziegler	2003	1,33	1,94	1,65			1,19	1,03	2,82	-0,30	0,25
Net 1 Applied	2004										

		Earnings growth					Debt: Equity					Interest cover								
		2001	2002	2003	1996	1997	1998	1999	2000	2001	2002	2003	1996	1997	1998	1999	2000	2001	2002	2003
Fashion Africa	2005	-16,68	-14,74				1,19	1,07	6,86	-5,90	-6,50				4,36	0,00	-11,00	-5,50	-5,80	
Siltek	2005				0,85	0,67	0,86	1,87	2,99				1,59	4,55	2,09	-13,60	-1,75			
Universal Growth	2005				0,64	0,37	2,51	11,50	2,60				19,80	9,51	6,41	-29,00	2,15			
Global Tech	2005	-300,90	-400,40	-86,30				1,25	1,24	0,47	6,71	-2,60				7,20	-13,60	2,78	-13,10	-2,70
Frontrange	2006																			

		Debt Equity			Interest cover						
		2007	2008	2009	2003	2004	2005	2006	2007	2008	2009
Beget	2011	5,78	9,28		-354,60	-24,70		-7,84	4,00	1,63	

		Debt Equity			Interest cover						
		2011	2012	2013	2007	2008	2009	2010	2011	2012	2013
Africa Cellular	2016	0,42			14,77	7,84	4,69	-13,30	-23,40		
Bioscience	2016	1,89	2,83			-9,18	-3,46	-2,17	-13,50	-2,00	
Erbacon Investment	2016	0,99	3,93	6,29			20,22	15,44	-5,97	-6,00	-2,00
Sanyati Holding	2016	0,60			23,63	15,85	4,56	6,92	-4,59		
Sea - Kay	2016	5,80			9,82	6,72	1,92	-4,23	-1,71		

ANNEXURE B:
NON-FAILED COMPANIES

Non-Failed companies (sectors) included in Annexture B include the following:

Consumer Goods Food

Consumer Services Food and Retail

Consumer Services Travel

Health Care Equipment

Industrial Construction

Industrial General

Technology Hardware

Technology Software

Telecommunication Mobile

NON-FAILED COMPANIES			ROA											
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
		Consumer Goods Food													
CG	Food	AVI	12,27	9,07	6,62	3,33	8,26	10,31	14,74	16,92	15,87	33,35	15,03	20,44	18,72
CG	Food	CROOKES	17,40	10,20	13,50	10,12	26,28	7,82	9,54	15,21	9,74	3,36	12,52	12,27	15,27
CG	Food	OCEANA	26,63	40,12	24,15	21,44	21,15	21,67	23,14	21,12	15,97	11,10	13,91	16,54	21,79
CG	Food	RCL	-5,64	-9,05	-19,71	2,49	4,05	8,80	12,26	13,98	14,51	15,92	23,51	23,29	22,00
CG	Food	TIGERBRANDS	15,76	14,08	13,28	16,80	17,88	18,21	19,59	17,82	19,11	25,57	36,14	23,90	24,09
CG	Food	TONGAAT	13,28	12,95	12,63	4,09	6,32	10,12	7,46	1,26	3,85	9,01	10,63	50,10	12,03
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	12,15	11,94	11,47	12,16	13,39	13,97	10,06	11,89	5,12	11,00	12,09	14,39	18,99
CS	Food	PICKNPAY -retail	7,29	7,41	4,98	6,23	9,10	10,47	12,26	13,89	14,30	17,09	17,44	17,23	18,79
CS	Food	SHOPRITE - retail	4,36	8,70	4,93	2,42	5,89	5,28	8,61	8,66	9,93	10,30	14,60	14,43	15,88
CS	Food	SPAR - CS retail	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	21,21	21,00	18,32	16,10	17,39
CS	Food	ADVTECH - retail	0,00	-65,10	-4,82	-50,08	6,64	3,86	-56,63	16,36	13,37	18,12	23,44	24,76	28,17
CS	Food	AF & OVR -retail	10,23	9,19	9,86	8,42	7,33	1,24	2,89	8,21	2,24	13,41	8,48	9,25	15,50
CS	Food	CASHBIL - retail	-3,93	7,87	8,02	6,28	0,33	6,29	7,90	13,30	14,32	15,35	14,89	17,72	14,27
CS	Food	CMH - retail	22,46	17,54	15,56	17,93	13,87	13,87	14,60	12,29	11,87	15,12	15,69	15,33	10,09
CS	Food	MR PRICE - retail	16,47	10,57	13,18	15,72	12,68	8,14	13,75	16,31	17,55	20,21	27,88	25,69	26,99
CS	Food	REX TRUE - retails	9,31	8,38	8,92	7,45	6,01	-0,01	2,02	7,14	2,32	13,66	8,89	9,62	15,90
CS	Food	TFG - retail	24,06	17,34	17,32	16,17	12,11	7,92	8,81	12,80	15,40	14,84	15,46	14,67	11,81
CS	Food	WOOLIES - retail	0,00	12,89	2,39	6,03	3,76	3,86	7,24	7,15	8,73	13,22	8,31	8,42	5,91
CS	Food	ITLTILE - retail	14,74	16,78	16,04	20,54	23,83	21,65	23,31	26,71	28,29	28,45	30,26	29,31	25,51
		Consumer Services Travel													
CS	Travel	CITYLDG	20,36	17,05	16,8	15,78	17,72	18,34	21,09	26,97	28,52	32,16	34,84	37,74	40,10
CS	Travel	FAMBRANDS	42,71	51,02	29,00	27,87	29,85	30,35	19,69	21,90	28,78	40,21	35,38	30,24	46,71
CS	Travel	SUNINT	10,94	12,88	24,05	3,51	4,22	3,98	2,10	9,93	20,48	26,95	21,08	24,79	24,26
CS	Travel	TSOGO	6,17	-8,82	-25,44	-7,35	-0,72	1,21	18,51	22,44	28,52	30,71	29,15	13,55	21,78
		Health Care Equipment													
HC	Equip	NETCARE	0,00	4,11	12,23	-11,01	13,62	13,63	19,02	18,05	18,87	20,03	4,76	8,91	9,07
NON-FAILED COMPANIES			**ROA**												

			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
		Industrial Construction													
Ind	Constr	DAWN constr	5,21	-6,22	0,00	18,05	16,58	12,14	10,81	16,57	16,89	22,22	19,74	18,40	16,97
Ind	Constr	GROUP 5 constr	5,73	2,74	4,90	5,53	2,60	5,09	5,63	7,42	7,82	6,80	5,26	6,03	8,10
Ind	Constr	PPC constr	22,48	22,99	19,94	9,74	12,65	17,60	21,24	25,22	32,99	46,56	42,88	45,02	51,58
Ind	Constr	WBHO constr	6,93	7,83	8,06	8,72	8,43	6,03	4,66	5,44	6,61	7,89	9,38	9,04	12,30
Ind	Constr	AVENG constr	0,00	0,00	0,00	6,44	8,42	7,30	8,10	10,87	2,94	4,25	6,62	39,73	11,50
		Industrial General													
Ind	Gen	BARLOWORLD gen	6,76	9,94	7,83	12,66	11,33	5,49	9,38	9,47	11,00	13,24	13,88	10,12	8,40
Ind	Gen	M&R HLD gen	9,91	1,54	11,03	1,87	-7,12	3,82	7,33	9,23	6,81	7,78	6,99	10,03	12,02
Ind	Gen	NAMPAK gen	19,56	19,52	16,44	11,20	13,47	8,97	9,39	17,35	16,42	14,46	13,56	13,56	6,31
Ind	Gen	BIDVEST gen	12,32	8,27	24,02	9,47	13,70	14,19	13,07	15,29	15,07	16,82	15,07	15,05	14,05
Ind	Gen	TRNPACO gen	12,22	12,80	19,06	-46,17	9,91	3,11	14,85	18,09	17,22	11,76	11,35	10,85	12,89
Ind	Gen	REMGRO gen	0,00	0,00	0,00	0,00	0,00	9.19	-4.31	-0.66	-4.20	2.00	10.69	2.16	4.45
		Technology Hardware													
Tech	HW	MUSTEK	21,43	14,71	21,60	15,63	3,64	9,76	13,83	13,83	6,17	9,18	5,73	7,69	8,14
Tech	HW	ALVIVA	0,00	0,00	0,00	13,55	6,80	4,74	6,85	7,84	10,53	14,18	11,33	17,47	17,69
		Technology Software													
Tech	SW	ALTRON A	7,41	11,86	15,08	15,07	11,08	11,51	7,86	18,42	11,05	12,26	14,58	19,59	19,49
Tech	SW	DATATEC	0,00	6,60	11,38	-46,92	-0,81	17,14	0,25	-3,05	-3,42	6,45	6,13	8,29	7,75
Tech	SW	ADAPTIT	0,00	0,00	0,00	25,36	-96,77	17,83	40,13	45,60	53,42	57,31	41,16	39,11	38,81
Tech	SW	JASCO	16,10	17,12	19,42	17,02	-0,13	-91,33	11,97	19,52	5,76	15,65	20,43	21,93	21,39
Tech	SW	EOH	0,00	0,00	0,00	-49,72	31,11	25,71	19,18	20,75	14,82	20,76	23,87	22,05	21,89
Tech	SW	COGNITION	0,00	0,00	0,00	-14,90	0,77	-46,45	-57,62	6,85	-15,78	8,83	11,99	31,44	20,73
		Telecommunication Mobile													
Tele	Mobile	MTN	19,98	7,10	12,98	15,04	-97,39	18,79	13,37	21,88	28,15	45,85	29,53	30,38	26,42
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	9,22

NON-FAILED COMPANIES			ROA								ROE				
			2009	2010	2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000
		Consumer Goods Food													
CG	Food	AVI	20,16	19,89	23,83	28,42	28,06	31,07	27,71	27,14	14,58	11,26	6,98	5,70	12,46
CG	Food	CROOKES	19,61	9,34	19,95	14,09	10,43	9,57	5,52	6,58	17,06	9,81	14,01	10,12	27,59
CG	Food	OCEANA	25,51	25,44	25,57	26,74	25,73	29,75	16,54	25,87	36,10	78,50	41,45	35,82	29,70
CG	Food	RCL	10,89	12,59	9,86	8,49	1,43	0,34	10,36	2,46	-23,22	-41,08	-31,37	-1,48	2,60
CG	Food	TIGERBRANDS	34,71	25,71	27,25	25,14	15,51	12,30	9,43	18,60	26,21	20,39	19,01	27,88	107,17
CG	Food	TONGAAT	0,00	22,48	11,29	10,76	10,13	10,07	8,00	5,99	16,86	20,45	23,88	8,25	9,65
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	18,56	21,93	24,19	23,01	21,93	21,82	19,65	19,97	17,81	19,05	16,46	19,41	19,36
CS	Food	PICKNPAY -retail	18,67	18,31	13,35	11,50	7,24	6,87	9,13	9,52	23,64	25,43	19,03	25,87	33,92
CS	Food	SHOPRITE - retail	17,60	18,69	19,49	14,93	16,40	14,43	14,33	15,56	14,8	32,59	22,91	10,47	22,73
CS	Food	SPAR - CS retail	18,13	18,03	17,73	15,89	17,56	12,97	13,48	10,93	0,00	0,00	0,00	0,00	0,00
CS	Food	ADVTECH - retail	27,44	24,13	22,02	17,17	15,15	14,42	15,15	18,87	0,00	-48,53	-1,37	-66,02	3,85
CS	Food	AF & OVR -retail	10,04	12,39	13,22	7,70	-6,54	-6,56	9,26	2,92	9,82	10,33	10,91	11,9	8,57
CS	Food	CASHBIL - retail	14,81	13,06	11,37	21,25	15,98	13,89	15,33	17,47	-29,7	11,15	12,84	10,51	-1,66
CS	Food	CMH - retail	2,51	5,64	9,58	9,07	11,05	12,81	12,32	13,53	31,08	20,48	21,28	22,73	24,19
CS	Food	MR PRICE - retail	26,86	23,36	37,80	41,55	43,24	39,97	40,80	46,85	13,36	9,41	12,97	18,53	21,17
CS	Food	REX TRUE - retails	10,47	12,79	13,61	8,21	-6,18	-6,18	9,72	3,66	8,61	9,36	9,8	10,77	6,83
CS	Food	TFG - retail	8,19	5,60	7,53	8,35	6,85	8,15	8,10	12,09	22,97	14,29	14,31	13,68	13,29
CS	Food	WOOLIES - retail	18,35	19,19	25,35	30,44	35,59	20,41	21,69	22,91	0,00	20,91	4,04	13,42	11,33
CS	Food	ITLTILE - retail	18,73	18,88	19,56	19,98	23,08	27,74	29,23	27,67	17,13	19,53	19,92	23,70	27,59
		Consumer Services Travel													
CS	Travel	CITYLDG	28,32	26,04	20,19	23,01	24,21	23,83	26,10	24,32	22,08	16,87	16,76	16,03	19,85
CS	Travel	FAMBRANDS	53,17	65,72	74,73	78,42	65,61	68,76	72,29	59,44	31,76	34,24	24,97	25,23	25,35
CS	Travel	SUNINT	20,17	15,55	14,83	15,91	15,54	12,67	14,47	3,36	10,10	14,05	32,82	6,14	6,81
CS	Travel	TSOGO	21,12	17,78	14,54	27,35	25,53	22,38	16,87	17,88	8,81	-12,59	-39,93	6,13	12,74
		Health Care Equipment													
HC	Equip	NETCARE	11,88	11,71	10,43	-25,76	30,55	14,16	13,42	7,95	0,00	1,68	11,52	-45,21	17,01

NON-FAILED COMPANIES			ROA								ROE				
			2009	2010	2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000
		Industrial Construction													
Ind	Constr	DAWN constr	11,70	9,33	1,39	6,73	9,23	2,34	17,27	-25,25	-7,6	-78,57	0,00	43,91	33,71
Ind	Constr	GROUP 5 constr	7,86	5,69	-0,04	4,37	6,31	6,51	3,57	6,94	25,66	1,80	9,71	13,70	6,62
Ind	Constr	PPC constr	37,03	32,33	26,94	25,71	21,07	15,37	10,95	10,74	29,39	28,63	26,31	12,38	15,06
Ind	Constr	WBHO constr	10,98	13,92	11,14	9,04	7,72	7,72	4,34	6,69	22,89	25,35	24,03	27,89	23,53
Ind	Constr	AVENG constr	9,84	9,02	6,40	2,03	2,18	-0,33	-0,35	2,15	0,00	0,00	0,00	14,51	16,32
		Industrial General													
Ind	Gen	BARLOWORLD gen	6,76	4,85	8,04	9,35	8,96	8,71	7,82	9,49	11,59	18,84	15,37	24,43	17,84
Ind	Gen	M&R HLD gen	12,66	8,78	-3,59	-0,74	7,15	7,98	6,27	7,47	11,69	-17,39	16,52	-7,75	-33,26
Ind	Gen	NAMPAK gen	4,34	10,64	11,80	12,34	10,22	8,74	8,29	10,78	22,18	19,09	18,15	13,13	24,47
Ind	Gen	BIDVEST gen	14,51	14,74	14,33	15,01	13,04	11,66	12,53	10,55	27,63	-12,72	33,55	25,47	27,95
Ind	Gen	TRNPACO gen	20,03	19,49	19,67	17,92	15,7	15,02	15,18	18,94	14,65	16,48	30,54	136,20	3,43
Ind	Gen	REMGRO gen	0.71	1.37	4.30	8.49	0.38	1.01	2.21	-0.25	0,00	0,00	0,00	0,00	0,00
		Technology Hardware													
Tech	HW	MUSTEK	6,70	7,43	9,60	6,38	6,86	6,84	6,88	6,26	25,85	29,16	35,52	25,86	7,36
Tech	HW	ALVIVA	16,50	15,61	18,84	18,67	15,92	11,82	12,42	13,67	0,00	0,00	0,00	8,60	4,71
		Technology Software													
Tech	SW	ALTRON A	15,95	14,04	12,15	4,59	-3,37	9,06	2,50	6,55	8,26	13,25	18,47	13,20	14,20
Tech	SW	DATATEC	9,07	4,27	5,47	7,45	6,09	4,93	5,12	4,08	9,68	5,70	8,62	-155,9	-20,04
Tech	SW	ADAPTIT	35,31	12,43	16,05	18,52	21,79	31,38	47,12	42,31	0,00	0,00	0,00	11,83	158,70
Tech	SW	JASCO	10,16	6,50	4,50	4,56	-11,94	2,77	-10,82	7,66	18,06	19,28	27,25	21,9	-6,06
Tech	SW	EOH	17,25	19,64	21,41	20,75	20,44	19,53	18,98	17,61	0,00	0,00	0,00	-85,34	40,25
Tech	SW	COGNITION	21,30	23,20	20,17	21,34	20,78	21,15	18,94	12,21	0,00	0,00	0,00	-16,22	11,45
		Telecommunication Mobile													
Tele	Mobile	MTN	22,68	25,81	26,73	28,02	26,22	24,97	14,22	7,14	31,94	8,33	12,94	21,10	336,20
Tele	Mobile	BLUETEL	13,89	14,20	9,70	14,87	12,88	13,15	17,09	18,71	0,00	0,00	0,00	0,00	0,00

