Hedging against exporting costs and risks in the South African extractive industry

Cherise Potgieter
21204233
B.Com Honours Financial Accounting

DISSERTATION PRESENTED IN THE FULFILMENT OF THE REQUIREMENTS OF THE DEGREE MASTERS OF COMMERCE IN THE SCHOOL OF ACCOUNTING SCIENCES AT THE POTCHEFSTROOM CAMPUS OF THE NORTH-WEST UNIVERSITY

SUPERVISOR: Prof D.P. Schutte
ASSISSTENT SUPERVISOR: Dr A. Heymans

Potchefstroom
May 2014

It all starts here ™

NORTH-WEST UNIVERSITY ®
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

DANKBETUIGING

In ‘n verhandeling is een van die laaste en moelikste paragrawe om te skryf die dankbetuiging. Om aan elke persoon dankie te sê wat hulp en bystand verleën het tydens die formulering van die verhandeling, is ‘n onmoontlike taak, maar daar is wel sekere besonderse individue wat ek wil uitlig:

- My Hemelse Vader. Dankie vir die vermoëns, talente en gawes wat U aan my gegee het. Dankie dat U met my is in elke tree van my lewe en my deur die moeilike tye dra.Sonder U is ek niks. “*Ek is tot alles in staat deur God wat my krag gee.”* Fillipense 3:17.
- My gesin. Dankie vir al die motivering, fondse, inspirasie, aanmoediging en leiding wat julle my gegee het deur die jare. Mamma en Pappa, dankie vir al die moed in praat en die geleenthede wat julle my tot vandag toe nog bied. Ek waardeer dit uit die diepte van my hart.
- Aan my sussie, Clarissa, dankie vir die feit dat jy altyd bereid was om my hoofstukke deur te lees, foute uit te lig en kritiek te lewer. Sonder jou leiding en bystand sou ek nie diè graad kon voltooi nie.
- Aan Prof. Visser en Prof. Stoop. Dankie vir die geleenthede en fondse wat julle my gebied het om die kursus te voltooi.
- Prof. Schutte en Dr. Heymans; jul bedank ek vir jul opgewondenheid oor my onderwerp en die opbouende kritiek wat julle gelewer het.
- Aan Erika, dankie vir die taalversorging wat jy op sulke kort kennisgewing gedoen het. Ek stel dit hoog op prys.
- Aan Ina en Ansia; dankie vir julle geselsies en moed in praat. Dit help altyd om wyse raad te ontvang vanaf goeie vriendinne. Dankie.
- Laaste, maar nie die minste nie, Lizan en Rachelle. Niemand anders sal beter weet waardeur ek gegaan het nie. Dankie dat julle daar was om moed in te praat en ook om my sekere tye te herinner hoekom ek die kursus wou voltooi. Julle is werklik twee uitsonderlike mensies en ek wens julle alle voorspoed toe met julle eie studies.

Dankie aan al die ander persone wat ook hand by gesit het in die afhandeling van die kursus. Sonder julle sou die juk te swaar en die taak te groot gewees het.

Dankie.

ABSTRACT

The revolutionisation of international economies and monetary systems has been taking place since the early 1970s. This occurred due to the diminishing fixed exchange rate systems of, initially, the Gold Standard and subsequently the Bretton Woods System. The collapse of these systems, especially the Bretton Woods System, led to the almost free movement of exchange rates. The lack of restriction placed on the movement of currencies created volatile markets; which, in turn, gave rise to an innumerable amount of risks.

In Correia, Holman and Jahreskog (2012) it was determined that an astonishing 74% of non-financial firms in South Africa hedge foreign exchange risk (the risk of currency movement). The 10% of firms which did not hedge any risks declared it was due to the lack of exposure to foreign exchange risks and that the cost of acquiring a hedging contract, in many cases, exceeded the contract's benefits. In the aforementioned study it was also established that the extractive sector of South Africa is one of the industries referring from the use of hedges.

The intention of this study is to improve the effectiveness of derivative instruments for companies in the extractive sector of South Africa exporting to the United States of America. South Africa is a large exporter and importer of goods, making it extremely important for market participants to determine the movement of the exchange rates. This estimates the amount of risk a company is willing to take and the amount of hedges they will use to protect themselves against inauspicious and adverse movements in the markets.

Therefore, incorporated in this study is the use of risk management tools from the technical analysis to predict the exchange rates at which companies should have set their hedging contracts on specific dates. This analysis could enable companies to perform an internal control that is inexpensive and which reduces risks of foreign exporting.

Keywords:

Exchange Rate
Fibonacci Arc
Fibonacci Extension Level
Fibonacci Fan
Fibonacci Retracement Level
Fibonacci Series
Fibonacci Time Zone
Foreign Exchange Market
Hedging and Hedging Contracts
Resistance Level
Support Level
Trend
Trend Line

OPSOMMING

Die verswakkende en folterende vaste wisselkoersstelsels in die sewentiger jare, genaamd die Goue Standaard en die Bretton Woods Stelsel, het veranderinge in internasionale ekonomieë laat plaasvind. Die ineenstorting, van veral die Bretton Woods Stelsel, het veroorsaak dat wisselkoerse vrylik rond beweeg. Sonder enige beperkings op die wisselkoersbeweging, het onstabiele markte ontstaan wat aanleiding gegee het tot ‘n ontelbare hoeveelheid risiko’s.

Correia *et al*. (2012) het bewys dat 74% van Suid-Afrikaanse, nie-finansiële firmas buitelandse risiko’s verskans. Van die firmas het 10% verklaar dat hul, eerstens, nie verskans nie, weens beperkte blootstelling aan buitelandse valuta risiko’s en, tweedens, is die koste van verskansing te duur om dit die moeite werd te maak of om gelyk te breek. In die bogenoemde studie is dit bevestig dat die mynbou – en ontginningsbedryf van Suid-Afrika nie verskans nie, juis oor die voorafgenoemde redes.

Die doel van die hierdie studie is om die effektiwiteit van verskansing, wat deur Suid-Afrikaanse ontginnende maatskappye gebruik word, te verbeter. Suid-Afrika is ‘n groot uitvoerder en invoerder van goedere, daarom is dit baie belangrik vir markdeelnemers om te bepaal waarheen die wisselkoerse beweeg. Dit sal die hoeveelheid risiko’s wat maatskappye gewillig is om te neem en die hoeveelheid skanse wat hul sal gebruik om hulself te beskerm teen veranderende wisselkoerse bepaal.

Daarom maak hierdie studie gebruik van risikobestuurmetodes uit die tegniese analise om die wisselkoers te bepaal waarteen maatskappye hul verskansingskoerse moet vasstel. Dié tipe analise kan maatskappye toelaat om ‘n interne kontrole uit te voer wat bekostigbaar is en wat die risiko’s van uitvoere kan verminder.

Sleutelwoorde:

Buitelandse Valuta Markte
Fibonacci Boog
Fibonacci Reeks
Fibonacci Terugryvlakke
Fibonacci Tydsones
Fibonacci Uitbreidingsvlak
Fibonacci Waaier
Neigings
Neigingsvlakke
Ondersteuningsvlakke
Verskansing en Verskansingskontrakte
Weerstandsvlakke
Wisselkoerse

TABLE OF CONTENT

DANKBETUIGING i
ABSTRACT iii
KEYWORDS iv
OPSOMMING v
SLEUTELWOORDE vi
TABLE OF CONTENT vii
LIST OF FIGURES AND TABLES x

CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.1 INTRODUCTION 1
1.2 METHODS OF REDUCING RISK 2
1.2.1 HEDGING AGAINST RISK 2
1.2.2 FORECASTING THE EXCHANGE RATE 3
1.3 PROBLEM STATEMENT 4
1.4 RESEARCH OBJECTIVE 6
1.5 HYPOTHESIS 6
1.6 METHODOLOGY 6
1.6.1 TRENDS 7
1.6.2 SUPPORT AND RESISTANCE LEVELS 7
1.6.3 FIBONACCI TOOLS 7
1.6.4 EMPIRICAL DATA 8
1.7 SUMMARY 8
1.8 CHAPTER LAYOUT 9

CHAPTER 2: FINANCIAL MARKETS

2.1 INTRODUCTION 11
2.1.1 HISTORY OF FINANCIAL MARKETS 11
2.1.2 PARTICIPANTS IN THE FINANCIAL MARKETS 12
2.1.3 FUNCTIONS OF FINANCIAL MARKETS 12
2.1.4 VOLATILITY OF FINANCIAL MARKETS 14
2.1.5 THE FOUR MAIN STRUCTURES OF MARKETS 15
2.2 THE STOCK MARKET 16
2.2.1 HISTORY OF STOCK EXCHANGE MARKETS 17
2.2.2 ADVANTAGES AND DISADVANTAGES OF STOCK MARKETS 18
2.3 FOREIGN EXCHANGE MARKET 20
2.3.1 HISTORY OF THE FOREIGN EXCHANGE MARKET 21
2.3.2 PARTICIPANTS IN THE FOREIGN EXCHANGE MARKET 21
2.3.3 FUNCTION AND VOLATILITY OF FOREIGN EXCHANGE MARKET 23
2.3.4 TRANSACTIONS AND TYPES OF FOREIGN EXCHANGE MARKETS 25
2.3.5 ADVANTAGES AND DISADVANTAGES OF THE FOREIGN EXCHANGE MARKET 27
2.3.6 RISKS RELATED TO THE FOREIGN EXCHANGE MARKET 29
2.4 SUMMARY 30

CHAPTER 3: CURRENCIES AND EXCHANGE RATES

3.1 INTRODUCTION 31
3.2 SUPPLY AND DEMAND OF FOREIGN CURRENCIES 31
3.2.1 INTEREST RATES 32
3.2.2 INFLATION AND PRICE STAGES 32
3.2.3 GENERAL PROFITS 33
3.2.4 PREDILECTIONS 34
3.2.5 FINANCIAL AND ECONOMIC POLICY 34
3.2.5.1 Employment releases 35
3.2.5.2 Retail sales 36
3.2.5.3 Inventories 36
3.2.5.4 Housing-starts and building-permits 36
3.2.5.5 Consumer Price Index (CPI) 36
3.2.6 POLITICAL EVENTS 37
3.2.7 UNITED STATES DOLLAR MOVEMENTS 37
3.3 EXCHANGE RATE SYSTEMS 38
3.3.1 FIXED EXCHANGE RATE SYSTEMS 39
3.3.1.1 Gold Standard Period 39
3.3.1.2 Factors affecting the Gold Standard 41
3.3.1.3 Turning away from the Gold Standard 42
3.3.1.4 Bretton Woods System 43
3.3.1.5 The fall of the Bretton Woods System 43
3.3.1.6 The Smithsonian Agreement 44
3.3.1.7 European Monetary System 44
3.3.2 FLOATING EXCHANGE RATE SYSTEMS 45
3.3.3 SUMMARY OF SECTION 3.3 46
3.4 SOUTH AFRICAN EXCHANGE RATES AND EXPORTING INDUSTRIES 46
3.4.1 HISTORY OF SOUTH AFRICAN EXCHANGE RATES 47
3.4.2 VOLATILITY OF THE ZAR 48
3.4.2.1 1997 Depreciation of the ZAR 50
3.4.2.2 1998 and 2001 Depreciation of the ZAR 50
3.4.2.3 2007 and 2008 Depreciation of the ZAR 50
3.4.3 SOUTH AFRICA'S EXTRACTIVE INDUSTRY 51
3.4.4 THE EXPORTING EXTRACTIVE INDUSTRY OF SOUTH AFRICA 52
3.5 RISKS RELATED TO EXPORTS IN THE EXTRACTIVE INDUSTRY OF SOUTH AFRICA 54
3.5.1 MAIN CAUSES OF RISKS 56
3.5.2 DECREASING RISKS 56
3.6 SUMMARY 59

CHAPTER 4: HEDGING AND FORECATING ANALYSES

4.1 HEDGING 60
4.1.1 INTRODUCTION 60
4.1.2 DEFINITION AND HISTORY 60
4.1.3 HEDGING STUDIES 61
4.1.4 HEDGING IN THE FOREIGN EXCHANGE MARKET 63
4.1.5 HEDGING IN SOUTH AFRICAN MARKETS 67
4.1.6 ADVANTAGES 68
4.1.7 DISADVANTAGES 69

4.1.8 SUMMARY 70
4.2 FORECASTING ANALYSES 71
4.2.1 INTRODUCTION 71
4.2.2 HISTORY AND DEFINITION 72
4.2.3 THE THREE SCHOOLS OF THOUGHT 72
4.2.3.1 Fundamental analysis 72
4.2.3.2 Technical analysis 73
4.2.3.3 Random walk analysis 80
4.3 SUMMARY 81

CHAPTER 5: EMPIRICAL ANALYSIS

5.1 INTRODUCTION 83
5.2 COMPANIES UTILIZED IN THIS STUDY 84
5.3 HEDGING CONTRACT INFORMATION 89
5.4 THE EXCHANGE RATES OVER THE 3 YEAR PERIODS 102
5.5 METHODOLOGY 104
5.5.1 THE TECHNICAL ANALYSIS 104
5.6 RESULTS AND DISCUSSION 110
5.7 SUMMARY 115

CHAPTER 6: SUMMARY AND CONCLUSION

6.1 SUMMARY 116
6.2 CONCLUSION 118

REFERENCES **119**
APPENDIX A **140**
APPENDIX B **149**

LIST OF TABLES AND FIGURES

TABLES:

TABEL 3.1: AVERAGE USDZAR EXCHANGE RATE 49
TABLE 4.1: FIBONACCI'S SERIES CALCULATIONS 79
TABLE 5.1: HEDGING INFORMATION OF THE COMPANIES 101
TABLE 5.2: PREDICTED RATES IN ZAR 111
TABLE 5.3: PREDICTABILITY OF TECHNICAL TOOLS 114
TABLE B.1: TRENDS 149
TABLE B.2: TIME ZONE'S TRENDS 149

FIGURES:

FIGURE 2.1: THE SIZE OF THE FOREIGN EXCHANGE MARKET 20
FIGURE 2.2: EXAMPLE OF THE EURUSD BIDASK SPREAD 23
FIGURE 3.1: AFFECT OF INFLATION ON EXCHANGE RATES 33
FIGURE 3.2: AVERAGE EXCHANGE RATE OF THE USDZAR 49
FIGURE 3.3: SALES AT CURRENT PRICES OF APRIL IN ZAR MILLION 53
FIGURE 3.4: VOLUME OF MINING PRODUCTION BASE 2005=100 54
FIGURE 5.1: INDICATION OF ARM'S SHAREHOLDERS 84
FIGURE 5.2: KUMBA AS PART OF THE ANGLO AMERICAN GROUP 87
FIGURE 5.3: BUSINESS ACTIVITY OF METOREX 88
FIGURE 5.4: ARM'S 2009 AND 2010 FOREIGN EXCHANGE CONTRACTS 90
FIGURE 5.5: ARM'S 2011 FOREIGN EXCHANGE HEDGING CONTRACT 91
FIGURE 5.6: EXXARO'S 2009 AND 2010 HEDGING CONTRACTS 92
FIGURE 5.7: EXXARO'S 2011 HEDGING CONTRACT 93
FIGURE 5.8: ANALYSIS OF REVENUE FOR KUMBA 2009 AND 2010 94
FIGURE 5.9: DERIVATIVE INSTRUMENTS USED FOR EXPORTING 95
FIGURE 5.10: ANALYSIS OF REVENUE FOR KUMBA 2011 96
FIGURE 5.11: DERIVATIVE INSTUMENTS USED FOR EXPORTING 96
FIGURE 5.12: 2009 AND 2010 HEDGING CONTRACTS 97
FIGURE 5.13: FOREIGN EXCHANGE CONTRACTS 2009 98
FIGURE 5.14: FOREIGN EXCHANGE CONTRACT 2010 99
FIGURE 5.15: FOREIGN EXCHANGE CONTRACTS 2011 100

FIGURE 5.16: EXCHANGE RATES OF USDZAR 103
FIGURE 5.17: TREND AND ELLIPSE FOR THE YEAR-ENDS 2008 AND 2009 106
FIGURE 5.18: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2008 AND 2009 107
FIGURE 5.19: ARCS AND FANS FOR THE YEAR-ENDS 2008 AND 2009 FIGURE 109
FIGURE B.1: TREND AND ELLIPSE FOR THE YEAR-END 2009 150
FIGURE B.2: TREND AND ELLIPSE FOR THE YEAR-ENDS 2009 AND 2010 151
FIGURE B.3: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2009 152
FIGURE B.4: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2009 AND 2010 153
FIGURE B.5: ARCS AND FANS FOR THE YEAR-END 2009 154
FIGURE B.6: ARCS AND FANS FOR THE YEAR-ENDS 2009 AND 2010 155
FIGURE B.7: TREND AND ELLIPSE FOR THE YEAR-END 2010 156
FIGURE B.8: TREND AND ELLIPSE FOR THE YEAR-ENDS 2010 AND 2011 156
FIGURE B.9: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2010 157
FIGURE B.10: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2010 AND 2011 157
FIGURE B.11: ARCS AND FANS FOR THE YEAR-END 2010 158
FIGURE B.12: ARCS AND FANS FOR THE YEAR-ENDS 2010 AND 2011 159
FIGURE B.13: TREND AND ELLIPSE FOR THE YEAR-END 2011 160
FIGURE B.14: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2011 161
FIGURE B.15: ARCS AND FANS FOR THE YEAR-END 2011 161
FIGURE B.16: TREND AND ELLIPSE FOR THE YEAR-ENDS 2008 AND 2009 162
FIGURE B.17: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2008 AND 2009 163
FIGURE B.18: ARCS AND FANS FOR THE YEAR-END 2008 AND 2009 164
FIGURE B.19: TREND AND ELLIPSE FOR THE YEAR-END 2009 165
FIGURE B.20: TREND AND ELLIPSE FOR THE YEAR-ENDS 2009 AND 2010 166
FIGURE B.21: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2009 166
FIGURE B.22: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2009 AND 2010 167
FIGURE B.23: ARCS AND FANS FOR THE YEAR-END 2009 168
FIGURE B.24: ARCS AND FANS FOR THE YEAR-ENDS 2009 AND 2010 169

FIGURE B.25: TREND AND ELLIPSE FOR THE YEAR-END 2010 170
FIGURE B.26: TREND AND ELLIPSE FOR THE YEAR-ENDS 2010 AND 2011 170
FIGURE B.27: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2010 171
FIGURE B.28: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2010 AND 2011 172
FIGURE B.29: ARCS AND FANS FOR THE YEAR-END 2010 172
FIGURE B.30: ARCS AND FANS FOR THE YEAR-ENDS 2010 AND 2011 173
FIGURE B.31: TREND AND ELLIPSE FOR THE YEAR-END 2011 174
FIGURE B.32: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2011 175
FIGURE B.33: ARCS AND FANS FOR THE YEAR-END 2011 175

CHAPTER 1
INTRODUCTION AND PROBLEM STATEMENT

1.1 Introduction

Since the collapse of the Bretton Woods system in the 1970s (Lothian & McCarthy, 2009), exchange rates have become extremely volatile (Levinson, 2003). Floating exchange rate regimes dominated due to the International Monetary Fund's (IMF) conference in Jamaica on fundamentals, such as discarding gold as a resource asset and the approval of floating exchange rates (Hill, 1999). To manage these floating exchange rates became an important aim for the changing conditions in the South African environment, especially the forces which influence exporting and importing companies (Aron, Elbadawi & Kahn, 1997).

The South African Rand (hereafter referred to as ZAR) underwent major movements in 1970 to 1995 due to South Africa's political stance and the shocks to gold prices (Van der Merwe, 2003). South Africa was also influenced by crises taking place around the world, for instance the Mexican crisis in 1994 and the Argentinean currency crisis in 2001 to 2002 (Savastano, 1999). In 2000 a formal inflation method – where price targets are identified for certain periods - as well as a floating exchange rate system (see chapter 3, section 3.3.2) were adopted in South Africa. Though this did stabilise the ZAR somewhat, the ZAR was still expected to depreciate, but in the beginning of the 21st century, nominal effective exchange rates improved by 26% and in 2002 the ZAR improved with 19% after 30 years of struggle (Van der Merwe, 2003), which was an excellent sign for companies in South Africa.

South Africa was and still is one of the largest exporters of platinum, gold and coal in the world and this has led to South Africa having a very liquid foreign exchange market (Potgieter, 2012). In 2007 South African trade exports totalled United States Dollar (hereon USD) 36.3 billion, including gold and agricultural products and South Africa conducted a total of USD 34 billion imports with trading partners such as Eastern Asia, Germany, the United Kingdom and the United States

(Tilkin & Epstein, 2007). These imports and exports are constantly influenced by varying exchange rates, which bear risks of more than one country (Tilkin & Epstein, 2007). Factors influencing exports and imports might include wars, volatile economic environments and natural disasters with regards to both the countries involved in the transaction. In succession, the exchange rate is then influenced, causing great instability in the financial markets.

Additionally, these risks and influential factors drove companies to formulate certain techniques of reducing risks, which are discussed in the following section.

1.2 Methods of reducing risk

It is of the utmost importance for market participants and trading partners to establish the way the exchange rate moves. This estimates the amount of risk a company is willing to take and the amount of hedges they will use to protect themselves against inauspicious and adverse movements in the markets (Van Heerden, 2010). To reduce these risks, traders may select various methods such as hedging transactions or forecasting the foreign exchange market to determine the exchange rate on future payment dates of their transactions (Brandt, 1984; Finance Learners, 2011).

1.2.1 Hedging against risk

Many investors believe the only way to reduce their risk is to diversify their portfolio or to construct two opposing positions in the same or a uniform trade. This is known as hedging risk, where traders feel that advantages lie in the variety and number of trades (Keasey, Hudson & Littler, 1998; Cotsakos, 2000). Hedging relocates risks from one trader to another, where each trader anticipates a perfect hedge (price movements are perfectly balanced, cancelling out each other's movements).

There are various types of hedging contracts participants can make use of to hedge their transactions with, such as future contracts (hereon futures), options or swaps (Blake, 1990). These may create one of three different hedges: a fair value hedge – the protection a market participant has against the movements in fair value of certain

assets or liabilities - , a cash flow hedge – participants are shielded against the risks affecting profit, loss or cash flow movements of associated assets or liabilities - or a net investment hedge – a hedge which defends foreign investments and assets (PWC, 2007; Rashty & O'Shaughnessy, 2010).

Though any of the abovementioned hedges can accumulate money for a market participant, a hedging contract can also cost a participant dearly when it is set at the wrong price (Blake, 1990); due to hedges having very high costs regarding transactions and contracts (Blake, 1990; Logue & Oldfield, 1997). Furthermore, many extractive and mining companies refuse to hedge due to these costs overshadowing the benefits of hedges (Blake, 1990; Logue & Oldfield, 1997; Chong, 2009;Correia *et al.,* 2012).

1.2.2 Forecasting the exchange rate

The amount of risk in a market can also be reduced using basic techniques traders developed for quicker, easier and more cost-efficient forecasting methods (Colby, 2003). There are three different forecasting methods (Krow, 1969; Yao & Tan, 2000; Babypips, 2011). The *random walk analysis* states that market changes are random with no definite patterns (Krow, 1969). Therefore, market changes cannot be predicted (Krow, 1969; Yao & Tan, 2000). Random walk theorists believe historical price movements cannot be used to predict future price movements, if price movements were seen as self-regulating over time (Yao & Tan, 2000). It can be compared to the throw of a dice. Many traders feel this theory is a nihilistic notion which relates the markets to a casino (Keasey *et al.*, 1998; Pilbeam, 2005). *Fundamental analysis* is the study of any news-based item that might affect the market price of a product or exchange rate (Babypips, 2011). Such news-based items may include government regulations, certain beliefs with regards to a certain market, weather conditions and the political health of a country (Schwab, 1996; Levinson, 2003). The final determinant for a trader using fundamental analysis is the effects of supply and demand on each country's currency (Krow, 1969; Murphy, 1999; Yao & Tan, 2000). *Technical analysis* is the oldest analysis with traces dating back to the 19th century and it is still widely used today, with 90% of traders using

some form of charting (Keasey *et al.*, 1998; Lien & Dyess, 2011). It is also known as chartism and assumes that trends in the exchange rates can be used to predict future exchange rate movements (Murphy, 1999; Yao & Tan, 2000; Gordon, 2006; Greenblatt, 2006). Chartists believe they can determine the exact time to enter and exit a market (Keasey *et al*., 1998; Babypips, 2011).

Although these analyses were developed to forecast market movements, they are not always suitable for each area of movement in a market. All market has two areas of movement: trending areas (upwards or downwards movements) and trading areas (sideways movements). These areas cause traders great difficulty in predicting markets accurately when using only one indicator or analysis (Meyers, 1989).

This study makes use of technical analysis forecasting tools as an internal control for companies to determine the exchange rate of a hedge-able transaction. This will enable companies to verify if a hedging contract will be of value and, in this way, reduce the risks and costs of exporting transactions and contracts.

1.3 Problem statement

The currency of a country changes its value frequently; leading to profits or losses experienced by participating parties. These participating parties' income, earnings, foreign property and foreign liabilities can be influenced positively or negatively by sudden changes in currency values. It is this movement in the currencies that participants refer to as foreign exchange risk (Bessie, 2006).

Foreign exchange risk is also a factor to take into consideration for the ZAR, due to worldwide globalisation and South Africa being one of the largest mining and extractive countries in the world (Manuel, 2008;Potgieter, 2012). Therefore, there should be a thorough understanding of the volatility of exchange rates and their causes. These risks can be determined and predicted using different methods, models and hedges.

Eichengreen (2007) stated that exchange rate risks are increasing for future periods, because of contract dates and the actual dates on which the transactions are recorded differing in price and value. Companies and participants therefore make use of risk management strategies to hedge and possibly decrease the foreign risks and exposures.

South Africa is a large exporter and importer of goods (Potgieter, 2012), opening up the risks and exposures of foreign trade. Determining the way exchange rates are about to move, estimates the amount of risk a company is willing to take and the value of hedges companies will use to protect themselves against unfavourable movements in the markets (Van Heerden, 2010). Hedging and forecasting of the foreign exchange market may increase or decrease a market participant's susceptibility to the foreign exchange risks.

This study poses various research questions such as: can technical analysis forecasting tools be used to determine the exchange rates for hedging contracts and, in this way, reduce the risks and costs of hedging transactions and contracts? Stated differently, could the technical analysis perhaps influence the companies' decisions to hedge as indicated in their financial statements and could it possibly increase the number of companies who make use of hedging contracts?

The abovementioned questions are the motivation for investigating South African exporting companies and their hedging contracts. This study focuses on the hedging contracts of five extractive and mining companies; paying attention to the exchange rates of the hedging contracts. Using the United States Dollar – South African Rand (hereon USDZAR) exchange rate over a period of three years (to show the volatile tendency of exchange rates) the technical analysis forecasting method will be implemented to predict the exchange rate at which the extractive companies should have set their hedging contracts.

1.4 Research objective

In this study, two methods of reducing risks will be placed under observation to determine which will provide market participants with the most benefits. The main focus will be on hedges of South African extractive companies exporting to the United States. The technical analysis will be used as an internal control that any extractive company should be able to use to determine if hedging certain exporting transactions would be of value to the company.

1.5 Hypothesis

Future exchange rate movements in the foreign exchange market can be determined using technical analysis tools as internal controls in extractive companies. This will lower the risks and costs of hedging for companies and make it possible for unhedged companies to reconsider hedging.

1.6 Methodology

In order to address the problem of increasing exchange rate risk for exporting South African extractive companies, this study will focus on the use of the technical analysis as an internal control for any extractive company's exchange rate management system.

The varying exchange rates influence contract prices of contracts and according to Antweiler (2003) there is no accurate way to predict exchange rates or their risks. In contrast, research done by Murphy (1999), Cheung and Lai (2000) and Sarno and Taylor (2002) indicates that exchange rates have a susceptibility to trend that moves towards an average rate in the long term.

As mentioned before in (1.2.2), a trading company can choose from three forecasting methods to determine the future movement and trends of the foreign exchange market: random walk analysis, fundamental analysis and technical

analysis (Krow, 1969; Babypips, 2011). This study focuses on using technical analysis methods and its indicators.

Technical analysis methods are used to study price activity and can be implemented to forecast any market (Osler, 2000; Babypips, 2011). It has many different tools that can be used to predict the movement of the exchange rates. This study applies trend lines, support and resistance levels and Fibonacci tools seeing as though these tools are easy to understand and use for the non-financial trader or director and are also the building block for the technical analysis (Babypips, 2011). In addition, a brief overview of the three technical tools will now be discussed:

1.6.1 Trends

Trend analysis is the most popular analysis, because currencies tend to develop strong trends and rarely have tight trading ranges (Lien & Dyess, 2011). Using trend lines can establish the general direction of previous prices and see where prices might be heading.

1.6.2 Support and resistance levels

Support is the willingness to buy that is sufficient enough to halt or delay a fall in an issue. Resistance is the desire to sell that is powerful enough to block a rise in prices (Krow, 1969; Osler, 2000). Markets often “test” support and resistance levels (Norris, Gaskill & Bell, 2010). The longer the period of time and the larger the volume that prices trade in support or resistance areas, the more noteworthy those areas become (Murphy, 1986).

1.6.3 Fibonacci tools

The Fibonacci series and price patterns are used to predict future turning points in influential trends (Bhattacharya & Kumar, 2006). In trading it is divided into retracement and extension levels, where the retracement levels are 23.6%, 38.2%, 50%, 61.8% and 76.4%. They are used as support and resistance levels (Osler,

2000). The extension levels are 38.2%, 50%, 61.8%, 100%, 138.2%, and 161.8% (Cofnas, 2004) and are used to set profit margins. The four most common Fibonacci ratios for analysts and traders are 38.2%, 50%, 61.8% and 100% (Norris *et al.*, 2010).

Critics often criticize the Fibonacci sequence and proclaiming it as a self-fulfilling prophecy, which is true. If enough market participants rely on the Fibonacci levels to forecast the markets, they end up self-validating the efficiency of the Fibonacci sequence in a circular reference (Bhattacharya & Kumar, 2006).

Other Fibonacci tools are arcs, fans and time zones. Fibonacci arcs and fans are use as support and resistance levels and Fibonacci time zones indicate specific dates at which significant price movements will take place (Cofnas, 2004; Chen, 2010).

1.6.4 Empirical data

This study considers five JSE listed extractive companies and the risks and costs related to these companies' financial statements with regards to their hedging contracts. The depreciation of the ZAR, for instance, benefits exporting companies, such as SASOL, where every 10c the ZAR falls, ZAR 946 million operating profits are made in SASOL (Brand & Gunnion, 2011).

America is one of South Africa's largest trading partners and it is for this reason that the USDZAR rate is hedged through the use of forward-currency contracts (Brand & Gunnion, 2011; Sasol, 2011a). Taking the contract rates of these companies into consideration, this study can provide estimates of the potential rates they should have negotiated to increase profits.

1.7 Summary

Due to the changing nature of the exchange rates, countries are extremely dependant of movements that might affect their currency as well as their trading

countries' currency. This influences the amount of trades that companies are willing to take, but the possibility to forecast potential activity in the currency market will enable companies to establish the exchange rate risks they are letting themselves into.

To understand the exchange rate, participants should first have a general understanding of the markets in which trading and speculating is possible.

1.8 Chapter layout

Charter 1 is an introduction to the problem of the study. The problem statement, aim and objectives and methodology presented an overview of the study. The focus of the study is to reduce the exchange rate risks (as explained in (1.3)) for extractive companies, especially South African exporters.

Chapter 2 gives an overview of the financial markets. This chapter discusses the history, advantages and disadvantages of the stock market and foreign exchange market. Both markets are discussed to provide a foundational basis to the study, because both markets play a major role in today's modern economies.

In Chapter 3 the history of exchange rate regimes is examined and the exchange rate risks that stem from regime changes are mentioned. Lastly the reasons for the importance of reducing these regime changing risks are explained.

Chapter 4 discusses the risk reducing methods, with an emphasis on hedging and forecasting of exchange rates. With hedging the advantages and disadvantages are mentioned. Considering the prediction of future foreign exchange market movements, the three schools of thought are explained. This chapter will give a definition and short discussion of each analysis's advantages and disadvantages and how they should be used as trading and hedging tools.

In Chapter 5 the empirical analysis is done, with assessments completed for each technical tool and, at the end, a combination of all the tools will be provided. Lastly

the total amount of estimated profit or loss will be compared to the actual profits or losses derived from the companies to determine if forecasting the markets are a better option than hedging contracts.

Chapter 6 is a summary and conclusion of the study's findings. This chapter also indicates the best options to use when wanting to reduce risks in foreign market movements.

CHAPTER 2
FINANCIAL MARKETS

2.1 Introduction

Financial markets determine the health of a nation by examining the performance of the nation's economy (Schwab, 1996). Each different market (in this study the meaning of the word market refers to financial markets) facilitates investors and traders in verifying the current and future movements of the economy, because markets are unprejudiced in their appraisals of transactions. For instance, two parties agree on a price of their transaction where both parties intend to benefit from the trade (Schwab, 1996). In order to gain an understanding of the foreign exchange market, which is the focus of this study, the different financial markets as a whole will first be explained in this chapter.

In addition, it is the objective of this chapter to fully describe the financial markets and their purpose in the world today. The discussion begins with a historic overview, followed by an explanation of the functionality and volatility of the financial markets. Lastly, the four main structures of the financial markets are introduced and a separate discussion is given on the stock and foreign exchange market. Though this study only focuses on the foreign exchange market, it is important to keep in mind that the stock market is also a major financial market and therefore it can influence the foreign exchange markets' movements

2.1.1 History of financial markets

Markets have been around for many years (Crump, 1952; Levinson, 2003). The creation of markets started with the trading of commodities. Three thousand years ago, during the process of building King Solomon's Temple, a trade was made between Solomon and Hiram, the neighbouring emperor. The trade was for as many cedar and fir trees as Solomon desired, and in return Hiram would receive 20 000 measures of wheat and 20 000 measures of oil. If it was not for this exchange, King Solomon's Temple would not have been built (Crump, 1952).

Another instance of prior barter is of farmers and anglers who were accustomed to trade their catch and harvests for food. The catch and harvest's value differed according to the weather and the seasons. This led to their exchange rates being unstable (Levinson, 2003) and market activity increasing with every passing year.

As the financial markets have changed every year, with new advantages and disadvantages emerging, various participants have been introduced to the financial markets with each one performing a specific role. The next section sheds some light on these participants and their diverse responsibilities.

2.1.2 Participants in the financial markets

Initially, financial markets were mainly used for trading commodities (Levinson, 2003), but as the trading resources and assets grew, the markets became complicated and intricate. With the markets increasing in complexity, assorted professionals were needed to make the markets more comprehensible to traders and investors which led to the types of participants taking part in the markets today.

The main participants are brokers, dealers, investment bankers, speculators, arbitragers, hedgers and financial intermediaries (Pilbeam, 2005; Tesfatsion, 2012). Brokers and market-makers act as agents and dealers on behalf of traders and investors who want to trade or take part in the market; arbitragers buy and sell financial resources to make riskless assured profits; hedgers reduce or limit exposure through the purchase of financial securities and speculators rely on an open position on the market to make a profit (Pilbeam, 2005). Each of these individual participants utilise the financial markets for different goals, causing multiple functions of the financial markets to arise.

2.1.3 Functions of financial markets

The interaction between possibility, fortune, compulsion and intention unfolds the financial markets (Tesfatsion, 2012). Financial markets help people to become affluent traders and investors; to buy investment assets such as stocks, currencies

and bonds which are traded at economic market costs (Pilbeam, 2005; Tesfatsion, 2012). Economic market costs are unprejudiced amounts that show the expectations of all market participants and this cost will create future wealth and consumption. This allows people to keep their income constant and stable (Pilbeam, 2005; Phillips, 2012).

Keeping income from financial markets constant and stable is a strenuous task, but financial markets are used to price financial resources from which income is produced, and keep cautious financial control and order (Pilbeam, 2005). Moreover, markets act as financial intermediaries and create economic wealth (Pilbeam, 2005). A financial intermediary is where borrowers take on commodities from the market and lenders are the investors of the financial markets (Timimi, 2010; Cooper, 2012). A board is created on which assets, resources, commodities and trade prices are set for price estimation (Tesfatsion, 2012). A general rule for the setting of prices is that an item is worth the amount someone is willing to pay for it. In short this is referred to as supply and demand, where markets rely on buyers and sellers for price setting to determine the comparative values of different items (Levinson, 2003). Markets also organise and summarise information of economies according to the economies' supply and demand (Tesfatsion, 2012).

This lays the foundation to collect information of different trades, assets and investments. Markets assist entities and governments by delivering discreet well-organised financial information. Additionally, financial markets transport financial assets and are used to elevate universal financial union (Jalloh, 2009; Tesfatsion, 2012).

The merger of worldwide financial markets may decrease risks and transaction costs (Tesfatsion, 2012). For instance, commercial transactions take place where assets can be sold or liquidated and risks are divided and shared between traders and investors to achieve an optimal strategy for both sides (Levinson, 2003; Tesfatsion, 2012). Financial markets allow certain risks to be dispensed by appropriate escalation. Aggregate risk might not be suitably delayed, but it may be transferred from people avoiding risk to people accepting risk (Phillips, 2012).

A further function of markets is arbitrage and asset valuation (Levinson, 2003). Poorly developed markets and currencies trade and operate at diverse prices and locations. The trading that occurs in these locations, leads to uniform price levels and it is these price levels that help to determine the worth of a firm or the worth of its property and resources (Levinson, 2003).

Increasing financial investing and health for firms and firm property can be done by raising capital through the use of financial instruments. It allows traders and investors to earn returns on funds and accumulate assets for future income. Financial instruments, such as derivative contracts, provide protection against many risks which decrease the income, especially where a foreign currency will lose value against the domestic currency when a payment is received. Risk management allows the market participants to determine a value for the risk (Levinson, 2003). As a result, the measures implemented by risk managers protects against the chaotic movements in the financial markets and it is these measures that prevent the participants from decreasing profits and increasing losses due to market volatility.

2.1.4 Volatility of financial markets

The financial market is a huge business with tri-billion dollars traded daily based on each individual trader's beliefs, predictions and forecasts (Thompson & Guttmann, 2008). This causes the financial markets to change every day, minute by minute, which creates various problems for investors and participants who keep track of market activity and risk management (Levinson, 2003).

Market activity may increase or decrease due to various factors such as personal opinions (which causes the markets to become private and emotional) and inflation (which erodes the values of financial assets and extends the value of physical assets, pensions, stock and bond market performances and risk management). Aforementioned factors can either affect the market in a positive or a negative way (Levinson, 2003; Ritchie, 2009).

Furthermore, technology has dramatically changed the cost structure of every part of the financial industry. Deregulation and liberalisation of the world's economies have made the barriers between market's participants break down and has brought colossal changes to these economies through consolidation and globalisation of companies, permitting firms to operate in a global network in all the financial centres, allowing companies to take risks with higher returns, without paying much attention to the location (Levinson, 2003). All these forces which influence the markets, affect the prices and values of the various resources that are traded on the market.

2.1.5 The four main structures of markets

Many different resources are traded on financial markets at certain prices. Certain prices refer to prices set at the demand of a specific resource for future periods. Trading of resources can occur directly or indirectly between buyers, sellers and brokers participating in one of the four main structures of financial markets (Timimi, 2010; Cooper, 2012). These structures are auction markets (run by brokers); over-the-counter or OTC markets (run by dealers); organised exchanges (a combination of auction and OTC markets) and intermediation financial markets (run by financial intermediaries) (Tesfatsion, 2012). The aforementioned market structures consist of the institutions that channel resources between deficits and surpluses. This is known as financial intermediation (Jalloh, 2009). In financial markets participants seek better and higher quality information, which results in healthier profits made and more trust placed on management (Kothari, 2000).

Apart from the financial structures markets are divided into, markets can also be classified by the types of resources traded, the age of the resources, the dates of issue of the assets, the way the transaction is going to be paid, the structure of the market, and the way the market is priced (Pilbeam, 2005). Immediate information with regards to prices and trades cause traders and investors to conduct transactions with ease. If traders do not trust the consistency of the markets, contracts can be used to settle arguments and enforce certain rules. These contracts will depend upon the resources under consideration and the type of market the transaction is made in (Pilbeam, 2005).

As stated above, markets can also be classified according to the resources exchanged and the type of transactions in which participants take part, for instance capital, money, derivative, foreign exchange, insurance and commodity markets (Timimi, 2010; Cooper, 2012). The money market trades assets that can essentially be put into cash, the stock market creates new capital, the foreign exchange market is where currencies are traded and the derivative market is where financial resources are bought and sold (Pilbeam, 2005; Fasani, 2011; Cooper, 2012). Other formal market characteristics associated with all market types and which are also used to classify markets are usually liquidity, transparency, reliability, legal procedures, suitable investors' protection, suitable investor's regulations and reasonably low transaction costs (Cooper, 2012).

The most common types of financial market transactions occur in are the stock and foreign exchange markets (Cooper, 2012) and it is for this reason that the next section briefly discusses the stock market.

2.2 The stock market

Stocks are a form of possession which allows traders and investors to own a share of a company in which they trust (Schwab, 1996; Cotsakos, 2000; Hummel, 2012). Traders and investors ought to diversify their portfolios, spreading the risks related to their investments over a range of different companies; each having their own, but different types of risks. To diversify a portfolio in such a way that it is in the best interest of the investor or trader; the participants should try and keep the trading costs and taxes as little as possible. Doing research beforehand, rather than just investing blindly in any company or market, might improve a participant's chances for a beneficial transaction (Tyson, 2003; Monetos, 2012). Unfortunately stockholders face almost the entirety of the company's risks due to their ownership of the company, but they are expected to receive a higher return on their investments in the form of dividends (Cotsakos, 2000; Tyson, 2003; Jaswani, 2008; Monetos, 2012). It is due to the risks and ownerships that investors choose companies from the main stock markets to invest in, seeing as these companies are the most reliable and less risky companies to invest in. The three main stock markets to choose from are the

New York Stock Exchange (NYSE), Tokyo Stock Exchange and the London Stock Exchange (LSE) and it is on these markets that most of the traders and investors place their faith.

Though all of the abovementioned stock exchanges might deal in the purchasing and retailing of shares; their trading systems and structures all differ (Pilbeam, 2005) due to the way in which they came into being. This leads to the next section on the history of the stock exchange and the different advantages and disadvantages of the stock markets follow.

2.2.1 History of stock exchange markets

There are many different beliefs of how and when stocks came into being. Ritchie (2009) states that it was in 1531 in Antwerp, Belgium, where "*sans*" stocks were traded, but Keasey *et al.* (1998) believes the concept of stock exchange began in 1553. According to Keasey *et al.* (1998) "sans" stocks were started by an adventurer called Sebastian Cabot who had a company – "*Mysterie and Companie of the Mercant Adventurers for the Discoverie of Regions, Dominions, Islands and Places Unknowen"* – that was used to accumulate profits and manage costs of expeditions (Keasey *et al.*, 1998, Valdez, 2007). In 1599 another company was formed, the *"Governor and Company of Merchants of London trading with the East Indies,"* to decrease the losses of ships and cargo at sea. This company led to business growth in most of the European countries (Ritchie, 2009). The first of these companies to issue stocks was the *Dutch East India Company*, which also shared its profits with all its investors (Valdez, 2007; Ritchie, 2009).

In the year 1791 the first official stock exchange was created in Philadelphia in the United States of America (Schwab, 1996). The United States of America had countless stock exchanges, but they all vanished with New York growing dominant due to improvements in technologies (Schwab, 1996; Valdez, 2007). In 1792 the forerunner of the New York Stock Exchange (hereon NYSE) started in New York (Schwab, 1996). It was in 1817 that this exchange became known as the New York Stock Exchange. Between 1865 and 1868 the NYSE launched its services of trading

bank stocks and had authorised 533 forms of entities to take part in trading (Schwab, 1996). Mohawk and Hudson Railroad was the first railroad to enlist its stock on the NYSE and by 1857 its total amount of shares already enlisted, aggregated to 75 000 shares a day (Schwab, 1996). The New York Stock Exchange was the world's most esteemed and leading stock exchange until the Senate Committee on Banking and Currency established that fraudulent stock stage systems occurred, causing the Great Crash of October 1929 (Schwab, 1996). The crash led to the Great Depression of the 1930s (Keasey *et al.*, 1998).

On a lighter note, the main index for the United States is the Dow Jones Index of the NYSE which is used to express the state of the United States markets (Keasey *et al.*, 1998). Exchanges on the European markets are less popular and insignificant in the equities markets (Keasey *et al.*, 1998).

The stock exchange in the United Kingdom came into being in the 17th century due to shares of joint-stock companies trading with each other. These companies were the East India Trading Company, the Royal Africa Company and the Hudson's Bay Company. During the 19th century there was an average of 20 stock exchanges that came into being, but they all later merged to form the exchange known today as the London Stock Exchange (Keasey *et al.,* 1998).

Each of the abovementioned stock exchanges has their own significant advantages and disadvantages and therefore the next section highlights these benefits and shortcomings.

2.2.2 Advantages and disadvantages of stock markets

The main advantage of the stock market is that it delivers a greater profit for the holders of ownership over a period of time. This also leads to its greatest disadvantage. The stock market is mainly for investing and not for short term trades or speculation, with trades taking place over various different countries (Schwab, 1996; Bissember, 2010). Trading stocks over a shorter period of time may increase the returns, but also leads to higher risks (Sedlabank Islands, 2008; Hummel, 2012).

Other advantages of the stock market are soaring returns, taxation free investments, lithe and lasting investments, stock options that are safer with fewer risks and supervised stocks (Sedlabank Islands, 2008; Bissember, 2010; Hummel, 2012; Monetos, 2012). Market participants also tend to know the companies they buy stocks in, because most of the listed companies are well-known brands (Wreford, 2012).

Disadvantages may be that the returns are circumstantial; there are specific charges related to the stock and investments which may decrease the returns on the investments. Moreover, the money that investors provide might be lost, creating expenses that investors did not conceive (Monetos, 2012).

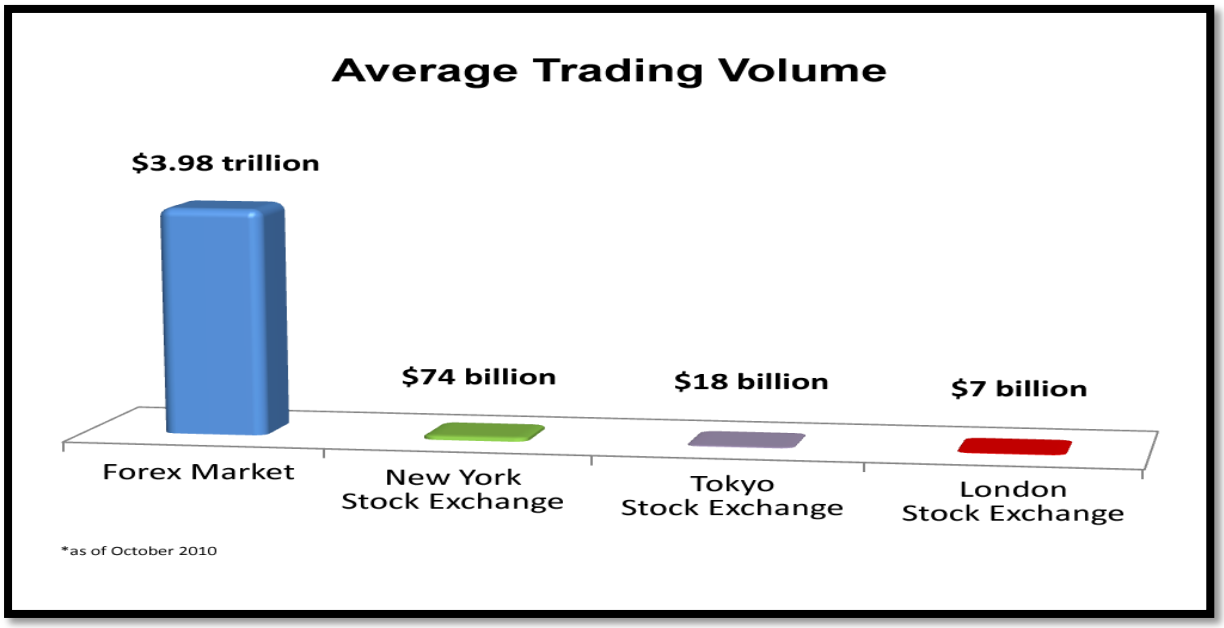
Other drawbacks of stock markets are incoherency and volatility in the short-term and the performance of companies in the same industry is most likely to differ from each other (Ludvigson & Steindel, 1999; Sedlabank Islands, 2008; Hummel, 2012). Stocks are also long term investments; usually three to ten years; freezing up capital and costs, for instance admin fees and penalty fees when a trader wants to extract capital (Monetos, 2012). Traders have to take numerous rules into account in the stock market, such as uptick rules, pattern day trader rules and plenty of associated costs. These rules make it difficult for the man on the street to understand the movements of the stock markets; leading to the majority of people making use of the services provided by brokers, which are costly and expensive.

In contrast with the stock market's complexity is the foreign exchange market. Though the foreign exchange market is the largest market in the world, the trades are quite easy to understand and participants vary from brokers to speculators. As stated earlier in chapter 1 and in 2.1.5 of this chapter, the study will be focussing on the foreign exchange market, therefore the next area of discussion is the foreign exchange market.

2.3 Foreign exchange market

The foreign exchange market is also known as the money exchange market or forex market for short and is seen as an asset class, where traders and investors alike can increase their profits if their transactions are beneficial (Lipton, 2005; Mel, 2012). It is where traders reciprocate or barter one currency with another, relocating the currencies between the participating countries (Tilkin & Epstein, 2007; Babypips, 2011). The foreign exchange market has a daily turnover of approximately $ 1.5 trillion a day and $ 4 trillion trades a day, compared to the $ 74 billion traded daily on the NYSE as seen in Figure 2.1 (Hau, Killeen, Moore, Honohan & Franks, 2002; Babypips, 2011; Mel, 2012). This has been created by a 20% increase in the foreign exchange activity over the past 3 years as shown in the 2010 Triennial (King & Rime, 2010).

FIGURE 2.1: THE SIZE OF THE FOREIGN EXCHANGE MARKET (BABYPIPS, 2011)



The foreign exchange market operates in every imaginable currency and has an estimated 150 000 transactions occurring daily (Levinson, 2003). This makes it the most liquid and largest of the financial markets, which leads to easy in-and-outs for participants (Tilkin & Epstein, 2007; King & Rime, 2010; Lien & Dyess, 2011). The in-and-outs for participants refer to the ease with which a market participant can formulate a transaction and just as easily find another trader or investor to buy the

transactions from the participants for a profit. The following section provides an understanding of the foreign exchange market's history and can provide some clarity on why this market is so large.

2.3.1 History of the foreign exchange market

Foreign exchange markets originated in ancient times and has increased or decreased depending on the degree of international trade and the financial agreements of the day (Levinson, 2003). In medieval times, gold and silver coins were scattered across European kingdoms. Coins were traded freely, no matter what precious metals they were made of (Levinson, 2003). In the late 14th century Italian bankers were contracting in assorted issues of debits or credits of various currencies, lowering their values according to bankers' judgement of the currencies' relative values (Levinson, 2003). These debits or credits allowed international trade to increase tremendously (Levinson, 2003).

Yet foreign exchange markets stayed an inconsequential part of finance. The widespread use of paper money in the 18th century did not make the foreign exchange market any more important or famous. When the Bretton Woods system (see section 3.3.1.4 for more information) came into use at the end of World War II, it was based on fixed exchange rates (Levinson, 2003). It was in the 1960s and 1972 that the largest economies allowed market forces to decide exchange rates. These new uncertainties of exchange rates led to a dramatic increase in currency trading (Levinson, 2003). Since the late 1990's the amount of trading has dwindled, mainly because 12 European countries introduced the use of the euro which eliminated exchange between those currencies and the various participants (Levinson, 2003).

2.3.2 Participants in the foreign exchange market

International trade, dividends, interest payments and foreign currency loans are reasons why market participants take part in the foreign exchange market (Mathur, 1982). According to Lipton (2005) foreign exchange market participants are divided into four main groups:

- Exporters and importers: Companies that trade or operate internationally use the domestic currencies of each country to pay their workers and any other applicable transaction.

- Investors: Acquire the foreign currencies to make purchases.

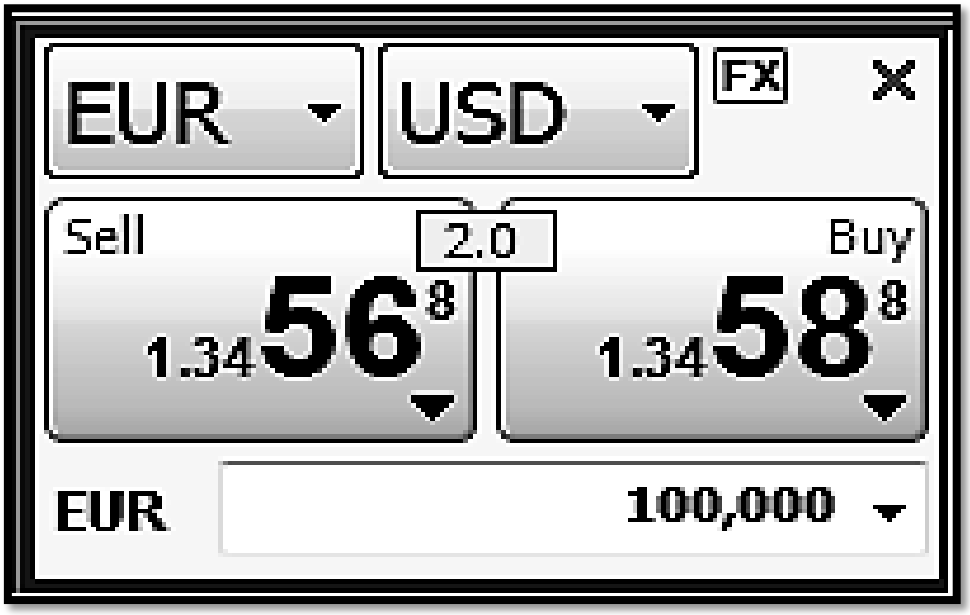
- Speculators: They want to profit from pre-empt changes in exchange rates, without engaging in other business transactions. They only function and perform in the currency market to make profits (Copeland, 1989).

- Governments: They may trade in currencies to affect the exchange rates. This is known as intervention.

Other market participants include banks, international corporations, mutual and hedge funds and market makers (also known as middlemen). These middlemen conduct all exchanges, creating a difference between the lower selling price for market makers and the higher buying price from them, thus creating what traders call the bid-ask spread (Lipton, 2005).

Figure 2.2 indicates the two quoted prices on a bid-ask spread. The bid price is almost always the lower price at which the base currency (the euro) is bought in exchange for the quoted currency and in this case this price is the 1.34568, as indicated in Figure 2.2. The offer or ask price is the price that the base currency will be sold at in exchange for the quoted currency, in other words the 1.34588 in Figure 2.2. The variation between the two prices is identified as the spread. It is this spread that is used by the market participants to set prices and make trades (Babypips, 2011). For example, when participants want to invest their money in foreign bonds and equities, they first have to exchange their domestic currency for the foreign currency at the specified spot rate as indicated on the bid-ask spread (Lipton, 2005). When they want to sell their assets or securities, they have to convert the foreign currency back into the domestic currency (Lipton, 2005).

FIGURE 2.2: EXAMPLE OF THE EURUSD BID-ASK SPREAD (BABYPIPS, 2011)



Due to the conversions of currencies, investors have to take note of national and international risks and changes to the foreign exchange market rates caused by the volatility in the foreign exchange rate (Lipton, 2005).

2.3.3 Function and volatility of foreign exchange market

The foreign exchange market is very clear, adaptable, abstruse, volatile and irregular (Lipton, 2005; Yu, Wang, Lai & Huang, 2007). It is influenced by many factors such as politics, psychological factors, economic conditions and traders' expectations (Yao & Tan, 2000; Yu *et al.*, 2007; Treepongkaruna & Gray, 2009). This has a significant influence on foreign exchange market trading and risk management movements (Treepongkaruna & Gray, 2009). Movements in the foreign exchange market can be created by a number of factors and forces, all of which influences the foreign exchange market in either a positive or negative way.

Shifts in foreign exchange rates are caused by profound structural changes in the different economies and has a large impact on the world economy (Lipton, 2005). The foreign exchange market is an essential factor for long-term economic growth and stability. Global events have an instantaneous effect on the foreign exchange rates and currency values (Investopedia Staff, 2011). It is always an arduous task to

determine the economic repercussions a natural disaster (for example) brings about (Elmerraji, 2011). Understanding the effects of a disaster is one of the first things traders can do to prepare themselves for misfortune (Elmerraji, 2011). According to Investopedia Staff (2011) certain global events include:

- Political events. A country's elections are seen as a possible case of political unpredictability, which can lead to currency volatility. Traders will contemplate pre-election polls to determine if the election will have a positive or negative effect on the currency of the economy. An unexpected election wreaks havoc on a currency. It creates a precarious currency and political health. In such instances not even a positive, new government will change traders' minds.

- Natural disasters. A damaged infrastructure can intensely limit the economic output of a country. Such disasters also cost a great deal of money which could have been used to increase a country's wealth. Any economic strength turns to weakness.

- War. It has the same effect as a natural disaster. A nation's economic feasibility is affected negatively and the rebuilding of a country after a war causes lower interest rates, subsequently decreasing the domestic currency. War also has economic benefits. It can give rise to a young economy, for instance the United States of America in 1930 when the Great Depression was halted due to World War II. The economic strength of a country influences its currency's value. The more informed traders are, the more they can protect themselves to the risks and shield against the changes.

Unexpected forces also have a significant effect on the foreign exchange market, for instance the bankruptcy of the Lehman Brothers. It caused the activity in the foreign exchange market to recover after a sharp fall in October 2009. This drop in activity caused an increase in market volatility, which in succession caused traders to hedge risks and irregularities in the spot markets (King & Rime, 2010).

Since foreign exchange markets have their own irregularities, it is very difficult to identify, model, deduce and recombine patterns such as trends and cycles and the effects these irregularities have on the foreign exchange market (Yao & Tan, 2000). Examples of these irregularities include no physical or specified geographical locations for foreign exchange markets which means traders usually perform transactions in places where costs will be reasonable and low (Levinson, 2003). Most trading occurs among financial institutions situated in various countries, with London being the largest trading centre of them all (Levinson, 2003; Valdez, 2007; King & Rime, 2010). In the earlier days, trading took place via telephone conversations between participants, but nowadays 50% of foreign exchange transactions are computerised (Levinson, 2003; King & Rime, 2010). The Bank of International Settlements estimated that in 2001 50-70% of all currencies traded, occurred electronically. This is compared to the 10% or less traded electronically in 1995. Over the last 10 years, the central trading location was London, with New York far behind (Levinson, 2003; Nor & Ergun, 2009). Tokyo, which was once a major contender, has trouble keeping up with the aforementioned two locations. Other major trading locations include Singapore and Frankfurt (Levinson, 2003, Lipton, 2005; King & Rime, 2010). The foreign exchange market directly affects each country's foreign trading patterns, calculates the flow of global investment and alters local interest and inflation rates (Levinson, 2003).

Apart from the abovementioned functions in the foreign exchange market, there is also a range of transactions that traders can take part in. These transactions create the different foreign exchange markets in which participants take part.

2.3.4 Transactions and types of foreign exchange markets

There are 2 branches of a foreign exchange market transaction: the trade itself - referring to the buying or selling of a specific asset, commodity or resource - and the consignment of the currencies; meaning the pair of currencies in which the transaction is made (Crump, 1952). Supply and demand also referred to as buying and selling, determines the prices of currencies (Copeland, 1989). Importers buy

commodities from foreign suppliers. These suppliers are in turn known as exporters (Copeland, 1989).

Currencies are traded in four different foreign exchange markets which are closely related to each other (Levinson, 2003; Lipton, 2005):

- The *spot market* is for instant delivery and the highly liquid foreign exchange market lowers the instability of the spot market (Copeland, 1989; Levinson, 2003).

- The *futures market* locks in an exchange rate at a certain future date by purchasing or selling a futures contract (Copeland, 1989; Levinson, 2003). Forward contracts require the buyer (seller) to buy (sell) an instrument for a prearranged spot rate at a predetermined time. Typically an upfront premium is paid in order to settle the contract (Lipton, 2005).