NON-FAILED COMPANIES			ROE											
			2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
		Consumer Goods Food													
CG	Food	AVI	16,85	18,55	21,62	18,16	54,58	14,00	18,33	19,39	18,97	15,85	23,91	26,85	29,52
CG	Food	CROOKES	9,58	8,94	13,92	8,85	2,37	11,44	10,80	14,54	21,18	6,04	25,69	15,66	16,21
CG	Food	OCEANA	28,73	27,46	24,77	19,37	12,52	16,33	19,37	25,37	26,77	24,29	24,53	28,01	28,41
CG	Food	RCL	10,18	17,95	23,63	16,06	17,37	24,99	24,69	23,06	12,77	13,36	10,75	9,18	0,39
CG	Food	TIGERBRANDS	66,24	49,91	37,71	34,45	48,38	51,52	38,77	39,47	35,59	26,36	26,21	24,05	19,95
CG	Food	TONGAAT	13,88	8,78	-0,98	5,19	10,23	14,59	126,40	21,22	0,00	50,70	17,35	13,25	12,77
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	17,13	11,97	13,32	-0,91	15,27	15,43	29,36	38,66	42,07	49,57	67,49	51,07	54,59
CS	Food	PICKNPAY -retail	34,73	31,3	45,42	45,54	60,22	82,79	67,60	65,34	61,83	55,44	36,36	46,32	22,79
CS	Food	SHOPRITE - retail	16,92	27,74	24,19	26,16	26,88	29,32	29,57	33,00	40,29	38,38	35,43	23,75	23,69
CS	Food	SPAR - CS retail	0,00	0,00	0,00	66,77	47,72	45,67	47,13	45,81	38,41	41,87	38,26	37,32	37,46
CS	Food	ADVTECH - retail	1,44	137,40	23,67	15,63	20,25	26,38	28,73	30,55	26,24	21,95	20,81	17,45	18,25
CS	Food	AF & OVR -retail	3,78	4,21	8,49	2,40	-16,37	4,42	8,76	19,78	11,08	12,05	14,04	7,31	-4,66
CS	Food	CASHBIL - retail	13,37	25,25	34,33	31,68	38,06	31,94	34,63	34,14	30,29	23,48	19,18	29,37	22,26
CS	Food	CMH - retail	24,67	21,87	22,25	22,72	30,92	34,61	42,38	20,77	1,80	10,87	20,39	19,55	23,33
CS	Food	MR PRICE - retail	15,66	20,60	20,47	21,15	25,48	38,27	36,39	37,24	34,90	32,53	42,20	43,79	46,35
CS	Food	REX TRUE - retails	1,56	2,95	6,91	2,79	-15,32	5,85	9,50	20,01	12,06	12,96	14,90	8,45	-3,67
CS	Food	TFG - retail	8,64	10,93	17,31	22,56	29,18	31,61	29,27	29,35	25,48	21,46	23,83	25,14	25,44
CS	Food	WOOLIES - retail	10,90	10,98	22,79	23,39	53,07	32,06	33,09	26,71	41,25	37,04	40,69	45,87	46,22
CS	Food	ITLTILE - retail	25,74	29,12	27,55	30,19	30,17	30,50	28,60	23,75	19,68	19,20	19,61	19,58	19,74
		Consumer Services Travel													
CS	Travel	CITYLDG	18,77	18,12	25,35	25,61	29,05	30,85	33,29	36,02	70,75	66,32	43,06	49,64	51,28
CS	Travel	FAMBRANDS	22,87	14,16	19,89	17,40	25,65	28,55	28,71	31,70	30,54	32,79	32,72	31,96	33,15
CS	Travel	SUNINT	-7,88	-10,29	5,08	24,15	37,44	30,26	33,99	384,03	88,05	42,40	28,54	42,25	31,85
CS	Travel	TSOGO	14,6	13,31	15,32	19,96	22,13	21,40	6,01	14,84	13,70	10,21	8,56	22,24	19,61
		Health Care Equipment													
HC	Equip	NETCARE	20,70	24,04	21,46	23,32	24,49	32,60	22,43	17,83	37,74	29,66	30,46	-422,7	71,13

NON-FAILED COMPANIES			ROE											
			2009	2010	2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000
		Industrial Construction													
Ind	Constr	DAWN constr	18,69	15,88	32,71	36,56	43,55	38,00	38,62	35,75	13,68	9,12	-2,58	6,54	10,74
Ind	Constr	GROUP 5 constr	14,03	20,17	21,26	21,50	20,73	21,07	14,57	20,86	21,69	10,75	-10,15	-15,39	12,65
Ind	Constr	PPC constr	21,31	25,98	29,34	33,60	47,04	55,11	60,83	87,51	123,28	117,72	90,58	65,31	59,68
Ind	Constr	WBHO constr	20,17	15,90	19,98	24,81	26,31	28,14	27,54	41,35	37,32	31,71	21,75	16,4	13,83
Ind	Constr	AVENG constr	14,55	14,19	20,80	7,67	13,24	16,69	68,13	21,88	19,24	15,33	9,11	4,04	3,51
		Industrial General													
Ind	Gen	BARLOWORLD gen	6,81	13,52	11,92	13,60	15,41	17,24	20,38	9,59	5,66	-0,07	8,21	12,12	11,00
Ind	Gen	M&R HLD gen	12,73	19,08	22,06	18,57	15,10	16,61	19,31	35,24	36,15	17,71	-41,11	-12,49	14,26
Ind	Gen	NAMPAK gen	15,04	13,71	19,00	17,91	14,92	15,49	17,56	8,66	4,01	15,46	10,95	19,25	18,19
Ind	Gen	BIDVEST gen	25,88	22,21	25,54	25,44	27,80	26,75	25,41	24,15	20,12	19,99	20,03	20,54	18,10
Ind	Gen	TRNPACO gen	-1,89	15,37	20,89	20,67	17,59	14,61	18,02	18,11	26,10	25,00	23,35	20,77	18,53
Ind	Gen	REMGRO gen	33.73	14.84	31.36	12.21	25.19	21.88	15.20	17.29	119.06	7.07	16.82	17.37	7.51
		Technology Hardware													
Tech	HW	MUSTEK	5,66	17,92	20,07	10,86	16,88	12,33	11,45	14,81	9,40	9,43	13,64	10,61	10,29
Tech	HW	ALVIVA	1,15	9,25	3,03	13,80	20,92	28,88	34,42	36,11	24,87	25,97	35,01	34,75	30,00
		Technology Software													
Tech	SW	ALTRON A	16,79	10,97	20,48	13,82	13,28	16,85	22,82	22,8	17,14	11,44	10,68	3,48	-6,29
Tech	SW	DATATEC	34,32	-7,11	-9,89	-12,33	12,68	7,54	11,28	11,08	11,95	3,79	5,71	9,37	8,02
Tech	SW	ADAPTIT	22,13	41,27	72,33	46,74	50,00	37,42	37,24	25,94	28,96	23,02	22,94	25,86	26,12
Tech	SW	JASCO	-756,70	37,76	52,21	1,47	7,03	16,96	20,85	22,15	10,90	7,59	2,95	6,45	-48,77
Tech	SW	EOH	34,31	28,01	27,41	28,33	26,73	24,89	24,66	25,20	25,24	23,38	20,74	19,72	20,46
Tech	SW	COGNITION	-56,08	-89,79	9,50	-28,81	18,22	27,91	52,39	27,76	26,69	24,32	20,10	20,04	19,70
		Telecommunication Mobile													
Tele	Mobile	MTN	4,83	3,59	11,31	18,64	62,00	27,42	22,42	20,05	20,93	19,90	23,35	23,26	22,97
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,00	0,00	0,00	0,00	9,47	17,33	14,07	14,67	14,98	13,04

NON-FAILED COMPANIES			ROE			TA T/over									
			2014	2015	2016	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
		Consumer Goods Food													
CG	Food	AVI	31,21	33,81	32,99	1,55	1,46	1,47	1,31	1,51	1,20	1,13	1,19	1,23	2,02
CG	Food	CROOKES	26,41	5,22	5,98	0,43	0,48	0,47	0,56	0,52	0,52	0,53	0,62	0,58	0,54
CG	Food	OCEANA	34,22	17,54	23,47	2,35	2,45	2,40	2,40	2,22	2,19	2,37	2,04	1,75	1,82
CG	Food	RCL	-3,08	8,45	2,11	1,30	1,40	1,59	1,68	1,86	2,02	2,44	2,27	2,09	2,03
CG	Food	TIGERBRANDS	15,33	12,49	21,26	1,75	1,85	1,61	1,96	1,95	1,72	1,93	2,14	2,20	1,73
CG	Food	TONGAAT	10,94	8,32	6,13	1,09	0,95	1,28	0,64	0,63	0,62	0,77	0,79	0,77	0,88
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	55,18	47,43	44,61	2,06	2,20	2,03	2,32	2,31	2,29	2,41	2,29	2,66	2,81
CS	Food	PICKNPAY -retail	21,60	27,53	27,33	4,73	4,64	4,40	4,25	4,02	4,00	4,45	5,71	5,79	5,94
CS	Food	SHOPRITE - retail	21,66	21,60	22,69	4,20	3,77	3,04	3,35	3,58	3,04	3,39	3,59	3,37	3,50
CS	Food	SPAR - CS retail	44,44	42,69	32,16	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	6,11	5,55
CS	Food	ADVTECH - retail	17,99	10,03	14,05	0,00	0,67	0,69	0,56	1,24	1,21	1,17	1,28	1,35	1,38
CS	Food	AF & OVR -retail	-5,25	8,22	2,94	1,46	1,36	1,31	1,34	1,47	1,45	1,68	1,63	1,80	1,78
CS	Food	CASHBIL - retail	21,73	26,74	30,30	3,98	2,94	3,47	3,46	3,11	3,03	2,68	2,91	2,86	2,90
CS	Food	CMH - retail	29,96	23,80	38,01	6,43	6,17	5,19	5,81	4,51	4,61	5,02	3,63	3,79	3,99
CS	Food	MR PRICE - retail	47,62	45,59	46,96	2,44	2,77	2,45	2,69	2,23	2,11	2,01	2,11	2,17	2,15
CS	Food	REX TRUE - retails	-4,24	9,12	4,51	1,46	1,35	1,32	1,34	1,47	1,47	1,70	1,63	1,81	1,79
CS	Food	TFG - retail	25,73	22,85	21,78	1,30	1,30	1,22	1,20	1,00	1,02	1,07	1,15	1,17	1,13
CS	Food	WOOLIES - retail	43,57	21,87	21,91	0,00	1,94	1,78	1,99	1,81	1,87	2,13	1,99	1,85	1,74
CS	Food	ITLTILE - retail	23,36	26,20	24,70	1,67	1,72	1,59	1,63	1,55	1,29	1,12	1,19	1,06	1,07
		Consumer Services Travel													
CS	Travel	CITYLDG	49,02	43,75	36,16	0,39	0,34	0,34	0,37	0,48	0,50	0,54	0,61	0,63	0,70
CS	Travel	FAMBRANDS	32,80	33,52	35,78	3,79	4,38	2,76	2,95	3,16	2,82	2,65	2,67	2,56	2,29
CS	Travel	SUNINT	34,60	38,28	30,53	0,59	0,53	0,45	0,39	0,41	0,43	0,48	0,64	0,68	0,71
CS	Travel	TSOGO	19,17	23,71	21,56	0,59	0,44	0,56	0,00	0,00	0,00	0,66	0,78	0,86	0,92
		Health Care Equipment													
HC	Equip	NETCARE	24,37	23,39	16,38	0,00	0,48	0,80	0,88	0,89	0,88	1,17	1,07	1,30	1,27

NON-FAILED COMPANIES			ROE			TA T/over									
			2014	2015	2016	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
		Industrial Construction													
Ind	Constr	DAWN constr	4,98	32,84	-75,05	2,60	2,36	0,00	3,32	3,15	2,92	2,94	3,21	2,82	2,24
Ind	Constr	GROUP 5 constr	15,32	7,65	10,70	1,95	1,73	1,93	1,81	1,78	1,93	1,77	1,96	1,79	1,72
Ind	Constr	PPC constr	46,28	26,41	24,37	0,98	0,98	0,87	0,80	0,70	0,71	0,69	0,87	0,97	1,23
Ind	Constr	WBHO constr	9,21	12,33	13,37	2,54	2,30	2,08	2,31	2,05	1,77	1,79	1,81	1,71	2,12
Ind	Constr	AVENG constr	-2,85	-3,55	-0,75	0,00	0,00	0,00	1,49	1,54	2,02	1,82	1,79	1,74	1,65
		Industrial General													
Ind	Gen	BARLOWORLD gen	12,69	8,82	9,94	1,60	1,61	1,43	1,48	1,39	1,37	1,42	1,56	1,46	1,52
Ind	Gen	M&R HLD gen	21,36	13,56	10,45	1,50	1,72	1,56	1,91	2,35	1,51	1,42	1,65	1,39	1,50
Ind	Gen	NAMPAK gen	14,74	11,85	17,50	1,60	1,64	1,53	1,44	1,38	1,34	1,11	1,80	1,76	1,66
Ind	Gen	BIDVEST gen	14,48	16,22	441,52	2,71	1,63	1,86	1,99	3,28	3,14	2,90	3,39	3,21	3,43
Ind	Gen	TRNPACO gen	17,32	17,42	20,89	2,18	1,85	1,80	2,09	1,69	1,70	1,96	2,09	1,75	1,35
Ind	Gen	REMGRO gen	10.47	11.92	6.83	0,00	0,00	0,00	0,00	0,00	0.31	0.29	0.32	0.31	0.25
		Technology Hardware													
Tech	HW	MUSTEK	11,72	13,36	7,55	2,60	2,89	2,70	2,41	1,90	2,18	2,35	2,14	1,90	1,74
Tech	HW	ALVIVA	22,14	18,12	16,38	0,00	0,00	0,00	2,68	1,84	2,10	1,96	2,56	2,60	2,71
		Technology Software													
Tech	SW	ALTRON A	14,45	-0,25	-30,66	1,83	1,59	1,43	1,40	1,40	1,50	1,45	2,00	1,80	2,05
Tech	SW	DATATEC	6,29	7,53	4,83	1,60	1,63	1,57	1,41	1,79	2,19	2,22	3,25	2,53	2,83
Tech	SW	ADAPTIT	20,60	17,76	16,79	0,00	0,00	0,00	0,78	2,25	1,90	1,79	2,18	2,37	2,30
Tech	SW	JASCO	1,85	-40,08	6,31	1,55	1,84	1,50	2,24	1,52	2,36	1,94	2,37	2,32	2,55
Tech	SW	EOH	18,62	15,35	14,10	0,00	0,00	0,00	1,53	1,72	1,84	1,68	2,39	2,09	2,45
Tech	SW	COGNITION	19,95	17,04	12,57	0,00	0,00	0,00	1,01	1,91	1,52	1,36	2,21	2,57	2,55
		Telecommunication Mobile													
Tele	Mobile	MTN	24,96	13,80	-2,55	0,52	0,82	0,89	0,85	1,03	1,01	0,96	1,24	1,16	1,48
Tele	Mobile	BLUETEL	12,72	14,79	15,48	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0.00

NON-FAILED COMPANIES			TA T/over										QUICK	
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	1996	1997
		Consumer Goods Food													
CG	Food	AVI	1,61	1,68	1,66	1,72	1,77	1,81	1,76	1,71	1,72	1,63	1,55	1,00	1,21
CG	Food	CROOKES	0,60	0,60	0,61	0,59	0,58	0,50	0,50	0,51	0,48	0,47	0,41	2,22	2,34
CG	Food	OCEANA	1,99	1,80	1,99	1,96	1,87	1,82	1,87	1,79	1,75	1,02	1,27	0,72	0,74
CG	Food	RCL	1,67	1,68	1,68	1,75	1,68	1,54	1,61	0,87	1,43	1,69	1,63	0,26	0,61
CG	Food	TIGERBRANDS	1,91	1,58	1,81	2,10	1,76	1,65	1,64	1,42	1,49	1,53	1,62	0,89	1,04
CG	Food	TONGAAT	0,87	0,84	0,75	0,00	0,68	0,68	0,69	0,69	0,67	0,62	0,55	1,45	1,52
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	3,12	2,77	3,53	3,22	3,60	3,66	3,54	3,51	3,35	3,13	3,08	0,38	0,41
CS	Food	PICKNPAY -retail	5,86	5,71	5,59	5,48	5,49	4,86	5,35	4,91	4,81	4,89	4,65	0,46	0,49
CS	Food	SHOPRITE - retail	3,45	3,36	3,28	3,62	3,88	3,62	2,76	2,86	2,60	2,68	2,80	0,48	0,37
CS	Food	SPAR - CS retail	5,17	4,51	4,79	5,08	4,82	4,86	4,54	5,04	3,78	4,56	3,88	0,00	0,00
CS	Food	ADVTECH - retail	1,59	1,48	1,69	1,72	1,75	1,57	1,46	1,21	1,09	0,92	1,04	0,00	4,95
CS	Food	AF & OVR -retail	1,74	1,97	1,88	1,89	1,67	1,67	1,64	1,52	1,74	1,67	1,69	2,11	2,53
CS	Food	CASHBIL - retail	3,06	3,35	2,54	2,99	2,93	2,69	3,35	3,16	2,63	2,54	2,76	0,21	0,25
CS	Food	CMH - retail	4,19	4,10	4,19	3,57	3,40	3,53	3,47	3,37	4,30	4,07	4,01	0,38	0,58
CS	Food	MR PRICE - retail	2,56	2,43	2,60	2,66	2,67	2,82	2,81	2,77	2,49	2,39	2,59	0,94	0,65
CS	Food	REX TRUE - retails	1,74	1,97	1,88	1,89	1,67	1,67	1,64	1,53	1,76	1,68	1,71	2,22	2,64
CS	Food	TFG - retail	1,09	1,07	1,09	0,94	0,94	0,93	0,91	0,84	0,83	1,14	1,28	2,03	2,13
CS	Food	WOOLIES - retail	1,62	1,67	1,83	2,66	2,71	3,06	3,24	3,61	2,05	2,19	2,14	0,00	0,96
CS	Food	ITLTILE - retail	1,15	1,10	1,05	0,68	0,66	0,66	0,71	0,81	1,00	1,01	0,94	0,35	0,82
		Consumer Services Travel													
CS	Travel	CITYLDG	0,73	0,76	0,77	0,69	0,61	0,63	0,68	0,71	0,63	0,66	0,69	1,09	0,45
CS	Travel	FAMBRANDS	2,16	1,91	2,65	3,15	3,66	3,92	4,10	3,52	3,44	3,53	3,28	1,06	1,23
CS	Travel	SUNINT	0,84	0,89	0,92	0,84	0,76	0,85	0,87	0,82	0,81	0,81	0,59	0,87	0,68
CS	Travel	TSOGO	0,87	0,58	0,68	0,68	0,68	0,26	0,82	0,89	0,77	0,63	0,64	1,20	0,55
		Health Care Equipment													
HC	Equip	NETCARE	0,35	0,56	0,60	0,75	0,73	0,66	0,66	1,39	1,42	1,26	1,43	0,00	0,94