- The *option markets* give holders the right, but not the obligation, to buy or sell foreign currency at a specified price during a certain time frame (Levinson, 2003). Options allow buyers an option to buy (call) or sell (put) the underlying instruments and allow the seller of an option the liability to sell (call) or to buy (put) this instrument at a predetermined spot rate and maturity date. The seller of an option can lose millions, while a buyer cannot lose more than the premium paid. The rise of a call option's price or the fall of a put option's price is beneficial for its holder (Lipton, 2005).

- The *conventional market* is where most of the foreign transactions occur. These transactions are not traded on organised exchanges. Transactions include forward contracts, foreign exchange swaps, forwards rate agreements and barrier options (Levinson, 2003).

These different types of markets all have their various advantages and disadvantages relating to their characteristics. The following section gives a broad overview of the advantages and disadvantages relating to the abovementioned

markets, seeing as though all the aforementioned markets are classified as part of the foreign exchange market.

2.3.5 Advantages and disadvantages of the foreign exchange market

Immediate foreign exchange transactions reflect their actual values, as well as supply and demand considerations (Lipton, 2005). The foreign exchange market is a 24 hour market; it is speculative, has a very high liquidity and has no central location, so trades are made over the counter in major banks (Bollerslev & Domowitz, 1993; Hau *et al.*, 2002). All this makes it possible to trade on the foreign exchange market anywhere and at any time, making the foreign exchange market more accessible which is rewarding for all traders (Bollerslev & Domowitz, 1993).

The availability of the markets is due to the easy communication systems via computers or telephones and other means of information or communication. These systems are used because the foreign exchange market is so enormous. It is also due to the market's size that governments cannot control the foreign exchange market. It is a great example of traders agreeing on a set of rules which is used in their transactions and settlements (Hau *et al*., 2002; Foreign exchange market, 2012). With these rules in place, the foreign exchange market is not a chaotic, lawless venture; it cannot be if thousands of dollars and pounds are traded over the telephone (Hau *et al*., 2002).

A disadvantage of the foreign exchange market is that it has many dimensions and it is influenced by them all (Cofnas, 2009). They all play a crucial role in formulating the market, for instance housing growth rates, inflation, growth, zero- or high rates, account deficit or surplus, equity bear or bull market, risk aversion, consumer confidence, producer confidence, low and high volatility, commodity price trend, easy or right bank lending, china growth rate, dollar reserve percentage in central banks and foreign ownership of US treasuries (Cofnas, 2009). All these dimensions make the foreign exchange market extremely volatile, making it difficult for traders to determine the market's next move.

The highest risk for traders arises from the fact that trading takes place over many time zones (Prindl, 1976; Walker, 1981; Levinson, 2003). If an agreement is reached between banks in London and Tokyo, Tokyo will receive its payment first while London will still be waiting for it. If the Tokyo bank cannot pay its debt to the London bank, this could have an enormous negative influence on the London bank and this can also put other banks in danger (Levinson, 2003). Traders call this the Herstatt risk, named after a German bank that failed, because of partially completed trades worth $ 620 million. This risk is lowered by speeding up the settlement of transactions, but it cannot be eliminated (Levinson, 2003). Government banks can undertake to manipulate the markets and in this way affect the value of the currency's prices, leading to various other shortcomings (Grant, 2010).

On the other hand, the foreign exchange market is affordable, due to liquid currencies traded on its spread. For instance for very liquid currency pairs (EURUSD; USDGBP; USDJPY), the majors, transaction cost can be 0.5 to 1.5 basis points, which is 0.00015 basis points of 0.00005 basis points. However, compared to stock or equity markets, basis points tend to be 50 times larger causing greater risks (Hau *et al*., 2002).

When traders acquire foreign currency, they also acquire that currency's risk. To decrease this risk, the traders distribute their assets among each other. This is known as hot potato trading, where transactions and trades circulate between traders. Each transaction is recorded and this explains the high turnover volume of the foreign exchange market (Hau *et al.*, 2002). Traders reckon sharing risks leads to fewer risks for each trader to carry and control. The hot potato trading is ideal to spread the risk from participant to participant (Hau *et al.*, 2002).

As indicated in the above section, the main advantage of the foreign exchange market is its size and accessibility. The main disadvantage is the various risks traders have to take into consideration before making a trade. These risks are explained below.

2.3.6 Risks related to the foreign exchange market

In the markets something unbeneficial or unprofitable can happen. Traders refer to this as “exposure” or “risk”. In the foreign exchange market risks occur when companies trade currencies over time and the reversal rate differs from the currency of their income and the currency of their expenses (Walker, 1981). In other words, traders can make profits or losses due to the variation in exchange rates.

The exchange rate, also known as the reversal rate, is the price of a currency and reflects that specific currency’s supply and demand (Pilbeam, 2005; Rusydi & Islam, 2007; Mun, 2011). Exchange rates can be divided into nominal, real and effective exchange rates (Pilbeam, 2005). These rates reflect everything that traders know about certain currencies (Ainson, 2011). The difference between the rates, allows traders and investors to make profits on the markets and these rates are also a direct indication of the health of an economy (Levinson, 2003; Babypips, 2011).

The exchange rate of two parties often changes, which causes transaction exposure. There are three factors to consider with transaction exposure circumstances namely the home currency, foreign currency and time (Walker, 1981). The exchange rate risk is very volatile and traders normally trade currencies of strong, healthy economies and avoid weak economies (Walker, 1981; Copeland, 1989; Levinson, 2003). An election, particular politician or a new or trouncing of legislation may all cause a currency to strengthen or weaken (Levinson, 2003). Other causes are the different currencies and the time between fixing the price of a transaction and the actual payment. Transactions include buying, selling, borrowing and lending (Walker, 1981) of resources.

When an exchange risk needs to be determined it must be (1) managed, (2) systematically structured and (3) plays an important role in financial administration (Prindl, 1976). Managing the exchange rate is becoming extremely important due to the globalisation of current businesses, the increase of world economies, trends to economic union in European countries and any changes in economically technological processes (Riechel, 1978; Copeland, 1989). The foreign exchange

market leads to immense profits, caused by the volatility of exchange rates (Tilkin & Epstein, 2007). This volatility also leads to high risks and the opportunity to lose a great deal of money (Sircar, 2008).

Due to the great effects exchange rates have on the foreign exchange market, as well as all the other markets, the next chapter will be focussing on exchange rates and their risks.

2.4 Summary

Risk in the foreign exchange market is an important dimension in investments and price movements (Carrieri & Majerbi, 2006). It is universally priced and uses a risk premium which is created by the exchange risk exposure (Carrieri & Majerbi, 2006). Exchange rates of a short term movement depends on information that doesn't normally make any sense or may not necessarily be seen as important enough (Chang & Osler, 1999). It is these small influences that create a very large shift in exchange rates and cause investing and trading companies' problems and risks.

In the next chapter these causes of exchange rate movements are discussed, along with the systems of exchange rates over the years and a closer look is given to the South African exchange rate movements against the USD.

CHAPTER 3
CURRENCIES AND EXCHANGE RATES

3.1 Introduction

The exchange rate is the currency of a country stated in the currency of another country (Scott, 2004; Potgieter, 2005). Exchange rates can indicate the amount of assurance countries have in the domestic currency and its country. Countries should synchronize their interests with regards to a specific movement of a currency and should make use of official and non-official channels (Scott, 2004).

The foreign exchange market, as discussed in chapter 2, is the market that implements the exchange rates the most. The foreign exchange market can refer to various money units of other countries; certain tools used in international trade and payments and it can also refer to the amounts of foreign money controlled by a country (Lall, 1981). This market is where prices for countries' currency are estimated (Lall, 1981). It is in this market where buyers and sellers of currency meet to interact with each other and perhaps record transactions which relates to the supply and demand in the market. With the currency crises and economic recessions experienced over the world, 2012 showed weak international supply and demand and the currencies indicated more volatility (Global Insight, 2012). Prices of commodities and services were determined in the foreign exchange market and that is why the supply and demand of a product plays such a big role in the price determination process; bringing the buyers and suppliers of commodities together to ensure the best outcome for both parties (Lall, 1981).

3.2 Supply and demand of foreign currencies

Supply and demand of currencies determine the price of a country's currency which is also known as the exchange rates. When deciding and calculating the supply and demand for a currency, central banks are only authorized to intercede to reduce large fluctuations in the rates (Scott, 2004; Potgieter, 2005). The foreign exchange

market can be placed into a balance where there is no increased or decreased movement in supply and demand. The exchange rate will always try to move to this balance, causing the free floating exchange rate regime where no interference is authorized. This causes a link to the balance of payments where credit transactions cause foreign currency supply and debits cause foreign currency demand (Scott, 2004; Rogova, 2011). Exchange rates are influenced by various other economic factors which are discussed in section 3.2.1 to section 3.2.7 below (Scott, 2004).

3.2.1 Interest rates

According to Gray and Irwin (2003) interest rates affected by inflation has a major effect on the demand of exchange rates. Countries with a high rate of return attract foreign investors, leading to an appreciation of the currency value and this is all done by an increased interest rate. In theory, if two currencies are compared, where the one is a high-yielding currency and the other a low-yielding currency, and the one's interest rate is lower than the other, the difference will indicate an appreciation of the lower-yielding currency (Gray & Irwin, 2003). Investors would invest in the lower-yielding currency to equalize the rates of return of the currencies. In other words, the differences in currencies' interest rates indicate expected appreciation or depreciation of the currencies involved (Gray & Irwin, 2003; Scott, 2004).

3.2.2 Inflation and price stages

As said by Gray and Irwin (2003) differences in the inflation rate can be compared to the differences in the percentage depreciation of currencies over the long-term (Scott, 2004). The inflation in a country leads to a decrease in purchasing power parity (Colander & Gamber, 2002). Just for clarity, the purchasing power parity theorem refers the difference in price levels of two countries, affecting the exchange rates in such a way that it also changes (Van Heerden, 2010). Inflation is controlled by economic policies and it should be remembered that exchange rates are influenced by economic policies, thus economic policies managing the inflation of a country would not allow the currency's exchange rate to affect the inflation rate in such a way that it would spiral out of control (Laflèche, 1996).

FIGURE 3.1: AFFECT OF INFLATION ON EXCHANGE RATES (COLANDER & GAMBER, 2002)

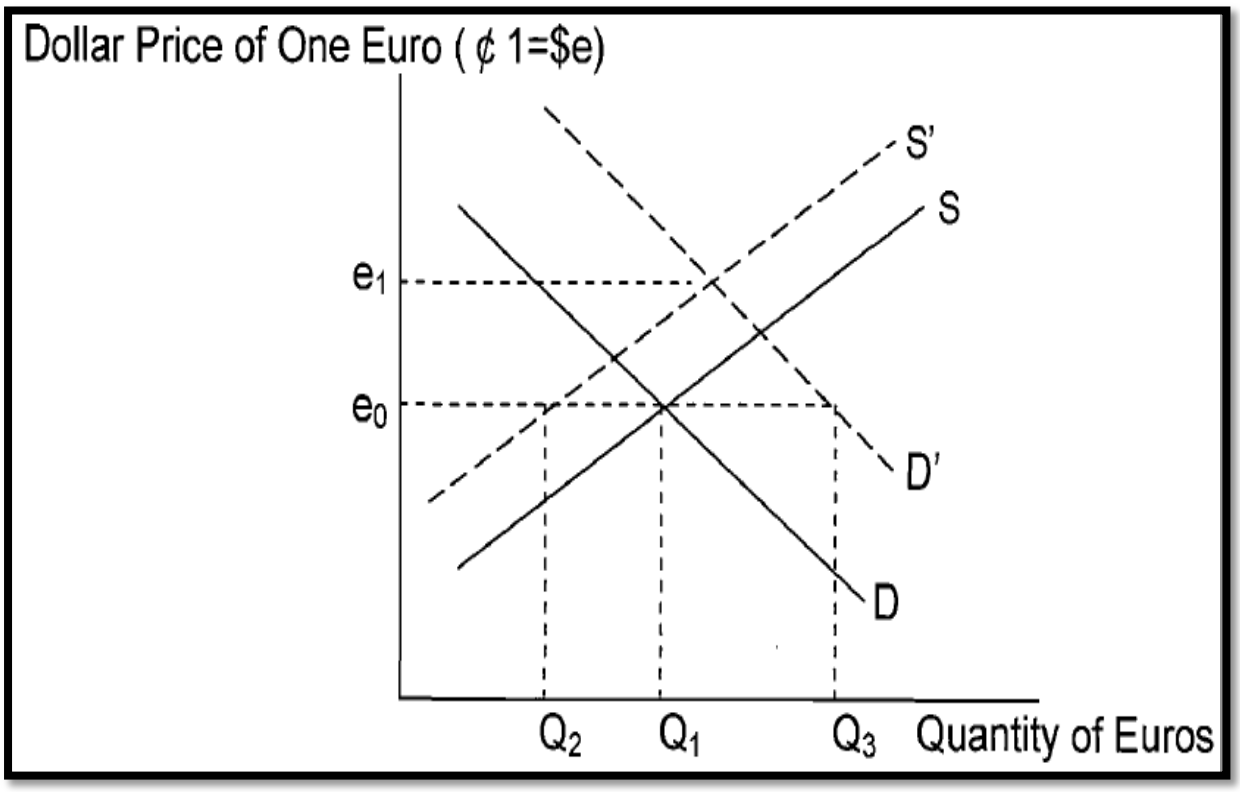


Figure 3.1 indicates an example where an increase in the demand of USD causes inflation in the USD, leading to increased prices of commodities in the Euro-countries. This is indicated by the move of the supply curve from S to S`. This causes a decrease in the use of US commodities which is a decrease in the demand for USD and a depreciation of the USD (Colander & Gamber, 2002). Though the USD decreases, the demand for the Euro then increases as shown by D` which also leads to an increase exporting rate for the European countries. The exchange rate and its price stages bring prices back to the price stages of other countries to increase the competition between countries and attract more traders. This is indicated by e_0 moving to e_1 where a new equilibrium price is determined (Colander & Gamber, 2002).

3.2.3 General profits

The trades and investments in a country are closely related to the supply and demand of a country's commodities to trading partners and investors (Scott, 2004).

When the general profits of a country increase due to foreign trade, it means that the demand for commodities related to that country has increased and that the country would soon have to increase the supply of their commodities. This will lead the country to have an increased supply of the foreign currencies used to buy the commodities. In this case the opposite is also true, where the profits decrease, supply should decrease and foreign currency holding will also decrease (Scott, 2004).

3.2.4 Predilections

The changes in trends of commodities and trades can influence the foreign trade of a country. These changes may be due to natural disasters or even war outbreaks (Macdonald, 1990; Tucker, 2000). With regards to natural disasters, a damaged infrastructure can intensely limit the economic output of a country. Such disasters also cost a great deal of money which could have been used to increase a country's wealth. Any economic strength turns to weakness.

War's infliction on a nation's economic feasibility is almost the same as a natural disaster's wreckage and affects the economy negatively. The rebuilding of a country after a war causes lower interest rates, consequently decreasing the domestic currency. War also has economic benefits. It can start a young economy; for instance the United States of America in 1930 when the Great Depression was halted due to World War II. The economic strength of a country influences its currency's value. The more informed traders are, the more they can protect themselves to the risks and shield against the changes (Investopedia Staff, 2011).

3.2.5 Financial and economic policy

Milton Friedman, a Nobel Prize winning economist, affirmed that the performance of the economy and trading markets did not show a positive correlation with each other (Froot & Stein, 1991; Schwab, 1996). Though this may be true, in the long run it becomes important for investors and traders to determine the connections between the two, as well as their distinguished influences on one another (Schwab, 1996).

Any macroeconomic event may affect the markets in such a way that financial systems are also influenced (Mun, 2011). Companies and industries, participants in the economy, are in a constant state of alarm (Friedman, 1953; Schwab, 1996). Any movement in the economy will affect the companies and industries and this will allow traders and investors to determine the influences of any possible price movements on their income and cash flow (Friedman, 1953; Schwab, 1996; Rao, 2012). All industries and companies are affected by the changes in demand and supply for their products (Friedman, 1953; Spall, 2009). Supply and demand are both very fickle concepts and cannot be predicted accurately in economies or markets (Umstead, 1977; Schwab, 1996; Masih, 2010). This unpredictability is caused by the amount of open positions a bank is willing to hold in a day, bank trading times, the role of a market or currency, effects that substantial exchange movement (profits or losses) have on markets (Einzig, 1969), a growing economy, improved profit and trends in markets (Schwab, 1996; Masih, 2010). These market trends, which are caused by traders and investors, create the levels at which certain market prices are set.

The supply of money, which is a major factor of price setting, is controlled by the government. The government can influence relative prices by adapting laws, policies and taxation rates (Schwab, 1996). Determining the health of the economy helps traders and investors to predict changes in government policies, interest and exchange rates, organisational profits and numerous other factors that influence markets and investment decisions (Schwab, 1996). Certain government and agency reports, which are released at specific periods during the year, are key concepts to determine an economy's health. According to Schwab (1996) the governmental reports are:

3.2.5.1 Employment releases

Employment releases are used to determine industrial production, personal income and even the gross domestic product. Creating jobs is an important start to improving personal income. When improvement is moving upwards, it is bullish; for the economy as well as the markets. However, if unemployment occurs, markets tend to become apprehensive, because costs of appointing and hiring increases,

which leads to higher production costs and increases in inflation. All this leads to higher interest rates which reflect badly on markets (Taulbee, 2000).

3.2.5.2 Retail sales

Retail sales examine the consumer sector and some economists believe it is a measure of the overall economy. If retail sales are lower than expected, it will indicate a weakening economy and influence the markets negatively.

3.2.5.3 Inventories

Business inventories show the consanguinity between sales and production. Inventory shows the health of manufacturing in the economy by indicating the amount of assets available for trade.

3.2.5.4 Housing-starts and building-permits

Housing-starts and building-permit show a demand in building and indicate a buying economy. Buying and filling houses with furniture, appliances and the necessary resources indicate a growing economy which will also influence the markets positively (Duca, 2007).

3.2.5.5 Consumer Price Index (CPI)

Consumer price indexes (CPI) are used as an aid for pricing securities, setting wages and adjusting lifestyle costs. This causes traders and investors to be careful of CPI changes which might affect the money supply in a negative way (Taulbee, 2000).

Taking all these major economic instruments into account, can improve a trader's market analysis and allow investors to make better investment choices by determining the health of an economy (Schwab, 1996). For this reason, traders and investors see the economy as the master of markets. Despite markets affinity to

move in various directions, the economy still governs the degrees of variation (Bloch, 2011).

3.2.6 Political events

A country's elections are seen as a possible case of political unpredictability, which can lead to currency volatility. Traders will contemplate pre-election polls to determine if the election will have a positive or negative effect on the currency of the economy. An unexpected election inflicts disaster on a currency. It creates a precarious currency and political health. In such instances not even a positive, new government will change traders' minds (Investopedia Staff, 2011).

3.2.7 United States Dollar movements

Ninety percent of trades in the foreign exchange market include the USD. The United States' economy makes up 20% of the world's total gross product. It is the largest economy with the fourth largest workforce in the world and is the largest trading partner for many other countries (Tilkin & Epstein, 2007).

A financial market is where supply and demand for a certain product intersects (Fimarkets, 2012). These markets play a very important role in an economy's growth. Financial systems that are fragile and weak, lead to a nation that is susceptible to risks of international capital flows (Fimarkets, 2012). This affects the wealth of an economy and aggravates the expenses of any financial crisis that takes place (Fischer, 2003). From this, traders and investors can tell that a bustling financial market and dependable financial system is needed for a growing economy (Fimarkets, 2012).

The role of any financial system is to find a midway between borrowers and lenders, supplying them with various options with conflicting risks and returns and lending a hand to investor's financing. A financial system takes into consideration the risks and returns borrowers and lenders are willing to take with regards to a specific project. Judging the different risks and returns decreases costs and helps allocate

the quota of risks in the economy. All of this expands the capability of the investment process (Fischer, 2003). The economic growth rate will also increase with an effective financial system. The more effective the financial system, the more the growth rate will increase (Fischer, 2003). An improvement of economic growth can cause productive investments, trades and business mergers of human and physical assets (Jalloh, 2009). Moderate and liquid markets also aid the transmission of monetary policy to the economy, provide information on future interest rates and improve the composition of financial assets (Sedlabank Islands, 2008).

3.3 Exchange rate systems

The economy of a country is largely based on the exchange rate policies and regimes the country uses (Potgieter, 2005). The international monetary systems and exchange rate regimes have a very narrow relationship, affecting each other in various ways (Zhang, 2001). It is indicated by Chacholiades (1990) that economic policy-makers take into account the current exchange rate regimes of countries. Every country has an exchange rate which is a summary of decisions taken by the market participants, influenced by politics and economic indicators (Van Bergen, 2004).

Before the First World War, there were fixed exchange rates tied to international gold standards, but as the Bretton Woods System (see section 3.3.1.4) took its toll, countries started to indicate losses in their balance of payments. This caused countries to look for different monetary policies and exchange rate regimes (Van der Merwe, 2003). The suitable system for a country depends on the country`s history, background, economic stance and appropriate currency area (Edwards, 2001).

These exchange rate regimes can be classified according to their flexibility and their volatility; in other words fixed exchange rate regimes or floating exchange rate regimes (Zhang, 2001). The extent of elasticity of monetary systems is used to group these different regimes. The currency prices of countries are determined according to the setup of each country’s laws and policies. These laws and policies

are what determine the amount of movement in a floating exchange rate (Chacholiades, 1990).

Various countries use the floating exchange rate nowadays, because it allows the flexibility of transactions between countries. Exchange rate regimes are determined through different circumstances in countries, and the best currency part principles (which includes its history), should be taken into consideration (Potgieter, 2005).

It is the intention of this section to explain in detail the fixed and floating exchange rate regimes. Firstly, a historic outline of the exchange rate systems is given. The section begins with the fixed exchange rate regime with the Gold Standard at the forefront, moving on to the Bretton Woods Agreement, the European monetary system and finally the beginning of floating exchange rate systems. The next section then follows with the South African exchange rate regimes.

3.3.1 Fixed exchange rate systems

Traces of the “classical gold standard” have been found as early as the nineteenth century (Zhang, 2001). In this period all the trading countries tied their currencies to their gold resources and gold was exchanged freely. This all changed due to the World Wars and countries pegged their currencies to the USD and the United States were prepared to trade gold at the set price of USD 35 per ounce. In 1979 the European countries tied their exchange rate regimes together and this formed the European monetary system (Potgieter, 2005). Nowadays countries are left to choose the exchange rate regime best suited for their needs (Zhang, 2001).

3.3.1.1 Gold Standard Period

Gold has been mined for thousands of years. It started in Egypt in 2200 BC and uses for gold existed in Egypt as well as Mesopotamia, where ornaments, jewellery and decorations were made (Walker, 2011). The coinage of gold originated in Turkey and Persia became the universal exchange for barter (Walker, 2011). Gold usually was the focus point for many wars, where the victor won the valuables.

Rome introduced the first currency of gold (Walker, 2011) and so the gold standard resolved that all currencies were coupled with the amount of gold riches a country had (Potgieter, 2005). This caused unhindered exchange of gold. The gold standard is well known through the centuries; this was the period where barely any capital activity took place. Gold was sold at a fixed price for each country and all clandestine citizens could exchange gold freely. The gold standard's main focus was that exchange rates were fixed. This standard influenced the price activity and thus evened out payments. To achieve payment balance is to ensure that the countries' imports and exports even out. With this standard, countries seldom had any disagreements about the value of transactions, laws and policies of countries exchange customs. The price-specie-flow mechanism of the gold standard was implemented to eliminate the exchange report shortage, which occurred when the imports exceeded exports (Chacholiades, 1990; Potgieter, 2005).

Certain nations had limited gold resources, which in turn caused discrepancies to appear. Any losses were said to be paid in gold, but countries did not all have the same amount of resources. This led to various losses that had to be changed and corrected. The only way to do this was to adjust the gold standard's policies for a debit country and a credit country. A debit country should have put more limitations and laws on their credit policies and credit countries should have loosened up their credit policies (Potgieter, 2005).

The Gold Standard reigned for four decades by which time the insecurity and exposure of exchange rates were decreased and intercontinental focus and international welfare was encouraged (Chacholiades, 1990).

In the 1880s Great Britain played an enormous role on the Golden Standard as a result of its influential industrial and economic interactions. London was the epicentre of world trade and Sterling's value became synonymous with the value of gold. This caused London to have large amounts of sterling balances and led Britain to a free exchange regulation, where the country acted as the only remaining option in periods of exchange crises (Hill, 1999; Potgieter, 2005).

But the Gold Standard wasn't implemented in smaller countries before World War One. The underdeveloped countries had fluctuating exchange rates due to foreign supply and demand for certain products and disruptions in capital flows (Potgieter, 2005). After the World Wars took place it became impossible for the Gold Standard to function, because it did not fare well in environments with shocks. This Standard functioned in conditions where there were largely no risks or exposures to the market. After the First World War and the 1930s' Great Depression, exchange rates moved in chaos (Potgieter, 2005).

3.3.1.2 Factors affecting the Gold Standard

The 1930s Great Depression led to certain countries drifting back to the Gold Standard. The Great Depression went hand in hand with few trades, decreased progress, bank closures and an unemployment level shooting through the roof. Countries tried to decrease unemployment numbers and bring their economies into balance, but this took some time and caused global cooperation to fall to an unsurpassed low. This sent the world countries into a panic and caused them to either anchor their exchange rates or leave their exchange rates to float freely. In 1936 the Tripartite Agreement was signed by the United States, Britain and France. The Second World War interfered with this agreement and the restructuring of the global monetary systems were delayed until after the war (ITRISA, 2000; Potgieter, 2005).

In the interwar period, the aggressive nations stopped the exchange of gold into their currencies and placed restrictions on their gold exports to guard their gold reserves. Certain countries had to make use of their gold deposits to fund the war. Due to this, central banks secured gold reserves and currencies could no longer be converted into gold (ITRISA, 2000; Potgieter, 2005).

Supply and demand conditions ruled the foreign exchange market and established that private individuals were still able to trade paper currencies. This changed the fixed exchange rate to a floating exchange rate in most countries and, after the dismissal of the Gold Standard; the exchange rates of the countries became extremely volatile, leading to spikes in inflation. Many countries felt that this was a

short term agreement and that the Gold Standard should be reinstated, but gold became a scarce resource and shortages took place. The change of Sterling into gold took place in 1925. This started a mad rush of countries returning to the Gold Standard or rather a standard where gold and currencies were used as resources to exchange. This system was ineffective due to the fact that countries could not coincide on the value of foreign currencies. Some countries wanted their currencies to be as low as possible to improve their exporting competitiveness. Currency prices differed in this period, where some countries allowed floating rates to govern their exchanges and others fixed their exchange rates at particularly determined levels through the interference of the governing law. This caused various countries to indicate balance of payment profits and losses and the under and overvaluation of the different countries' currencies (Chacholiades, 1990; Potgieter, 2005).

In 1931 Britain had to stop the conversion of their currencies due to lack of resources. This caused the systems to fall again and divided the world into three blocks: the Sterling block situated around Great Britain, the United States Dollar situated around United States and the Gold block situated around France and its colonies. All the remaining countries discarded their conversions in total and rather focussed on installing accurate exchange controls (Potgieter, 2005).

3.3.1.3 Turning away from the Gold Standard

In 1944 a conference was held in Bretton Woods, New Hampshire, USA where countries tried to reform the global monetary system. Off these countries the United States, South Africa and the United Kingdom were involved. These countries painstakingly considered two options; one formed by Lord John Maynard Keynes and the other created by Harry Dexter White of the United States Treasury (Chacholiades, 1990; Potgieter, 2005).

Lord Keynes suggested the creation of an amalgamation that would supervise overdraft facilities as well as produce resources. The amalgamation would make use of a unit called the Bancor which will enable them to provide liquidity in the markets and require borrowers and lenders to pay interest on their accounts. This would have required profitable countries to carry a major part of the adjustments

(Potgieter, 2005). The other option to be considered was the Bretton Woods System also known as the White plan. This plan was chosen and implemented in the world economy from 1944 until 1971 (Potgieter, 2005).

3.3.1.4 Bretton Woods System

It was only after World War II that the Bretton Woods System became popular. The Bretton Woods System required that there should be a global organization that controls the Bretton Woods System and this organisation should have specific rights and powers given to it. This organisation would consult on global matters that related to any monetary matters that could influence the world economy. These organisations were the International Monetary Fund (IMF), which guaranteed that countries had a certain set of laws to follow when they practiced foreign exchange transactions and gave countries assistance when countries struggled with their balance of payments, and the World Bank that ensured an increase in economic growth (Potgieter, 2005; Jones & Jones, 1987).

This was the policy of demeanour after World War Two. "Fundamental disequilibria" – which is said to the continuous profits or losses on the balance of payments - allowed fixed exchange rates to be adjusted, if the IMF agreed that the currency could be changed to its par value if the change was more than 10%. The Bretton Woods System required a fixed exchange rate system controlled by the IMF. In other words countries had to fix their currency's value to the countries gold reserves, but no exchange of gold was required. Foreign exchange transactions were not allowed to be restricted or limited in any way, because this would waste the efforts of the new system. Gold and other currencies was given a fixed price set in United States Dollars as the Dollar was the only currency still convertible into gold (Jones & Jones, 1987; Potgieter, 2005).

3.3.1.5 The fall of the Bretton Woods System

In the 1960s the United States had an increased loss on its balance of payments due to the Vietnam War. International trade was growing at a faster rate than what gold could be produced and thus, Special Drawing Rights (SDRs) were issued to affiliate

countries. SDRs were used as reserves for foreign exchange and gold, but were not represented by gold. They were backed by resources made by the IMF. This right allocated a simulated value that related to the average of the world's main currencies. A SDRs assigned to affiliates were proportional to the affiliates' amount of resources. These rights took some weight off of the USD, but in the 1960s countries started to doubt the ability of the United States Dollar to convert and rather held other major currencies for fear of the devaluation of the USD (Eichengreen, 1993; Van der Merwe, 2003; Potgieter, 2005).

In 1971 the United States Dollar was devalued and currencies were asked their permission to revalue the USD. This caused the Bretton Woods System to fail, but it could have been prevented had the States' inflation rate been lower and had the country not shown a balance of payment loss (Potgieter, 2005).

3.3.1.6 The Smithsonian Agreement

A floating exchange rate system did not start immediately. The Smithsonian Agreement was first formulated by the Group of Ten, which were Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, UK and the USA. This agreement provided that the price of gold be increased and that the USD would still be used as a reserve currency. The USD was devalued with almost 12% and the other currencies were overvalued to realign with the USD. Floating exchange rates were increased to 2.25% to cope with the volatility in the foreign exchange market (Potgieter, 2005).

The Smithsonian Agreement caused the Sterling to return to a floating rate and the price of gold had to be increased in 1973 from USD 38 to USD 42.22 an ounce. In 1973 exchange rates started to float again and a system of controlled floating exchange rates pursued (Potgieter, 2005).

3.3.1.7 European Monetary System

In 1979 the European monetary system (EMS) came into being due to the fall of the Bretton Woods System. The European countries decided on the system, because

chaos in one of these countries can cause problems for the rest of the countries. The EMS creates a fixed exchange rate and causes the European countries' currencies to fluctuate opposite the USD. Countries part of the EMS includes Belgium, Denmark, France, Germany, Italy, Ireland, Luxembourg and the Netherlands. The EMS led to equilibrium and stability to these countries' economies in times of chaos and caused the Euro to become a very popular trading currency in the modern world (Zhang, 2001).

3.3.2 Floating exchange rate systems

The supply and demand in a market determines the exchange rate and central banks are only authorised to intercede to reduce large fluctuations in the rates (Potgieter, 2005). Exchange rate began to float in the 1970s (Bailliu & King, 2005). It was also during this time that traders felt it necessary to determine the exchange rate regimes that ought to be used (Bailliu & King, 2005).

In 1971 the expenses of the Vietnam War on USA, there were more dollars in circulation than were backed by the USA gold reserves (Jones & Jones, 1987). This decreased the dollar's value, as other countries lost their faith in its strength (Jones & Jones, 1987). It was in this time that President Nixon declared that the dollar would not be backed by USA gold reserves anymore (Jones & Jones, 1987). This caused the exchange rates to float relatively free since 1973 (Jones & Jones, 1987). It is during the floating stage of the exchange rate that risks started to increase, due to economic supply and demand in the markets (Jones & Jones, 1987). It is these risks that may be decreased by companies through hedging.

The IMF met in Jamaica to discuss the new floating exchange rates and their role in the new system. Gold was no longer used as a resource asset and affiliate countries made contributions to the yearly IMF quotas of USD 41 billion. Countries could now decide which system works the best for their economy and use it as their exchange rate system. Countries were advised to use economic laws and regulations that would lead to monetary balance and stability (Potgieter, 2005).

3.3.3 Summary of Section 3.3

There have been various exchange rate regimes, but the two main categories are fixed exchange rates and floating exchange rates. Fixed exchange rates started in the 1870s where exchange rates were fixed on the Gold Standard. This later changed to the Bretton Woods System, which ended in the 1970s. It was after the dismissal of the Bretton Woods System that countries, such as South Africa, mostly left their exchange rates to float (Potgieter, 2005).

3.4 South African exchange rates and exporting industries

South Africa is the largest producer of raw materials in the world and has a very long history of exchange rate systems (Zhang, 2001; Potgieter, 2012). To manage the exchange rate is an important aim for the changing conditions in the South African environment, especially the forces which influence exporting and importing companies. Such forces include exchange rate growth over the long run, the real exchange rate in relation to the symmetrical real exchange rate and its consistency, gold price changes, political crises that led to capital outflows and amplified endorsements (Potgieter, 2005).

The South African Rand (also known as the ZAR) underwent major movements in 1970-1995 due to South Africa's political stance and the shocks to gold prices (Van der Merwe, 2003). South Africa was also influences by the crises taking place all over the world, for instance the Mexican crisis in 1994 and the Argentine currency crisis in 2001 to 2002 (Savastano, 1999). In 2000 a formal inflation method as well as floating exchange rate system was adopted in South Africa. Though this did stabilise the ZAR somewhat, the ZAR was still expected to depreciate, but in the beginning of the 21st century, nominal effective exchange rates increased by 26% and in 2002 the ZAR improved after 30 years of struggle (Van der Merwe, 2003), which was an excellent sign for companies in South Africa.

3.4.1 History of South African exchange rates

Major blows were experienced in South Africa between 1970 and 1995. These influential forces were South Africa's political stance at the time and the movements in the price of gold. After the Sharpeville slaughter in 1960 the country experience capital account losses (Potgieter, 2005).

The South African Reserve Bank (SARB) protects the trade of ZAR as a commodity and can also influence the movement of ZAR if it buys or sells ZAR on a large scale. The balance of payments is where the ZAR is influenced by importing and exporting prices as well as changes in volumes of trades. Balance of payment is the global transactions between a country and the world (Scott, 2004). Every transactions in divided into a debit and a credit part of the exact same amount and this causes a balance of zero. This is known as a double-entry system in accounting (Scott, 2004). The balance of payments is divided into existing accounts (all commodities are included in this section where they are only traded in a normal transaction and serves as an indication of supply and demand), monetary accounts (these accounts are categorized according to the function or category of investment), funds transfer accounts (these accounts indicate commodities that were previously a part of the existing accounts) and global investment arrangements (which are all other forms of investment). The BOP has an impact on the foreign resources of a country. Resources are in balance in a floating exchange rate regime, because in a fixed regime all the movements fall on the authorized resources. Exchange rates were controlled when authorized resources changed within a year (Scott, 2004).

South Africa has experienced four major phases of exchange rate regimes. Direct monetary management was implemented in the first phase, were there was still a desire to keep the exchange rate fixed and stable (Van der Merwe, 2003; Potgieter, 2005). The South African system of exchange rates was firstly based on the Gold Standard which lasted for 40 years from 1874 until 1914, but this phase was unsuccessful with regards to economic and employment growth. The second phase included the interwar period and the time it took the countries to recover from the wars. This was from 1922 to 1963 and set a money supply target (Van der Merwe,

2003; Potgieter, 2005). The Bretton Woods System started the third phase and it subjugated for the 8 years after the second period until 1971. This phase controlled floating exchange rates and concentrated on inflation. The political stance of South Africa was also restructured and led to better changes and conditions in the country. But this phase had to be stopped due to malformed local interest rates, discouraged foreign savings and prominent costs. In the fourth phase, which was between 1985 and 1994, a floating exchange rate regime was implemented and formal inflation levels were set (Van der Merwe, 2003; Potgieter, 2005). The ZAR was devalued against the major currencies, but in 1994 a floating exchange rate system was adopted to return South Africa to the line of international trends.

3.4.2 Volatility of the ZAR

During 1970-2000 the South African Reserve bank implemented a variety of exchange rate regimes (Jonsson, 2001). In the 1970s the ZAR was attached to either the USD or the Pound Sterling with the SARB making changes on the ZAR whenever they felt fit to do so through distinct step changes (Jonsson, 2001). In the beginning of the 1980s a change in the exchange rate regime was made and an indirect control of currency provision was implemented (Jonsson, 2001). At 1985 South Africa's political stance caused great problems and led to a debt standstill (Jonsson, 2001). After the elections in 1994 liberalisation took place and exchange rates were united (Jonsson, 2001). Exports and imports increased due to trading that became cheaper and inflation was controlled (Jonsson, 2001).

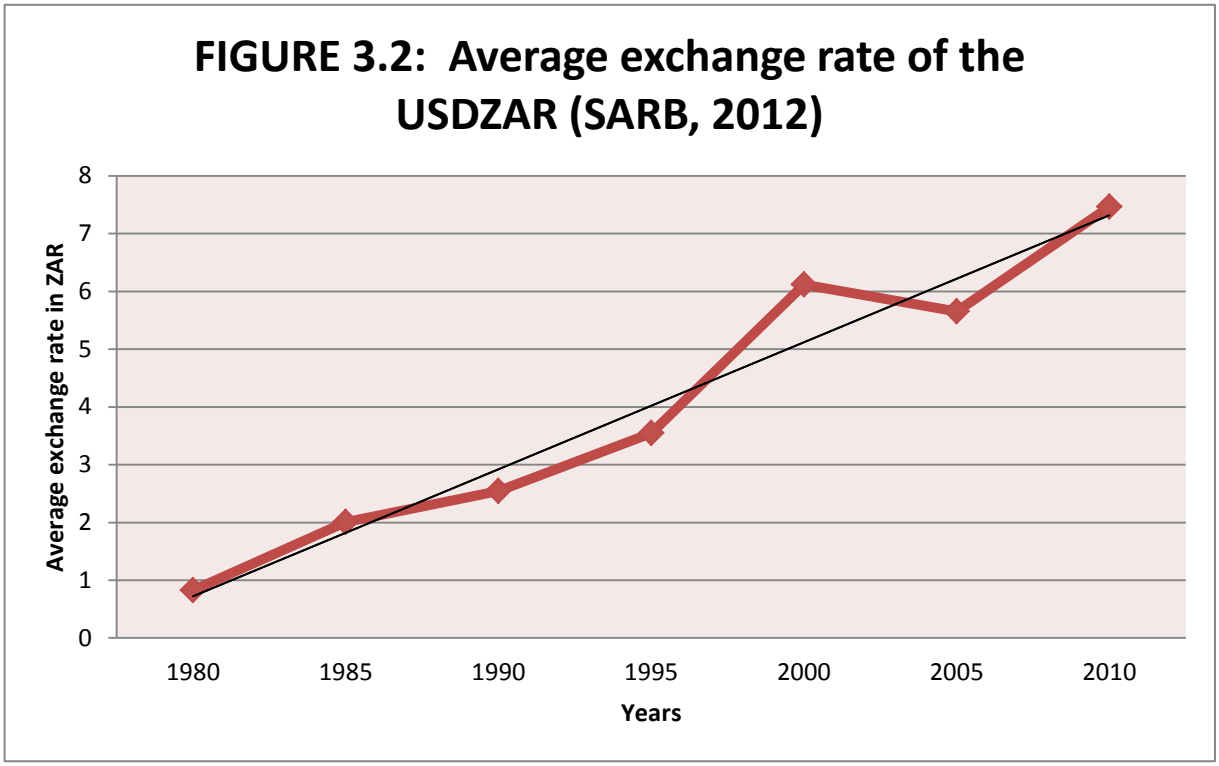
This all lead South Africa to having the biggest economy in Africa with a focus on tertiary sectors and major benefit in the production sector of the mining, agricultural and manufacturing industries (IMF, 2010). According to IMF (2010) average USDZAR exchange rates for the past couple of years are indicated in Table 3.1.

TABEL 3.1: AVERAGE USDZAR EXCHANGE RATE (IMF, 2010)

Years	USDZAR
1980	ZAR 0.8267
1985	ZAR 2.0052
1990	ZAR 2.5419
1995	ZAR 3.5486
2000	ZAR 6.1188
2005	ZAR 5.6497
2010	ZAR 7.4620

In Figure 3.2 there is an indication of an upwards trend (see the red line), which signals a depreciation of the ZAR against the USD. The major movements in the ZAR exchange rate were due to the crises taking place around the world (Potgieter, 2005). According to Hodge (2005) the ZAR exchange rate has depreciated four times and appreciated twice in the last 20 years. The 1997 Asian financial crisis led to the first main depreciation of the ZAR. The second was in 1998 followed by the ZAR's biggest drop in 2001 and then in 2007 the world financial crisis led to another decrease in the value of the ZAR (Zhang, 2001, SARB, 2012).

FIGURE 3.2: Average exchange rate of the USDZAR (SARB, 2012)



3.4.2.1 1997 Depreciation of the ZAR

In this first major depreciation of the ZAR it had depreciated by 18.7%. This was mainly caused by the first growing account loss in over ten years. The South African Reserve Bank estimated that the loss could have been managed with the surplus portfolio capital of ZAR 13.4 billion, but the foreign exchange outflows of ZAR 10.3 billion which weren't recorded countered this affect. This caused the SARB to influence the forward exchange market and control the ZAR exchange rate; helping the ZAR back on its feet and appreciating again (Zhang, 2001).

3.4.2.2 1998 and 2001 Depreciation of the ZAR

The Asian financial crisis countered this appreciation of the ZAR and caused it to depreciate again in 1998. Many economists believed and hoped South Africa would go through the crisis unharmed, but the crisis still influenced the ZAR negatively. The current account loss was still growing and foreign investors started to withdraw their money to invest in first world currencies like the pound sterling or the USD. This started of the fall of 2001 in the ZAR which was the biggest fall in the ZAR's history (Zhang, 2001).

In this period the ZAR fell with 26.9%. This was mainly caused by speculation in the ZAR where the aim was to depreciate the ZAR. Again investors withdrew their investments and the ZAR fell. After this major move he ZAR equalised due to an encouraging trade performance (Zhang, 2001).

3.4.2.3 2007 and 2008 Depreciation of the ZAR

In 2007 the global financial crisis struck South Africa again and caused yet depreciation in the ZAR's value. The crisis led traders in the foreign exchange market to decline and made investors withdraw their investments yet again (Zhang, 2001).

3.4.3 South Africa's extractive industry

In 1886 gold was discovered in South Africa. This country became one of the world's biggest gold deposits and it is also renowned for its precious metals. South Africa is one of the largest producers of platinum, diamonds, chrome ore, vanadium, titanium and coal (Tarring & Robbins, 1983; Hausmann & Klinger, 2008; SAinfo, 2012). The range of South African minerals covers all the main categories of resources, namely valuable metals, energy minerals, non-ferrous metals, ferrous minerals and industrial minerals (SAinfo, 2012). The mining industry influences the economy in an exceptional way; creating jobs and increasing foreign exchange profits. One-third of the JSE's capital is formulated by the South African extractive industry. This entices other countries to invest in South Africa. Gold, coal and platinum is South Africa's main form of mineral sales (Potgieter, 2012; SAinfo, 2012).

Certain traders are fearful to trade with developed countries, because they are more prone to bend the rules when the markets do not move in their favour (Tarring & Robbins, 1983). Many traders feel precious metals are a form of investment, which may lead to affluence and riches. The volatility of the precious metal markets have increased extremely over the years (Tarring & Robbins, 1983). Gold is mostly kept as investment and is mostly produced in South Africa and Russia. Traders have tried to demonetise gold, but it has been used for trading purposes for 6000 years and this creates an extremely old tradition which is hard to forget (Tarring & Robbins, 1983).

The mining industry is home to many top-ranking companies, creating wealth and employment (Spall, 2009; Ford, 2011). Traders of metals have a very important responsibility to ensure that any losses which may occur during a buying transaction, is to their benefit and, when the roles are reversed; in other words the trader is selling; there will be a profit made (Tarring & Robbins, 1983). This responsibility of the trader creates a need for forward trading and hedging contracts, especially in volatile trading markets (Tarring & Robbins, 1983). Precious metals such as gold and silver perform well during short periods of uncertainty, but are appalling investments. They do not issue dividends and rarely lead to very high profits (Tyson,

2003). Traders should be certain, quick and realistic in trading metal as this will eliminate some of the risks (Tarring & Robbins, 1983). To stop possible financial problems, traders require a letter of credit for 80% to 100% of the value of the metals promised on the shipping document (Tarring & Robbins, 1983). The future mining and refining capacity plans increase the difficulty of price volatility. Prices of metals have increased in volatility owing to the increase of tonnage and metal consumption due to certain technological improvements (Tarring & Robbins, 1983). Volatile prices require swifter decision making and improved communications (Tarring & Robbins, 1983).

South Africa is a first class mining country which has been the major gold country for the past 120 years. The JSE was created to fund the mining sector in 1887 and has only grown from there. Huge publically listed companies, companies which produce gold as a by-product of their specific mining; subsidiaries of the larger companies and small mining companies are the sub-sectors South African mining is divided into. Not only did mining improve South Africa's economy as a whole, but it also led to other industries' improvement, for instance financial services, engineering services and geological and metallurgical services (Tarring & Robbins, 1983; Short & Radebe, 2008; Potgieter, 2012). South Africa does try to keep the price movements of gold stable through mining low grade ore when prices are high and selling high grade ore when prices decrease (Tarring& Robbins, 1983). Platinum group metals are also widely distributed across South Africa. In South Africa and the USSR platinum group metals are found in large quantities, where in Sudbury and Canada it is a by-product of nickel (Tarring & Robbins, 1983). 80% of platinum is recovered in mines of South Africa and Russia (Tarring & Robbins, 1983).

3.4.4 The exporting extractive industry of South Africa

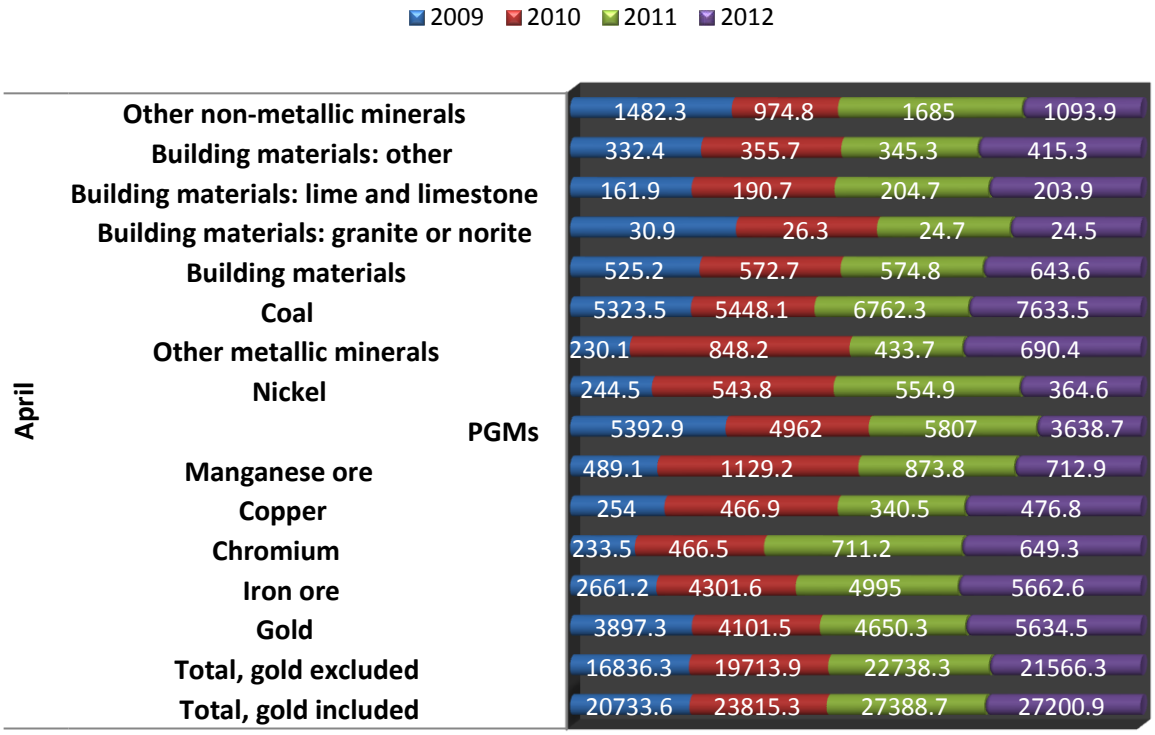
Exporting is the selling of domestic products and services to foreign companies and countries. According to statistics, South Africa exported resources valued at ZAR 61.7 billion in June 2012 (South Africa Exports, 2012). Because South Africa is such a resource rich country, it is one of the main exporters of gold, diamonds, platinum and coal to the US, UK, China, Germany and Japan (US Commercial Service, 2011;South Africa Exports, 2012).

In 2011 the estimated export amount was set at USD 94.21 billion (2010 was USD 85.7 billion) setting South Africa in the 42 place in comparison to the world. South African imports were set at USD 92.86 billion in 2011 (USD 81.86 billion in 2010) placing the country 35 in the world (CIA, 2012). South African exporting partners include China (15.8%), USA (9.5%) and Japan (8%) in 2011 year. South Africa's reserves of gold and foreign exchange were USD 50.26 billion in 2011 and USD 43.83 billion in 2010 placing SA 34th in the world.

South Africa's imports are inelastic to changes in income and price movements, but elastic in export demand (Narayan & Narayan, 2010). South Africa's exports should have increased over the years, but the lack of organised renovation led to its current suffering state of exporting (Hausmann & Klinger, 2008).

Income in the mining is mostly due to the sale of coal (ZAR 7,633.5 million), gold (ZAR 5,634.5 million), iron ore (ZAR 5,662.6 million) and platinum group minerals (ZAR 3,638.7 million) as indicated by Figure 3.3.

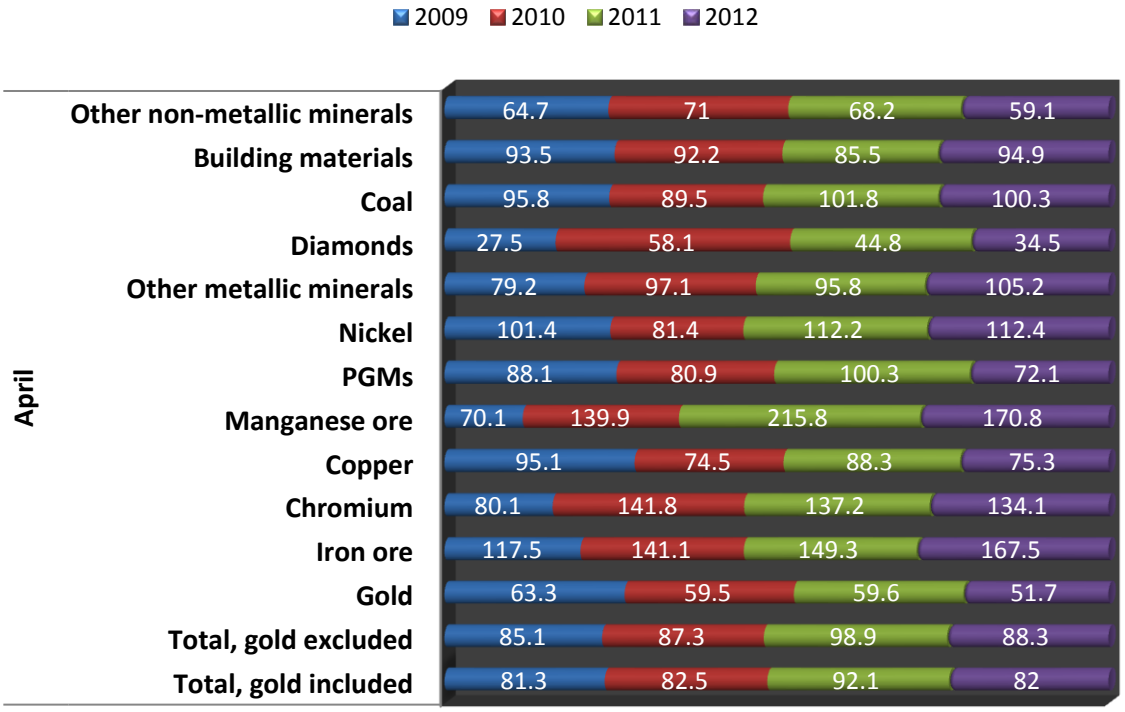
FIGURE 3.3: Sales at current prices of April in ZAR million



Own source

Manganese ore, iron ore and chromium are the minerals that were most widely produced in 2012 as shown in Figure 3.4.

FIGURE 3.4: Volume of mining production base 2005=100



Own source

3.5 Risks related to exports in the extractive industry of South Africa

Exchange rate risk, also known as currency risk, is due to the changing nature of the exchange rates. Though the words exposure and risks is used interchangeably; currency risk and currency exposure are two different terms, where currency risk is the changing value of a company due to changes in exchange rates and currency exposure is the amounts of assets values in foreign currencies at some future date (Scott, 2004).

In the 1970s exchange rate risk and the controlling thereof was seen as crucial for the use and securing of assets, including the preparation and performance of exporting companies. Due to all the currency crises in the 1990s risk management became a hot topic. Markets change because of globalization, improved technology

and communication, mergers and political environment. Exporting to various foreign countries allows companies new funds, information, understanding and growth, available calculated and tactical moves. All these factors should be considered when deciding the analyses to use and the control measures used with regards to risk management (Scott, 2004).

Exposure can be classified as credit exposure, market exposure and active exposure. Credit exposure exists due to trading partners not having enough funds to satisfy their obligations. Market exposure is the activity in the market prices affecting a company's financial position. Active exposure includes all the other types of exposures not covered in the aforementioned two classifications (Scott, 2004).

In the current trading world companies are ever more in reliant on the exchange rates of the currencies in the transactions. Taking into consideration the forces influencing the exchange rates of a country can make the forecasting and prediction of the currencies much easier (Scott, 2004). The main aim of traders is to protect themselves and their profits against exchange rate volatility (Mathur, 1982). Traders use money to create an opportunity to make profits in the future (Blake, 2000). Risks can be caused by many things and that is why investors and traders divide it into two types of risks: transaction and translation risks (Mathur, 1982).

The most common risk which traders should look out for is transaction risk. This risk is found where any transaction is completed with currency (Valdez, 2007; Kaye & Giannone, 2010). Between the different dates of a currency, markets or exchange rates may change. In other words there is an increase or decrease in the exchange rate. This leads to transaction risk (Mathur, 1982; Coyle, 2000; Kaye & Giannone, 2010). Translation risk is mostly found in the financial statements of a company with parents or affiliates, where exchange rates cause differences in companies' valuations (Mathur, 1982; Coyle, 2000; Valdez, 2007; Kaye & Giannone, 2010). This risk affects the balance sheet of a company. Understanding the risk is the first step in limiting it. Traders should always keep in mind their affinity for risks (Valdez, 2007; Kaye & Giannone, 2010).

3.5.1 Main causes of risks

The prices of stocks or currencies reflect all available information that might influence the market (Newbold, Wohar, Rayner, Kellard & Ennew, 1998). Different countries and states are influenced by factors related to macroeconomics across borders. This causes different types of risks in different countries especially regarding exchange rates (Grant, 2010; Mun, 2011). Exchange rates and the exporting of commodities have many different types of risks due to their volatility, such as transaction costs, storage costs, handling costs, taxes and government risk (Robinson, 1981; Adam-Müller, 1997; Blake, 2000, Cluchier, 2009). Some of the most important economic indices are foreign exchange rates (Yao & Tan, 2000). United States news affects the foreign exchange extremely (Neely, 2011). The foreign exchange market is volatile due to general association in market prices (Neely, 2011).

Due to the start of floating exchange rates in 1971, companies should protect themselves against these floating exchange rate fluctuations, through hedging (Jones & Jones, 1987). Taking a look at foreign exchange markets, companies should not just take into consideration the exchange rates, but also the different countries cultures, decrees and regulations and the finances as well as the levy of different foreign country with which to trade (Jones & Jones, 1987). Exchange rates are influenced by time, which is one of the factors that create the volatility in a market, because it creates a chance for the rates to move. For a hedge to be successful it should first be used to protect against a risk that is appropriately recognized and measured and calculated.

3.5.2 Decreasing risks

Both traders and investors aim to predict their future profits, but the disclosures of foreign exchange currencies as well as their hedges are horrifying. Investors and traders want to understand the risks companies face when dealing in imports and exports and also any information companies have on their hedges (PWC, 2012).

High risks lead to higher returns. Risk can be minimised, but not eradicated (Tyson, 2003). To reduce risks in financial markets, there should be better organisation and management between monitors of the markets (Sekirin, 2012). Traders transfer risks between each other (Blake, 2000), but many investors and traders use risk management instruments to protect them from volatility and this creates a constant globalisation (Kaul, 2006). Risk is created by globalisation, but it can be managed through economic sincerity and eminent financial market union (Kaul, 2006).

There are many ways to reduce risks, but hedging and forecasting the markets are the most widely used. Firms that export and have international investments, hedge their instruments to protect against risk (Adam-Müller, 1997; Cornwell, 2007; Hummels & Schaur, 2010). Traders would rather hedge risks, before they accept the exposure and lose profits (Hummels & Schaur, 2010). Countries that are major exporters face huge risks, because of the long shipping times. This causes profits to decrease due to volatile demand in markets and exchange rates (Lipton, 2005; Hummels & Schaur, 2010). Emerging market currency-hedging is very expensive (Cornwell, 2007; Kim, 2012). The hedging of currencies is where a forward of foreign currency is sold. Due to the high costs of hedging emerging market currencies, traders are reluctant to do so (Kim, 2012). Some companies would rather face the volatility of markets than pay the costs of hedging (Cornwell, 2006). Administration costs can be reduced when abandoning hedging strategies (Cornwell, 2006). The universal and optimal hedge ratio is to hedge most of the currency risk. Kim's (2012) analysis or study shows that unhedged portfolios do better than hedged portfolios. His study also uses a carry-profit-based calculation of his results (Kim, 2012).

Traders feel that if statements include more relevant information, they can make more reliable decisions and, in this way, decrease their risk opportunities (Drees & Eckwert, 2003). Markets only reveal known information at a certain point in time and does not reflect any future data (Marshall, Young & Rose, 2006), but Cofnas (2005) states that markets have long-term memories. Present prices are linked to previous prices, but the trader does not know which previous price intervals affect the present or future prices (Cofnas, 2005). There are many forecasting analyses used to predict exchange rate expectations or movements (Chang & Osler, 1999). Traders

across the globe use analyses to predict future movements and thus increase their profits and reduce their risks. Trying to increase profits is not always going to deliver the most accurate or correct answer, but it should deliver more profit and be worth the costs. Traders and investors take a look at profitability and do not need to be perfectly accurate, but there is also no guarantee that forecasting will always be accurate and correct, that is why traders are warned to not use any money they are not willing to lose (Umstead, 1977, Chang & Osler, 1999). Traders should not just invest in one bank or keep their money in one bank, but in several banks. This will prevent a great loss for traders if a bank should liquidate. Diversifying traders' portfolios also leads to fewer risks as investments do not all face the same risks (Sekirin, 2012). To incorporate foreign exchange management effectively, a trader or investor should forecast (Prindl, 1976).