NON-FAILED COMPANIES			TA T/over										QUICK	
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	1996	1997
		Industrial Construction													
Ind	Constr	DAWN constr	1,69	1,71	1,62	1,89	1,62	1,62	1,74	1,64	1,51	1,48	1,91	0,69	0,66
Ind	Constr	GROUP 5 constr	1,20	1,12	0,96	1,17	1,14	1,18	1,20	1,27	1,55	1,35	1,32	0,77	0,76
Ind	Constr	PPC constr	1,08	1,14	1,38	1,18	1,13	1,08	1,09	0,97	0,85	0,65	0,59	0,86	0,93
Ind	Constr	WBHO constr	1,98	1,95	1,38	1,57	1,68	1,62	1,66	2,02	2,02	2,15	2,09	0,41	0,55
Ind	Constr	AVENG constr	1,73	1,18	1,40	1,56	1,47	1,49	1,55	1,80	1,77	1,64	1,37	0,00	0,00
		Industrial General													
Ind	Gen	BARLOWORLD gen	1,38	1,77	1,56	1,58	1,80	1,75	1,77	1,74	1,58	1,40	1,57	0,81	0,78
Ind	Gen	M&R HLD gen	1,17	1,40	1,34	1,54	1,51	1,61	1,64	1,49	1,98	1,71	1,80	1,06	0,89
Ind	Gen	NAMPAK gen	1,35	1,42	1,23	1,43	1,47	1,33	1,21	1,02	1,13	1,02	0,95	0,79	0,90
Ind	Gen	BIDVEST gen	3,16	3,33	3,00	3,31	2,97	2,90	2,81	2,70	2,72	2,76	4,71	1,38	1,40
Ind	Gen	TRNPACO gen	1,57	1,64	1,77	1,99	1,84	1,97	1,88	1,89	1,92	1,87	2,07	0,95	0,85
Ind	Gen	REMGRO gen	0.24	0.16	0.15	0.27	0.25	0.21	0.23	0.25	0.33	0.29	0.27	0,00	0,00
		Technology Hardware													
Tech	HW	MUSTEK	1,70	1,85	1,72	1,96	2,02	2,19	2,01	2,18	1,80	1,56	1,80	0,95	0,84
Tech	HW	ALVIVA	1,93	2,76	2,92	2,95	2,61	2,97	2,72	2,22	2,21	2,30	2,43	0,00	0,00
		Technology Software													
Tech	SW	ALTRON A	2,07	2,25	2,26	2,22	2,29	2,25	2,23	2,21	1,93	2,01	1,98	0,80	1,46
Tech	SW	DATATEC	2,65	2,65	2,52	3,74	2,49	2,67	2,47	2,16	2,28	2,10	2,34	0,97	1,07
Tech	SW	ADAPTIT	2,00	2,69	2,35	2,39	1,31	1,85	1,83	2,25	2,57	2,89	2,47	0,00	0,00
Tech	SW	JASCO	2,41	2,22	2,22	1,17	1,10	1,19	1,44	1,46	1,63	1,67	1,97	0,81	0,71
Tech	SW	EOH	2,18	2,18	2,37	1,99	2,21	2,23	2,13	2,09	1,95	1,80	1,59	0,00	0,00
Tech	SW	COGNITION	1,62	1,61	0,84	0,79	0,84	0,75	0,74	0,71	0,75	0,66	0,94	0,00	0,00
		Telecommunication Mobile													
Tele	Mobile	MTN	0,91	0,95	0,82	0,93	0,92	0,83	0,92	0,72	0,68	0,57	0,67	1,57	1,16
Tele	Mobile	BLUETEL	0,00	0,00	4,59	4,47	4,24	4,00	4,23	3,79	3,53	3,82	4,29	0,00	0,00

NON-FAILED COMPANIES			QUICK											
			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Consumer Goods Food													
CG	Food	AVI	1,20	1,09	1,62	1,24	1,38	1,35	1,21	1,26	0,84	0,94	0,99	1,12	0,96
CG	Food	CROOKES	1,45	1,30	1,49	1,85	1,44	1,65	2,30	1,72	2,91	3,28	2,73	3,03	2,87
CG	Food	OCEANA	0,75	1,03	1,06	1,25	1,43	1,43	1,20	1,57	1,24	1,31	1,40	1,15	1,43
CG	Food	RCL	0,44	0,39	0,48	0,73	1,07	1,19	2,22	1,17	1,29	1,45	1,51	1,44	1,59
CG	Food	TIGERBRANDS	0,98	0,96	0,74	0,89	0,95	0,92	0,83	0,93	0,91	0,91	0,69	0,93	1,08
CG	Food	TONGAAT	1,55	1,40	1,45	1,85	1,42	0,76	0,83	1,01	0,92	0,88	0,56	0,00	0,47
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	0,42	0,48	0,43	0,17	0,21	0,42	0,58	0,39	0,54	0,68	0,46	0,51	0,43
CS	Food	PICKNPAY -retail	0,61	0,53	0,47	0,56	0,45	0,42	0,48	0,41	0,34	0,28	0,29	0,39	0,39
CS	Food	SHOPRITE - retail	0,39	0,45	0,48	0,55	0,49	0,47	0,52	0,54	0,48	0,51	0,55	0,42	0,39
CS	Food	SPAR - CS retail	0,00	0,00	0,00	0,00	0,00	0,00	0,75	0,88	0,87	0,85	0,84	0,87	0,89
CS	Food	ADVTECH - retail	1,92	2,33	0,76	0,35	0,20	0,14	0,25	0,38	0,45	0,74	0,46	0,43	0,42
CS	Food	AF & OVR -retail	2,86	2,35	2,28	2,11	2,19	1,53	2,88	3,03	3,47	3,51	3,22	3,42	3,90
CS	Food	CASHBIL - retail	0,18	0,30	0,27	0,45	0,52	0,40	0,46	0,39	0,34	0,27	0,45	0,42	0,59
CS	Food	CMH - retail	0,67	0,71	0,64	0,48	0,59	0,48	0,54	0,54	0,29	0,39	0,35	0,35	0,39
CS	Food	MR PRICE - retail	0,60	0,71	0,69	1,14	1,28	1,00	1,07	1,15	1,28	1,10	0,97	1,07	1,49
CS	Food	REX TRUE - retails	2,95	2,41	2,30	2,04	2,01	1,36	2,75	3,00	3,54	3,54	3,23	3,43	3,92
CS	Food	TFG - retail	2,39	2,20	2,90	2,61	2,11	2,58	2,06	1,81	2,29	2,23	1,73	2,52	2,87
CS	Food	WOOLIES - retail	1,15	1,31	1,42	1,56	1,45	1,29	1,35	2,40	1,63	1,48	0,51	1,09	0,88
CS	Food	ITLTILE - retail	0,98	0,47	0,52	0,61	0,74	1,27	1,25	1,25	1,34	0,98	1,46	3,29	3,53
		Consumer Services Travel													
CS	Travel	CITYLDG	1,17	1,46	1,26	0,55	1,01	1,48	1,18	2,23	3,00	2,59	1,71	1,49	0,90
CS	Travel	FAMBRANDS	1,37	0,83	0,98	0,97	1,24	1,17	0,94	1,10	0,88	1,08	1,13	1,01	1,05
CS	Travel	SUNINT	1,54	1,48	1,05	0,51	1,03	1,08	1,01	0,73	0,72	0,69	0,53	0,46	0,37
CS	Travel	TSOGO	0,59	1,69	1,50	1,84	0,87	0,32	0,81	1,18	0,35	1,05	1,24	1,28	1,11
		Health Care Equipment													
HC	Equip	NETCARE	0,65	0,56	0,83	1,07	0,84	1,08	0,92	0,80	0,69	0,82	0,85	0,84	0,64

NON-FAILED COMPANIES			QUICK											
			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
		Industrial Construction													
Ind	Constr	DAWN constr	0,00	0,87	1,06	1,08	1,09	0,93	0,93	0,69	0,82	0,81	0,67	0,56	1,05
Ind	Constr	GROUP 5 constr	0,77	0,80	0,79	0,84	0,82	0,84	0,85	0,90	0,89	1,01	1,01	0,99	1,07
Ind	Constr	PPC constr	0,88	0,90	1,71	2,61	2,32	2,19	2,69	1,66	1,29	0,91	0,42	0,69	0,64
Ind	Constr	WBHO constr	0,45	0,75	1,21	0,96	1,00	1,01	1,01	1,04	1,04	0,99	1,02	1,08	1,14
Ind	Constr	AVENG constr	0,00	1,08	0,97	0,40	0,77	0,83	0,76	0,91	0,98	1,95	1,36	1,24	1,31
		Industrial General													
Ind	Gen	BARLOWORLD gen	0,70	1,08	0,90	0,77	0,74	0,77	0,97	1,11	1,16	1,00	0,90	0,93	0,95
Ind	Gen	M&R HLD gen	1,15	1,08	0,99	1,10	1,24	1,19	1,13	1,28	1,00	0,99	0,97	0,92	1,04
Ind	Gen	NAMPAK gen	0,99	1,07	0,84	1,01	0,79	0,82	0,88	0,93	0,82	0,70	0,87	0,75	0,84
Ind	Gen	BIDVEST gen	2,14	0,83	0,84	0,94	0,94	0,99	0,77	0,73	0,81	0,69	0,69	0,74	0,75
Ind	Gen	TRNPACO gen	0,83	0,73	1,05	0,95	1,15	1,34	1,36	1,86	1,45	1,00	0,97	1,25	1,33
Ind	Gen	REMGRO gen	0,00	0,00	0,00	2.60	3.48	2.56	3.35	2.09	3.61	3.62	2.88	4.23	3.43
		Technology Hardware													
Tech	HW	MUSTEK	0,89	1,27	0,77	0,74	0,85	1,24	1,11	0,98	0,75	0,84	0,81	0,94	0,92
Tech	HW	ALVIVA	0,00	0,69	0,71	0,84	0,59	0,82	0,91	1,01	0,97	1,01	0,90	1,00	1,04
		Technology Software													
Tech	SW	ALTRON A	1,34	1,38	1,51	1,24	1,45	1,52	1,63	1,34	1,31	1,24	1,20	1,01	0,91
Tech	SW	DATATEC	1,28	1,12	0,95	0,87	1,05	1,06	1,01	1,18	1,18	1,14	1,01	1,05	1,05
Tech	SW	ADAPTIT	0,00	2,87	1,60	1,73	3,90	2,52	4,78	3,59	4,11	4,67	2,86	3,06	1,23
Tech	SW	JASCO	1,06	0,79	0,72	0,62	0,81	0,86	0,89	1,20	1,07	1,08	1,13	0,66	0,99
Tech	SW	EOH	0,00	3,39	2,10	1,35	1,31	1,68	1,77	1,00	1,33	1,33	1,33	1,11	1,02
Tech	SW	COGNITION	0,00	4,24	4,20	1,66	0,95	1,29	1,14	1,36	1,49	1,83	3,22	3,22	4,15
		Telecommunication Mobile													
Tele	Mobile	MTN	1,18	0,90	0,72	0,78	0,81	0,79	1,28	1,09	0,98	0,92	0,96	0,81	1,13
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1,62	1,76	1,82

NON-FAILED COMPANIES			QUICK						CF:DT						
			2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000	2001	2002
		Consumer Goods Food													
CG	Food	AVI	0,91	1,12	0,75	0,83	0,64	0,60	20,29	11,16	16,22	26,97	47,42	63,62	48,89
CG	Food	CROOKES	6,57	4,15	5,47	3,51	2,20	4,70	184,34	188,31	146,61	162,78	107,33	127,55	134,33
CG	Food	OCEANA	1,77	1,38	0,97	1,62	1,36	1,51	30,18	23,59	23,03	33,64	39,28	27,66	52,45
CG	Food	RCL	1,54	1,30	2,08	0,66	1,06	1,06	-2,21	-57,02	-17,68	12,10	20,72	48,38	25,70
CG	Food	TIGERBRANDS	0,77	0,79	0,58	0,64	0,66	0,82	23,93	22,12	28,14	25,86	11,44	14,98	17,71
CG	Food	TONGAAT	0,44	0,56	0,79	1,05	1,15	1,01	40,63	22,27	26,63	23,59	17,59	28,37	31,08
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	0,34	0,38	0,43	0,42	0,44	0,43	48,00	20,11	8,53	34,09	10,16	15,05	20,27
CS	Food	PICKNPAY -retail	0,51	0,43	0,41	0,46	0,42	0,38	26,08	18,69	24,51	21,94	21,17	20,64	26,57
CS	Food	SHOPRITE - retail	0,35	0,82	0,73	0,69	0,64	0,50	25,80	0,81	0,47	13,44	22,04	23,83	21,51
CS	Food	SPAR - CS retail	0,90	0,92	0,94	0,83	0,82	0,90	0,00	0,00	0,00	0,00	0,00	0,00	0,00
CS	Food	ADVTECH - retail	0,44	0,37	0,30	0,30	0,35	0,37	0,00	49,36	61,57	62,17	13,90	34,27	11,05
CS	Food	AF & OVR -retail	3,95	5,43	2,73	1,74	2,43	2,19	68,21	72,88	71,52	71,60	38,73	9,90	-0,51
CS	Food	CASHBIL - retail	0,65	0,70	0,45	0,63	0,65	0,47	24,04	-6,63	53,73	-0,42	11,74	24,58	25,68
CS	Food	CMH - retail	0,41	0,39	0,35	0,30	0,36	0,63	12,89	8,64	21,36	8,48	27,86	8,82	30,76
CS	Food	MR PRICE - retail	1,79	1,80	1,99	1,66	1,81	1,66	24,45	27,24	23,33	30,84	20,21	14,39	47,76
CS	Food	REX TRUE - retails	3,97	5,46	2,70	1,68	2,40	2,17	68,74	74,35	72,12	70,04	33,35	7,62	-5,88
CS	Food	TFG - retail	1,91	2,43	2,06	1,99	1,32	1,37	21,49	32,13	-3,66	-4,13	24,81	13,44	27,98
CS	Food	WOOLIES - retail	0,87	0,66	0,56	0,79	0,26	0,29	0,00	-31,47	13,06	36,20	40,57	39,30	24,91
CS	Food	ITLTILE - retail	3,76	3,63	1,49	0,95	1,85	1,75	17,11	66,70	49,37	39,69	74,06	40,95	50,29
		Consumer Services Travel													
CS	Travel	CITYLDG	0,42	0,51	0,51	1,53	1,74	2,24	23,48	34,32	25,58	33,12	32,22	36,69	98,15
CS	Travel	FAMBRANDS	1,07	0,88	0,89	0,93	1,25	1,04	23,12	29,33	15,18	23,09	29,45	42,01	30,89
CS	Travel	SUNINT	0,28	0,35	0,34	0,27	0,24	0,48	69,29	44,56	49,84	29,01	14,40	31,31	16,55
CS	Travel	TSOGO	0,59	0,71	0,50	0,87	0,68	0,62	3,06	-0,29	-14,08	-5,77	-81,11	112,23	44,61
		Health Care Equipment													
HC	Equip	NETCARE	0,77	0,93	0,87	0,84	0,89	0,94	0,00	10,85	16,64	20,33	22,43	21,03	29,83

NON-FAILED COMPANIES			QUICK								CF:DT				
			2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000	2001	2000
		Industrial Construction													
Ind	Constr	DAWN constr	0,73	0,91	0,92	0,90	0,86	0,78	-5,62	-16,20	0,00	4,52	15,10	8,21	17,30
Ind	Constr	GROUP 5 constr	1,07	1,14	1,17	1,14	1,17	0,95	19,16	18,84	6,11	7,64	0,76	28,99	3,60
Ind	Constr	PPC constr	0,69	0,62	0,84	0,88	0,59	0,27	37,23	43,19	58,07	57,23	72,83	80,26	60,74
Ind	Constr	WBHO constr	1,18	1,18	1,15	1,16	1,18	1,16	13,49	39,81	27,00	33,80	32,38	6,83	18,14
Ind	Constr	AVENG constr	1,28	1,15	1,22	1,12	1,25	1,38	0,00	0,00	0,00	22,88	27,63	10,04	5,54
		Industrial General													
Ind	Gen	BARLOWORLD gen	0,99	0,84	0,84	0,89	0,89	1,06	10,04	13,66	15,72	19,22	18,61	18,71	15,24
Ind	Gen	M&R HLD gen	0,92	0,92	1,15	0,76	0,82	0,96	5,35	-2,34	27,04	12,93	10,85	17,57	24,67
Ind	Gen	NAMPAK gen	0,99	0,84	1,18	0,71	0,58	0,94	41,90	63,53	56,49	41,42	22,73	15,74	17,01
Ind	Gen	BIDVEST gen	0,73	0,75	0,86	0,77	0,76	0,78	27,25	-3,16	37,95	26,26	27,99	26,20	26,47
Ind	Gen	TRNPACO gen	1,36	1,24	1,50	1,37	1,61	1,40	8,17	10,97	-6,01	18,01	13,96	1,68	30,90
Ind	Gen	REMGRO gen	4.31	4.20	2.53	1.03	1.35	1.63	0,00	0,00	0,00	0,00	0,00	112.97	193.50
		Technology Hardware													
Tech	HW	MUSTEK	0,88	0,73	0,84	0,62	0,71	0,72	0,00	-4,90	38,97	-27,26	4,90	23,59	15,57
Tech	HW	ALVIVA	0,89	0,79	0,97	0,92	0,89	1,36	0,00	0,00	0,00	7,01	-2,32	0,07	18,35
		Technology Software													
Tech	SW	ALTRON A	0,93	0,92	0,80	0,68	0,95	0,97	21,99	25,04	32,68	17,45	16,93	16,78	26,77
Tech	SW	DATATEC	1,05	0,97	0,99	0,96	0,94	0,91	-4,07	10,48	6,25	-21,36	2,40	3,26	29,24
Tech	SW	ADAPTIT	1,19	1,20	1,11	1,04	1,08	0,86	0,00	0,00	0,00	39,43	159,80	84,20	107,09
Tech	SW	JASCO	0,87	0,65	0,91	0,76	0,97	1,03	-6,99	10,99	106,32	4,87	9,67	-13,96	10,90
Tech	SW	EOH	1,18	1,27	1,35	1,33	1,58	1,57	0,00	0,00	0,00	34,43	55,29	47,82	26,47
Tech	SW	COGNITION	4,70	5,22	4,77	5,43	5,42	4,09	0,00	0,00	0,00	-21,07	0,34	-47,16	-16,76
		Telecommunication Mobile													
Tele	Mobile	MTN	1,16	1,02	1,23	1,23	1,00	0,97	61,73	41,72	38,71	40,17	46,77	43,58	29,78
Tele	Mobile	BLUETEL	1,54	1,73	1,02	1,18	1,22	1,26	0,00	0,00	0,00	0,00	0,00	0,00	0,00