Market participants securing themselves against the effects of risks are known as hedgers (Coyle, 2000). Hedgers try to protect themselves from risks by taking contracts, known as hedges, which leads to various outcomes such as the removal of the risk or either completely or moderately avoiding the risk (Coyle, 2000). When hedgers want to conduct a hedge, they should keep in mind their affinity to risk as well as the risk which is under consideration (Coyle, 2000). Participants that do not hedge are setting themselves up for risk where those that do hedge should bear in mind the costs that the hedging brings along and state that hedging is only worthwhile if the movement of the exchange rate is unfavourable, making a profit for the hedger (Coyle, 2000).

Hedgers would like to believe there is four ways to protect trades from risks in the market. Firstly avoid risk as well as hedging at all cost; secondly decrease the probability of losses by for instance financing some procedures through the foreign exchange rate; thirdly share risks between companies; lastly is risk bearing where the company feels that the risks are insignificant and should be taken as they come (Coyle, 2000).

3.6 Summary

Floating exchange rates are volatile and almost always in imbalance. For major countries it is a norm for their exchange rates to be out of balance. The amount and number of exchange rates differ tremendously, but are reversed with no explanation why. This regime creates problems for the companies to forecast or predict the exchange rates. Companies have difficulty making accurate forecasts which leads prediction errors to be high, but not accidental (Scott, 2004).

The foreign exchange market mainly consists of companies importing or exporting. The South African exchange rate moves in very large ways and this is the usual way for this countries exchange rate to move (Baines, 1988). Companies would like to avoid these risks that are brought upon by the exchange rate that moves so drastically and that is why they incur foreign exchange hedges (Baines, 1988). South African traders can use money market contracts, forward exchange contracts or currency option contracts to hedge their risks (Baines, 1988). Supply and demand also plays a big role on the exchange rate and its movements (Baines, 1988). All costs and profits of foreign transactions are exposed to the risks of the exchange rate and it is these risks that are said to affect the profits of companies (Baines, 1988). Hedging contracts should adhere to the South African Exchange Control authorities and should coincide with the company's attitude towards risks (Baines, 1988). The foreign exchange market helps to bring together the supply and demand of different countries and can be seen as an institutional structure (Baines, 1988).

The next chapter indicates the risks management methods of hedging and predicting the foreign exchange rate to minimise the risks that exporting companies are open to.

CHAPTER 4
HEDGING AND FORECASTING ANALYSES

4.1 Hedging

4.1.1 Introduction

Hedging is the protection of a company against exchange rate movements (Baines, 1988; Soenen & Lindvall, 1992; Pircheggar, 2006) and can either be internal or external (Baines, 1988) depending on the companies' affinity for risks.

Currency risk is one of the foremost reasons companies choose to hedge and this led to the development of risk management departments in companies. According to Smithson and Simkins (2005) risk management adds worth to the organisation of foreign exchange risks. Many firms use the derivatives available to reduce the risks in currency movement as well as decrease the volatility of the cash flow in each individual company.

4.1.2 Definition and history

Hedging is a well-known risk management tool implemented by the use of a contract to secure a company against certain market movements; this assists the contract holder in preventing or decreasing any risk and may even assist the contract holder in making a profit from the contracts' translation risk (Alghalith, 2006).

Before hedging was fully understood and incorporated in risk management, market participants did not know what hedging's true advantages and disadvantages were or even how they were formed. In the 19th century future contracts were created to hedge certain agricultural prices due to their fluctuating nature. The prices differed, because of rainfall and the inconsistency of the elements (Alghalith, 2006). It is as a result of this volatile agricultural market that a variety of hedging contracts such as forward exchange contracts, future contracts and money market processes for currencies came into being. Natural hedges (two contracts taking opposing

transactions where the first contract benefits the trade and the other impairs the trade) were also formed, but mostly to improve cash flows (Alghalith, 2006) and were and still are generally implemented by consolidated companies.

In the 1970s interest rates increased and decreased extremely, which led to traders and investors finding it difficult to predict the exchange rate's future movements, causing it to disturb their financial status (Logue & Oldfield, 1977). It is during this time that the use of hedges increased, because these hedges protect the traders against the interest movement. The theoretical worth of hedging contracts in 1994 was USD 18 trillion. According to Ngugen and Faff (2003) this number had increased to an estimated USD 70 trillion by 1998 and ten years later the theoretical value was USD 600 trillion.

With the growth of hedging contracts and derivatives increasing sporadically, it is a necessity to gain an understanding as to why exactly companies make use of this instrument, the risks mostly limited by the implementation of the derivative and the hedges creating value in a firm (Correia *et al.*, 2012).

4.1.3 Hedging studies

Derivatives have been studied for their characteristics, their outcomes and effects on firm worth. Derivative usage has been studied in the USA as shown by Bodnar, Hayt, Marston and Smithson (1995), Bodnar, Hayt and Marston (1996) and Bodnar, Hayt and Marston (1998). This led to similar studies regarding the use of derivatives in companies in countries such as Australia (Berkman, Bradbury, Hancock & Innes, 2002; Benson & Oliver, 2004), Belgium (De Ceuster, Durinck, Laveren & Lodewyckx, 2000), Germany (Bodnar & Gebhardt, 1999), Netherlands (Bodnar, Hayt, de Jong & Macrae, 1995), New Zealand (Berkman, Bradbury & Magan, 1997),Sweden (Alkeback & Hagelin, 1999; Alkeback, Hagelin & Pramborg, 2006), the United Kingdom (Mallin, Ow-Yong & Reynolds, 2001; El-Masry, 2006).

All the aforementioned surveys employed the same methodology as the Wharton School surveys as done in the USA. The study was also done in South Africa (Correia *et al.*, 2012) on the same principal as above.

Various surveys have made the use of derivatives apparent in the developed countries. In 1995 only 35% of USA companies taking part in the Bodnar, Hayt, Marston and Smithson (1995) questionnaire made use of derivatives to apply risk management. In 1998 the study was updated and it found that 50% of the 2000 non-financial firms taking part in the study used derivatives. The same surveys conducted in Germany determined that in Germany the use of derivatives were 78% of all the applicable firms making use of hedging contracts to lessen risks (Bodnar & Gebhardt, 1998). In Sweden the use of derivatives started at 52% in 1999 (Alkeback & Hagelin, 1999) and increased to 59% in 2006 (Alkeback *et al.*, 2006).

As stated above by all the studies it can be seen that the growth of derivatives as the tool to manage risk has increased over the years. Larger firms tend to hedge more due to their wider expansion of risk exposure (Correia *et al.*, 2012). They tend to interact more with foreign companies causing the expanse of foreign exchange rates. The investment in foreign systems also requires the ability of companies or investors to pay on-going costs. By looking at Bodnar, Hayt, Marston & Smithson (1995), the USA had 65% of large firms and 13% of small firms making use of derivatives. In the follow-up study done by Alkeback *et al.* (2006) it indicated that of the 59% large firms in Sweden, 86% hedged. According to Berkman *et al.* (1997) 100% of the New Zealand companies were hedged and only 37% of the small firms. In 2000 this percentage had decreased to 95% according to Prevost, Rose and Miller (2000).

Emerging market and large firms tend to use hedges only for currency risk management, though there are at least three main risk categories which could be hedged. These categories are *economic risk*, which is the obligation of a country towards certain currencies; *translation risk* which is the indication of assets and liabilities in the financial statements shown in foreign currency and, lastly, *transaction risk* which is trading of countries in foreign investments and trades (Baines, 1988).

As the focus of this study is to reduce translation and transaction risk for mining and extractive companies as well as reducing some of the costs of hedging, the next section gives a description of hedges in the foreign exchange market.

4.1.4 Hedging in the foreign exchange market

When exporting or importing, companies immediately participate in the foreign exchange market; exposing themselves to foreign exchange risks. Using hedging procedures in this market can vastly decrease exposures (Baines, 1988; Chong, 2009), because traders set their contracted rates at specific levels. Many investors believe the only way to reduce their risk is to diversify their portfolio or to construct two opposing positions in the same or a uniform trade. This is known as hedging risk, where traders feel that advantages lie in the variety and number of trades (Mathur, 1982; Keasey *et al.*, 1998; Pircheggar, 2006; Cotsakos, 2000).

In addressing the abovementioned, hedging relocates risks from one trader to another, where each trader anticipates a perfect hedge which is where price movements are perfectly balanced, cancelling out each other's movements (Blake, 1990; Pircheggar, 2006). Traders can implement three hedging procedures namely currency market agreements, forward exchange agreements and money options agreements (Baines, 1988; Blake, 1990; Pircheggar, 2006). These may create one of three different hedges: a fair value hedge, a cash flow hedge or a net investment hedge (Rashty & O'Shaughnessy, 2010). These hedges are explained in an accounting context as (Tufano, 1998; Rashty & O'Shaughessy, 2010):

- *Fair value hedge*, which is a hedge that tries to decrease a certain risk which affects a certain asset or liability for a firm. It records the change in the value of the item that is being hedged coinciding with the profit or loss on the hedging derivative (Finnerty & Grant, 2002).

- *Cash flow hedge* is a hedge that protects the cash flow of an asset, liability or predicted transaction. It records the changes in the value of the item in other comprehensive income until it is recognized in retained earnings (Finnerty & Grant, 2002). This hedge protects the company against the volatility in cash flow movements as a result of future transactions (Pircheggar, 2006). Cash flow hedging may reduce the profits of shareholders due to the removal of the discipline that lends value to the managers' external financing (Tufano, 1998). Curbing risks can lead to potential profits, such as the decreasing of

deadweight costs of liquidity, taxation and protecting certain investments. Cash flow hedges have specific costs that protect the profits for managers, but not the shareholders (Tufano, 1998). These hedges are a convenient way to hedge risks and are not too expensive. If markets had no movements of forces inflicted on them, hedging would not be necessary. Supply and demand in a market does not move for the same reasons or forces and thus excesses and shortages occur (Tufano, 1998).

- *Net investment hedge* is a hedge of the risk in a foreign currency of a net investment in foreign activities.

Hedgers, some of the main participants in the markets, may implement any one of the three hedges to decrease their ownership of exposure by preparing contracts opposite to their current trades (Keasey *et al*., 1998; Pircheggar, 2006). This may lead to lower risks, but not all risks are hedge-able in a transaction, for instance transportation risk, production risk, uncertain demands and provisional risks (Adam-Müller, 2000). Often traders try to hedge against these risks, but hedging aforementioned currency risks is highly priced and costly. Not all traders and companies can afford to hedge for the whole transaction period (Adam-Müller, 2000).

Hedging uses instruments to reduce and balance out exposure of variable prices (Cusatis & Thomas, 2005). It is widely used by portfolio traders, bankers and pension fund managers. Most traders hedge, because they are not willing to bear the risks related to currency market prices. The efficiency of a hedge is how effective a hedge reduces risks in a system for a trader (Cusatis & Thomas, 2005) and should show a good understanding of mathematical finance, hedging tools and the physical application of the hedging instrument (Cusatis & Thomas, 2005).

The amount of risk a trader is willing to accept for his investment is directly linked to the amount of costs he is willing to accept (Spanò, 2004). The optimal hedging system would be the cooperation between the profits made from an investment and the influence on the internal funds (Spanò, 2004). Internal financing is very expensive and hedging is a tool to correlate investments and the financing decisions

(Spanò, 2004). Through the use of derivative markets, traders can isolate themselves from exchange rate exposure (Broll, 1997). For parties that are only partly convertible, exporting industries may use forward contracts on other financial assets (Broll, 1997). The financial assets spot rates are directly linked to the currencies in which the incomes are invoiced. This is known as cross hedging (Broll, 1997). Traders feel it is necessary to hedge some of the risks they are exposed to and thus hedge 50% of their transaction and leave the other 50% unhedged (Gastineau, 1995). However, traders are sceptic of hedges, because in the long haul they increase costs. This leads traders to diversify their portfolios (Gastineau, 1995).

Traders should choose to hedge carefully in any market (Wojakawski, 2012). Hedging of an item is influenced by the amount of risks; as well as the expected costs using hedges to settle cash flows which will also decrease costs (Wojakawski, 2012). The risk related to foreign exchange transactions is caused by future foreign cash flows being traded for home currency at a certain rate, in other words the prices for each currency (Kerkvliet & Moffett, 1991).

Industrial firms make use of the foreign exchange derivatives up to a value of $ 5 trillion (Kim, Mathur & Nam, 2006). Operational hedging in combination with financial hedging strategies intends to decrease the variability of future cash flows and induce firm value. The unpredictable currency exchange rate movements are effectively managed by hedging for importers and exporters (Kim *et al.*, 2006). Financial hedge is more for short-term hedges while operational hedges are more for long-term hedges (Kim *et al.*, 2006).

When considering hedging of an item or contract, there is certain topics to take into account, for instance agency enigmas, aligned taxes, financial harrowing costs and exposure volume limitations (Hummel, 2012). Hedgers prefer financial hedging for a short-term strategy. Currency exposures of exporters are hedged by trading in expected income from foreign sales and this depends on parallel instruments (Hummel, 2012). Hedging undergone for each currency in a portfolio is less cost-efficient than one create from a pro rata construction of the importance of each

currency to the total value of the currency portfolio (Celebuski, Hill & Kilgannon, 1990). Implementing a faulty hedge, could increase risk in a portfolio, even if the hedge reduces currency risk (Celebuski *et al.*, 1990). A foreign currency portfolio holds two types of exposure: the risk in the domestic currency and the risks affected on the volatility of the portfolio (Celebuski *et al.*, 1990).

When traders hedge, they try to decrease their foreign exchange risk which is the risk of a products value changing because of the currency`s movement (Hill & Schneeweis, 1982; Herbst & Swanson, 1991; Broll & Wahl, 1997; Chong, 2009). They strive to decrease companies risk exposure, such as interest rates, exchange rates and values of commodities (Broll, Wong & Zilcha, 1999). Hedging may be beneficial, but can also lead to extra costs (Chong, 2009). Costs may include operational and opportunity costs (Chong, 2009). Hedging costs should be minimized in a transaction (Lai & Lim, 2009). Other costs that should be taken into account are levies, setback costs and opportunity costs (Zakamouline, 2009). A firm has to make decisions regarding its production and hedging volume and keep in mind the different cost related to hedging the different risks (Broll & Wahl, 1997).

When traders choose an optimal hedge, they set the hedge ratio equal to the change of the current and future prices to the changes in the coming prices (Myers & Thompson, 1989; Lapan, Moschini & Hanson, 1991; Broll & Wahl, 1997). If traders believe the future price to be impartial, the best level for a trader to hedge at is the full hedge (Lapan *et al.*, 1991). If they believe it to be inequitable the best level for a trader to hedge is a partial hedge (Lapan *et al*., 1991). Traders export after they took into consideration the future spot exchange rate (Wong, 2003). Traders, thus, prefer to hedge against the foreign exchange exposure (Wong, 2003). Exchange rates are extremely volatile (Wong, 2003).

Exporting companies should hedge their transactions to overcome exchange rate risks (Kanas, 1996). Economic risk is due to competitive companies trading in currencies that differ from the domestic currency. Three market types lead to economic exchange risk, one is the competitive market, two is the international markets and three is the foreign exchange market movements (Kanas, 1996).

Extractive firms are open to various kinds of risk, but the two types of risks that is truly a big problem for these types of companies, is the price of their commodities, such as Brent crude oil and fuel prices and the other risk is the risk of exploration. Hedging these risks can affect the essential cash flows (Pincus & Rajgopal, 2002).

In contrast, when considering currency exposure one also have to keep in mind the hedging costs, composition and volume of the global provision and the attitude towards risk (Nesbitt, 1991). When hedging, traders have to take into consideration that the hedging of risk will also lower the profits that can be suspected and they should also bear in mind the transaction costs with which the hedge is made (Nesbitt, 1991). Currency hedging also has different costs related to it such as contract completion costs, contract operating costs, administration fees and lastly protection costs (Nesbitt, 1991).

Some companies feel that it is best to leave certain risks unhedged seeing as though these hedges may lead to higher costs and even higher risks. Traders hedge due to many reasons, such as financial suffering (this creates a reason for companies to hedge if these hedges can lead to a less like risk of bankruptcy), underinvestment costs (happens a lot where most profits go to debt holders), size (small firms are more likely to hedge due to the fact that risks are more substantial to them) and taxes (Nesbitt, 1991).

4.1.5 Hedging in South African markets

In a study conducted by Correia *et al.* (2012), the use of derivatives and hedges in South African companies were compared to those of other foreign companies in other countries. The aforementioned study determined the amount of hedges used in South Africa as well as the reason why companies hedged. Correia *et al*. (2012) indicated that 90% of firms in South Africa used derivative instruments. The study consisted of 98 of South Africa's largest non-financial companies as listed on the JSE. This is consistent with the studies done in other countries such as USA where 83% of the large companies used derivatives (Bodnar *et al.*, 1998), 89% of Swedish companies (Alkeback *et al*, 2006), 88% Netherland companies, 81% German

companies (Bodnar & Gerhardt, 1999) and then New Zealand 95% companies used hedges (Prevost *et al.*, 2000).

Though South Africa is a developing country it is interesting to see that its use of derivatives contradicts this fact. This could be due to the ZAR having such a volatile nature. Compared to other developing countries this is truly an anomaly as tested by Bartram, Brown and Fechle (2009) which indicated that other developing countries such as Malaysia only hedges 20% of their risk. In this study Bartram *et al.* (2009) also tested 58 large companies in South Africa which indicated a derivative use of 89.9%.

According to the study of Correia *et al.* (2012) the main reason companies do not hedge is that there is not enough exposure to interest rates, exchange rates, equity or resource risk, accounting treatment concerns and that the cost of starting and upholding a derivative exceeds the expected benefits.

As said by Correia *et al.* (2012) South African companies mostly hedge the foreign exchange rate risks. The study of Bartram *et al.* (2009) indicated that 88% of South African companies hedged foreign exchange risks, 36% of companies hedged interest rate risks and 15% of the companies hedged commodity risks.

Using hedges for protection against foreign exchange risk, is not the only advantage derivatives are used for and the following section discusses all the advantages.

4.1.6 Advantages

Foreign exchange volatility has increased over the past couple of years, which led to many concerns for traders (Jorion, 1991). Traders and companies hedge against these transaction and exchange rate risks (Jorion, 1991). Though hedging risk can lower it, it also increases the costs (El-Masry, 2006; Frestad, 2009). These increased costs can lead to traders and investors to resign their work and rather invest or trade in something else (Jorion, 1991).

Traders can share risks between each other. Hedging saves traders the stress of wondering what the market will do (Jorion, 1991).

Many traders believe derivatives increase value of a firm by mitigating certain risks in a market with the help of hedging (Broll& Wahl, 1997; Sy-Changco, Souchon & Evangelista, 2005). Hedging prevents under investing by reducing traders` risks of going bankrupt (Spanò, 2004; Campello, Lin, Ma & Zou, 2011). Hedging can prohibit a company`s cash flow or wealth being endangered by fluctuating currencies (Koziol, 1990; Fraser, 2001). History shows that trading experts trade transactions in USD to avoid most risks (Fraser, 2001). Some traders believe hedging presents the best alternative to currency prediction and reducing exposure (Fraser, 2001).

Hedging increases the worth by relieving the problems by capital demand abrasion (Boyle & Guthrie, 2006; Carter, Rogers & Simikins, 2006). In other words, hedging allows traders to have enough internal funds to proceed with wealth creating investment projects (Boyle & Guthrie, 2006). Cash flow variability is decreased through hedging; where cash is moved from a high-cash position to a low-cash position (Boyle & Guthrie, 2006).

4.1.7 Disadvantages

Hedging costs include interest carry costs (FxConsulting, 2012). Interest carry costs are the interest rates charged for the purchases and sales of currencies for the present and future. These costs vary according to changing interest and foreign exchange rates (FxConsulting, 2012). Where interest rates increase, it becomes perplex and expensive to hedge.

Hedging costs can be defined as the variations in the price of buying and selling the hedge. Traders should remember that a hedge is not there to make a profit from, but rather to ensure fewer risks by choosing a future payment price. Single period cash flow hedges and long term fixed hedges may create a foreign exchange exposure for certain traders and firms (Lioui, 1998). A forward contract needs an immediate rebalancing hedge to improve its accuracy and effectiveness (Lioui, 1998).

The volatility of bids is increased by hedging (Liu & Parlour, 2009). The amount of hedging in a firm influences the way it competes (Liu & Parlour, 2009). This, in turn, influences the amount of hedges trading firms will make in the future (Liu & Parlour, 2009).

Industry outcomes are increased in volatility with the use of hedges (Liu & Parlour, 2009). Hedging is not accurate on industry outcomes. Either the winner is under hedged and the loser is over hedged or the decreases in social welfare are carried by the seller (Liu & Parlour, 2009).

Hedgers see losing as costly and winning as valuable. Some industry outcomes become more volatile with every hedge (Liu & Parlour, 2009). It is very difficult for traders to hedge perfectly if time zones and transaction costs should be taken into account (Meindel & Primbs, 2008). Hedging may lead to a fall in profits, if the transaction costs were expensive (Soenen & Lindvall, 1992; Pircheggar, 2006). Hedgers can hedge risks with super-hedges which are even more expensive and seldom lead to increases in the profits together with the higher risk.

4.1.8 Summary

Though, certain financial officers believe that hedging has no effect on the values of firms and only increases the costs for firms and companies (Logue & Oldfield, 1977), other financial officers also believe that hedges are created to reduce risks and in this way reduce costs. Perfect hedges eliminate all possible risks, but also incur costs (Stulz, 2003). Sometimes these costs can be non-material when measured against the benefits of a hedge. Certain costs, such as sunk costs of salaries, wages, computer data systems, etc., do not affect the decisions of traders to hedge, because the benefit of hedging overshadows the cost. Hedging costs may also include expected payoffs and transaction costs (Stulz, 2003). These costs are expensive and may lead to losses if the hedge is recorded incorrectly.

Currency hedges are where traders such as mining companies step into a transaction to counter their foreign investment (Jones & Jones, 1987). They then

offset the two transactions against one another to get the necessary outcome (Jones & Jones, 1987). Hedging gives the hedger a sense of certainty. It reduces and decreases exposure, but does not eliminate it. A hedge can be seen as insurance against losses in exchange rate risks (Jones & Jones, 1987). But like any insurance, not all risks are covered. That is why in this study the hedging processes of companies are seen as external risk reducing methods and the forecasting of the exchange rates are seen as internal measure to be implemented (Brandt, 1984). The forecasting analyses will help companies to lower or even eliminate the risks that hedges are still susceptible to by predicting the exchange rates at which hedging contracts are set.

Despite hedges protecting against asset risks (activity in the assets price), credit risk (a liability might not be paid), currency risk (the risk of negative movement in the exchange rate of a currency), volatility risk (the risk of exchange rates) and lastly the volumetric risk (supply and demand of a product), there is another way for the firms to protect themselves against the risks.

This study incorporates technical forecasting techniques which can be implemented by companies to predict the exchange rates for contracts and hedges, to reduce the risks (Jorion, 2009; Rashty & O'Shaughessy, 2010).

4.2 Forecasting analyses

4.2.1 Introduction

When predicting markets, companies and traders alike should always bear in mind three things which are (1) the direction the exchange rates are moving in; (2) the volume of the trade and (3) the timing of the transaction (Baines, 1988). Forecasting future events in any field are very complicated (Krow, 1969).

However, according to Yao and Tan (2000) two basic steps for choosing a forecasting method is firstly analysing the data series and secondly select a method that is best applicable for the data series.

There are 3 methods of forecasting namely the fundamental analyses, the technical analyses and the random walk analysis (Baines, 1988; Yao & Tan, 2000).

4.2.2 History and definition

Three schools of thought exist to forecasting markets (Krow, 1969). The first school is based on the fundamentals of investment value and is known as the fundamental analysis (Krow, 1969). The fundamental analysis investigates each country`s financial conditions and circumstances. It is the study of each currency and the effects of supply and demand thereon (Baines, 1988; Yao & Tan, 2000). The next school`s sole concern is with the judgement of the market place. Its main focus is on the market itself and not the global economies (Krow, 1969). The concept is called the technical analysis which assumes that exchange rates move in trends and traders use these trends to determine future price movements. Other tools and indicators that can also be used is Elliott waves, Fibonacci series` and Gann lines (Krow, 1969, Baines, 1988; Yao & Tan, 2000). The third school, random walk analysis, believes the future is unpredictable and chaotic. It regards markets as a game of chance in which price activity is chaotic and cannot be predicted (Krow, 1969). The random walk theory states that historical and present information, only, cannot be used to earn above average trading advantages and relies on traders' own thoughts (Baines, 1988; Yao & Tan, 2000). It is best to combine a series of tools to achieve the utmost accuracy and gain an upper hand on the markets (Yao & Tan, 2000). In the following sections these three analyses will be discussed.

4.2.3 The three schools of thought

4.2.3.1 Fundamental analysis

The fundamental analysis looks at a company`s financial aspects before making an educated and evaluated decision (Gittman & Joehnk, 1990). Fundamentals is getting and using the basic characteristics of a company (Laschinger, 2006). Many factors causes a company`s stock to have a value change for instance competition between companies, the way sales is constructed, profits of a company and the dividends allocated to stakeholders and the company`s capital management

(Gittman & Joehnk, 1990). Modern fundamentalists investigate information of sales, profitability ratios, new commodities, the ability to manage, revenue statements and business assessments. He evaluates the flow of a business (Krow, 1969). All these evaluations allow a fundamentalist to make accurate forecasts for the future (Krow, 1969). The fundamental school takes dividends, assets, profits and other various factors into consideration (Krow, 1969). The technician uses charts, trendlines and support and resistance levels to help him understand the movements (Krow, 1969).

When the fundamental analysis is applied to the forex market it takes into consideration macroeconomic indicators, asset management and markets and any political conditions (McDonald, 2007). When a country has more imports than exports, it shows traders that money is leaving the country and this will automatically decrease the country`s currency value (McDonald, 2007). According to traders using the fundamental analysis, a company`s publically attainable information regarding turnover, dividends, growth rates and debt/equity ratios determines, as well as influences the company`s value and the values investors sees the company as (Lee, 1987). Data costs consist of acquisition and interpretation, which may not always be trivial (Lee, 1987).

Disadvantages of fundamental analysis are that it is time-consuming, focuses only on one market and cannot always take important information into consideration immediately (Laschinger, 2006; Rom, 2006). Fundamental analysts miss a lot of opportunities, because it is a very time-consuming analysis which may miss small changes in market movements, which later becomes huge bull or beat markets (Laschinger, 2006).

4.2.3.2 Technical analysis

The technical analysis is the study of the market date and not the business records or prospects of firms themselves. Technical analysts believe the market is its own best forecaster (Krow, 1969). The technical analysis`s goal is predicting market price over a continuous future of sequential short runs (Krow, 1969). Technical analysts have determined that prices move in discernible repetitive movements

(Meyers, 1989). This allows them to make more profits in the markets, because they can predict the possible future movements of the prices (Meyers, 1989).

According to Murphy (1986) and Meyers (1989), there are three grounds on which the technical approach is based. Firstly, *market action discounts everything.* The cornerstone of the technical analysis is that anything that can possibly affect the market price is reflected in the price of that currency. Price should reflect shifts in supply and demand (Murphy, 1999). If demand exceeds supply, prices should rise and vice versa. Therefore, if prices rise the fundamentals must be bullish and if prices fall the fundamentals must be bearish. Chartists do not concern themselves with the reasons why prices go up or down. They know there are reasons for market volatility, but they just believe that knowing what these reasons are is unnecessary in the forecasting process (Colby, 2003; Norris *et al.*, 2010). Secondly, *prices progress in trends.* A trend in motion is more prone to continue than to reverse (Cofnas, 2004). Lastly, *history repeats itself.* Markets are based on the study of human psychology, which does not change very often. Thus, future markets are only repetitions of the previous markets (Babypips, 2011).

A fluctuation in supply and demand cannot always be because of a logical explanation such as political events and economics. It also depends on human decisions and psychology (Krow, 1969). The technical analysis focuses on the supply and demand, which is controlled by many rational and irrational factors (Levy, 1966). Past prices and movements are used to predict future movements. Technical analysts can act immediately on changes in markets whereas a fundamentalist has to wait for several factors to take place which will change the markets.

Many traders argue that past price movements cannot be used to predict future price movements. They reason that even though the analysis was flourishing over the past few years, it does not mean that it will be the same in the future. Traders that use these methods for forecasting, create a self-fulfilling prophecy. If this analysis continues to be accurate and sufficient, an increase in these traders will neutralize any possible profits that may occur (Levy, 1966).

A few counter arguments are given: If technical systems have been as successful as traders want it to be, it would not have been made public to be used by anyone. Other analysts could not believe that a successful technical system exists (Levy, 1966).

It is the study of statistics generated by market behaviour and the study of prices' movements over a specific time period. The technical analysis studies the human psychology and is compared to being voodoo economics (Ainson, 2011).

Technical analysis is very versatile and can be used for and in any market to create profitable opportunities for traders. This analysis can also be applied to any time period for a transaction (Meyers, 1989). In this study the technical analysis will be used to predict future exchange rates to be used in derivative contracts. The analysis will be used as an internal control that any extractive company should be able to use to determine if hedging certain exporting transactions would be of value to the company. Using the technical analysis, can forecast how far a market might retreat or advance (Gordon, 2006).

The study of market movement, through price charts, to predict future price trends is known as chartism. This study assumes that fundamental information, political affairs, natural disasters and psychological human factors are quickly rejected in market movements. In other words, these factors will instantaneously affect price movements. The technical analysis is only a shortcut form of the fundamental theory. Price charts show a direct indication of bullish and bearish markets. Chartists look at the big picture and can immediately react on fluctuations without knowing the factors behind the changes. Price charts reveal important trends that persist once they have been confirmed. Charts have been used to determine significant trends, to estimate the feasible extent of the trends and to detect any approaching changes (Babypips, 2011).

The technical analysis tools that are used in this study are discussed next (Thompson & Guttman, 2008).

Firstly: *trends*. Trends have two main uses: Identifies support and resistance levels in a market to begin new positions. The longer the trend exists and the amount of times it has been tested, the more important it becomes. The infringement of a trend is usually the best indicator of a changing trend. Though trend analysis is very subjective, traders always trade in the general direction of the trend. Computer trend analysis is more objective. These systems were created to eliminate the human element in the forecasting equation(Thompson & Guttman, 2008).

One of the technical analysis`s main aspects are that when prices start to move in one direction it will continue moving in that direction until a force is inflicted on it, making it change direction (Meyers, 1989). Trend analysis is the most popular analysis, because currencies tend to develop strong trends and rarely spends much time in tight trading ranges (Lien & Dyess, 2011). There are many relationships with Newton`s first law of movement. Prices may move in upward, downward or sideways trends. Trend lines can also change direction, which is referred to as a trend role reversal (Meyers, 1989).

A trend reveals the major direction of a currency (Cofnas, 2004). Prices of currencies move up, down or sideways. Using trendlines, allows traders to determine the general price movement and it indicates where future prices might be heading (Cofnas, 2004). Once a dominant trend has been determined traders synchronise trading strategies with the trend itself (Cofnas, 2004).

A sequence of peaks and troughs exist in a trend. An uptrend is a series of peaks and troughs and the general direction is moving upward. Downtrends are peaks and troughs moving in a downwards direction. There are also three genres of trends: a six month period is known as major trends; one to three months are secondary trends and a couple of weeks are a minor trend. Traders use key points of previous price movements to draw trends (Cofnas, 2004). These trends are projected into the future to be used as support and resistance levels, as long as the trend holds (Cofnas, 2004).

Secondly: *support and resistance*. This tool can be compared to supply and demand in a market (Meyers, 1989; Osler, 2000). Support is the lowest point a

market reaches before moving back up and resistance is the highest point a market reaches before moving back down. These levels may replace roles and become the other. These levels are regularly found close to round numbers such as 10, 20, 25, 50, 75, and 100 and so it can go on to infinity. In an increasing market level, traders usually put buy orders above round numbers and orders to stop a buying transaction below these numbers (Meyers, 1989).

Troughs are levels where buying force surpasses selling force and a decrease is stopped. This is known as support. Peaks are levels on top of the market where selling force surpasses buying force and a protest or rally is stopped. This is known as resistance. Once three levels reverse roles, they are distinctively broken. This means that support levels below the market become resistance levels above the market and vice versa. Recent levels are more powerful and influence the market action with a strong affect. Many of the speculators that took part in the support and resistance levels are still current business companies and can influence the future trading outcomes (Meyers, 1989; Osler, 2000).

Thirdly: *Fibonacci tools*. The Fibonacci series is used in various theories, from plant growth to Bedford's law to predicting the markets (Dunlap, 1999). In the thirteenth century a mathematician named Leonardo Fibonacci da Pisa discovered the Fibonacci sequence (Frost & Prechter, 1990). He was born between 1170 and 1180 and was the son of a city official. He often travelled with his father and on one of these trips; he published his famous *Liber Abaci* (Book of calculations). This book contained one of the greatest mathematical discoveries of all time; the decimal system; which used 0 as the first digit in the notation of the number sequence (Frost & Prechter, 1990). The symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are universally known as the Hindu-Arabic system (Frost & Prechter, 1990).

Leonardo de Pisa received his education from the Mohammedans of Barbary. The term Fibonacci is derived from Filius Bonaccio which means the son of Bonacci (Dunlap, 1999). His first book, *Liber Abaci,* was published in 1202 and produced the theory of Fibonacci famous rabbits:

"A pair of adult rabbits produces a pair of baby rabbits once each month. Each pair of baby rabbits requires one month to grow to be adults and subsequently produces one pair of rabbits each month thereafter. Determine the number of pairs of adult and baby rabbits after some number of months. It is also assumed that rabbits are immortal."

Thus the problem would be solved as follows: Assume that r_n is the amount of baby rabbit pairs; R_n is the amount of adult rabbit pairs and total amount of rabbit pairs are $(r+R)_{n.}$ The calculations to the problem are pointed out by Table 4.1.

These numbers are used to forecast the markets (Dunlap, 1999). Fibonacci numbers are 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, and 144 to infinity. The sum of any two following numbers in the sequences forms the next higher number in the sequence. The ratio of any two consecutive numbers in the sequence is 1.618 or its inverse 0.618; after the first several numbers (Frost & Prechter, 1990).

Fibonacci price and time relationships can be found among the components of a complete Elliott wave. The Elliott wave-theory has quite a unique and remarkable relationship towards the Fibonacci series (Prechter, 2003) and it was R.N. Elliot that truly discovered the predicting ability of the Fibonacci series.

Trends could be used to determine future price movements (Greenblatt, 2006). The technical analysis is used to determine a specific time factor when major changes will occur (Greenblatt, 2006). The Fibonacci sequence is said to be the groundwork for deciphering the Elliott Wave Principle. Because of this, traders and companies can comprehend that the Elliott Wave Principle is the closest to identifying the structure and shape of financial markets (Greenblatt, 2006).

TABLE 4.1: FIBONACCI'S SERIES CALCULATIONS (DUNLAP, 1999)

MONTH	r_n	R_n	$(r+R)_n$
1	0	1	1
2	1	1	2
3	1	2	3
4	2	3	5
5	3	5	8
6	5	8	13
7	8	13	21
8	13	21	34
9	21	34	55
10	34	55	89
11	55	89	144
12	89	144	233
13	144	233	377
14	233	377	610
15	377	610	987

Though the currency rates reveal long-term forces, traders must have opportune entrance and exit strategies for everyday trading, to control the risks (Cofnas, 2003). To determine the appropriate entrance strategies, we can use the Fibonacci retracement levels. Finding these appropriate levels are very important since a poor entry into a market tends to lead to excessive risk (Cofnas, 2003). Fibonacci fans are very popular since they take momentum into consideration. They also provide hard price levels where you can position close stops (Cofnas, 2003).

A major market move will often be reversed by 38.2%, 50% or 61.8% Fibonacci retracements (Osler, 2000; Bhattacharya & Kumar, 2006). Each of these percentages is closely 0.618 times the following number and closely 1.618 times the previous number or percentage (Bhattacharya & Kumar, 2006). Turning points in influential trends could be predicted for the future by using the Fibonacci series and price movements (Bhattacharya & Kumar, 2006). The Fibonacci series tries to determine why specific price structures reoccur in the chaos of the market. Critics often criticize the Fibonacci series. If enough traders rely on the Fibonacci levels to forecast the markets, they end up self-validating the efficacy of this technical indicator in a circular reference (Bhattacharya & Kumar, 2006).

Future buying and selling prices are predicted using Fibonacci retracements levels. Fibonacci levels are 61.8%; 50%; 38.2% and 161.8% (Cofnas, 2004). The Fibonacci analysis can be applied in any direction and time frame as long as a significant move in price has occurred. It is most accurate when used in conjunction with other technical tools (Cofnas, 2004).

The Fibonacci forecasting tool is a technical indicator which allows investors and traders to accept a transaction with confidence and to maintain it for the time specified (Adams, 1972). This allows traders to distinguish between false trend movements that can mislead traders into making the wrong investment decisions. The Fibonacci series was reported in 1278 AD by a 13th Century Italian mathematician and merchant Leonardo Fibonacci. The unique series has a golden ratio running through it. This ratio is 1.618 (Adams, 1972).

4.2.3.3 Random walk analysis

The random walk theory is one of the most famous prospective theories studied (Lawler & Limic, 2010). Prospective theory is everywhere and in every other theory it is as well (Spritzer, 2010). Random walk theorists believe charts are merely a tool to indicate past prices. The information on the chart market is important, but these theorists are not on Wall Street (Krow, 1969). They believe it is impossible to predict future prices form past prices. They compare the markets to a casino; games of chance and fancy, or astrology. Any price action is uninfluenced by any past events.

Imperfection is the rule in markets, not the exception (Krow, 1969). Random walk dollar exchange rates occur because central banks interfere in forex to support their country`s currency on a day-to-day basis (Mulligan, 2000). The trading-amount is comparatively low and stable (Mulligan, 2000).

If the random theorists are correct and exchange rates are as chaotic as they say, financial markets will be a lottery, with everything determined by chance (Qiu, Pinfold & Rose, 2011). The incapacity to predict future foreign exchange rates causes the high volatility of the markets (Qiu *et al.,* 2011). Random walk exchange rates do not have a transitory part to their characteristics (Lastrapes, 1992). These shocks help to develop the exchange rate policies and models (Lastrapes, 1992).

Random walk theorists would like to believe that the reason fundamental analysis doesn't always work is due to an unexamined fundamental aspect which in itself is random (Evans & Lyons, 2005).

Many practitioners believe that the market prices reflect all known factors that can influence it and do not believe in the random walk (Kim & Shamsuddin, 2008). They believe that the prices as shown today can perfectly predict the prices that are shown tomorrow (Kim & Shamsuddin, 2008). Random walk theorists believe that market prices are completely random and unpredictable (Yao & Tan, 2000). The Efficient Market Hypothesis compares the markets to a sponge. It soaks up information immediately, without any traders waiting for confirmation of information, in other words, waiting to see if a clear trend is established (Yao & Tan, 2000).

4.3 Summary

To forecast the markets is the most important step in the assessment procedure. Forecasting can be based on the established study of supply and demand factors that influence the movement of the market prices. Traders call this the fundamental analysis. The fundamentalist looks at earnings, profits, trade losses and changes in money provisions, to arrive at an estimate of the value of a futures market. This helps them determine if the market is under- or overrated. Chartism focuses on the action of the market itself. They study the effects and the movements of the prices

itself. To enter the market at the correct or opportune moment is the most important thing in the markets.

The technical analysis has many advantages (Colby, 2003). It organizes information, provides a strong foundation for making decisions, and is less costly, easy to use and quick. Technicians do not rely on causes and effects for market changes. They know that trends persist and do not care how long it lasts, but that it keeps going till supply and demand changes (Colby, 2003).

Theories such as fundamentalism and technicalism should be intertwined when making decisions (Krow, 1969). All the analyses should be used to validate each other (Laschinger, 2006). The technical analysis focuses on the price of items, where the fundamental analysis takes a closer look at the supply and demand of an item (Laschinger, 2006).

It is difficult to forecast exchange rates (Leung, Chen & Daouk, 2000). For companies that trade internationally, in either imports or exports, it would be of major importance and increased profits if the exchange rate could successfully be predicted (Torkamani, Mahmoodzadeh, Pourroostaei, & Lucas, 2007).

This chapter concludes the literature part of the study. It has shown us the advantages and disadvantages of hedging and also of the three different school of forecasting. The next part of the study is the empirical analysis and calculations related to the prediction of the exchange rates to be used in hedging contracts.

CHAPTER 5
EMPIRICAL ANALYSES

5.1 Introduction

In the previous chapters there have been focussed on the history of markets and exchange rates and their importance in the modern world. In today's world of trade, the variability of the exchange rates originates risks and losses for important companies in global industries. In South Africa the most influential companies are those operating in the extractive industry; causing a tendency for the companies to incur transactions with foreign countries which lead to foreign exchange risks (IMF, 2010).

It is this risk that can be countered by the use of hedging contracts, but hedging contracts are expensive to enter into and may even lead to losses if the transaction rate is set at the wrong foreign exchange rate (Baines, 1988; Tilkin & Epstein, 2007). The purpose of this study is to determine if the technical analysis forecasting tools will have the ability to sufficiently predict the rates at which companies' hedging contracts should have been set and, thus, allowing the technical analysis to be applied as an internal control for companies.

Below is a description of the five extractive companies used during this study as well as information of each company's hedging contracts. The information includes a description of the companies' affinity for risks and the hedging contracts they realised to protect themselves against the risks, together with an elaboration of the companies' hedging policy portrayed on the financial statements. The financial statements for 2009, 2010 and 2011 are used at the time of this study. The following section depicts a discussion of the technical analysis' calculations and the results. Thereafter a combination of the tools as well as a summary of the findings will be given in relation to the companies' hedging contracts.

5.2 Companies utilized in this study

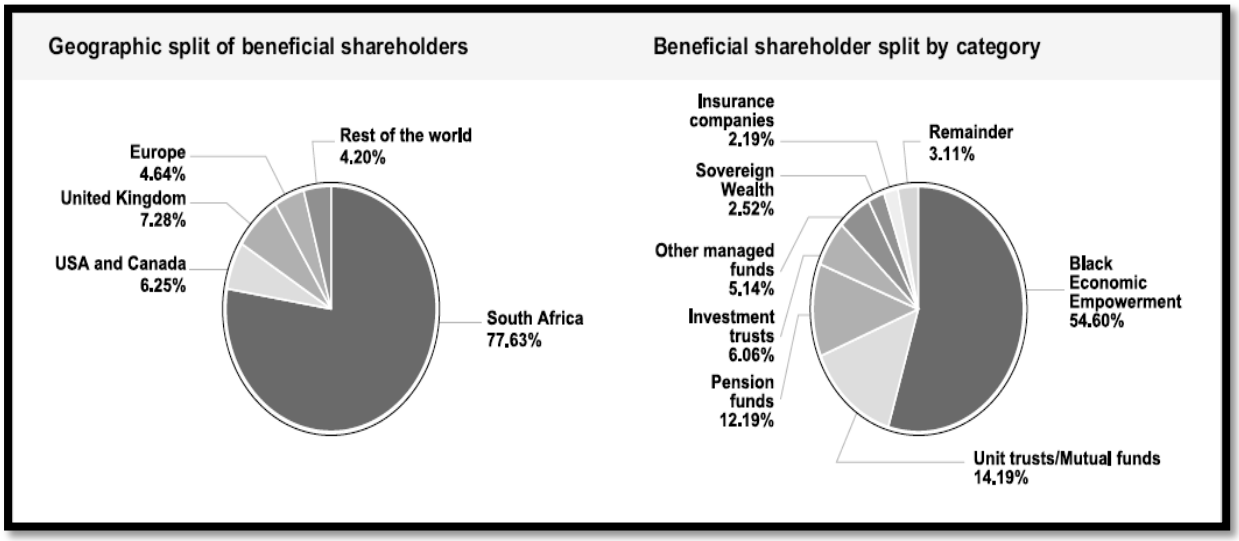
According to a survey done by Correia *et al.* (2012) there are approximately 60% of South African companies wishing to hedge foreign exchange exposure. Only 10% of the companies used in the survey indicated that they would not hedge. The other 29% were undecided. Correia *et al.'s* (2012) survey signified that extractive companies fall in the unhedged 10%. Their incentive for not hedging refers to the extra costs of hedging contracts overshadowing the benefits provided by the contracts.

Due to the abovementioned reasons, the current study aims to provide a more practical option for extractive companies by predicting the exchange rate for hedging contracts, to increase the benefits to the companies.

The South African companies being implemented in this study are listed below with motivations as to why they are chosen for this study:

As indicated in Figure 5.1, **African Rainbow Minerals Limited (ARM for short)** is one of South Africa's leading extractive companies with mature, inexpensive commodities. They build, create and grow joint ventures and affiliates with key organisations in the extractive sector (ARM, 2011).

FIGURE 5.1: INDICATION OF ARM'S SHAREHOLDERS (ARM, 2011)



This company was formed to operate specific commodity companies in the mining and extractive industry of South Africa such as ARM Platinum, ARM Ferrous, ARM Coal, ARM Copper and ARM Exploration (ARM, 2009; ARM, 2010; ARM, 2011).

ARM mostly deals with the United States of America; creating a trading partnership which leads to the United States Dollar-South African Rand exchange rate (hereon known as USDZAR). The USDZAR has a great impact on the company's financial results (ARM, 2011), with ARM seeing the movement of the USDZAR as a prospect of profit and, in conjunction, a risk of losses (ARM, 2009). During each financial year, ARM is exposed to various risks such as currency risk (the focus of this study), resource price, interest risk, counterparty risk, credit risk and acquisition risks. ARM attempts to combat the effects of commodity price movements by diversifying their portfolio. By diversifying a portfolio, participants may be able to move risks form one transaction to another (ARM, 2010).

It is not ARM's policy to hedge every transaction, but in severe cases they might make use of hedges. The risk management team of ARM closely monitors the risks and endeavours to contain the risks to a minimum (ARM, 2010).

Throughout the years ARM entered into various foreign exchange contracts whereby USD proceeds are hedged to a maximum of the estimated net local ZAR operating costs for a future 12 month period. The company predominantly uses foreign exchange hedging on key projects. ARM feels that the USDZAR activity brings risks and opportunities to the company, directing the company to use currency hedges only on certain transactions and, in general, the company does not hedge. When hedges are used, the company incorporates forward sale and purchase contracts and forward exchange contracts (ARM, 2011).

Exxaro Proprietary Limited (Exxaro for short) is one of the JSE Ltd's top40 companies, with products such as iron ore, base metals, mineral sands and coal being produced. It is the second largest coal producer in South Africa and the third largest international producer of mineral sands. The company's foreign holdings navigate to risks related to exchange rates (Exxaro, 2011).

Exxaro has operations based in South Africa, Namibia and China. With operations based in so many different countries, it is understandable that the company will have various foreign exchange risks. The company hedges 60% of its lead and zinc for an average price of USD 2,216-USD 2,061 for Zinc and USD 1,967-USD 1,713 for Lead. The company hedges through the use of forward exchange contracts. Trades denominated in foreign currencies are converted at the rate of exchange on the date of the trade. Fiscal transactions denominated in foreign currencies are converted at the rate of exchange on the reporting date. Gains or losses from conversion and completion are endorsed to or charged against proceeds (Exxaro, 2011).

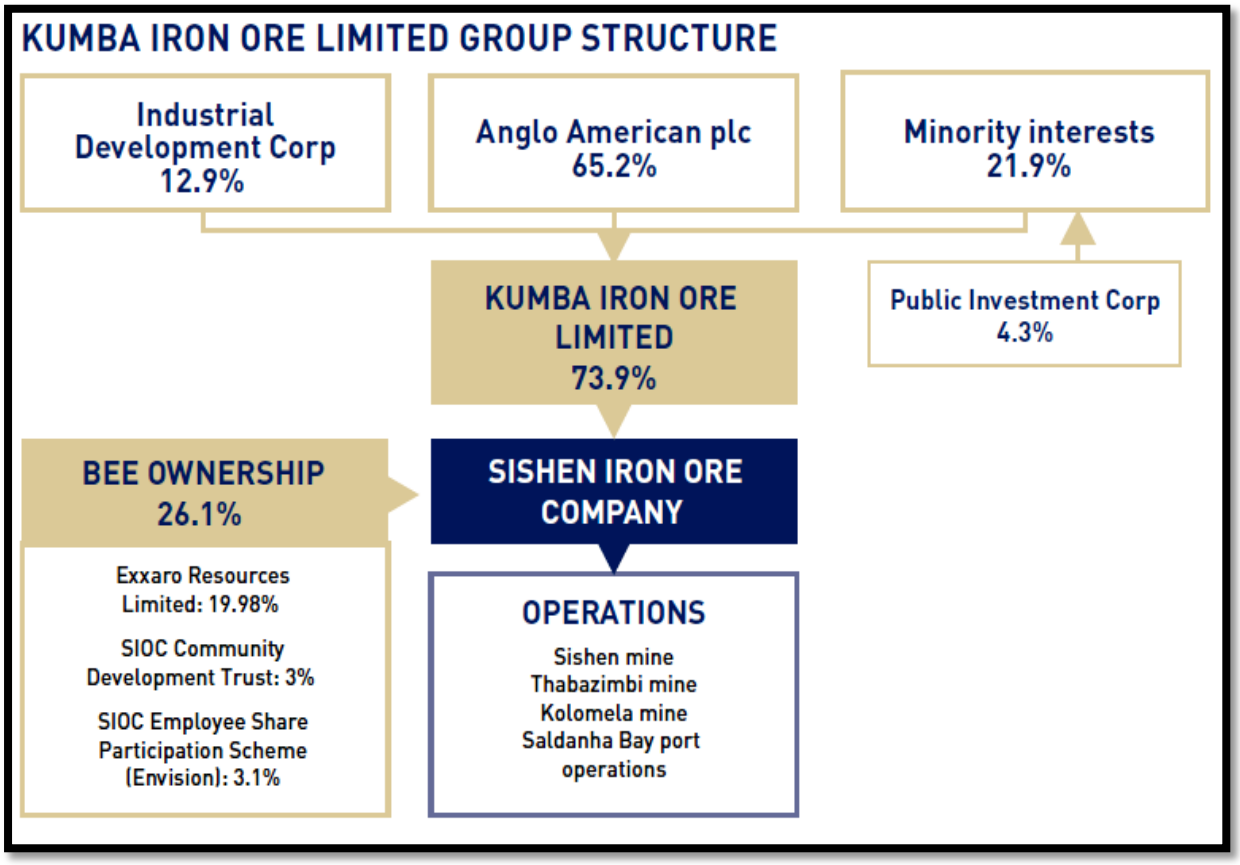
Exxaro seeks to reduce the effects of these exposures by using derivative monetary tools to hedge against these exposures. The utilisation of derivative monetary tools is managed by Exxaro's procedures accepted by the board of directors, which offer written principles on foreign exchange exposure, interest rate exposure, credit exposure, the application of monetary derivatives and non-derivative monetary tools, and the saving of surplus liquidity. Agreements with strategy restrictions and exposure restrictions are re-examined by the internal auditors on a constant basis and conclusions are recorded to the board audit committee (Exxaro, 2011).

Kumba Iron Ore Limited (Kumba for short) is part of the Anglo American plc. Group, as shown in Figure 5.2, and supplies high quality iron ore to the international community (Kumba, 2011).

Kumba's major exporting partners are China (68%), Western Europe (13%), Japan and South Korea (18%) as well as the Middle East (1%).

The ore export prices are denominated in USD and thus transaction negotiations are done in USD with customers. Any movement in the exchange rate can have an influence on the financial statements of Kumba. To protect this company, it undertakes foreign exchange hedges and contracts (Kumba, 2011).

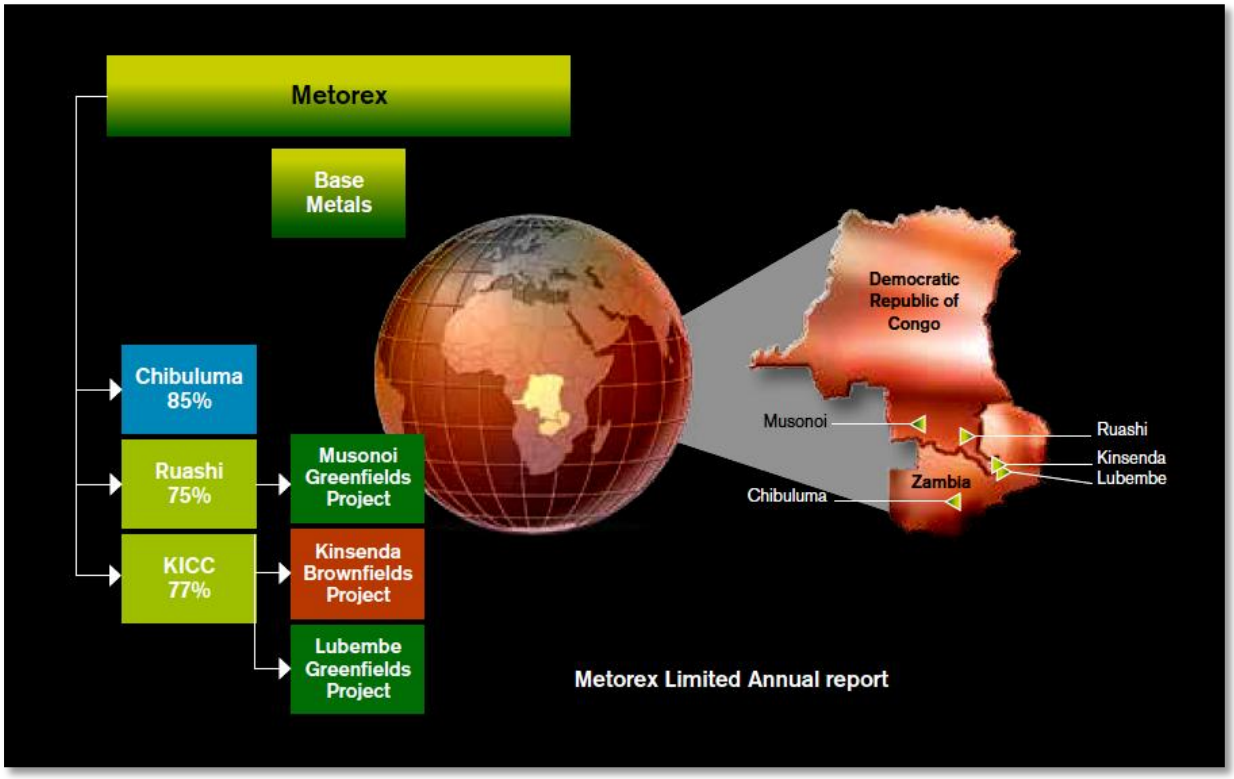
FIGURE 5.2: KUMBA AS PART OF THE ANGLO AMERICAN GROUP (KUMBA, 2011)



Metorex Limited (Metorex for short) has its main business in the base metal mining industry. Their products are mainly copper and cobalt. This company started mining in 1955 and is a subsidiary (100%) of the Jinchuan Group (Metorex, 2011). The company has three major mining fields, indicated in Figure 5.3, namely Chibuluma (85%), Ruashi (75%) and KICC (77%).

The main exporting partner countries are Durban in South Africa, Walvis Bay in Namibia and Tanzania in Mozambique. The movement of the exchange rate is the major risk factor of the company and for this the company enters into forward contracts (Metorex, 2011).

FIGURE 5.3: BUSINESS ACTIVITY OF METOREX (METOREX, 2011)



SASOL Limited (Sasol for short) is one of South Africa's main exporters of Brent crude oil and is South Africa's largest revenue company with a reported net income of ZAR 19, 8 billion in the 2011 financial year (Sasol, 2011a). It is one of the world's leading oil and gas producers, which initiates various foreign transactions, but also has various other extractive clusters such as energy and chemical clusters.

Due to the ZAR's plunge of 19% in 2011, Sasol's shares increased with a premium of 40% (Brand & Gunnion, 2011). The depreciation of the ZAR benefits exporting companies, like Sasol, where every 10c the ZAR falls, ZAR 946 million operating profits are made in Sasol (Brand & Gunnion, 2011).

Sasol has to take a few factors into consideration when analysing the market, for instance the basic fuel and Brent crude oil prices, the costs to the refineries as well as the USDZAR exchange rates applicable for trades and transactions (Sasol, 2011a). With the intention of protecting Sasol against these factors, forward exchange contracts and futures are entered into (Sasol, 2011a).

Sasol (2011b) has tried to decrease the currency risks of its transactions through the use of forward exchange contracts. Approximately 30% of South Africa's synthetic fuels and West Africa's Brent crude oil production was proportionately hedged. These hedges protect Sasol against oil prices below US$ 85 per barrel. Though this hedge is meant to protect Sasol, it creates opportunity losses if oil prices increase to a level higher than USD 172.77 per barrel (Sasol, 2011b).

5.3 Hedging contract information

The mining and extractive companies indicated above primarily export their commodities to the United States of America or use the USD to denominate the exporting transaction in. This causes the companies to experience foreign exchange currency risks. To protect against these risks various hedging contract are implemented. The hedging contract information of each company is indicated below. A summary is given in Table 5.1, which covers a period of three years and the hedging information of each company from the 2009 to 2011 financial years.

The subsequent paragraphs designate the hedging contract information of each company.

ARM may hedge various risks such as commodity price volatility and foreign exchange movement (created by the opposite relationship between the USD and the ZAR), but the companies' general policy is not to hedge the aforesaid risk, because the group consolidated companies monitor the risk. The companies observe and assess this risk and the applicable market; keeping a close eye on the demand for the commodity which would influence the resource's price (ARM, 2009). Another reason for not hedging foreign exchange risk and commodity risk is due to the expenses incurred if such a risk would have been hedged (ARM, 2009).

In contrast, though these movements of the resource price and foreign exchange rate lead to risk, there is also an amount of opportunity involved (ARM, 2009). This opportunity creates the basis for one of ARM's philosophies: to enter into a hedging contract; protecting the company against several of the currency movements, but

only on specific purchase transactions. This philosophy is only used in necessity and in general ARM does not hedge (ARM, 2009).

Where and when hedges are relevant, it is ARM's policy not to apply hedge accounting, except for a shared hedging contract (more than one company has part of the ownership of a contract). If a shared hedging contract is pertinent, then the hedging contract is reported as part of the equity investments in an associated company (ARM, 2009; ARM, 2010).

In ARM's financial statements for the year ending 30 June 2010 the foreign exchange hedging contracts for 2009 and 2010 are indicated under the caption in note 37 (see Figure 5.4) of "Foreign currency denominated items included in overdrafts and short-term borrowings."

FIGURE 5.4: ARM'S 2009 AND 2010 FOREIGN EXCHANGE CONTRACTS (ARM, 2010)

	Foreign currency amount	Year-end exchange rate
Financial assets		
Foreign currency denominated items included in receivables:		
30 June 2010	US$179 million	7.67
30 June 2009	US$118 million	7.72
Foreign currency denominated items included in cash and cash equivalents:		
30 June 2010	US$20 million	7.67
30 June 2009	US$20 million	7.72
Financial liabilities		
Foreign currency denominated items included in payables:		
30 June 2010	US$6 million	7.67
30 June 2009	US$12 million	7.72
Foreign currency denominated items included in overdrafts and short-term borrowings		
30 June 2010	US$nil million	7.67
30 June 2009	US$42,5 million	7.72

As seen in Figure 5.4, 30 June 2009 a hedging contract was entered into. This contract was taken out in May 2009 to protect a contract rate of USD 42.5 million at a rate of ZAR 8.1720: USD 1. The set price would have been payable on 31 August 2009. An unrealised loss of ZAR 16 million, which was disclosed in the statement of comprehensive income, was indicated for the hedging contract (ARM, 2009; ARM, 2010).

Though Figure 5.4 does not indicate any hedging contract for the 2010 financial year, the contract discussed above is also taken into consideration due to the contract's expiry date falling within the 2010 financial year.

For the 2011 financial year, the foreign exchange hedging contracts are indicated in the note to the financial statements; number 36 as shown in Figure 5.5 (ARM, 2011).

FIGURE 5.5: ARM'S 2011 FOREIGN EXCHANGE HEDGING CONTRACT (ARM, 2011)

	Foreign currency amount	Year-end exchange rate
Financial assets		
Foreign currency denominated items included in receivable:		
30 June 2011	US$250 million	6.76
30 June 2010	US$179 million	7.67
Foreign currency denominated items included in cash and cash equivalents:		
30 June 2011	US$5 million	6.76
30 June 2010	US$20 million	7.67
Financial liabilities		
Foreign currency denominated items included in payables:		
30 June 2011	US$23 million	6.76
30 June 2010	US$6 million	7.67
Foreign currency denominated items included in overdrafts and short-term borrowings		
30 June 2011	US$nil million	6.76
30 June 2010	US$nil million	7.67

For the 2011 financial year there has been no foreign exchange hedging contract incurred.