NON-FAILED COMPANIES			CF:DT											
			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Consumer Goods Food													
CG	Food	AVI	64,84	51,08	106,25	27,62	27,02	16,60	22,04	36,62	49,76	70,24	47,16	66,09	45,43
CG	Food	CROOKES	211,44	78,23	6,78	108,22	85,09	71,04	6,08	19,14	24,36	44,57	77,40	4,38	18,45
CG	Food	OCEANA	34,48	23,70	45,37	56,83	37,28	50,21	31,85	49,61	108,19	29,66	11,01	90,14	11,90
CG	Food	RCL	64,05	74,35	39,92	70,37	57,93	37,33	34,56	33,15	34,26	24,63	8,17	7,53	19,74
CG	Food	TIGERBRANDS	16,88	28,89	37,18	36,19	48,19	32,58	49,69	67,18	50,53	48,23	29,43	31,07	23,22
CG	Food	TONGAAT	3,35	9,16	38,99	22,69	10,25	14,99	0,00	24,61	3,01	9,43	14,84	12,41	16,40
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	20,84	18,18	6,77	11,69	46,51	12,85	38,10	13,41	17,06	24,31	26,51	33,76	24,64
CS	Food	PICKNPAY -retail	21,83	26,42	20,83	18,69	24,17	13,56	23,99	21,15	10,08	20,77	5,18	24,36	19,67
CS	Food	SHOPRITE - retail	19,39	23,33	5,12	26,31	40,67	30,67	24,91	23,55	22,12	27,95	16,59	34,35	24,37
CS	Food	SPAR - CS retail	0,00	20,38	22,10	21,90	31,00	-0,58	15,56	15,93	24,35	26,74	5,31	10,07	14,98
CS	Food	ADVTECH - retail	42,18	51,72	59,97	70,62	77,41	80,31	78,65	66,13	56,19	54,83	38,37	19,24	17,41
CS	Food	AF & OVR -retail	36,77	190,82	63,17	126,26	46,70	91,05	108,81	138,89	101,47	138,70	-39,31	27,49	134,65
CS	Food	CASHBIL - retail	8,30	24,00	21,27	10,22	10,52	37,91	14,78	36,53	32,91	1,86	8,41	69,11	39,55
CS	Food	CMH - retail	9,62	14,59	21,11	12,32	6,19	10,34	6,61	13,79	12,53	19,19	9,06	19,58	16,19
CS	Food	MR PRICE - retail	23,82	37,27	69,20	39,99	36,66	48,57	54,89	75,77	85,77	80,16	105,53	117,92	85,50
CS	Food	REX TRUE - retails	27,75	191,77	63,21	131,33	50,11	93,70	94,21	155,97	104,64	146,63	-36,29	30,61	138,12
CS	Food	TFG - retail	36,83	39,75	30,46	28,33	41,70	27,30	41,50	28,68	18,75	8,38	10,53	24,49	11,28
CS	Food	WOOLIES - retail	31,24	35,07	22,21	7,54	7,18	23,17	35,86	44,93	59,46	67,18	62,63	29,07	19,41
CS	Food	ITLTILE - retail	77,62	75,41	88,03	88,20	72,55	50,00	57,95	49,23	62,26	58,81	152,79	120,59	188,95
		Consumer Services Travel													
CS	Travel	CITYLDG	104,56	134,64	162,76	182,08	270,67	299,76	106,33	76,87	63,35	92,92	130,96	84,80	85,76
CS	Travel	FAMBRANDS	35,96	4,19	31,16	31,44	36,93	32,72	31,49	49,40	68,70	78,54	74,75	104,81	136,67
CS	Travel	SUNINT	33,38	35,85	39,27	40,65	36,63	21,62	18,11	17,90	27,52	24,25	27,07	23,78	16,59
CS	Travel	TSOGO	76,21	162,26	150,30	55,49	22,90	30,93	33,08	35,27	26,85	37,48	39,76	33,80	18,67
		Health Care Equipment													
HC	Equip	NETCARE	22,86	26,70	38,92	3,23	4,18	4,98	5,51	7,51	8,48	6,38	21,18	23,58	21,57

NON-FAILED COMPANIES			CF:DT											
			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		Industrial Construction													
Ind	Constr	DAWN constr	26,37	13,08	11,61	13,72	12,95	0,53	11,65	8,22	4,31	13,19	13,79	-2,20	-18,30
Ind	Constr	GROUP 5 constr	4,91	6,68	9,80	10,35	-1,08	21,52	20,98	14,52	-13,25	8,33	12,71	3,26	4,53
Ind	Constr	PPC constr	74,85	78,87	118,27	77,12	65,90	69,60	41,48	39,21	33,17	37,19	40,97	22,19	18,49
Ind	Constr	WBHO constr	7,30	17,87	15,91	9,36	35,76	40,50	26,98	11,84	-1,69	10,64	16,59	3,91	25,12
Ind	Constr	AVENG constr	10,94	15,94	9,63	24,74	30,75	45,08	23,04	16,14	3,94	7,25	-1,57	-1,67	-10,94
		Industrial General													
Ind	Gen	BARLOWORLD gen	21,51	20,79	24,51	24,03	20,79	9,68	16,21	25,34	18,63	3,45	21,5	16,15	6,85
Ind	Gen	M&R HLD gen	11,85	10,03	18,26	8,77	22,07	20,52	10,30	5,07	2,88	-16,04	12,57	7,64	5,70
Ind	Gen	NAMPAK gen	23,88	24,93	32,75	22,34	24,44	19,48	19,07	36,59	24,17	23,57	17,45	19,04	6,55
Ind	Gen	BIDVEST gen	24,31	26,38	23,72	18,61	12,75	13,61	18,66	22,86	20,31	20,43	12,87	15,5	16,49
Ind	Gen	TRNPACO gen	44,66	47,21	19,79	27,64	-1,54	16,04	58,68	40,05	56,79	33,08	35,00	40,28	47,07
Ind	Gen	REMGRO gen	230.01	195.66	168.32	235.05	198.36	201.06	98.47	90.77	108.15	126.57	38.31	46.33	27.86
		Technology Hardware													
Tech	HW	MUSTEK	21,82	5,53	5,90	12,81	-5,89	8,83	-6,32	15,81	6,69	5,52	12,01	-11,65	11,74
Tech	HW	ALVIVA	31,54	26,57	28,23	24,45	-4,79	12,48	22,00	8,85	16,61	4,71	-0,56	9,67	17,01
		Technology Software													
Tech	SW	ALTRON A	37,35	40,42	32,94	31,85	11,52	32,56	18,20	31,64	26,39	8,53	19,73	8,17	12,73
Tech	SW	DATATEC	23,86	-5,23	3,61	7,77	-0,44	2,77	15,15	17,39	-8,58	2,24	14,20	-1,73	5,06
Tech	SW	ADAPTIT	145,62	119,38	112,95	141,15	140,66	110,36	141,48	28,58	19,04	27,81	32,04	41,80	26,32
Tech	SW	JASCO	22,25	28,21	54,97	32,03	40,35	22,47	19,18	4,48	-7,11	0,34	-14,48	1,45	2,12
Tech	SW	EOH	34,83	59,08	40,85	19,05	31,62	22,58	27,80	23,73	2,34	21,52	19,59	14,11	14,16
Tech	SW	COGNITION	31,81	-3,36	34,47	18,98	70,66	66,97	55,44	84,02	68,77	102,48	85,50	125,50	66,55
		Telecommunication Mobile													
Tele	Mobile	MTN	56,82	85,53	104,97	38,52	47,48	43,94	52,18	57,34	50,20	55,91	50,50	48,50	29,82
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,00	0,00	1,30	41,62	28,56	17,34	26,48	-17,95	31,92	4,47

NON-FAILED COMPANIES			CF:DT	Sales Growth											
			2016	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
		Consumer Goods Food													
CG	Food	AVI	43,16	8,86	4,60	-12,48	-13,54	-39,69	-20,97	14,24	13,58	7,07	-6,30	-17,69	16,82
CG	Food	CROOKES	38,41	10,38	19,17	13,57	27,46	-1,80	8,10	10,04	29,03	1,13	-4,69	16,16	5,06
CG	Food	OCEANA	10,73	39,13	21,69	40,68	4,58	18,20	19,30	29,07	-4,01	-3,68	3,58	-1,24	2,53
CG	Food	RCL	10,73	10,04	10,92	2,92	0,34	6,68	8,60	21,85	23,48	2,17	5,14	1,85	15,33
CG	Food	TIGERBRANDS	42,70	13,79	13,91	7,51	14,41	-4,97	-7,21	19,84	14,16	10,34	-41,19	10,45	-1,84
CG	Food	TONGAAT	3,12	-6,63	13,89	83,29	-48,91	4,09	11,84	19,18	7,47	-3,98	9,97	13,31	-18,51
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	24,37	-8,85	63,08	26,27	44,93	17,77	9,20	25,72	34,26	9,24	8,27	14,76	0,51
CS	Food	PICKNPAY -retail	26,87	15,78	6,81	12,02	13,97	10,30	9,68	24,40	39,20	16,24	8,96	5,74	12,14
CS	Food	SHOPRITE - retail	14,11	60,02	-8,03	54,57	19,13	6,87	6,33	12,82	12,94	6,69	11,91	12,41	16,23
CS	Food	SPAR - CS retail	13,60	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	13,47	25,08	27,60
CS	Food	ADVTECH - retail	24,91	0,00	0,00	69,92	34,37	168,35	-6,91	-8,89	3,34	17,30	16,00	25,58	15,97
CS	Food	AF & OVR -retail	70,92	10,99	3,20	4,33	11,43	11,88	-2,76	17,86	7,07	5,31	-16,34	1,60	22,99
CS	Food	CASHBIL - retail	36,04	44,51	-13,03	17,20	2,92	3,39	2,82	14,26	24,24	17,24	35,08	22,70	27,23
CS	Food	CMH - retail	17,75	23,74	-13,61	4,94	15,71	16,57	37,73	29,10	-2,12	24,28	38,30	51,70	34,46
CS	Food	MR PRICE - retail	85,37	64,01	33,62	15,87	18,77	19,63	15,23	13,58	19,63	12,98	13,07	14,33	17,21
CS	Food	REX TRUE - retails	74,39	10,64	2,69	6,25	11,43	11,88	-2,76	17,86	7,07	5,31	-16,34	1,60	22,99
CS	Food	TFG - retail	10,75	22,14	3,35	6,33	4,79	5,26	12,62	10,38	17,95	13,64	19,71	21,84	12,40
CS	Food	WOOLIES - retail	22,99	0,00	0,00	19,10	16,64	7,05	11,17	22,63	10,26	12,09	14,76	16,26	22,30
CS	Food	ITLTILE - retail	157,81	8,26	13,16	16,49	14,88	27,60	12,64	25,76	20,87	6,77	29,60	23,95	14,94
		Consumer Services Travel													
CS	Travel	CITYLDG	100,81	17,49	13,24	15,55	5,25	11,04	16,32	19,94	26,32	14,66	16,40	13,09	15,29
CS	Travel	FAMBRANDS	73,88	71,84	22,66	32,20	44,64	30,81	-9,44	7,78	14,65	24,71	28,03	43,99	30,33
CS	Travel	SUNINT	7,98	9,12	4,15	2,83	-11,86	2,85	23,38	17,18	13,29	6,24	14,81	15,75	16,61
CS	Travel	TSOGO	21,77	46,32	-0,81	26,44	0,00	0,00	0,00	0,00	14,84	16,90	10,29	30,18	14,81
		Health Care Equipment													
HC	Equip	NETCARE	27,71	0,00	0,00	130,61	22,35	11,02	25,88	34,20	24,94	13,97	9,94	54,19	64,55

NON-FAILED COMPANIES			CF:DT	Sales Growth											
			2009	2010	2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000
		Industrial Construction													
Ind	Constr	DAWN constr	1,18	127,32	-9,91	0,00	0,00	-8,09	10,10	4,49	10,43	12,26	29,59	28,26	72,47
Ind	Constr	GROUP 5 constr	3,30	10,93	-2,70	20,53	-8,63	7,11	10,60	26,96	1,98	3,70	16,15	18,75	31,11
Ind	Constr	PPC constr	3,12	24,68	16,32	6,15	-1,78	-5,73	16,46	24,09	17,34	14,07	15,51	17,94	18,77
Ind	Constr	WBHO constr	17,07	387,61	3,53	21,03	17,78	10,36	29,91	34,26	5,44	4,25	89,80	21,61	40,25
Ind	Constr	AVENG constr	-16,79	0,00	0,00	0,00	0,00	10,88	81,51	27,80	0,45	-11,36	15,29	18,61	37,62
		Industrial General													
Ind	Gen	BARLOWORLD gen	25,73	11,70	8,85	5,93	1,44	5,44	27,20	28,82	-3,88	5,98	7,44	12,86	13,02
Ind	Gen	M&R HLD gen	9,37	15,76	12,43	4,17	3,07	2,67	-35,91	5,77	12,01	-16,69	26,94	11,46	49,95
Ind	Gen	NAMPAK gen	15,49	11,45	7,59	4,11	7,90	24,06	6,29	30,65	32,81	-3,74	-10,93	-2,06	11,48
Ind	Gen	BIDVEST gen	26,78	21,4	21,68	46,61	97,04	80,44	11,3	42,62	12,21	8,90	22,53	23,03	23,78
Ind	Gen	TRNPACO gen	30,48	27,98	9,15	55,82	90,77	7,04	5,13	11,77	14,07	-5,89	10,21	7,17	65,56
Ind	Gen	REMGRO gen	15.62	0,00	0,00	0,00	0,00	0,00	0,00	17.33	29.81	7.43	6.23	-1.68	-19.64
		Technology Hardware													
Tech	HW	MUSTEK	2,35	0,00	103,52	14,16	16,68	20,86	37,00	32,84	5,30	-9,80	9,62	8,77	4,83
Tech	HW	ALVIVA	18,50	0,00	0,00	0,00	0,00	-16,45	-2,28	21,23	16,53	19,00	43,90	48,27	61,75
		Technology Software													
Tech	SW	ALTRON A	11,65	18,77	1,76	10,78	34,05	-0,30	28,72	10,32	15,13	-11,87	21,51	14,44	22,26
Tech	SW	DATATEC	2,80	200,73	619,89	196,10	383,46	83,97	65,00	2,57	-2,20	-88,39	8,14	17,25	6,46
Tech	SW	ADAPTIT	24,21	0,00	0,00	0,00	0,00	62,72	-4,09	22,95	7,01	5,43	4,94	7,99	43,32
Tech	SW	JASCO	13,81	18,44	38,96	-1,29	112,17	4,40	4,85	-33,39	10,45	-14,71	-2,59	34,69	20,63
Tech	SW	EOH	6,36	0,00	0,00	0,00	0,00	80,39	42,56	35,95	53,92	70,22	40,29	19,77	39,81
Tech	SW	COGNITION	67,82	0,00	0,00	0,00	0,00	141,97	-40,52	-44,18	145,56	16,43	37,86	8,72	75,47
		Telecommunication Mobile													
Tele	Mobile	MTN	28,74	0,00	127,88	45,55	72,67	312,47	38,77	49,11	56,09	23,01	135,46	-8,20	41,77
Tele	Mobile	BLUETEL	16,13	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

NON-FAILED COMPANIES			Sales Growth								Earnings Growth			
			2008	2009	2010	2011	2012	2013	2014	2015	2016	1996	1997	1998	1999
		Consumer Goods Food													
CG	Food	AVI	20,14	32,11	29,81	29,75	-14,23	108,54	-72,29	49,97	-0,61	3,97	-7,78	49,04	39,08
CG	Food	CROOKES	183,44	-66,82	1,25	71,39	-34,14	-73,78	420,26	-0,29	50,95	72,82	-71,50	446,38	-30,64
CG	Food	OCEANA	14,03	21,52	33,99	3,86	-13,71	-32,15	16,36	30,06	45,77	18,74	0,76	13,16	33,20
CG	Food	RCL	259,50	335,97	63,95	64,85	-25,17	22,44	71,64	18,9	13,65	-41,10	11,99	7,97	-30,50
CG	Food	TIGERBRANDS	5,79	16,00	22,52	-7,61	11,00	12,12	47,15	-2,63	1,38	9,32	-11,80	17,86	5,20
CG	Food	TONGAAT	20,77	61,11	-34,15	-110,20	651,20	108,85	53,18	378,15	-81,23	0,00	0,00	-71,26	6,72
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	25,75	8,70	-16,05	46,56	105,90	-1,730.15	20,21	54,68	16,27	6,77	19,69	15,13	5,80
CS	Food	PICKNPAY -retail	68,52	19,43	25,39	13,45	13,64	25,96	8,24	-3,91	38,66	11,90	13,41	-33,98	41,87
CS	Food	SHOPRITE - retail	157,13	-18,08	68,17	3,75	32,55	1,98	56,75	20,89	45,92	27,26	13,43	10,73	20,59
CS	Food	SPAR - CS retail	0,00	0,00	0,00	0,00	0,00	22,49	13,97	28,31	30,33	9,33	22,89	4,02	11,16
CS	Food	ADVTECH - retail	110,10	-63,91	-4,036.49	120,30	-22,20	47,32	49,31	38,10	30,38	3,06	-7,12	5,04	-11,45
CS	Food	AF & OVR -retail	-24,03	-55,30	14,88	114,71	-71,89	634,20	128,60	111,86	176,06	-38,70	20,69	31,70	-45,31
CS	Food	CASHBIL - retail	-116,20	-1,028.33	112,51	88,49	17,74	42,40	8,90	47,09	32,17	10,13	-7,50	-8,28	90,94
CS	Food	CMH - retail	26,99	33,00	4,90	21,27	23,32	82,26	46,47	12,43	-47,13	-91,72	569,85	120,49	9,39
CS	Food	MR PRICE - retail	43,04	-11,89	57,95	16,45	21,21	47,81	35,67	22,09	14,98	11,76	9,39	49,99	20,47
CS	Food	REX TRUE - retails	-34,43	-77,09	92,18	146,80	-59,95	544,00	140,70	74,20	154,81	-33,97	19,28	30,74	-40,46
CS	Food	TFG - retail	10,46	-31,85	25,72	79,84	43,78	48,44	28,62	13,41	0,82	1,54	-5,25	19,92	21,53
CS	Food	WOOLIES - retail	-7,28	8,39	1,42	113,02	21,32	66,35	-24,67	28,58	-12,22	32,30	0,83	29,65	25,57
CS	Food	ITLTILE - retail	49,38	18,77	61,94	23,91	28,27	26,37	22,22	15,88	1,85	-6,55	6,23	17,58	17,76
		Consumer Services Travel													
CS	Travel	CITYLDG	-18,90	12,55	49,19	57,72	15,42	21,49	17,37	23,62	26,83	-41,52	26,95	-35,22	38,01
CS	Travel	FAMBRANDS	11,20	0,22	-26,76	51,28	48,25	81,32	63,04	22,91	47,67	16,86	27,30	20,32	15,87
CS	Travel	SUNINT	20,20	219,40	33,08	-142,2	413,11	89,64	-23,55	-14,49	-42,73	9,63	2,40	-15,59	45,96
CS	Travel	TSOGO	209,45	33,46	22,40	23,39	55,72	18,47	10,22	-42,66	145,4	0,78	-22,09	115,58	183,48
		Health Care Equipment													
HC	Equip	NETCARE	142,40	47,85	52,95	24,92	0,44	24,00	-10,89	27,11	-13,59	95,26	-21,16	27,33	369,80

NON-FAILED COMPANIES			Sales Growth								Earnings Growth				
			2009	2010	2011	2012	2013	2014	2015	2016	1996	1997	1998	1999	2000
		Industrial Construction													
Ind	Constr	DAWN constr	4,71	-31,60	-2,99	60,63	44,55	84,65	52,38	55,19	34,13	-57,92	-2,91	127,80	373,80
Ind	Constr	GROUP 5 constr	-49,97	68,81	47,21	25,66	19,28	15,83	7,37	63,62	78,18	22,99	-48,06	181,60	27,65
Ind	Constr	PPC constr	40,39	59,35	45,28	4,46	25,40	19,98	28,70	17,68	4,90	-24,75	-10,46	-14,36	-11,21
Ind	Constr	WBHO constr	6,17	5,45	3,48	35,16	36,67	39,59	43,89	39,72	159,31	24,26	8,04	-23,71	-11,55
Ind	Constr	AVENG constr	25,15	1,59	35,31	62,01	-67,10	100,10	51,99	1,173.50	-69,24	-9,15	-10,43	-37,15	-55,76
		Industrial General													
Ind	Gen	BARLOWORLD gen	-10,79	-56,12	145,38	-24,64	32,95	22,68	26,65	-3,69	-45,73	-45,54	-101,00	14,628.57	53,29
Ind	Gen	M&R HLD gen	205,78	144,20	100,32	11,74	-14,24	-7,44	14,42	36,98	144,07	17,70	-45,56	258,00	-57,6
Ind	Gen	NAMPAK gen	59,29	-32,58	56,66	39,76	4,84	-19,23	10,35	22,33	-51,04	-60,32	303,27	-23,97	92,24
Ind	Gen	BIDVEST gen	26,22	16,94	18,68	11,36	11,47	33,32	16,28	13,03	20,47	-13,85	19,37	5,79	25,55
Ind	Gen	TRNPACO gen	-104,10	147,80	-1,045.51	59,32	12,49	11,05	-31,35	44,26	16,49	82,40	16,50	17,75	3,86
Ind	Gen	REMGRO gen	0,00	0,00	-45.86	144.45	-58.34	142.35	-6.87	-15.36	42.51	358.20	-93.25	254.28	-14.36
		Technology Hardware													
Tech	HW	MUSTEK	-70,13	-31,14	251,65	40,92	-44,64	63,93	-25,76	-3,32	36,17	-32,75	12,14	54,17	-15,26
Tech	HW	ALVIVA	-65,26	-74,88	792,33	-62,96	424,74	75,75	98,26	69,44	37,63	2,50	32,06	58,13	27,25
		Technology Software													
Tech	SW	ALTRON A	1,89	37,72	-23,72	117,60	-26,35	1,46	42,36	62,96	26,58	-18,06	-34,97	-0,18	-67,90
Tech	SW	DATATEC	-87,96	481,90	124,10	-6,42	-83,47	227,50	-27,72	58,98	25,99	-22,42	-57,49	67,88	92,98
Tech	SW	ADAPTIT	-301,40	117,90	221,43	30,83	-16,92	3,79	-2,34	18,57	19,62	27,81	44,32	-15,69	64,26
Tech	SW	JASCO	-127,80	2,635.86	107,10	150,12	-95,71	411,48	190,89	44,37	27,88	12,00	-43,28	-55,22	130,26
Tech	SW	EOH	-165,10	25,22	18,29	20,38	32,92	24,40	57,37	30,92	24,37	27,62	34,12	41,07	51,13
Tech	SW	COGNITION	-219,60	-438	-15,64	117,20	337,90	177,30	140,36	259,15	65,34	22,25	10,80	-3,18	15,05
		Telecommunication Mobile													
Tele	Mobile	MTN	-3,986.73	111,00	-19,75	236,88	91,81	230,35	-13,20	-0,02	44,37	-4,34	-2,39	45,13	-0,24
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	115,90	-6,54	18,20	1,54

NON-FAILED COMPANIES			Earnings Growth				Debt Equity								
			2013	2014	2015	2016	1996	1997	1998	1999	2000	2001	2002	2003	2004
		Consumer Goods Food													
CG	Food	AVI	11,87	21,18	1,26	11,18	1,10	0,85	0,68	0,62	0,57	0,61	0,57	0,56	0,59
CG	Food	CROOKES	19,82	114,50	-79,77	48,57	0,06	0,06	0,08	0,09	0,10	0,09	0,06	0,06	0,14
CG	Food	OCEANA	10,64	16,89	6,50	49,94	1,39	1,66	1,83	1,22	1,06	1,01	0,71	0,63	0,69
CG	Food	RCL	-90,06	-1,190.43	-393,40	-75,14	1,35	0,86	0,60	0,55	0,52	0,36	0,44	0,51	0,38
CG	Food	TIGERBRANDS	-5,48	-21,37	-14,51	91,40	1,29	1,16	1,34	1,63	9,17	4,66	2,57	2,08	1,77
CG	Food	TONGAAT	20,36	7,94	-14,37	-17,09	0,40	0,64	0,72	0,71	0,63	0,62	0,47	0,71	0,60
		Consumer Services Food + Retail													
CS	Food	CLICKS - retail	9,07	15,1	10,41	14,59	1,23	1,35	1,13	1,21	1,09	0,95	1,02	1,14	9,07
CS	Food	PICKNPAY -retail	-50,55	6,01	47,63	23,64	3,28	2,96	3,27	3,70	3,08	2,90	2,75	3,91	-50,55
CS	Food	SHOPRITE - retail	18,87	3,68	10,56	17,39	4,50	3,45	3,49	3,69	2,71	3,01	3,08	2,79	18,87
CS	Food	SPAR - CS retail	12,43	12,98	5,64	27,74	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	12,43
CS	Food	ADVTECH - retail	12,50	7,32	34,59	65,58	0,00	0,11	0,14	0,36	0,59	0,53	1,24	0,78	12,50
CS	Food	AF & OVR -retail	-159,20	4,07	-270,6	-64,12	0,37	0,40	0,35	0,41	0,37	0,32	0,30	0,39	-159,20
CS	Food	CASHBIL - retail	-14,41	8,32	34,97	21,88	2,95	3,11	2,72	2,65	3,12	2,74	3,30	2,55	-14,41
CS	Food	CMH - retail	41,97	-9,10	-10,06	19,76	1,98	1,35	1,52	1,15	1,74	1,85	1,87	2,21	41,97
CS	Food	MR PRICE - retail	26,28	21,54	22,75	15,35	0,55	0,62	0,78	0,87	0,81	0,88	0,85	0,77	26,28
CS	Food	REX TRUE - retails	-140,00	5,60	-336,8	-50,65	0,20	0,20	0,18	0,21	0,20	0,17	0,17	0,25	-140,00
CS	Food	TFG - retail	13,27	3,77	-0,09	16,02	0,70	0,50	0,46	0,35	0,32	0,47	0,58	0,55	13,27
CS	Food	WOOLIES - retail	26,81	11,21	7,89	39,41	0,00	0,97	0,70	0,55	0,53	0,49	0,59	0,86	26,81
CS	Food	ITLTILE - retail	17,46	14,64	37,52	16,14	0,65	0,53	0,61	0,48	0,56	0,65	0,67	0,44	17,46
		Consumer Services Travel													
CS	Travel	CITYLDG	45,84	26,99	14,74	-0,93	0,90	0,64	0,65	0,64	1,00	0,83	0,31	0,30	0,24
CS	Travel	FAMBRANDS	23,24	22,15	15,96	13,30	0,80	0,56	1,12	1,00	0,96	0,79	0,67	0,80	1,33
CS	Travel	SUNINT	11,87	-26,73	71,81	-146,50	0,67	0,85	0,53	0,70	0,64	0,96	1,10	1,01	1,02
CS	Travel	TSOGO	-5,13	15,22	-10,92	6,94	0,15	0,28	0,32	0,48	0,14	0,04	0,65	0,46	0,22
		Health Care Equipment													
HC	Equip	NETCARE	-220,30	-58,63	14,48	-30,89	0,00	1,86	1,42	1,23	1,14	1,27	0,86	0,79	0,83
NON-FAILED COMPANIES			**Earnings Growth**				**Debt Equity**								

			2013	2014	2015	2016	1996	1997	1998	1999	2000	2001	2002	2003	2004
		Industrial Construction													
Ind	Constr	DAWN constr	88,23	-52,57	554,53	-257,20	1,12	4,65	0,00	2,65	1,61	1,48	1,29	1,97	1,95
Ind	Constr	GROUP 5 constr	-197,90	47,23	-44,23	69,39	6,33	2,52	2,61	2,23	2,42	3,39	4,94	3,58	3,39
Ind	Constr	PPC constr	21,22	-9,77	-16,90	-47,13	0,49	0,48	0,49	0,44	0,32	0,41	0,45	0,51	0,44
Ind	Constr	WBHO constr	-5,70	-30,90	34,52	27,58	2,61	2,22	2,33	1,85	1,83	2,72	2,76	2,63	2,52
Ind	Constr	AVENG constr	-10,52	-181,80	20,73	-78,04	0,00	0,00	0,00	1,08	1,12	2,20	2,13	1,88	1,94
		Industrial General													
Ind	Gen	BARLOWORLD gen	8,53	26,65	-20,07	9,92	1,56	1,64	1,72	1,06	0,97	1,32	1,29	1,33	1,36
Ind	Gen	M&R HLD gen	-236,50	25,57	-30,14	-14,55	1,18	1,57	1,57	1,58	2,01	1,67	1,27	1,28	1,27
Ind	Gen	NAMPAK gen	6,58	-9,10	-10,79	54,37	0,69	0,55	0,52	0,69	1,55	1,53	1,64	1,16	0,94
Ind	Gen	BIDVEST gen	7,42	-3,54	28,13	1,281.70	1,37	0,92	0,45	1,62	1,42	1,31	1,48	1,51	1,85
Ind	Gen	TRNPACO gen	0,45	4,17	13,83	37,79	1,74	1,99	2,06	1,44	0,96	1,36	0,95	0,78	0,75
Ind	Gen	REMGRO gen	-52.20	55.86	25.99	-38.20	0,00	0,00	0,00	0,00	0,00	0.07	0.05	0.05	0.05
		Technology Hardware													
Tech	HW	MUSTEK	6,07	26,20	23,65	-43,77	0,98	1,16	0,81	0,64	1,44	1,93	2,20	1,92	1,90
Tech	HW	ALVIVA	15,96	-16,12	2,67	22,08	0,00	0,00	0,00	0,99	1,63	1,19	1,58	1,02	1,10
		Technology Software													
Tech	SW	ALTRON A	-271,30	-306,40	-101,50	9,600.00	1,82	2,04	2,16	1,42	1,51	1,75	1,72	1,10	0,99
Tech	SW	DATATEC	-3,43	-28,56	32,26	-45,85	1,34	1,28	0,88	2,43	3,62	1,96	1,55	1,56	1,84
Tech	SW	ADAPTIT	32,78	58,25	52,00	35,22	0,00	0,00	0,00	0,30	1,04	0,80	0,36	0,60	0,23
Tech	SW	JASCO	-601,80	-104,80	1,669.30	-117,00	1,22	1,32	1,04	1,19	1,61	7,87	4,03	1,50	0,77
Tech	SW	EOH	48,94	47,09	41,65	34,26	0,00	0,00	0,00	0,93	1,02	1,09	1,28	0,91	1,49
Tech	SW	COGNITION	10,99	10,23	-6,82	-28,82	0,00	0,00	0,00	0,61	0,29	0,57	0,99	0,83	1,18
		Telecommunication Mobile													
Tele	Mobile	MTN	26,98	22,02	-37,02	-112,9	0,39	0,62	0,88	1,16	1,74	0,45	0,61	0,55	0,51
Tele	Mobile	BLUETEL	-3,03	5,98	28,29	19,73	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

NON-FAILED COMPANIES			Debt Equity										
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
		Consumer Goods Food												
CG	Food	AVI	0,51	0,71	0,64	0,91	0,91	0,77	0,72	0,41	0,62	0,53	0,86	0,85
CG	Food	CROOKES	0,21	0,13	0,11	0,15	0,29	0,34	0,21	0,28	0,21	0,19	0,26	0,18
CG	Food	OCEANA	0,60	0,61	0,64	0,51	0,48	0,42	0,39	0,50	0,53	0,65	1,81	1,57
CG	Food	RCL	0,50	0,57	0,48	0,50	0,55	0,50	0,50	0,60	1,28	0,94	0,79	0,87
CG	Food	TIGERBRANDS	1,51	1,10	0,68	1,01	0,56	0,47	0,53	0,48	0,76	0,76	0,74	0,49
CG	Food	TONGAAT	0,44	0,54	1,37	1,49	0,00	1,34	1,45	1,16	1,07	0,85	0,80	0,87
		Consumer Services Food + Retail												
CS	Food	CLICKS - retail	1,30	1,20	1,90	1,86	2,47	2,36	3,14	2,33	2,78	2,77	2,60	2,25
CS	Food	PICKNPAY -retail	4,55	6,70	6,67	5,46	4,84	3,89	3,79	3,57	4,01	3,83	3,33	2,93
CS	Food	SHOPRITE - retail	2,68	2,02	2,05	1,93	2,21	1,86	1,76	1,34	1,13	1,28	1,23	1,19
CS	Food	SPAR - CS retail	2,54	2,88	3,40	2,80	2,26	2,35	2,25	2,40	2,01	4,42	4,58	3,52
CS	Food	ADVTECH - retail	0,68	0,61	0,59	0,55	0,52	0,45	0,54	0,68	0,91	1,11	0,87	0,71
CS	Food	AF & OVR -retail	0,37	0,34	0,36	0,41	0,33	0,33	0,30	0,21	0,30	0,32	0,30	0,39
CS	Food	CASHBIL - retail	2,64	2,23	1,76	2,25	1,77	1,49	1,56	0,87	0,78	1,04	1,19	1,31
CS	Food	CMH - retail	2,07	2,63	4,30	3,67	3,31	2,98	2,68	2,69	2,42	3,55	3,20	4,80
CS	Food	MR PRICE - retail	0,63	0,80	0,80	0,81	0,81	0,65	0,54	0,48	0,41	0,62	0,53	0,40
CS	Food	REX TRUE - retails	0,20	0,18	0,20	0,23	0,22	0,18	0,16	0,12	0,16	0,17	0,17	0,22
CS	Food	TFG - retail	0,74	0,71	0,66	0,69	0,77	0,67	0,80	0,90	1,03	0,68	1,18	1,14
CS	Food	WOOLIES - retail	2,03	2,08	1,98	1,33	1,46	1,39	1,00	0,97	0,90	2,12	1,68	1,35
CS	Food	ITLTILE - retail	0,48	0,42	0,39	0,33	0,45	0,41	0,36	0,31	0,15	0,22	0,13	0,12
		Consumer Services Travel												
CS	Travel	CITYLDG	0,22	0,19	0,15	0,14	1,31	1,59	1,45	0,99	0,51	0,67	0,62	0,56
CS	Travel	FAMBRANDS	1,17	1,04	1,16	1,00	1,05	0,74	0,53	0,39	0,46	0,33	0,27	0,44
CS	Travel	SUNINT	1,00	1,03	1,96	61,72	13,62	6,25	4,69	5,39	3,70	6,22	4,50	-12,22
CS	Travel	TSOGO	0,21	0,65	0,70	0,79	0,65	0,56	0,78	0,77	0,77	0,80	1,99	1,64
		Health Care Equipment												
HC	Equip	NETCARE	0,79	16,77	8,64	8,72	8,04	7,96	7,27	41,29	1,67	1,46	1,44	1,34

NON-FAILED COMPANIES			Debt Equity										
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
		Industrial Construction												
Ind	Constr	DAWN constr	2,27	2,23	2,76	2,48	1,74	0,96	1,11	1,05	1,07	1,17	0,83	1,33
Ind	Constr	GROUP 5 constr	3,44	5,95	3,23	3,57	3,33	2,95	2,52	3,00	2,98	2,71	2,44	1,87
Ind	Constr	PPC constr	0,47	0,85	0,96	1,38	4,55	5,02	4,53	3,77	3,39	4,25	3,78	3,54
Ind	Constr	WBHO constr	3,19	3,15	3,16	3,44	2,80	2,00	1,73	1,77	1,75	1,73	1,95	1,78
Ind	Constr	AVENG constr	2,05	1,83	0,75	1,06	1,07	0,92	0,84	1,11	1,18	1,24	1,07	0,81
		Industrial General												
Ind	Gen	BARLOWORLD gen	1,21	1,46	1,66	1,58	1,48	1,35	1,44	1,71	1,45	1,41	1,29	1,17
Ind	Gen	M&R HLD gen	1,30	2,22	2,43	3,14	2,72	2,2	2,94	2,38	1,95	2,09	1,68	1,16
Ind	Gen	NAMPAK gen	0,84	0,97	0,94	1,31	1,43	1,08	0,93	1,08	1,38	1,43	1,46	1,36
Ind	Gen	BIDVEST gen	1,76	2,06	2,00	2,00	1,65	1,48	1,58	1,47	1,43	1,45	1,35	1,30
Ind	Gen	TRNPACO gen	0,82	1,01	1,81	1,76	1,14	0,86	0,71	0,70	0,60	0,56	0,53	0,59
Ind	Gen	REMGRO gen	0.06	0.06	0.04	0.04	0.06	0.06	0.05	0.05	0.17	0.14	0.23	0.31
		Technology Hardware												
Tech	HW	MUSTEK	2,26	2,62	2,53	2,67	2,10	1,66	1,37	1,52	1,65	1,91	2,44	2,11
Tech	HW	ALVIVA	1,55	2,86	2,07	2,20	1,37	1,31	1,73	1,73	1,83	1,69	1,30	1,21
		Technology Software												
Tech	SW	ALTRON A	1,13	1,18	0,98	1,24	1,46	1,22	1,15	1,25	1,60	2,68	3,12	4,10
Tech	SW	DATATEC	1,31	1,50	1,52	1,78	1,74	1,69	1,62	1,78	1,97	2,29	2,62	2,92
Tech	SW	ADAPTIT	0,34	0,29	0,21	0,27	0,30	1,68	1,11	1,04	0,90	0,60	0,67	0,96
Tech	SW	JASCO	0,46	0,63	0,73	0,83	1,04	0,98	1,22	1,23	2,65	1,58	2,54	1,76
Tech	SW	EOH	1,78	1,06	1,09	1,09	1,73	1,53	1,30	1,18	1,10	1,10	0,83	0,95
Tech	SW	COGNITION	1,24	1,33	1,07	0,58	0,51	0,36	0,31	0,25	0,26	0,21	0,17	0,21
		Telecommunication Mobile												
Tele	Mobile	MTN	0,99	1,26	1,23	1,10	1,09	1,00	0,89	0,86	0,81	0,83	0,97	1,42
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,65	0,70	0,68	0,71	0,67	0,76	0,82	0,75	0,60