Exxaro has numerous transactions taking place in the foreign exchange market, where exposures to exchange rate movements arise. Almost all the transactions are denominated in USD and forward exchange contracts, currency options and currency swaps are implemented as hedging contracts to protect against volatile movements. The risk of fluctuation in markets (which is influenced by various macroeconomic factors) is hedged in accordance with a sensible hedging policy. Exxaro makes use of derivative financial instruments to hedge the possible exposures to foreign currency risks, interest rate exposures and price movements (Exxaro, 2010). The company also incorporates hedge accounting to record their hedging transactions and contracts (Exxaro, 2009; Exxaro, 2010; Exxaro, 2011).

The conversion rate applicable for the 2009 year of assessment is ZAR 8.35: USD 1. The statement of financial position is the only statement that is translated at the closing rate on the last day of the reporting period. The closing rate for the 2009 financial period was ZAR 7.4: USD 1 (Exxaro, 2009). For the 2010 financial year the exchange rates employed as the conversion rate was ZAR 7.3: USD 1 and the statement of financial position was converted using the last day of the reporting period's exchange rate of ZAR 6.63: USD 1 (Exxaro, 2010). Conversion in 2011 occurred at ZAR 8.18: USD 1 with no rate indicated for the separate conversion of the statement of financial position (Exxaro, 2011).

Below, in Figure 5.6, is an indication of the foreign currency risk management as shown in the 2010 notes to the annual financial statements; number 27.4.2.1.

FIGURE 5.6: EXXARO'S 2009 AND 2010 HEDGING CONTRACTS (EXXARO, 2010)

	Market-related value Rm	Foreign amount million	Contract value Rm	Recognised fair value profits/ (losses) Rm
GROUP				
2010				
Exports				
United States dollar – FECs	**676**	**101**	**726**	**50**
2009				
Exports				
United States dollar – FECs	164	22	175	11

Figure 5.6 indicates, for 2009, foreign exchange contracts (FECs) at the value of ZAR 175 million: USD 22 million, incurring a profit of ZAR 11 million. For 2010 this number increased with a value for foreign exchange contracts of ZAR 726 million: USD 101 million, creating a profit of ZAR 50 million.

Figure 5.7 depicts the 2011 financial statements' note to the annual financial statement; number 29.4.2.1 (Exxaro, 2011).

FIGURE 5.7: EXXARO'S 2011 HEDGING CONTRACT (EXXARO, 2011)

	Market related value Rm	Foreign amount million	Contract value Rm	Recognised fair value profits/ (losses) Rm
GROUP				
2011				
Exports				
United States Dollar - FECs	**1 777**	**215**	**1 622**	**(155)**
2010				
Exports				
United States Dollar - FECs	676	101	726	50

According to Figure 5.7 the foreign exchange contracts for 2011 is a total of ZAR 1622 million: USD 215 million, leading to a loss of ZAR 155 million.

Kumba is part of the Anglo American plc. Group, leading to various exporting transactions denominated in USD. These transactions increase the risks of foreign currency hedging for the company. The functional currency of the group is used to measure the financial results derived for the group. The ZAR is Kumba's functional currency, as this is the currency in which the companies major economic environment is located (Kumba, 2011).

All applicable transactions are translated into the ZAR at the rate of exchange on the transaction date. All the assets and liabilities arising from these foreign exchange transactions are translated on the last date of the financial year and are reflected at this rate on the statement of financial position (Kumba, 2011).

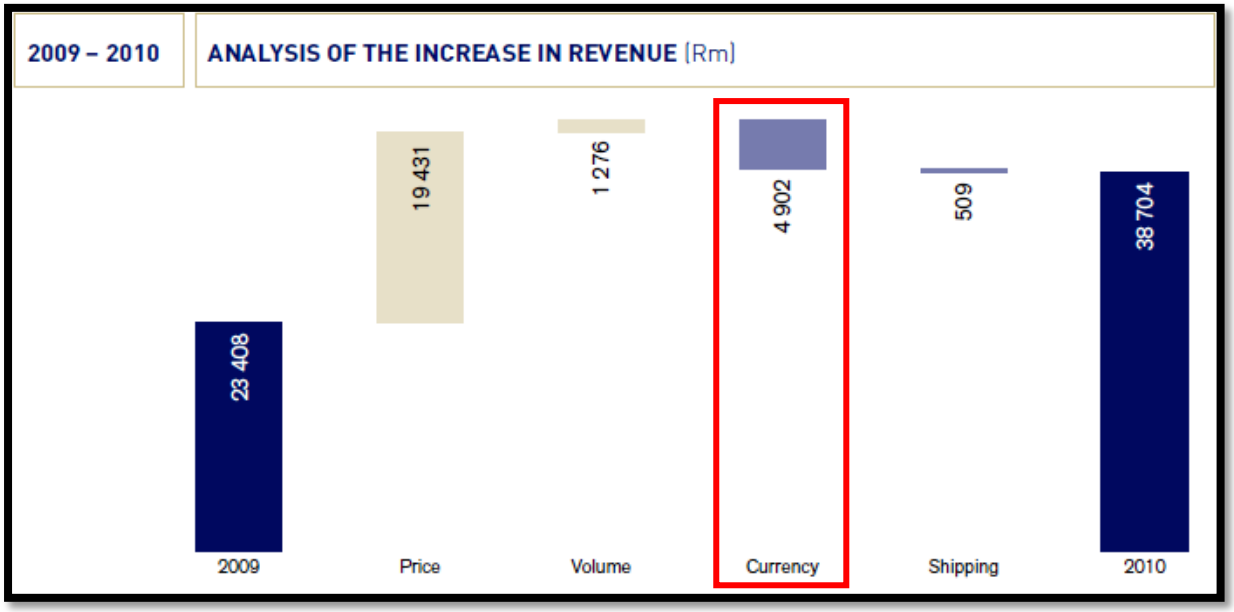
Any of the foreign exchange translations causing a profit of loss, are indicated in the statement of comprehensive income, besides those profits or losses relating to a cash flow movement. Cash flow movement transactions are indicated on the statement of changes in equity (Kumba, 2011). Kumba's iron ore exporting prices are denominated in USD. The average USDZAR rate for 2011 was ZAR 7.25: USD 1, with ZAR 7.3: USD 1 in 2010 and in 2009 was ZAR 8.39: USD 1. Aforementioned exchange rates were used to translate the statement of

comprehensive income. The statement of financial position, on the other hand, was translated on the last day of the financial year and was translated at ZAR 8.18: USD 1 in 2011, ZAR 6.63: USD 1 in 2010 and ZAR 7.39: USD 1 in 2009 (Kumba, 2009; Kumba, 2010; Kumba, 2011).

The use of derivative financial instruments decreases the uncertainty of the future cash flows of the companies. The board of the company has certain approve policies and directives and it is these policies and directives which only allow for some of the foreign exchange transactions to be hedged (Kumba, 2009; Kumba, 2010; Kumba, 2011).

In the financial review for 2010 (page 4), a depiction for the 2009 and 2010 financial years are given regarding the amount of increases or decreases made for revenue.

FIGURE 5.8: ANALYSIS OF REVENUE FOR KUMBA2009 AND 2010 (KUMBA, 2010)



As indicated in Figure 5.8, the 2009 and 2010 financial year of Kumba demonstrated that an appreciation of the ZAR from ZAR 8.39: USD 1 (2009) to ZAR 7.3: USD 1 (2010) reduces the operating profit of the company by ZAR 4.9 billion.

In note 31 to the financial statements of 2010, Figure 5.9 indicates the foreign exchange contracts implemented in the company. Figure 5.9 also indicated the 2009 year's foreign exchange contracts as comparative figures.

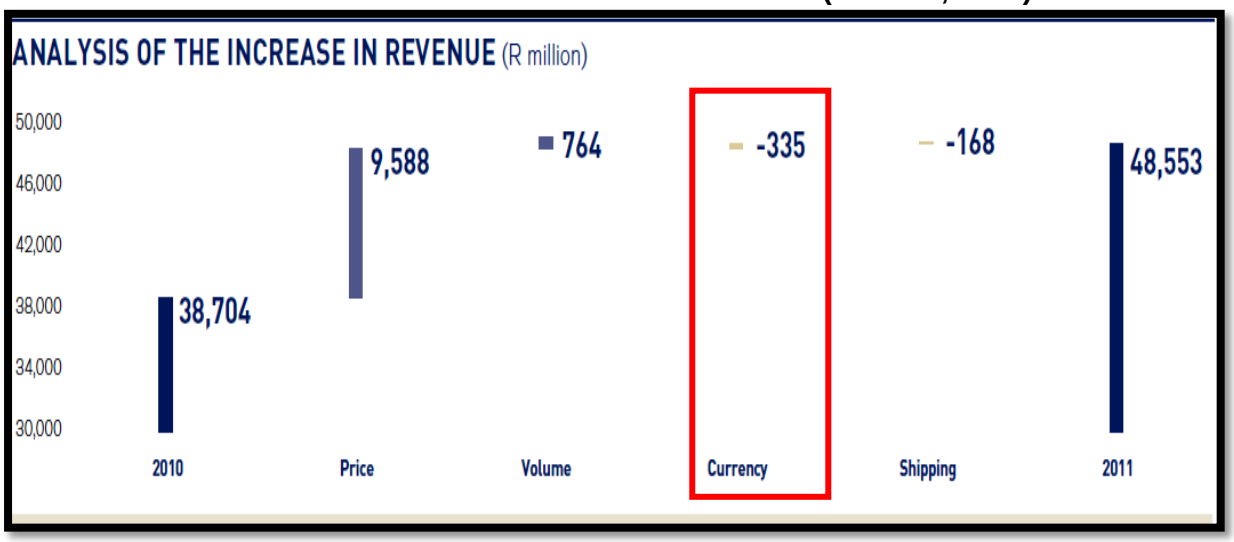
FIGURE 5.9: DERIVATIVE INSTRUMENTS USED FOR EXPORTING (KUMBA. 2010)

	Foreign amount (m)	Market related value Rm	Contract value Rm	Recognised fair value in profit or loss Rm
Derivative instruments – held for trading				
2010				
FECs related to the repatriation of foreign cash receipts				
US Dollar	130	863	925	62
Related to commitments for the import of capital equipment				
US Dollar	(15)	(99)	(107)	(8)
Euro	–	(3)	(6)	(3)
		761	812	51
2009				
FECs related to the repatriation of foreign cash receipts				
US Dollar	172	1 278	1 320	42
		1 278	1 320	42

As indicated in Figure 5.9 a transaction amount of USD 130 million was hedged for 2010, with this amount being USD 172 million for the 2009 reporting year. The profits created by these hedging contracts were respectively ZAR 42 million for 2009 and ZAR 62 million for 2010 (Kumba, 2010).

The financial review of 2011's reporting statements portrayed the analysis of increase in revenue as shown in Figure 5.10.

FIGURE 5.10: ANALYSIS OF REVENUE FOR KUMBA 2011 (KUMBA, 2011)



As indicated in Figure 5.10, the 2011 financial year of Kumba demonstrated that an appreciation of the ZAR from ZAR 7.3: USD 1 (2010) to ZAR 7.25: USD 1 (2011) creates a loss of ZAR 335 million affecting the operating profit of the company (Kumba, 2011).

FIGURE 5.11: DERIVATIVE INSTUMENTS USED FOR EXPORTING (KUMBA, 2011)

Rand million	Foreign amount (million)	Market related value	Contract value	Recognised fair value in profit or loss
Derivative instruments – held for trading				
2011				
FECs related to the repatriation of foreign cash receipts				
US dollar	180	1,466	1,505	39
		1,466	**1,505**	**39**
2010				
FECs related to the repatriation of foreign cash receipts				
US dollar	130	863	925	62
FECs related to future commitments for the import of capital equipment				
US dollar	(15)	(99)	(107)	(8)
Euro	–	(3)	(6)	(3)
		761	**812**	**51**

As indicated in Figure 5.11 a transaction amount of USD 180 million was hedged for 2011. The profit created by this hedging contract was ZAR 39 million for 2011 (Kumba, 2011).

Metorex enters into foreign exchange forward contracts to protect against the translation and foreign exchange risks. This group of companies apply hedge accounting on the foreign exchange forward contracts (Metorex, 2009; Metorex, 2010; Metorex, 2011).

Metorex uses the USD as their functional currency seeing as though the South-African operating subsidiaries are disposed in the 2011 year (Metorex, 2011). In the 2010 financial statement there is a note 25.2 to the financial instruments for 2010 indicating the following:

FIGURE 5.12: 2009 AND 2010 HEDGING CONTRACTS (METOREX, 2010)

Foreign currency hedges – On the statement of financial position

Currency	Maturity	Amount US$000	Average forward rate	Fair value profit/(loss) Rm
2010				
US Dollar	11 months	21 897	R7,74/US$	(21,6)
Total assets				(21,6)
2009				
US Dollar	1 month	10 000	R8,14/US$	(3,8)
US Dollar	1 month	8 054	R10,87/US$	(24,6)
Total assets				(28,4)

For the 2009 financial year there was two hedging contracts. The first was for an amount of USD 10 million at a rate of ZAR 8.14: USD 1 creating a loss of ZAR 3.8 million. This contract was entered into for only one month. The second contract, also for one month, was for an amount of USD 8.054 million at a rate of ZAR 10.87: USD 1. This contract led to an increased loss of ZAR 24.6 million (Metorex, 2010).

In Figure 5.12 the 2010 year indicates an amount of USD 21.897 million being hedged for eleven months at a rate of ZAR 7.74: USD 1, creating a loss of ZAR 21.6 million (Metorex, 2010). There were no hedging contracts entered into for the 2011 financial year.

The chief financial officer of **Sasol**, Christine Ramon, proclaimed that Sasol's hedging strategy is used in conjunction with other risk management tools such as cost containment, cash conservation and capital prioritisation. These tools are incorporated to make the hedges more successful and to strengthen the company's statement of financial position (Sasol, 2011a).

For the 2009 financial year there has been an indication of forward contracts being entered into as designated by note 64 of the financial statements for 2010 financial year:

FIGURE 5.13: FOREIGN EXCHANGE CONTRACTS 2009 (SASOL, 2010)

	Contract foreign currency amount 2009 million	Contract amount – Rand equivalent 2009 Rm	Average rate of exchange 2009 (calculated)	Estimated fair value (losses)/ gains 2009 Rm
Forward exchange contracts				
Related to transactions which have already occurred				
Derivative instruments – cash flow hedges				
Imports – capital				
Euro	10	127	12,76	(5)
US dollar	1	7	9,23	–
Pound sterling	–	2	13,61	–
Other currencies – US dollar equivalent	13	106	8,20	(6)
		242		(11)
Exports				
US dollar	4	41	9,23	6

Figure 5.13 indicates an amount of USD 4 million being hedged at a rate of ZAR 9.23: USD 1, creating a profit of ZAR 6 million indicated in the statement of comprehensive income. Figure 5.14 indicates the forward contracts entered into as signified by note 64 of the financial statements for 2010 financial year:

FIGURE 5.14: FOREIGN EXCHANGE CONTRACT 2010 (SASOL, 2010)

	Contract foreign currency amount 2010 million	Contract amount – Rand equivalent 2010 Rm	Average rate of exchange 2010 (calculated)	Estimated fair value (losses)/ gains 2010 Rm
Exports				
Euro	–	3	9,31	–
US dollar	64	471	7,40	(16)
Pound sterling	2	25	10,80	(1)
Other currencies – US dollar equivalent	8	62	7,56	(4)
		561		(21)

Figure 5.14 specified an amount of USD 64 million being hedged at a rate of ZAR 7.4: USD 1, creating a loss of ZAR 16 million indicated in the statement of comprehensive income.

For the 2011 financial year there has been an indication of the following forward contracts being entered into as depicted by note 64 of the financial statements for 2011 financial year: Figure 5.15 indicates an amount of USD 97 million being hedged at a rate of ZAR 6.84: USD 1, creating a profit of ZAR 6 million indicated in the statement of comprehensive income.

FIGURE 5.15: FOREIGN EXCHANGE CONTRACTS 2011 (SASOL, 2011a)

	Contract foreign currency amount 2011 million	Contract amount – Rand equivalent 2011 Rm	Average rate of exchange 2011 (calculated)	Estimated fair value (losses)/ gains 2011 Rm
Exports				
Euro	1	5	9,79	–
US dollar	97	667	6,84	6
Pound sterling	7	76	11,15	2
Other currencies				
– US dollar equivalent	12	79	6,79	1
		827		9

To conclude and summarize the hedging contracts of each company and applicable period, Table 5.1 has been created. As seen in Table 5.1, column one indicates the specific company and the financial year which is used for that particular row. Column two is the financial year-end for the company. Please note that the year-ends for African Rainbow Minerals and Sasol are on the 30th of June for each year and that the year-ends of Exxaro, Kumba and Metorex are on the 31st of December of the applicable years. This has no significance for this study, except for the exchange rates calculated on year-end. The third and fourth columns indicate the contract amounts, but first in USD million and then in ZAR million. The fifth column indicates the profits or losses made by the companies for the applicable years and the sixth column shows the fair values of the contracts in ZAR as determined on the end of each financial year. The last column is the most important and is the one that this study is trying to improve for the companies. It is the hedging contract rates for each company.

TABLE 5.1: HEDGING INFORMATION OF THE COMPANIES

Company and year	Year end	Contract USD million	Contract ZAR million	Profit or (Loss) ZAR million	Fair values ZAR million	Contract rate ZAR
ARM [2009]	30/06/2009	42.50	347.31	(16.00)	363.31	8.1720
ARM [2010]	30/06/2010	42.50	347.31	(16.00)	363.31	8.1720
ARM [2011]	30/06/2011	0	0	0	0	0
Exxaro [2009]	31/12/2009	22.00	175.00	28.00	164.00	7.9545
Exxaro [2010]	31/12/2010	101.00	726.00	50.00	676.00	7.1881
Exxaro [2011]	31/12/2011	215.00	1622.00	(155.00)	1777.00	7.5442
Kumba [2009]	31/12/2009	172.00	1320.00	42.00	1278.00	7.6744
Kumba [2010]	31/12/2010	130.00	925.00	62.00	863.00	7.1154
Kumba [2011]	31/12/2011	180.00	1505.00	39.00	1466.00	8.3611
Sasol [2009]	30/06/2009	4.00	41.00	6.00	35.00	9.2300
Sasol [2010]	30/06/2010	64.00	471.00	(16.00)	487.00	7.4000
Sasol [2011]	30/06/2011	97.00	667.00	6.00	661.00	6.8400
Metorex [2009]	31/12/2009	10.00 8.05	81.40 87.55	(3.80) (24.60)	85.20 112.15	8.1400 10.8700
Metorex [2010]	31/12/2010	21.90	169.48	(21.60)	191.08	7.7400
Metorex [2011]	31/12/2011	0	0	0	0	0

According to Table 5.1 for 2009 and 2010 the largest hedging contracts were set by Kumba, amounting to USD 172 million (2009) and USD 130 million (2010), respectively. For the 2011 financial years, Exxaro hedged the largest amount of USD 215 million.

Exxaro's hedging contract for 2011 also resulted in the largest loss of ZAR 155 million. The company obtaining the largest profit from their hedging contracts was Kumba in the 2010 financial year, with an increase in profit of ZAR 62 million.

ARM made losses in both 2009 and 2010 financial years, resulting in a loss of ZAR 32 million over the three year span. Exxaro made profits from the hedging contracts for 2009 and 2010, but in 2011 the company had an enormous loss. Measuring the outcome over the three years for Exxaro, the loss of 2011 created an estimated loss of ZAR 77 million at the end of the three years. Kumba made hedging profits in all three years applicable; amounting to approximately ZAR 143 million for the three years. Sasol only made profits in 2009 and 2011 and the 2010 year created the overall loss for the three years of ZAR 4 million. Metorex, on the other hand, made losses in all contracts applied, ending with an estimated loss for the three year period of ZAR 50 million.

Studying the ZAR contract rates of Table 5.1 for each company and year, there is no resemblance between the exchange rates. The USDZAR exchange rate fluctuates in such a way that it makes it difficult for companies to find the correct hedging rate for their contracts. As mentioned above, almost all the companies had a gathered loss for the three years. It is the aim of this study to increase the possibility for the companies to incur a profit after a hedging contract and perhaps produce better foreign exchange contract rates to hedge at.

5.4 The exchange rates over the 3 year periods

The United States of America is one of South Africa largest trading partners and it is for this reason that the USDZAR rate is hedged through the use of forward-currency contracts (Sasol, 2011a; Brand & Gunnion, 2011). Taking the contract rates that the

companies used into consideration, this study can provide estimates of the potential rates the companies should have used to increase profits or decrease losses.

For this study the exchange rates for certain dates will be depicted on graphs and these graphs will be used in conjunction with the technical analysis to determine the optimal exchange rate to hedge at and confirm an increase or decrease in profits or losses.

FIGURE 5.16: EXCHANGE RATES OF USDZAR (SARB, 2012)

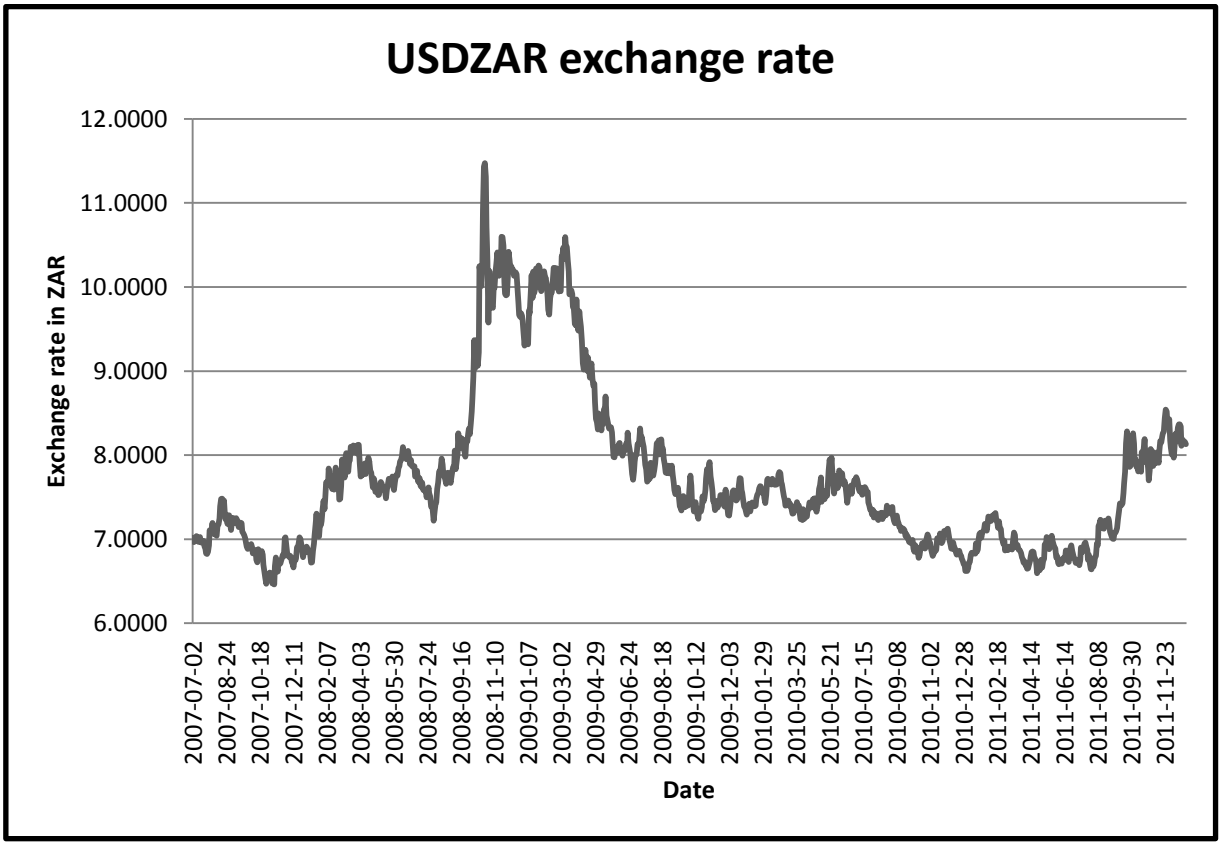


Figure 5.16 above indicates the USDZAR exchange rate for the periods 1st of July 2009 until the 31st of December 2011. This period is the period in which the financial periods of the companies are applicable. The fluctuating exchange rate of USDZAR indicated on Figure 5.16, causes the currency risks experienced by each company and its hedging contracts. The exchange rates as shown above are indicated in Appendix A.

The study incorporates these exchange rates with the technical analysis to estimate the necessary hedging contract rates. It is these rates that companies would be able to determine for themselves, if the technical analysis is applied.

5.5 Methodology

The technical analysis was made famous by Ralph N. Elliott, who was an accountant by trade. He determined that all markets have specific movements which he called waves; these waves could be predicted by using historic information depicted on graphs. This is where the technical analysis took its foothold on modern price estimation (Swannell, 2003; McHugh, 2012).

There have been various studies making use of the technical analysis as forecasting method, such as Dewachter and Lyrio (2003) who found that technical analysts' opportunity costs are rather high, even for traders with low risk preferences. This might put traders off of the use of the technical analysis, but in Bessembinder and Chan (1995), who used simple technical analysis tools as forecasting methods to determine future stock price activity in Asian markets, the technical analysis showed predictive power in the Malaysia, Thailand and Taiwan markets. This study also indicated that the technical analysis identifies periods of worldwide stability with regards to returns.

In the current study, the technical analysis is also used, but it is to predict future prices of the foreign exchange market and to determine the possible benefits the predictions of the technical analysis may have for mining and extractive companies in South African markets.

5.5.1 The technical analysis

There are various technical analysis tool to be used by technicians, but trends, support and resistance and the Fibonacci tools are basic technical tools; easy to understand and implement. Below are descriptions of how these tools are applied in this study with an example at each tool of the graphs used for the predictions. The graphs discussed in this chapter are only for the first periods relevant to the reporting

periods for the companies and for further reference to the technical calculations done for the other reporting periods, please relegate to Appendix B.

Trend lines are drawn through connecting a swing high (a chosen high point) and a swing low (a chosen low point). The applicable swing highs and swing lows are indicated in Appendix B in Table B.1 and B.2. It takes at least two tops or bottoms to portray a legitimate trend line, but it takes three to validate a trend line. The steeper the trend line is drawn, the less trustworthy it is going to be and the more likely it will break. Trend lines are similar to horizontal support and resistance levels, because they become stronger the more times they are tested (Chen, 2010; Babypips, 2011). The trend and ellipse indicates in which direction the market is moving and what traders and investors think of certain currencies and their trading value

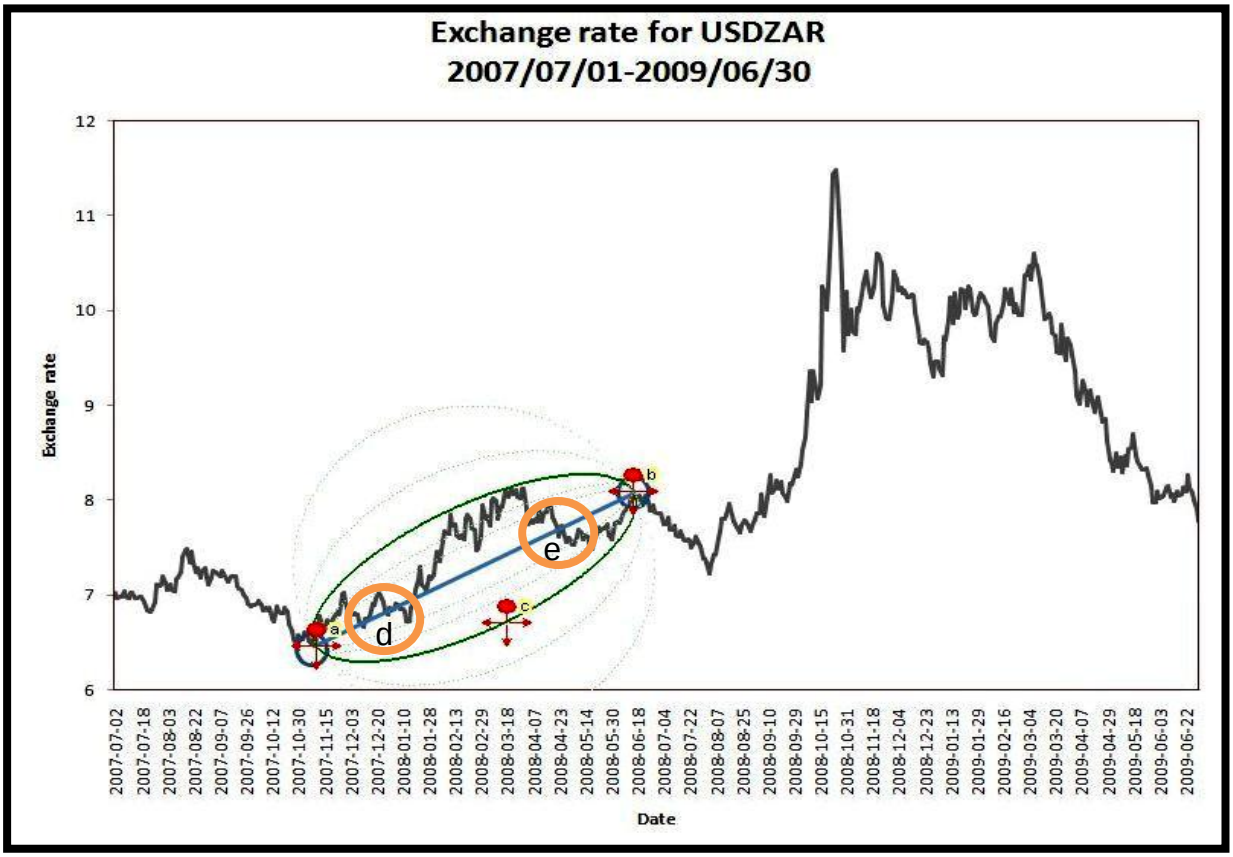
All the trends for the periods indicated start with either a swing low or a swing high which is indicated by point a on the figures. Point b would be the second swing which can also be either a swing high or low. By connecting point a and b there comes into being a trend line which shows the appreciation or depreciation of a market. To determine the strength of a trend line, apart from taking the steepness of the trend into account, the Fibonacci ellipse can be used. With this tool the trend is drawn and the ellipse forms with its curves on the swing low and high. If the exchange rate curve for the period of the trend falls within the ellipse's 0% level (in all the figures the 0% level is the darker ellipse) it is indicative of a very strong trend.