NON-FAILED COMPANIES			Interest Cover										
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
		Consumer Goods Food												
CG	Food	AVI	6,05	4,27	3,27	2,03	6,85	15,79	42,15	36,47	46,40	24,80	10,19	13,33
CG	Food	CROOKES	0,00	155,11	243,66	197,91	1,422.00	289,36	530,74	158,27	23,99	3,74	18,42	20,71
CG	Food	OCEANA	16,47	35,45	24,29	39,03	26,99	20,15	59,86	38,23	52,87	64,44	34,39	27,58
CG	Food	RCL	-1,07	-2,14	-9,32	0,69	1,69	6,64	42,69	145,68	403,40	295,95	245,79	241,02
CG	Food	TIGERBRANDS	5,51	6,40	6,41	4,20	2,27	2,26	3,02	2,60	3,80	3,99	11,40	8,03
CG	Food	TONGAAT	0,00	0,00	0,00	0,00	2,28	3,00	1,94	0,24	1,14	7,26	21,31	19,67
		Consumer Services Food + Retail												
CS	Food	CLICKS - retail	5,38	5,12	5,68	7,81	11,03	6,02	3,24	4,31	1,99	5,99	5,65	9,56
CS	Food	PICKNPAY -retail	8,47	8,79	6,43	7,28	14,99	13,8	14,31	15,38	16,14	29,03	27,79	24,08
CS	Food	SHOPRITE - retail	3,17	4,72	5,05	1,22	4,93	13,67	11,86	9,54	26,22	18,40	15,81	20,07
CS	Food	SPAR - CS retail	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	125,49	94,29	98,82	75,21
CS	Food	ADVTECH - retail	0,00	0,00	-2,28	-10,80	0,82	1,41	-5,53	2,60	12,63	16,91	31,68	51,28
CS	Food	AF & OVR -retail	83,48	153,81	0,00	90,29	105,27	41,96	145,67	143,89	13,90	69,35	271,67	1,527.00
CS	Food	CASHBIL - retail	-1,13	2,22	2,52	3,27	0,24	11,77	163,57	115,49	120,25	181,38	98,76	71,99
CS	Food	CMH - retail	3,50	3,54	6,16	6,40	14,11	7,61	5,21	4,97	6,54	13,47	10,78	7,99
CS	Food	MR PRICE - retail	9,65	6,81	17,13	10,71	45,90	5,79	12,42	7,27	8,88	11,91	44,14	101,31
CS	Food	REX TRUE - retails	74,75	144,32	63,46	0,00	87,32	-0,26	100,69	126,67	14,38	70,53	284,96	1,585.75
CS	Food	TFG - retail	6,95	5,52	7,91	8,96	13,66	5,34	2,69	6,77	10,50	11,93	11,50	9,46
CS	Food	WOOLIES - retail	0,00	188,68	0,82	2,09	2,75	3,93	6,48	3,91	4,62	6,09	2,98	2,32
CS	Food	ITLTILE - retail	44,62	0,00	0,00	0,00	0,00	0,00	0,00	97,27	144,12	219,77	112,67	196,50
		Consumer Services Travel												
CS	Travel	CITYLDG	4,30	4,53	4,67	3,78	3,51	3,79	7,33	13,32	18,87	46,89	36,19	67,44
CS	Travel	FAMBRANDS	26,36	23,16	13,13	8,61	4,74	7,40	3,62	7,86	6,45	4,33	6,45	7,34
CS	Travel	SUNINT	6,97	14,38	25,54	2,87	4,32	2,18	0,56	2,20	4,88	7,86	5,99	6,16
CS	Travel	TSOGO	3,96	-5,98	-6,85	-3,40	-0,66	1,68	3,43	6,03	27,78	20,07	13,70	7,36
		Health Care Equipment												
HC	Equip	NETCARE	0,00	1,84	2,51	-1,98	3,07	3,52	4,57	4,34	4,99	6,74	1,65	1,30

NON-FAILED COMPANIES			Interest Cover										
			1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
		Industrial Construction												
Ind	Constr	DAWN constr	0,61	-0,65	0,00	3,42	5,38	5,71	4,02	4,62	8,23	6,62	7,92	4,46
Ind	Constr	GROUP 5 constr	2,51	1,47	1,46	1,74	1,29	2,32	4,66	5,45	5,43	6,20	8,51	5,66
Ind	Constr	PPC constr	39,06	38,05	18,77	4,26	7,26	10,04	10,10	15,63	22,14	27,53	35,87	26,06
Ind	Constr	WBHO constr	6,67	8,84	13,28	10,52	46,90	27,56	12,95	16,83	24,24	49,95	19,84	22,35
Ind	Constr	AVENG constr	0,00	0,00	0,00	2,81	7,27	2,09	2,41	2,55	0,72	1,45	3,77	48,01
		Industrial General												
Ind	Gen	BARLOWORLD gen	2,75	2,90	2,12	8,14	7,36	3,68	5,95	3,95	5,92	7,40	7,42	3,51
Ind	Gen	M&R HLD gen	3,91	0,35	3,40	1,17	-2,88	2,38	4,73	6,93	12,01	10,21	9,22	11,52
Ind	Gen	NAMPAK gen	27,45	18,96	46,91	19,13	7,15	4,08	4,09	5,17	7,50	6,76	8,30	5,94
Ind	Gen	BIDVEST gen	19,37	25,21	65,10	15,78	19,31	9,27	9,33	8,16	8,81	8,92	9,03	6,69
Ind	Gen	TRNPACO gen	2,31	2,49	4,30	-12,66	2,68	0,74	4,22	4,10	8,42	7,40	5,61	4,85
Ind	Gen	REMGRO gen	0,00	0,00	0,00	0,00	0,00	25.10	-17.55	-4.04	-32.62	14.61	151.07	35.57
		Technology Hardware												
Tech	HW	MUSTEK	16,44	7,38	12,74	6,93	1,09	2,04	3,56	3,09	1,12	1,70	1,69	2,15
Tech	HW	ALVIVA	0,00	0,00	0,00	3,77	1,92	1,13	2,21	2,54	4,57	8,37	13,49	14,04
		Technology Software												
Tech	SW	ALTRON A	6,72	111,17	29,82	50,25	36,47	115,31	29,32	29,87	23,77	11,76	18,60	26,61
Tech	SW	DATATEC	0,00	3,14	5,93	-33,79	-0,36	6,30	0,13	-2,16	-3,32	6,55	5,97	5,14
Tech	SW	ADAPTIT	0,00	0,00	0,00	906,80	-144,40	341,83	668,89	751,38	253,44	3,977.00	3,534.50	717,70
Tech	SW	JASCO	5,13	5,71	3,43	2,07	-0,02	-9,54	1,34	1,70	0,55	2,76	9,29	11,24
Tech	SW	EOH	0,00	0,00	0,00	-505,20	38,74	14,91	20,86	51,78	31,74	33,00	38,13	53,13
Tech	SW	COGNITION	0,00	0,00	0,00	-25,50	0,35	-27,35	-31,30	10,02	-26,13	12,56	18,81	44,33
		Telecommunication Mobile												
Tele	Mobile	MTN	21,15	4,09	3,92	3,70	-24,19	5,83	4,06	5,40	11,07	13,22	5,07	4,71
Tele	Mobile	BLUETEL	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

NON-FAILED COMPANIES			Interest Cover								
			2008	2009	2010	2011	2012	2013	2014	2015	2016
		Consumer Goods Food									
CG	Food	AVI	8,32	5,96	8,27	17,40	44,40	24,11	33,04	29,22	15,75
CG	Food	CROOKES	18,76	10,49	8,51	27,46	29,70	38,16	21,64	8,39	10,91
CG	Food	OCEANA	50,90	76,82	84,55	178,51	213,34	69,89	50,07	6,31	4,37
CG	Food	RCL	303,98	83,78	577,43	305,46	36,47	1,08	0,10	3,89	1,04
CG	Food	TIGERBRANDS	9,09	7,97	9,35	40,33	18,22	7,69	5,83	4,70	18,87
CG	Food	TONGAAT	3,50	0,00	7,54	3,32	3,56	3,56	3,67	3,05	2,41
		Consumer Services Food + Retail									
CS	Food	CLICKS - retail	8,69	10,15	16,49	22,25	19,22	21,12	27,02	22,28	26,48
CS	Food	PICKNPAY -retail	19,25	16,47	20,13	12,86	9,38	6,66	6,26	10,51	12,68
CS	Food	SHOPRITE - retail	39,12	33,96	34,72	30,96	20,05	12,40	12,44	14,66	14,50
CS	Food	SPAR - CS retail	50,36	38,69	62,36	56,86	54,32	66,53	41,87	9,42	11,77
CS	Food	ADVTECH - retail	187,21	1,403.44	1,014.50	1,123.50	52,24	71,52	21,55	3,54	6,45
CS	Food	AF & OVR -retail	69,41	58,47	99,45	117,42	75,47	-84,44	-73,90	133,97	41,79
CS	Food	CASHBIL - retail	78,80	134,81	42,01	339,88	567,25	263,30	356,14	265,13	595,57
CS	Food	CMH - retail	4,03	0,92	3,16	6,18	6,38	8,01	3,59	3,16	3,17
CS	Food	MR PRICE - retail	106,77	87,63	175,06	256,60	113,50	0,00	0,00	3,076.00	0,00
CS	Food	REX TRUE - retails	80,58	74,47	126,26	147,03	97,86	-101,30	-86,08	183,64	66,99
CS	Food	TFG - retail	6,93	2,83	1,97	3,21	3,74	3,19	8,58	5,03	3,92
CS	Food	WOOLIES - retail	1,29	5,19	10,95	25,26	70,71	51,01	28,99	3,74	5,65
CS	Food	ITLTILE - retail	28,50	9,03	14,41	18,67	21,79	35,94	37,55	150,83	523,50
		Consumer Services Travel									
CS	Travel	CITYLDG	233,31	67,08	33,05	12,50	14,54	20,43	30,71	21,64	17,39
CS	Travel	FAMBRANDS	4,66	3,29	7,61	11,59	22,06	49,20	45,48	2,498.23	28,50
CS	Travel	SUNINT	6,58	4,52	4,70	5,06	5,79	6,58	4,39	4,05	1,09
CS	Travel	TSOGO	3,30	4,04	4,00	3,57	6,44	6,59	7,92	4,00	3,82
		Health Care Equipment									
HC	Equip	NETCARE	1,32	1,53	1,83	1,99	-5,01	8,10	5,63	5,13	2,70

NON-FAILED COMPANIES			Interest Cover								
			2008	2009	2010	2011	2012	2013	2014	2015	2016
		Industrial Construction									
Ind	Constr	DAWN constr	3,67	1,60	2,48	0,43	2,56	4,11	1,20	9,15	-8,87
Ind	Constr	GROUP 5 constr	5,35	4,84	4,89	-0,04	4,17	9,41	9,73	5,70	9,46
Ind	Constr	PPC constr	14,83	5,98	5,33	4,71	4,65	4,46	3,23	3,01	2,50
Ind	Constr	WBHO constr	47,16	32,42	74,15	56,03	70,14	31,25	28,93	12,47	58,91
Ind	Constr	AVENG constr	30,52	51,15	120,85	25,24	7,06	3,87	-0,31	-0,19	0,96
		Industrial General									
Ind	Gen	BARLOWORLD gen	2,69	1,87	1,64	3,03	3,73	3,42	3,19	2,81	2,98
Ind	Gen	M&R HLD gen	9,41	8,18	4,97	-2,31	-0,46	7,32	7,06	7,28	10,22
Ind	Gen	NAMPAK gen	2,37	1,35	5,17	8,54	8,24	7,46	4,20	5,31	4,10
Ind	Gen	BIDVEST gen	5,08	4,61	6,62	8,19	8,59	8,81	6,92	7,54	3,93
Ind	Gen	TRNPACO gen	3,00	5,04	11,24	20,21	24,94	30,19	37,13	44,41	23,2
Ind	Gen	REMGRO gen	63.60	6.06	11.07	85.46	233.24	1.46	0.70	5.31	-0.29
		Technology Hardware									
Tech	HW	MUSTEK	2,73	1,80	2,36	5,37	5,18	3,91	3,58	3,02	1,72
Tech	HW	ALVIVA	14,05	13,16	178,22	27,30	9,32	6,13	4,24	4,30	4,88
		Technology Software									
Tech	SW	ALTRON A	20,75	6,09	8,42	7,56	3,10	-1,69	3,59	0,91	1,28
Tech	SW	DATATEC	4,60	4,49	4,75	5,44	6,93	5,49	4,88	7,17	4,09
Tech	SW	ADAPTIT	3,170.67	790,86	20,03	13,67	31,41	37,45	54,78	8,34	6,12
Tech	SW	JASCO	7,58	2,60	1,79	1,60	1,52	-3,84	0,79	-3,23	1,93
Tech	SW	EOH	49,54	38,98	48,94	30,46	12,93	10,44	8,95	8,60	6,60
Tech	SW	COGNITION	57,01	13,21	19,86	26,79	37,43	57,21	75,8	75,17	33,82
		Telecommunication Mobile									
Tele	Mobile	MTN	4,95	5,39	5,21	5,94	4,08	3,92	5,19	4,34	1,06
Tele	Mobile	BLUETEL	1,71	4,21	4,58	3,90	3,64	3,86	4,33	4,23	5,34

ANNEXURE C
ANNUAL BANKRUPTCIES

CompanyName	JSECode	JSEIndustry	JSE Sector	Date	Reason
2002					**0 =**
2003					**8 =**
Softline Ltd	SFT	TECH	HARDWARE	11/25/2003	Voluntary Winding Up
Homechoice Holdings Ltd	HCH	CS	FOOD + DRUG RET	2/24/2003	Voluntary winding up
Ninian and Lester Holdings Ltd	NIN	CS	GEN RET	2/24/2003	Voluntary winding up
Forza Group Ltd	FOZ	CS	FOOD + DRUG RET	2/3/2003	Voluntary winding up
The Laser Group Ltd	LSR	CS	TRAVEL + LEISURE	3/18/2003	Voluntary Winding Up
Metje & Ziegler Ltd	MZG	IND	GEN IND	5/20/2003	Voluntary Delisting
Accord Technologies Ltd	ACR	TELE	MOBILE	6/2/2003	No Liquidation Dividend
Afribrand Holdings Ltd	ABR	CG	FOOD PRODUCERS	6/2/2003	No Liquidation Dividend
2004					**1 =**
Net 1 Applied Technology Holdings Ltd	APL	TECH	H/W + EQUIP	6/29/2004	Voluntary Winding Up
2005					**8 =**
Advanced Technical Systems Ltd	ADT	CS	GEN RETAIL	5/3/2005	No Liquidation Dividend
Choice Holdings Ltd	COI	CG	FOOD PRODUCER	5/3/2005	No Liquidation Dividend
Dynamo Retail Ltd	DNM	CS	FOOD + DRUG RET	5/3/2005	No Liquidation Dividend
Fashion Africa Ltd	FSH	CS	FOOD + DRUG RET	5/3/2005	No Liquidation Dividend
Leisurenet Ltd	LST	CS	TRAVEL + LEISURE	5/3/2005	No Liquidation Dividend
Siltek Holdings Ltd	STK	HC	EQUIP	5/3/2005	No Liquidation Dividend
Universal Growth Holdings Ltd	UNG	CS	FOOD + DRUG RET	5/3/2005	No Liquidation Dividend
Global Technology Holdings Ltd	GLT	TECH	H/W + EQUIP	1/31/2005	Voluntary Winding Up
2006					**2 =**
Frontrange Ltd	FRO	TECH	INFRASTRUCTURE SOFTWARE	1/10/2006	Voluntary Winding Up

CompanyName	JSECode	JSEIndustry	JSE Sector	Date	Reason
Omega Alpha International IT Holdings Ltd	OAI	TECH	H/W + EQUIP	3/13/2006	No Liquidation Dividend
2007					**0 =**
2008					**0 =**
2009					**0 =**
2010					**0 =**
2011					**2=**
Beget Holdings Ltd	BEE	TECH	H/W + EQUIP	6/13/2011	Company placed in final liquidation
Best Cut Ltd	BCH	CG	FOOD SECTOR	6/13/2011	Company placed in final liquidation
2016					**7 =**
Africa Cellular Towers Ltd	ATR	TECH	MEDIA	6/20/2016	Liquidation
Bioscience Brands Ltd	BIO	CG	HEALTH	6/20/2016	Liquidation
Erbacon Investment Holdings Ltd	ERB	IND	CONSTRUCTION	6/20/2016	Liquidation
Faritec Holdings Ltd	FRT	TECH	HARDWARE + EQUIP	6/20/2016	Liquidation
Sanyati Holdings Ltd	SAN	IND	CONSTRUCTION	6/20/2016	Liquidation
Sea Kay Holdings Ltd	SKY	IND	CONSTRUCTION	6/20/2016	Liquidation
Square One Solutions Group Ltd	SQE	TECH	INFO	6/20/2016	Liquidation

ANNEXURE D
TOTAL DELISTED (FAILED) COMPANIES PERIOD

CompanyName	JSECode	Date	Reason
a.b.e. Construction Chemicals Ltd	ABU	9/28/2010	Scheme of arrangement - Chryso Southern Africa (Pty) Ltd
Accord Technologies Ltd	ACR	6/2/2003	No Liquidation Dividend
Acucap Properties Ltd	ACP	4/29/2015	Scheme of Arrangement - Growthpoint Properties Ltd
Admiral Leisure World	ADL	10/5/2004	Scheme of Arrangement
Advanced Technical Systems Ltd	ADT	5/3/2005	No Liquidation Dividend
Afgem Ltd	AFG	8/31/2009	Disposal of company to MEEPO Investment Consortium (Pty) Ltd
AFGRI Ltd	AFR	4/1/2014	Scheme of arrangement - AgriGroupe Holdings (Pty) Ltd
Aflease Gold and Uranium Resources Ltd	AFL	12/27/2005	Scheme of Arrangement - Southern Cross Resources Inc
Aflease Gold Ltd	AFO	5/25/2009	Scheme of arrangement - Gold One International Ltd
Afribrand Holdings Ltd	ABR	6/2/2003	No Liquidation Dividend
Africa Cellular Towers Ltd	ATR	6/20/2016	Liquidation
African Brick Centre Ltd	ABK	1/10/2012	Scheme of arrangement â€“ Yakani Infraco (Pty) Ltd
African Harvest Ltd	AHV	7/8/2003	Scheme of Arrangement
African Life Assurance Company Ltd	AFI	3/6/2006	Scheme of Arrangement
African Rainbow Minerals Gold Ltd	AOD	9/23/2003	Scheme of Arrangement
Afrox Healthcare Ltd	AHH	3/23/2005	Scheme of Arangement
AG Industries Ltd	AGI	8/27/2013	At the company's request
Alacrity Financial Services Ltd	ALY	2/3/2004	Offer to Minorities
Alex White Holdings Ltd	ALX	6/20/2006	Scheme of Arrangement - Astrapak
Alexander Forbes Ltd	AFB	7/27/2007	Scheme of arrangement - Cleansheet Investments.
Alexander Forbes Preference Share Investments Ltd	AFP	9/23/2014	Unbundling of company.
Alliance Mining Corporation Ltd	ALM	6/20/2016	Liquidation
Alliance Pharmaceuticals Ltd	ACN	11/30/2004	Scheme of Arrangement with Thebe
Allied Technologies Ltd	ALT	8/20/2013	Scheme of arrangement - Allied Electronics Corporation Ltd
Aludie Ltd	ALD	6/7/2007	Failure to comply with JSE listing requirements.
Amalgamated Appliance Holdings Ltd	AMA	7/2/2013	Scheme of arrangement - Bidvest
Amalgamated Beverage Industries Ltd	ABI	12/14/2004	Scheme of Arrangement with SABMiller

CompanyName	JSECode	Date	Reason
Amalgamated Electronic Corporation Ltd	AER	11/1/2016	Scheme of Arrangement - Stellar Capital Partners Ltd
AMB Holdings Ltd	AMB	10/28/2003	Scheme of Arrangement
AMB Private Equity Partners Ltd	APP	7/22/2003	Scheme of Arrangement
Ambit Properties Ltd	ABT	7/14/2009	Scheme of arrangement - ApexHi Properties Ltd
Amlac Ltd	ALC	4/16/2007	Failure to comply with JSE listing requirements.
Annuity Properties Ltd	ANP	6/24/2014	Scheme of arrangement - Redefine Properties Ltd
ApexHi Property Fund Ltd	APA	8/18/2009	Scheme of arrangement - Redefine Income Fund Ltd
Appleton Ltd	ALE	4/15/2003	Scheme Of Arrangement
APS Technologies Ltd	APE	6/6/2007	Failure to comply with JSE listing requirements.
Aquila Growth Ltd	AQL	4/6/2006	Voluntary Winding Up
Arcay Group Ltd	ARC	2/10/2003	Specific repurchase
Arch Equity Ltd	ACH	8/15/2006	Scheme of Arrangement - shareholders
Ardor SA Ltd	ARD	3/31/2014	No longer meets listing requirements.
Assmang Ltd	ASG	2/28/2006	Scheme of Arrangement
Atlas Properties Ltd	ATS	8/28/2007	Scheme of arrangement - Acucap Properties Ltd.
Avgold Ltd	AVG	5/25/2004	Scheme of Arrangement
Avusa Ltd	AVU	9/25/2012	Scheme of arrangement â€“ Times Media Group Ltd
B&W Instrumentation & Electrical Ltd	BWI	4/23/2014	Scheme of arrangement - ELB Group Ltd
Barnard Jacobs Mellet Holdings Ltd	BJM	1/4/2011	Scheme of arrangement - FirstRand Investment Holdings (Pty) Ltd
Barnato Exploration Ltd	BNX	10/14/2003	Scheme of Arrangement
Barplats Investments Ltd	BPL	5/29/2007	Scheme of arrangement - Eastplats.
Bearing Man Ltd	BRM	9/2/2005	Scheme of Arrangement
Beget Holdings Ltd	BEE	6/13/2011	Company placed in final liquidation
Beige Holdings Ltd	BEG	9/27/2016	Scheme of Arrangement - The Lion Match Company (Pty) Ltd
Best Cut Ltd	BCH	6/13/2011	Company placed in final liquidation
Bioscience Brands Ltd	BIO	6/20/2016	Liquidation
Braemore Resources Plc	BRE	11/9/2009	Scheme of arrangement - Jubilee Platinum Plc
Brandcorp Holdings Ltd	BRC	9/4/2007	Scheme of arrangement - Main Street 565 (Pty) Ltd.
Bridgestone Firestone Maxiprest Ltd	BDS	9/27/2005	Scheme of Arrangement
Bryant Technology Ltd	BRY	6/18/2007	Failure to comply with JSE listing requirements.
Burlington Industries Ltd	BUR	3/7/2005	Decision by Shareholders

CompanyName	JSECode	Date	Reason
Business Connexion Group Ltd	BCX	8/25/2015	Scheme of Arrangement - Telkom SA SOC Ltd
Bytes Technology Group Ltd	BTG	1/15/2008	Scheme of arrangement - Allied Electronics Corporation Ltd
Cadiz Holdings Ltd	CDZ	11/3/2015	Scheme of Arrangement - Stellar Capital Partners Ltd
Cape Empowerment Ltd	CAP	5/14/2013	Scheme of arrangement - Directors
Cape Empowerment Trust Ltd	CAE	6/1/2010	Scheme of arrangement - Dynamic Cables RSA Ltd
Capevin Investments Ltd	CVI	8/13/2012	Scheme of arrangement â€“ Capevin Holdings Ltd
Capital Alliance Holdings Ltd	CPT	4/26/2005	Scheme of Arangement
Capital Property Fund	CPL	7/7/2014	Restructure of company.
Capital Property Fund Ltd	CPF	11/23/2015	Scheme of Arrangement - Fortress Income Fund
Caxton Publishers and Printers Ltd	CXT	12/24/2002	Scheme of Arrangement
CBS Property Portfolio Ltd	CBS	10/25/2007	Scheme of arrangement - PIC
CCI Holdings Ltd	CCG	4/16/2007	Failure to comply with JSE listing requirements.
CCN Holdings Ltd	CCN	7/13/2004	Offer to Minorities
Celcom Group Ltd	CEL	5/26/2009	Scheme of arrangement - V Cellular Stores disposal
Cementation Company (Africa) Ltd	CMT	10/19/2004	Scheme of Arrangement M & R
Centrecity Property Fund	CEN	4/4/2006	Voluntary Winding Up
Century Carbon Mining Ltd	CNY	6/2/2003	No Liquidation Dividend
Ceramic Industries Ltd	CRM	11/27/2012	Sale of company â€“ Rallen (Pty) Ltd and Italtile Ltd
Chariot Land Ltd	CAL	5/3/2005	No Liquidation Dividend
Chemical Services Ltd	CHE	12/17/2003	Scheme of Arrangement
Choice Holdings Ltd	COI	5/3/2005	No Liquidation Dividend
CIC Holdings Ltd	CCI	11/16/2010	Scheme of arrangement - Imperial Holdings Ltd
Cipla Medpro South Africa Ltd	CMP	7/16/2013	Scheme of arrangement - Cipla Ltd
Clientele Life Assurance Company Ltd	CLE	5/26/2008	Scheme of arrangement - Clientele Ltd
Commercial Finance Company Ltd	CFC	11/4/2003	Voluntary Winding Up
Compu-Clearing Outsourcing Ltd	CCL	9/22/2015	Scheme of Arrangement - Wisetechglobal (Pty) Ltd
Conafex Holdings Societe Anonyme	CNX	4/9/2009	No longer qualify for listing
Concor Ltd	CNC	7/4/2006	Scheme of Arrangement - Murray & Roberts
Congella Federation Ltd	CNF	10/28/2003	Voluntary Winding Up
Connection Group Holdings Ltd	CCT	12/20/2005	Scheme of Arrangement
Consol Ltd	CSL	4/11/2007	Scheme of arrangement - shareholders

CompanyName	JSECode	Date	Reason
Consolidated Property & Finance Ltd	PFN	2/16/2009	No longer qualify for listing
Control Instruments Group Ltd	CNL	5/20/2014	Scheme of arrangement - Torre Industrial Holdings Ltd
Core Holdings Ltd	COR	6/2/2003	No Liquidation Dividend
Core Holdings Ltd	COR	6/2/2003	No Liquidation Dividend
Coronation Holdings Ltd	CRH	8/13/2003	Offer to Minorities
Corpcapital Ltd	CPA	7/4/2005	Voluntary Winding Up
Corvus Capital (SA) Holdings Ltd	CVS	2/23/2009	No longer qualify for listing
Corwil Investments Ltd	CRW	7/29/2014	Failure to comply with listing requirements.
Country Bird Holdings Ltd	CBH	12/17/2014	Scheme of Arrangement - Black River Food Fund 2 LP
Country Foods Ltd	CFO	9/14/2009	No longer qualify for listing
Credit U Holdings Ltd	CUH	12/17/2008	Scheme of arrangement - Blue Financial Services Ltd
Crux Technologies Ltd	CRX	1/10/2003	Minority offer
CS Computer Service Holdings (South Africa)	CSH	1/20/2005	Scheme of Arangement with Bytes
Cycad Financial Holdings Ltd	CTD	6/15/2004	Offer to Minorities
Delrand Resources Ltd	DRN	9/26/2016	No Longer Eligible for Listing
Dialogue Group Holdings Ltd	DLG	2/13/2012	No longer qualify for listing
Diamond Core Resources Ltd	DMR	2/11/2008	Scheme of arrangement - BRC Diamond Corporation Ltd
Digicore Holdings Ltd	DGC	10/20/2015	Scheme of Arrangement - Novatel Wireless Inc
Dimension Data Holdings Plc	DDT	12/14/2010	Scheme of arrangement - Nippon Telegraph & Telephone Corporation (Japan)
Diversified Property Fund Ltd	DIV	6/30/2008	Scheme of arrangement - Resilient Property Income Fund Ltd
DNA Supply Chain Investments Ltd	DNA	11/14/2005	Voluntary Winding Up
Don Group Ltd (The)	DON	7/29/2014	No longer meets listing requirements.
Dorbyl Ltd	DLV	7/1/2014	Scheme of arrangement - Naledi Foundry
DTH Dynamic Technology Holdings Ltd	DTH	9/14/2010	Scheme of arrangement - DTH Management Consortium
Dynamo Retail Ltd	DNM	5/3/2005	No Liquidation Dividend
EC-Hold Ltd	ECH	11/30/2005	Voluntary Winding Up
E-Data Holdings Ltd	EDT	1/31/2003	Name change and not keeping history
Edgars Consolidated Stores Ltd	ECO	5/28/2007	Scheme of arrangement - shareholders.
Eersteling Gold Mining Company Ltd	ESL	6/15/2004	Offer to Minorities

CompanyName	JSECode	Date	Reason
Eland Platinum Holdings Ltd	ELD	11/27/2007	Scheme of arrangement - Xstrata Plc
Electronic Media Network & Supersport International Holdings Ltd	MNS	4/15/2004	Scheme of Arrangement
ElementOne Ltd	ELE	1/11/2010	No longer qualify for listing
Elexir Technology Holdings Ltd	ELX	4/20/2006	Reverse Listing - PSV Holdings Ltd
Ellerine Holdings Ltd	ELH	1/22/2008	Scheme of arrangement - African Bank Investments Ltd
Emergent Properties Ltd	EMG	3/8/2010	Failure to comply with JSE listing requirements
Emira Property Fund	EMI	7/13/2015	New company established as an internally managed REIT
Energy Africa Ltd	ENR	8/2/2004	Offer to Minorities
Enterprise Risk Management Ltd	ERM	8/12/2009	Scheme of arrangement - Consortium led by Mr. Mark Stein
Enviroserv Holdings Ltd	ENV	11/4/2008	Scheme of arrangement - Parchment Trading 72 (Pty) Ltd
Erbacon Investment Holdings Ltd	ERB	6/20/2016	Liquidation
Eureka Industrial Ltd	EUR	3/8/2010	Failure to comply with JSE listing requirements
Excellerate Holdings Ltd	EXL	10/9/2012	Scheme of arrangement â€“ Shareholders
Exxoteq Ltd	EXO	6/12/2007	Failure to comply with JSE listing requirements.
Faritec Holdings Ltd	FRT	6/20/2016	Liquidation
Fashion Africa Ltd	FSH	5/3/2005	No Liquidation Dividend
FBC Fidelity Bank Holdings Ltd	FBF	2/11/2003	Voluntary liquidation
First Uranium Corporation	FUU	12/24/2013	Scheme of arrangement - Algold Resources Ltd
Foord Compass Ltd	FCPD	4/1/2014	At the company's request.
Forim Holdings Ltd	FOM	11/30/2004	Scheme of Arrangement with Thebe
Forza Group Ltd	FOZ	2/3/2003	Voluntary winding up
Fountainhead Property Trust	FPT	8/11/2015	Scheme of Arrangement - Redefine Properties Ltd
Free State Development and Investment Corporation Ltd	FRE	12/23/2003	Scheme of Arrangement
Freestone Property Holdings Ltd	FSP	4/17/2007	Scheme of arrangement - Emira
Freeworld Coatings Ltd	FWD	12/29/2011	Scheme of arrangement â€“ Kansai Paint Co. Ltd (Japan)
Frontrange Ltd	FRO	1/10/2006	Voluntary Winding Up
Gencor Ltd	GMF	5/3/2006	Voluntary Winding Up
Gijima Group Ltd	GIJ	5/12/2015	Scheme of Arrangement - Guma Group
Glenrand MIB Ltd	GMB	4/28/2011	Scheme of arrangement â€“ AON South Africa (Pty) Ltd

CompanyName	JSECode	Date	Reason
Global Technology Holdings Ltd	GLT	1/31/2005	Voluntary Winding Up
Global Village Holdings Ltd	GLL	4/20/2009	No longer qualify for listing
Glodina Holdings Ltd	GDA	11/30/2004	Scheme of Arrangement with KAP
Gold One International Ltd	GDO	1/30/2014	Company acquired by BCX Gold Investment Holdings Ltd
Goliath Gold Mining Ltd	GGM	12/8/2015	Scheme of Arrangement - Gold One Africa
Grintek Ltd	GNK	5/17/2005	Scheme of Arrangement
Gubb & Inggs Ltd	GUB	6/17/2003	Offer To Minorities
Halogen Holdings Societe Anonyme	HAL	9/11/2009	Company in voluntary liquidation
Hardware Warehouse Ltd	HWW	2/26/2013	Scheme of arrangement - Steinhoff Doors and Building Materials (Pty) Ltd
Health Strategic Investments Ltd	HSI	12/20/2010	No longer meet listing requirements
Homechoice Holdings Ltd	HCH	2/24/2003	Voluntary winding up
House of Busby Ltd, The	BSB	4/30/2008	Scheme of arrangement - Ethos Private Equity
Idion Technology Holdings Ltd	IDI	11/21/2006	Sale and Voluntary Winding Up
IFA Hotels & Resorts Ltd	IFH	9/10/2013	Scheme of arrangement - IFA Hotels & Resorts KSCC
Ifanet Ltd	IFA	1/20/2003	Minority offer
iFour Properties Ltd	IFR	6/9/2008	Scheme of arrangement - Pangbourne Properties Ltd
Iliad Africa Ltd	ILA	1/12/2016	Scheme of Arrangement - Steinhoff International Holdings
Illovo Sugar Ltd	ILV	6/28/2016	Scheme of Arrangement - Associated British Foods
Incentive Holdings Ltd	ICT	4/16/2007	Failure to comply with JSE listing requirements.
Industrial Credit Company Africa Holdings Ltd	ICC	3/22/2011	Failure to comply with JSE Listing Requirements
Infrasors Holdings Ltd	IRA	10/13/2015	Scheme of Arrangement - Afrimat
Inmins Ltd	INM	5/23/2005	Scheme of Arrangement
Insurance Outsourcing Managers Holdings Ltd	INS	10/11/2005	Offer to Minorities
Intertrading Ltd	ITR	3/16/2012	No longer qualify for listing
Intervid Ltd	ITV	8/24/2004	Scheme of Arrangement
Investment Solutions Holdings Ltd	SLU	12/18/2002	Scheme of Arrangement
Iprop Holdings Ltd	IPR	7/22/2003	Voluntary Winding Up
IQuad Group Ltd	IQG	11/27/2012	Scheme of arrangement - shareholders

CompanyName	JSECode	Date	Reason
IST Group Ltd	IST	10/19/2004	Offer to Minorities
JCI Ltd	JCD	4/16/2013	No longer qualify for listing.
JD Group Ltd	JDG	7/7/2015	Scheme of Arrangement - Steinhoff International Holdings Ltd
Jigsaw Holdings Ltd	JGS	12/21/2004	Following continuous suspension
Johnnic Holdings Ltd	JNC	9/25/2008	Scheme of arrangement - Hosken Consolidated Investments Ltd
Kagiso Media Ltd	KGM	12/10/2013	Scheme of arrangement - KTH Media Holdings (Pty) Ltd
Kairos Industrial Holdings Ltd	KIR	2/13/2012	No longer qualify for listing
Kelgran Ltd	KLG	7/28/2008	At the request of the directors - voluntary winding up of company
Kelly Group Ltd	KEL	11/18/2014	Scheme of Arrangement - Adcorp Holdings Ltd
Kimberley Consolidated Mining Ltd	KCM	11/8/2010	Non-compliance with JSE listing requirements
King Consolidated Holdings Ltd	KNG	10/27/2009	Scheme of arrangement - Pocot Trust
Kirchmann-Hurry Properties Ltd	KHO	7/1/2003	Voluntary Winding Up
Kiwara Plc	KWR	2/9/2010	Scheme of Arrangement - First Quantum Minerals Ltd
Kwikspace Modular Buildings Ltd	KWS	2/24/2009	Scheme of arrangement - Clidet No 803 (Pty) Ltd
LA Group Ltd	LAR	5/30/2006	Scheme of Arrangement - Newco
Leisurenet Ltd	LST	5/3/2005	No Liquidation Dividend
Liberty Group Holdings Ltd	LGL	12/1/2008	Scheme of arrangement - Liberty Holdings Ltd
Litha Healthcare Group Ltd	LHG	2/10/2015	Scheme of Arrangement - Paladin Labs Inc
Lonrho Plc	LAF	8/5/2013	Scheme of arrangement - shareholders
Lyons Financial Solutions Holdings Ltd	LYS	5/25/2004	Offer to Minorities
M Cubed Holdings Ltd	MCU	11/19/2012	No longer qualify for listing.
Madison Property Fund Managers Holdings Ltd	MDN	8/18/2009	Scheme of arrangement - Redefine Income Fund Ltd
Makalani Holdings Ltd	MKL	6/1/2010	At the request of the directors
Marshall Monteagle Holdings Societe Anonyme	MTE	2/25/2011	Liquidation of Company - Group Restructure - New Company Listed
Mathomo Group Ltd	MTO	2/21/2006	Scheme of Arrangement - Mineworkers Investment Company
Maxtec Ltd	MEC	3/2/2004	Offer to Minorities
McCarthy Ltd	MCC	4/13/2004	Offer to Minorities
Mediclinic International Ltd	MDC	2/15/2016	Merger with Al Noor Hospitals Group Plc
Mercantile Bank Holdings Ltd	MTL	5/22/2012	Scheme of arrangement - shareholders

CompanyName	JSECode	Date	Reason
Merchant & Industrial Properties Ltd	MIP	11/22/2011	Scheme of arrangement â€“ Marshall Monteagle Plc
Messina Ltd	MES	2/7/2006	Scheme of Arrangement
Metboard Properties Ltd	MPL	8/21/2006	Scheme of Arrangement - Growthpoint
Metje & Ziegler Ltd	MZG	5/20/2003	Voluntary Delisting
Metmar Ltd	MML	10/27/2015	Scheme of Arrangement - Traxys Africa (Pty) Ltd
Metorex Ltd	MTX	1/17/2012	Scheme of arrangement â€“ Jinchuan Group Ltd (China)
Metoz Holdings Ltd	MOZ	4/19/2005	Scheme of Arangement
Mettle Ltd	MEL	6/18/2003	Offer To Minorities
MICC Property Income Fund Ltd	MCP	3/4/2007	Invocation of section 440K by Vukile Property Fund
MIH Holdings Ltd	MHH	12/24/2002	Scheme of Arrangement
Millionair Charter Ltd	MLL	4/16/2007	Failure to comply with JSE listing requirements.
Mobile Industries Ltd	MOB	7/16/2013	No longer qualify for listing.
Molope Group Ltd	MOL	12/24/2002	Scheme of Arrangement
Monyetla Property Fund Ltd	MYT	1/19/2009	Scheme of arrangement - Capital Property Fund
Morvest Group Ltd	MOR	8/12/2015	Scheme of Arrangement - Varachia Investment Group (Pty) Ltd
Mouldmed Medical Supplies Ltd	MUM	4/3/2006	Failure to meet JSE Listing Requirements
MTN Zakhele (RF) Ltd	MTNZBE	11/24/2016	Scheme of Arrangement - MTN shareholders
Mutual & Federal Insurance Company Ltd	MAF	2/8/2010	Scheme of Arrangement - Old Mutual Plc
Muvoni Technology Group Ltd	MTG	7/30/2013	Scheme of arrangement - Horizon Investment & Financial Services (Pty) Ltd
Mvelaphanda Resources Ltd	MVL	6/6/2011	Scheme of arrangement â€“ Northam Platinum Ltd
Mvelaserve Ltd	MVS	11/12/2013	Scheme of arrangement - Bidvest
Namibian Fishing Industries Ltd	NFH	6/17/2003	Companies Request - Primary Listing NSE
Namibian Sea Products Ltd	NMS	1/29/2007	Scheme of Arrangement - Listco
Nando's Group Holdings Ltd	NDS	4/15/2003	Scheme Of Arrangement
Net 1 Applied Technology Holdings Ltd	APL	6/29/2004	Voluntary Winding Up
New Africa Investments Ltd	NAI	1/30/2013	Sale of company to Primedia (Pty) Ltd
New Bond Capital Ltd	NBC	6/3/2013	Scheme of arrangement - Blackstar Group SE
Ninian and Lester Holdings Ltd	NIN	2/24/2003	Voluntary winding up
Northern Engineering Industries Africa Ltd	NEI	2/16/2009	No longer qualify for listing
O-Line Holdings Ltd	OLI	7/3/2012	Scheme of arrangement â€“ OBO Bettermann GmbH & Co KG

CompanyName	JSECode	Date	Reason
Omega Alpha International IT Holdings Ltd	OAI	3/13/2006	No Liquidation Dividend
Optimum Coal Holdings Ltd	OPT	7/9/2012	Scheme of arrangement â€“ Piruto BV & Lexshell 849 Investments (Pty) Ltd Consortium
OSI Holdings Ltd	OSI	8/19/2003	Offer to Minorities
OTR Mining Ltd	OTR	9/4/2003	Failure to meet JSE Listing Requirements
Ozz Limited	OZZ	5/8/2003	Offer To Minorities
Palabora Mining Company Ltd	PAM	4/15/2014	Company sold to Smart Union Resources SA Ltd (formerly Rio Tinto SA Ltd)
Paladin Capital Ltd	PLD	10/25/2011	Scheme of arrangement â€“ PSG Group Ltd
Pals Holdings Ltd	PAL	3/16/2009	No longer qualify for listing
Pamodzi Gold Ltd	PZG	6/20/2016	Liquidation
Pangbourne Properties Ltd	ICC	3/29/2011	Scheme of arrangement â€“ Capital Property Trust
Paracon Holdings Ltd	PCN	11/28/2011	Scheme of arrangement â€“ Adcorp Holdings Ltd
Paradigm Capital Holdings Limited	PDM	6/2/2003	Failure To Meet JSE Listing Requirements
Paramount Property Fund Ltd	PRA	4/18/2007	Scheme of arrangement - Growthpoint
Pasdec Resources SA Ltd	PSC	1/22/2007	Disposal of company
Peermont Global Ltd	PTG	4/25/2007	Scheme of arrangement - shareholders
Pepkor Ltd	PEP	3/3/2004	Scheme of Arrangement
Pick 'n Pay Holdings Ltd	PWK	8/30/2016	Company restructured.
Pinnacle Point Group Ltd	PNG	6/20/2016	Liquidation
Planit Investments Holdings Limited	PTH	6/2/2003	Failure To Meet JSE Listing Requirements
Platmin Ltd	PLN	1/3/2012	Restructuring of company
Prada Technologies Limited	PDH	6/2/2003	Failure To Meet JSE Listing Requirements
Premier Group Ltd, The	PML	5/3/2005	No Liquidation Dividend
Premium Properties Ltd	PMM	9/1/2014	Scheme of arrangement - Octodec Investments Ltd
President Steyn Gold Mines Ltd	PGD	5/14/2003	Offer To Minorities
Prima Property Trust	PRM	3/3/2006	Sale and Voluntary Winding Up
Primedia Ltd	PMA	10/1/2007	Scheme of arrangement - General Trading (Pty) Ltd
Primegro Properties Ltd	PMG	9/4/2003	Merger with Growthpoint
Prism Holdings Ltd	PIM	7/4/2006	Scheme of Arrangement
Profurn Ltd	PON	4/23/2003	Scheme Of Arrangement

CompanyName	JSECode	Date	Reason
PSG Investment Bank	PGH	4/1/2003	Scheme Of Arrangement
Putco Ltd	PTC	4/12/2005	Scheme of Arangement
Queensgate Hotels & Leisure Ltd	QHL	2/18/2013	No longer qualify for listing.
Racec Group Ltd	RAC	11/5/2013	Scheme of arrangement - Grindrod Holdings (SA) (Pty) Ltd
Rand Leases Properties Ltd	RPR	2/17/2004	Scheme of Arrangement
Rare Earth Extraction Co Ltd	RCO	6/6/2007	Failure to comply with JSE listing requirements.
Rare Holdings Ltd	RAR	9/27/2016	Scheme of Arrangement - Mayfair Speculators (Pty) Ltd
Real Africa Holdings Ltd	RAH	3/14/2012	Scheme of arrangement â€“ Sun International (SA) Ltd
Redefine Properties International Ltd	RIN	11/4/2013	Company restructure.
Ref Finance & Investment Corporation Ltd	REF	7/14/2003	Failure to meet JSE Listing Requirements
Relyant Retail Ltd	RLY	6/20/2005	Scheme of Arrangement
Rentsure Holdings Ltd	RNT	6/6/2007	Failure to comply with JSE listing requirements.
Retail Apparel Group Ltd	RAG	4/16/2007	Failure to comply with JSE listing requirements.
RGT Smart Market Intelligence Ltd	RGT	7/30/2013	Scheme of arrangement - Halls Technologies (Pty) Ltd
Richway Retail Properties Ltd	RHW	4/16/2007	Failure to comply with JSE listing requirements.
S&J Land Holdings Ltd	SJL	4/26/2010	No longer qualify for listing
SA Corporate Real Estate Fund	SAC	7/6/2015	New company established as an internally managed REIT
SA French Ltd	SFH	12/3/2012	Scheme of arrangement - Torre Industrial Holdings Ltd
SA Retail Properties Ltd	SRL	6/29/2007	Invocation of section 440K by SA Corporate Real Estate Fund.
Saambou Holdings Ltd	SBO	12/28/2011	Final payment made to shareholders
SAB&T Ubuntu Holdings Ltd	SUL	7/7/2008	Scheme of arrangement - Simeka Business Group Ltd
Sable Holdings Ltd	SBL	9/3/2013	Scheme of arrangement - shareholders
SABMiller Plc	SAB	10/13/2016	Scheme of Arrangement - Anheuser-Busch InBev
Sacoven Plc	SCV	12/20/2016	Company Wound Up
Sage Group Ltd	SGG	9/13/2005	Scheme of Arrangement
Sail Group Ltd	SIR	1/4/2005	Scheme of Arrangement
Sallies Ltd	SAL	12/20/2011	Scheme of arrangement â€“ Fluormin Plc
Samrand Development Holdings Ltd	SMR	5/13/2008	Invocation of Section 440K
Sanyati Holdings Ltd	SAN	6/20/2016	Liquidation
Sasani Ltd	SSA	10/4/2005	Scheme of Arrangement
Sea Kay Holdings Ltd	SKY	6/20/2016	Liquidation

CompanyName	JSECode	Date	Reason
SecureData Holdings Ltd	SDH	3/18/2014	Scheme of arrangement - MB Technologies Investments (Pty) Ltd
Set Point Group Ltd	SPO	5/25/2010	Sale of company
Shawcell Telecommunications Ltd	SWL	4/16/2007	Failure to comply with JSE listing requirements.
Sherbourne Capital Ltd	SHB	10/7/2014	No longer meets listing requirements.
Siltek Holdings Ltd	STK	5/3/2005	No Liquidation Dividend
Simmer & Jack Mines Ltd	SIM	4/16/2013	No longer qualify for listing.
Siyathenga Property Fund Ltd	SYA	6/9/2008	Scheme of arrangement - Pangbourne Properties Ltd
Softline Ltd	SFT	11/25/2003	Voluntary Winding Up
South African Coal Mining Holdings Ltd	SAH	11/29/2016	Scheme of Arrangement - JSW Energy Natural Resources
Southern Electricity Company Ltd	SLO	1/7/2014	Scheme of arrangement - Rural Maintenance (Pty) Ltd
Southern Mining Corporation Ltd	SMC	4/28/2004	Voluntary Liquidation
Spearhead Property Holdings Ltd	SPE	12/5/2006	Scheme of Arrangement - Redefine Income Fund Ltd
Spescom Ltd	SPS	1/25/2011	Scheme of arrangement - Jasco Electronics Holdings Ltd
Square One Solutions Group Ltd	SQE	6/20/2016	Liquidation
Steinhoff International Holdings Ltd	SHF	12/7/2015	Scheme of Arrangement - Steinhoff International Holdings NV
Stella Vista Technologies Ltd	SLL	1/21/2014	Scheme of arrangement - Muris Tabakovic, Dario Tabakovic, Out & About Marketing & Media (Pty) Ltd
Stilfontein Gold Mining Company Ltd	STI	4/20/2009	No longer qualify for listing
Stocks Hotels & Resorts Ltd	SCH	4/16/2007	Failure to comply with JSE listing requirements.
Sun International (SA) Ltd	SIS	8/18/2004	Scheme of Arrangement
Sweets From Heaven Ltd	HVN	5/27/2003	Scheme Of Arrangement
Sycom Property Fund	SYC	4/19/2016	Scheme of Arrangement - Growthpoint via Acucap
Taufin Holdings Limited	TUF	6/2/2003	Failure To Meet JSE Listing Requirements
Teal Exploration & Mining Inc	TEL	3/31/2009	Scheme of arrangement -ARM & Vale
Terexko Ltd	TRX	4/16/2007	Failure to comply with JSE listing requirements.
Terrafin Holdings Ltd	TRF	4/16/2007	Failure to comply with JSE listing requirements.
Thabex Ltd	TBX	7/9/2013	Failure to comply with listing requirements.
The Laser Group Ltd	LSR	3/18/2003	Voluntary Winding Up
Thebe Financial Services Ltd	TBE	7/1/2003	Sale and Voluntary Winding Up
Tiger Automotive Ltd	TAL	3/4/2008	Scheme of arrangement - Tiger Automotive Investments (Pty) Ltd
Tiger Wheels Ltd	TIW	4/20/2009	No longer qualify for listing

CompanyName	JSECode	Date	Reason
Tigon Ltd	TGN	4/16/2007	Failure to comply with JSE listing requirements.
Times Media Group Ltd	TMG	6/9/2015	Scheme of Arrangement - Blackstar Group SE
Top Info Technology Holdings Ltd	TOT	4/16/2007	Failure to comply with JSE listing requirements.
Tourism Investment Corporation Ltd	TRT	9/9/2008	Scheme of arrangement - Primetime Trading 6 (Pty) Ltd
Tradek Holdings Ltd	TDK	3/10/2003	In Terms Of Section 440K
TWP Holdings Ltd	TWP	12/21/2009	Scheme of arrangement - Basil Read Holdings Ltd
Ububele Holdings Ltd	UBU	7/7/2015	No longer meets listing requirements.
UCS Group Ltd	UCS	10/25/2011	Scheme of arrangement - shareholders
Union Alliance Media Limited	UAM	6/2/2003	Failure To Meet JSE Listing Requirements
Union Mines Ltd	UNN	7/14/2003	At Directors' Request
United Service Technologies Limited	USV	1/3/2005	Merger with SS Ltd
Unitrans Ltd	UTR	5/29/2007	Disposal & voluntary winding up of the company.
Unitrans Ltd	UTR	5/29/2007	Disposal & voluntary winding up of the company.
Universal Growth Holdings Ltd	UNG	5/3/2005	No Liquidation Dividend
Universal Industries Corporation Ltd	UNI	11/1/2011	Scheme of arrangement â€“ Ethos Private Equity Fund V
Uranium One Inc	UUU	10/22/2013	Scheme of arrangement - Uranium One Holding N.V.
Vaalauto Ltd	VLT	12/29/2004	Offer to Minorities
Vaaltrucar Ltd	VCR	12/29/2004	Offer to Minorities
VenFin Ltd	VNF	4/18/2006	Acceptance of offer - Vodafone Holdings (SA) (Pty) Ltd
Venter Leisure & Commercial Trailers Ltd	VTL	2/24/2009	Sale of company
Vestacor Ltd	VTR	4/3/2003	Offer To Minorities
Viking Investments & Asset Management Ltd	VKG	4/16/2007	Failure to comply with JSE listing requirements.
Vividend Income Fund Ltd	VIF	8/5/2014	Scheme of arrangement - Arrowhead Properties Ltd
Vox Telecom Ltd	VOX	11/29/2011	Scheme of arrangement â€“ Business Venture Investments No 1542 Ltd
Wesco Investments Ltd	WES	7/6/2009	Scheme of arrangement - SA Trust & Finance Company (Pty) Ltd
Western Areas Ltd	WAR	1/30/2007	Invocation of section 440K by Gold Fields Ltd
Wetherlys Investment Holdings Ltd	WET	10/28/2003	Scheme of Arrangement
Whetstone Industrial Holdings Ltd	WTS	5/3/2005	No Liquidation Dividend
Winecorp Ltd	WNE	8/3/2004	Voluntary Winding Up

CompanyName	JSECode	Date	Reason
Witwatersrand Consolidated Gold Resources Ltd	WGR	4/15/2014	Scheme of arrangement - Sibanye Gold Ltd
Womens Investment Portfolio Holdings	WPH	4/1/2003	Scheme Of Arrangement
Zaptronix Ltd	ZPT	4/30/2013	Failure to comply with JSE listing requirements.
Zarara Energy Ltd	ZRR	8/23/2004	Failure to meet JSE Listing Requirements
Zurich Insurance Company South Africa Ltd	ZSA	9/22/2015	Scheme of Arrangement - SA Fire House

122	Mining/ Financial
28	Bankruptcy

ANNEXURE E
PUBLISHED ARTICLE

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ANNEXURE F
DECLARATION OF LANGUAGE EDITING



Jomoné Müller
Language Practitioner
SATI No. 1002831
BA Hons (Language practice)

www.jmuller.co.za
Tel: +27 84 406 0029
jomone@jmuller.co.za

DECLARATION OF LANGUAGE EDITING

3 December 2020

To whom it may concern

This is to confirm that I, the undersigned, have language edited the research of *RJ Cassim* for the degree *Doctor of Philosophy in Accountancy* entitled: *Development and validation of bankruptcy prediction indicators on JSE Listed companies.*

No changes were permanently affected and were left to the discretion of the student. The responsibility of implementing the recommended language changes rests with the author of the thesis.

Yours truly



Jomoné Müller