Figure 5.17 depicts the trend line and the Fibonacci ellipse for the first period from the 1st of July 2007 until the 30th of June 2009. This period is applicable on ARM and Sasol, seeing as though their year-ends fall within this time.

Figure 5.17 has a rising trend line, also known as an uptrend, with point a being the swing low at ZAR 6.46 on the 9th of November 2007and point b indicating the swing high of ZAR 8.10 on the 13thof June 2008 (for further information refer to Table B.1 and Table B.2). This trend line has been tested various times for instance on 2007/12/09, 2007/12/28 and 2008/04/22 (designated by points d and e respectively) which makes it a rather strong trend and the Fibonacci ellipse also indicates this by

the USDZAR exchange rate which falls perfectly within the 38.2% level (indicated by the green ellipse circumventing through the points a, b and c).

FIGURE 5.17: TREND AND ELLIPSE FOR THE YEAR-ENDS 2008 AND 2009



Own source

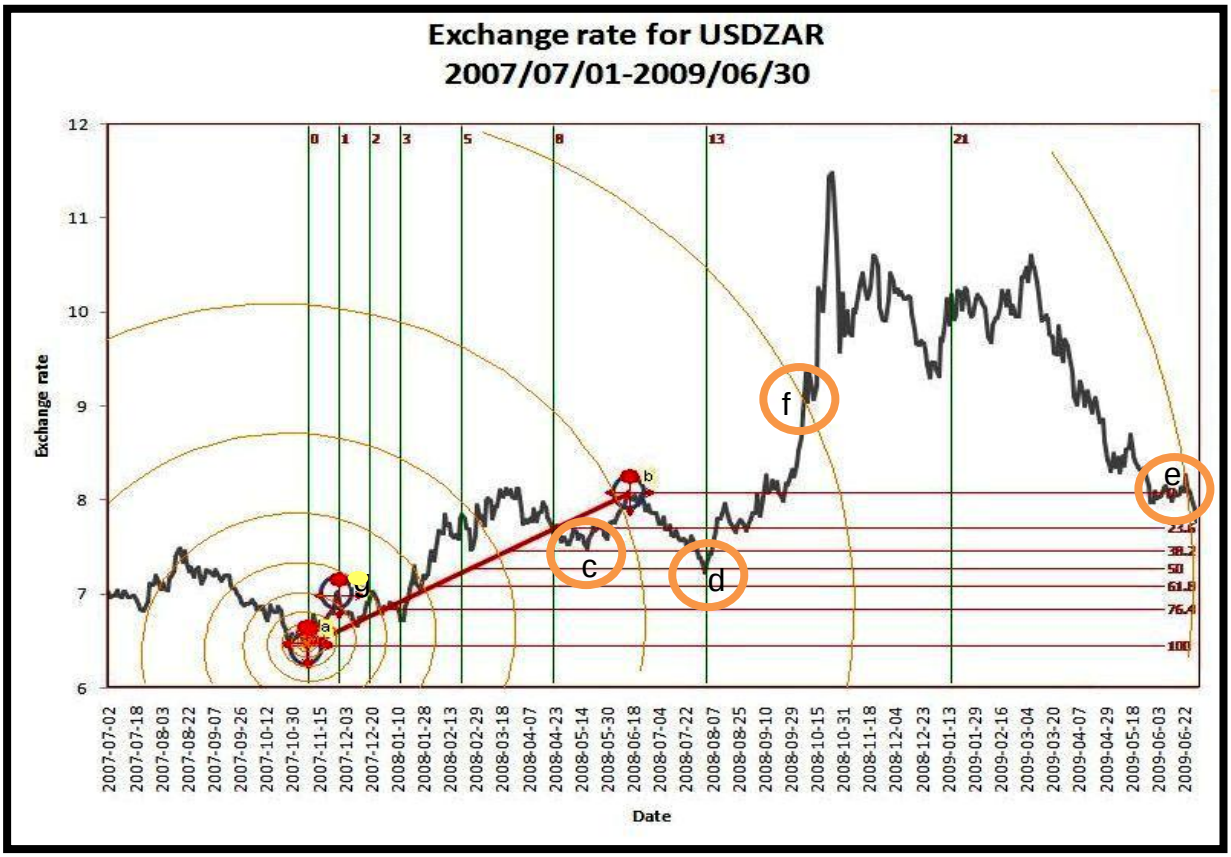
The Fibonacci ellipse not only confirms the strength of the trend line, but also indicates if the trend is among the popular Fibonacci levels used in forecasting. In Figure 5.18, the ellipse falls along the 38.2% Fibonacci level and the exchange rates moving along the trend line all fall within the 38.2% ellipse (seen in figure 5.18 as the dark green ellipse). This shows an excellent trend line with excellent predicting ability.

Support and resistance levels are subjective to each individual trader and his beliefs. The Fibonacci retracement levels (23.6%; 38.2%; 50%; 61.8%; 76.4%; 161.8%) are used as support and resistance levels on charts. They are drawn of key points on a previous price movement. These levels are projected into the future and used as support and resistance levels as long as the price faction, on which it was drawn, holds (Cofnas, 2004; Babypips, 2011).

Fibonacci retracement and extension levels are calculated using a swing high and swing low. Most trading programs contain a Fibonacci calculator which calculates the percentage levels between the swings such as 23.6%, 38.2%, 50%, 61.8% and 76.4%.

Other Fibonacci tools are **Fibonacci time zones** said to indicate specific dates at which significant price movements will take place (Cofnas, 2004; Chen, 2010). For time zones two points are determined on the chart and these points are used to calculate the length of a unit interval (Chen, 2010). These unit intervals are then drawn according to the Fibonacci sequence of 0, 1, 2, 3, 5, 8, 13, 21 to infinity.

FIGURE 5.18: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2008 AND 2009



Own source

The Fibonacci retracement levels were drawn off of the trend line as determined in the Figure 5.18. Unfortunately there was an extreme spike in the USDZAR exchange rate in October of 2008. This was the period where the recession struck and caused the retracement levels to be rather useless seeing as though it was an unexpected

event. Forecasting using the retracements would lead traders and companies to set their contract rates at the 38.2% and 50% levels, because they have been tested various times as indicated by points c and d on Figure 5.19.

Taking a look at the rest of the rate for the 2009 financial year, the major retracement levels turned out to be the 0% level and the 23.6% level and contact prices would have been set at the optimal price rage at the 0% level (shown by point e).

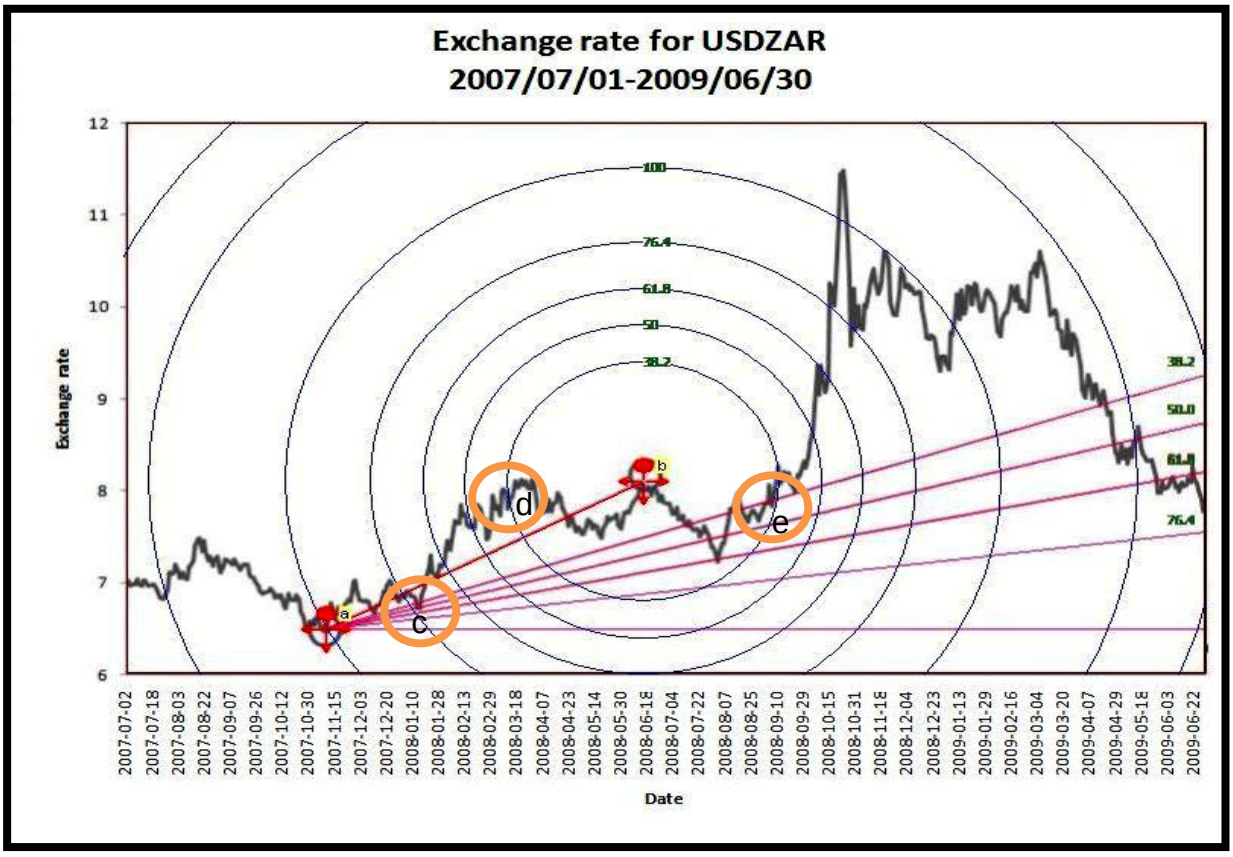
The Fibonacci spiral, drawn from point a, indicated major moves at 2008/10/20 (point f) and also intersected with the 0% level of the retracement levels which occurred at the year-end (point e) and this causes traders to determine the exchange rate at that intersecting point, which in Figure 5.19 is indicated by point e.

Unfortunately with the sudden movement of the exchange rate, the Fibonacci time zones could not accurately predict future movement dates, except for point d. It was at this point that the exchange rate made its last major plummet before raging upwards over the ZAR 11.00 mark.

Fibonacci arcs and fans are other Fibonacci tools built by drawing a trend line from a swing high and a swing low. A vertical line is drawn from the second swing and Fibonacci retracement and extension levels are determined according to this vertical line. Arcs are then built with their centres intersecting the vertical lines' retracement and extension levels. Fans are drawn by connecting the first swing with the retracement and extension levels indicated on the vertical line.

The **Fibonacci spiral** is drawn according to the Fibonacci sequence and can either turn to the left or the right of the selected point.

FIGURE 5.19: ARCS AND FANS FOR THE YEAR-ENDS 2008 AND 2009



Own source

The arcs are drawn with their centres fixed at point b and the key Fibonacci fans of 38.2%, 50% and 61.8% are drawn on the Figure 5.19. Seeing as though the areas of the arcs do not stretch that far into the future, it would be best if the Fibonacci levels of 138.2% and 161.8% is also used. Using these tools will cause the companies to determine the hedging contract rates at the end of the financial year of 2009. By using the Fibonacci levels of both tools at which the most movement occurred for the exchange rate, the companies may be able to determine a more accurate exchange rate to use in their contract. For the fans these levels will be the 38.2%, 50% and 61.8% level and for the arc at the level of 161.8%.

Taking previous price movements into consideration, traders and investors alike will make use of the 38.2%, 50% or 61.8% Fibonacci fans, due to the intersection it had with the low at point c.

The Fibonacci arc that will be used to predict the exchange rate is the 38.2% level due the fact that the exchange rate made more contact with this arc than any of the

others and, therefore, the price at year-end will be estimated using the 38.2% arc intersecting the three fan percentage levels.

Using the chart as indicated above, the companies could have estimated the exchange rates as indicated by Figure 5.6 at ZAR 7.97; signified by point e where the 0% retracement level and the Fibonacci spiral meets. Figure 5.19 estimates the exchange rate at ZAR 7.98 where the 38.2% arc and fan meets, shown by point e. Note that this level is not specifically at year-end like the previous estimation, but it is made on the assumption that the previous levels will prevail in the future, which in this case is the year-end. Combining the outcomes of Figure 5.18 and 5.19's predictions of the exchange rate at the year-end of 2009, the companies could have set their exchange rates used for hedging at the average rate of ZAR 7.98 (for more detail see Table 5.2).

The calculations as shown on each figure and depicting each technical tool is shown in Appendix B. There each figure is discussed as done above in the stipulated periods and the graphs visually indicate the different technical tools as discussed above.

5.6 Results and discussion

The next section is the predictions of the different tools indicated and discussed above and in Appendix B. Each period is handled separately. Each financial year-end exchange rate is predicted using graphs for one year before the financial year-end and then six months into the applicable financial year-end.

TABLE 5.2: PREDICTED RATES IN ZAR						
Company	**Year-ends**	**Periods**	**Retracements and Spirals in ZAR A**	**Fans and Arcs in ZAR B**	**Average ZAR rate for individual charts C**	**Average ZAR rate for year-end D**
SASOL & ARM	2009	2007/07/01-2009/06/30	7.97	7.98	7.98	8.5375
		2008/07/01-2009/06/30	8.25	9.95	9.10	
	2010	2008/07/01-2010/06/30	8.25	9.95	9.10	8.335
		2009/07/01-2010/06/30	7.49	7.65	7.57	
	2011	2009/07/01-2011/06/30	7.49	7.65	7.57	7.26
		2010/07/01-2011/06/30	7.01	6.89	6.95	
METOREX, EXXARO & KUMBA	2009	2008/01/01-2009/12/31	8.85	10.16	9.51	8.95
		2009/01/01-2009/12/31	8.27	8.52	8.40	
	2010	2009/01/01-2010/12/31	8.27	8.52	8.40	8.0625
		2010/01/01-2010/12/31	7.43	8.03	7.73	
	2011	2010/01/01-2011/02/31	7.43	8.03	7.73	7.455
		2011/01/01-2011/12/31	7.87	6.49	7.18	

Own source

According to the data for the financial year-ends falling on the 30th of June of each year (which are the year-ends of Sasol and ARM), there were two charts drawn for each of the year-ends. The one includes the financial year before the current financial year and the other is a chart drawn for six months into the financial year of the companies in question. For the 2009 financial year, the chart drawn from 2007/07/01 until 2009/06/30 indicated a predicted rate of ZAR 7.97 with the retracement levels (see A) and ZAR 7.98 with the Fibonacci arcs and fans (see B). These rates were then combined to determine an average rate for the exchange rate for the 24 month period before year-end (column C). The same steps were followed for the six months into the year to estimate the average ZAR rate (also column C) and lastly the six-month-rate and the 24 month-rate was combined to form the average optimum ZAR rate at the end of the financial year (refer to column D). The rates predicted for the 2009, 2010 and 2011 financial years of Sasol and ARM are individually ZAR 8.5375, ZAR 8.335 and ZAR 7.26.

The same steps were followed to predict the exchange rates of Metorex, Exxaro and Kumba and their ZAR rates were determined as follows: for the 2009 financial year, it was ZAR 8.95; for the 2010 financial year, it was ZAR 8.0625 and in 2011 it was ZAR 7.455.

These rates were then used together with Table 5.1 to produce Table 5.3. This table indicates the information of the hedging contracts and the profit and loss each company made in each of the three financial years. In column E our predicted rates are shown as set forth in Table 5.2. This rate (E) is then multiplied by the US million contract value (A) to determine our predicted ZAR million contract value (F). Column D is subtracted from column F to present the profits or losses made with the predicted rates. The last column indicates the value of the predictability and if the company would have been better or worse off if they had used the Fibonacci tools.

The following estimates are according to Table 5.3:

- African Rainbow Minerals the 2009 and 2010 financial years indicated better outcomes with the predictive rates where the 2009 year indicated a lesser loss of ZAR 470 thousand and 2010 year a lesser loss of ZAR 9.07 million. On average for the three years, the predicted loss amounted to ZAR 9.54 million in comparison to the actual loss of ZAR 32 million for the three years.

- Exxaro would have benefitted from the Fibonacci tools in the 2009 and 2010 years with ZAR 32.9 million and ZAR 138.31 million respectively. In 2011 there is an indication of a loss of ZAR 175.25 million which is ZAR 20.25 million worse than the original contract. The total effect for the three years would have been a predicted loss of ZAR 4.04 million, which is still an improvement over the ZAR 77 million losses that were actually incurred.

- For Kumba Iron Ore it is the same as in Exxaro's case where the company would have made ZAR 219.4 million (2009) and ZAR 123.13 million (2010) more profit had they used the Fibonacci predicted rates. Though in its 2011 year it would have experienced a major plunge in the exchange rate and the prediction would have led to a loss of ZAR 124.1 million. If Kumba had applied the technical tools to determine the hedging contract's rate of exchange, the company would have incurred a ZAR 322.43 million profits in comparison to the meagre ZAR 143 million profits actually received.

- Metorex indicated a profit of ZAR 4.3 million where it really made a loss of ZAR 3.8 million in the 2009 year. The 2009 predicted numbers for the second hedging contract of this year indicated a larger loss of ZAR 40.10 million than the company's real loss of ZAR 24.6 million. The 2010 year would have been a lesser loss of ZAR 14.51 million had the company used the technical analysis to fix their hedging contract's rates. Metorex would have been worse of had they used the technical analysis tools for the three years. The actual loss for the three years was ZAR 50 million where it could have been ZAR 50.3 million.

- Sasol indicated a worse effect in the 2009 year with a predicted loss of ZAR 850 thousand, but in 2010 and 2011 Sasol would have made larger profits of ZAR 46.44 million and ZAR 43.22 million respectively had they used the predicted rates as determined by the technical analysis to fix their hedging contract rates. For the three years applicable, Sasol could have made ZAR 88.81 million had it used the technical analysis to predict the hedging rate. The actual outcome was a loss of ZAR 16 million.

According to the calculations done in the empirical analysis, the forecasts were made for the 2009 to 2011 financial years of Sasol, African Rainbow Minerals, Kumba Iron Ore, Exxaro and Metorex extractive companies. Table 5.2 indicates the predicted rates for the USDZAR exchange rate, with two rates determined for each financial year. Combining these rates gives the average rate for each year-end.

TABLE 5.3: PREDICTABILITY OF TECHNICAL TOOLS

Company and year	Contract USD million A	Contract rate ZAR B	Contract ZAR million A x B=C	Fair values ZAR million D	Profit or (Loss) for contract in ZAR million C - D	Predicted ZAR rate E	Predicted ZAR million A x E=F	Predicted Profit or (Loss) in ZAR million F-D=G	Predictability is better or worse?
ARM [2009]	**42.50**	**8.17**	**347.31**	**363.31**	**-16.00**	**8.54**	**362.84**	**-0.47**	BETTER
ARM [2010]	**42.50**	**8.17**	**347.31**	**363.31**	**-16.00**	**8.34**	**354.24**	**-9.07**	BETTER
ARM [2011]	**-**	**-**	**-**	**-**	**-**	**7.26**	**-**	**-**	N/A
Exxaro [2009]	**22.00**	**7.95**	**175.00**	**164.00**	**11.00**	**8.95**	**196.90**	**32.90**	BETTER
Exxaro [2010]	**101.00**	**7.19**	**726.00**	**676.00**	**50.00**	**8.06**	**814.31**	**138.31**	BETTER
Exxaro [2011]	**215.00**	**7.54**	**1622.00**	**1 777.00**	**-155.00**	**7.45**	**1 601.75**	**-175.25**	WORSE
Kumba [2009]	**172.00**	**7.67**	**1320.00**	**1 278.00**	**42.00**	**8.95**	**1 539.40**	**261.40**	BETTER
Kumba [2010]	**130.00**	**7.12**	**925.0**	**863.00**	**62.00**	**8.06**	**1 048.13**	**185.13**	BETTER
Kumba [2011]	**180.00**	**8.36**	**1505.00**	**1 466.00**	**39.00**	**7.46**	**1 341.90**	**-124.10**	WORSE
Metorex [2009]	**10.00**	**8.14**	**81.40**	**85.20**	**-3.80**	**8.95**	**89.50**	**4.30**	BETTER
	8.05	**10.87**	**87.55**	**112.15**	**-24.60**	**8.95**	**72.05**	**-40.10**	WORSE
Metorex [2010]	**21.90**	**7.74**	**169.48**	**191.08**	**-21.60**	**8.06**	**176.57**	**-14.51**	BETTER
Metorex [2011]	**-**	**-**	**-**	**-**	**-**	**7.46**	**-**	**-**	N/A
Sasol [2009]	**4.00**	**9.23**	**41.00**	**35.00**	**6.00**	**8.54**	**34.15**	**-0.85**	WORSE
Sasol [2010]	**64.00**	**7.40**	**471.00**	**487.00**	**-16.00**	**8.34**	**533.44**	**46.44**	BETTER
Sasol [2011]	**97.00**	**6.84**	**667.00**	**661.00**	**6.00**	**7.26**	**704.22**	**43.22**	BETTER

5.7 Summary

In this chapter the empirical analysis was conducted. The steps for drawing the retracement levels, Fibonacci spiral, time zones, arcs and fans were discussed and they were performed on the charts for the companies Sasol, African Rainbow Mineral, Kumba Iron Ore, Metorex and Exxaro. These companies' financial statements were used and the hedging contracts of each company were summarized in Table 5.1. The charts were drawn for the companies' year-ends, in which case Sasol and African Rainbow Mineral ended on the 30th of June and Metorex, Exxaro and Kumba Iron Ore ended on the 31st of December of the three years from 2009 until 2011.

After the charts were drawn and the Fibonacci tools were used on the charts, the study gave a brief overview of the findings, as well as the ways in which the predicted rates would have affected the companies' hedging contracts had the predicted rates been used.

CHAPTER 6
SUMMARY AND CONCLUSION

6.1 Summary

Due to the changing nature of the exchange rates, countries are extremely dependant of movements that might affect their currency as well as their trading countries' currency. This influences the amount of trades that companies are willing to take, but the possibility to forecast potential activity in the currency market enables companies to establish the exchange rate risks they are letting themselves into. Risks in foreign exchange markets are an important dimension in investments and price movements (Carrieri & Majerbi, 2006). It is universally priced and uses a risk premium which is created by the exchange risk exposure (Carrieri & Majerbi, 2006). Current prices reflect past prices which makes technical trading futile according to market efficiency (Kwon & Kish, 2002). On the contrary, technical analysts may profit from supply and demand information by using the past prices. This is due to the slow response of some market participants (Kwon & Kish, 2002). All these factors led to different exchange rate regimes being created.

There have been various exchange rate regimes over the years, but the two main categories are fixed exchange rates and floating exchange rates. Fixed exchange rates started in the 1870s where exchange rates were fixed on the Gold Standard. This later changed to the Bretton Woods System, which ended in the 1970s. It was after the dismissal of the Bretton Woods System that countries, such as South Africa, mostly left their exchange rates to float (Potgieter, 2005). Floating exchange rates are volatile and almost always in imbalance. For major countries it is a norm for their exchange rates to be out of balance. The amount and number of exchange rates differ tremendously, but are reversed with no explanation why. This regime creates problems for the companies to forecast or predict the exchange rates. Companies have difficulty making accurate forecasts which lead to an increase in prediction errors (Scott, 2004).

The foreign exchange market mainly consists of companies importing or exporting. The South African exchange rate moves in very large ways and this is the usual way for this countries exchange rate to move (Baines, 1988). Supply and demand also plays a big role on the exchange rate and its movements (Baines, 1988). The foreign exchange market helps to bring together the supply and demand of different countries and can be seen as an institutional structure (Baines, 1988).

Currency hedges are where traders such as mining companies step into a transaction to counter their foreign investment (Jones & Jones, 1987). They then offset the two transactions against one another to get the necessary outcome (Jones & Jones, 1987). Hedging gives the hedger a sense of certainty. It reduces and decreases exposure, but does not eliminate it. A hedge can be seen as insurance against losses in exchange rate risks (Jones & Jones, 1987). But like any insurance, not all risks are covered. That is why in this study the hedging processes of companies are seen as external risk reducing methods and the forecasting of the exchange rates are seen as internal measure to be implemented (Brandt, 1984). The forecasting analyses will help companies to lower or even eliminate the risks that hedges are still susceptible to by predicting the exchange rates at which hedging contracts are set.

To forecast the markets is the most important step in the assessment procedure. Forecasting can be based on the established study of supply and demand factors that influence the movement of the market prices. Traders call this the fundamental analysis. The fundamentalist looks at earnings, profits, trade losses and changes in money provisions, to arrive at an estimate of the value of a futures market. This helps them determine if the market is under- or overrated. Chartism focuses on the action of the market itself. Here the effects and the movements of the prices itself is studied. To enter the market at the correct or opportune moment is the most important thing in the markets.

The technical analysis has many advantages (Colby, 2003). It organises information, provides a strong foundation for making decisions, and is less costly, easy to use and quick. Technicians do not rely on causes and effects for market

changes. They know that trends persist and do not care how long it lasts, but that it keeps going till supply and demand changes (Colby, 2003).

Theories such as fundamentalism and technicalism should be intertwined when making decisions (Krow, 1969). All the analyses should be used to validate each other (Laschinger, 2006). The technical analysis focuses on the price of items, where the fundamental analysis takes a closer look at the supply and demand of an item (Laschinger, 2006).

It is difficult to forecast exchange rates (Leung, Chen & Daouk, 2000). For companies that trade internationally, in either imports or exports, it would be of utmost importance and increased profits if the exchange rate could successfully be predicted or at least be predicted with better outcomes for the company (Torkamani, Mahmoodzadeh, Pourroostaei, & Lucas, 2007).

6.2 Conclusion

According to the results obtained in chapter 5, the conclusion can be made that, if the companies used the technical analysis tools to determine and fix their exchange rates of the hedging contracts, in most of the cases they would have been better off with lesser losses or increased profits. Traders should remember to bear in mind that the exchange rates are influenced by so many unpredictable factors that it is impossible to get a 100% outcome. The foreign exchange market is still a gamble and can still cause great losses or profits for a company, but using the technical analysis can improve the chances of getting the exchange rate correct and making a profit.

For future studies all three schools of forecasting analyses may be used to test the efficacy of the hedging contracts. This would provide a wider range of predicting techniques for market participants. Though the application of this study was on the foreign exchange market, future studies may focus on stock market predictions, which would lead to the improvement of stockholders' ownership and possible proceeds.

REFERENCES

Adam-Müller, A.F.A. 1997. Export and hedging decisions under revenue and exchange rate risk: A note. *European economic review*, 41:1421-1426.

Adam-Müller, A.F.A. 2000. Hedging price risk when real wealth matters. *Journal of international money and finance*, 19(4):549-560.

Adams, J.E. 1972. Forecasting tool: The Fibonacci indicator. *Financial analyst's journal*, 28(5):95-96.

Ainson, W. 2011. Getting technical. *Financial planning*: 107-109.

Alghalith, M. 2006. A note on hedging cost and basis risks. *Economic modelling*, 23:534-537.

Alkeback, P. & Hagelin, N. 1999. Derivative usage by non-financial firms in Sweden with an international comparison. *Journal of international financial management and accounting,* 10:105-120.

Alkeback, P., Hagelin, N. & Pramborg, B. 2006. Derivative usage by non-financial firms in Sweden 1996 and 2003: what has changed?. *Managerial finance*, 32(2):101-114.

Antweiler, W. 2003. Currency trends. http://www.universityofbritishcolumbia/sauerschool/business/pacific_exchangeratesservice/currencytrends.html Date of access: 22 November 2011.

ARM. 2009. Financial Statements 2009. http://www.arm.co.za/ Date of access: 20 June 2012.

ARM. 2010. Financial Statements 2010. http://www.arm.co.za/ Date of access: 20 June 2012.

ARM. 2011. Financial Statements 2011. http://www.arm.co.za/ Date of access: 20 June 2012.

Aron, J., Elbadawi, I. & Kahn, B. 1997. Determinants of the real exchange rate in South Africa. Oxford: Oxford University.

Babypips. 2011. School of pipsology. http://www.babypips.com/school/ Date of access: 5 March 2011.

Bailliu, J. & King, M.R. 2005. What drives movements in exchange rates?.*Bank of Canada review*, Autumn.

Baines, G.H.N. 1988. An evaluation of alternative hedging techniques in the foreign exchange market for the South African importer. Cape Town: University of Cape Town. (MBA.).

Bartram, S.M., Brown, G.W. & Fechle, F. 2009. International evidence on financial derivatives usage. *Financial management*, 38(1):185-206.

Benson, K. & Oliver, B. 2004. Management motivation for using financial derivatives in Australia. *Australian journal of management*, 29(2):225-242.

Berkman, H., Bradbury, M.E. & Magan, S. 1997. An international comparison of derivative use. *Financial management*, 26(4):69-73.

Berkman, H., Bradbury, M.E., Hancock, P. & Innes, C. 2002. Derivative financial instrument use in Australia. *Accounting and finance*, 42(2):97-109.

Bessembinder, H. & Chan, K. 1995. The profitability of technical trading rules in the Asian stock markets. *Pacific-Basin finance journal,* 3:257-284.

Bessie, J. 2006. Risk management in banking. England: John Wiley & Son Ltd.

Bhattacharya, S & Kumar, K. 2006. A computational exploration of the efficacy of Fibonacci sequence in technical analysis and trading. *Annals of economics and finance*, 7(1):219-230.

Bissember, E.E. 2010. The role and function of a stock exchange. http://slidefinder.net/e/eeb-presentation-to-gasci/33061519 Date of access: 28 July 2012.

Blake, D. 1990. Financial market analysis. Berkshire, England: McGraw Hill Book Company Europe.

Blake, D. 2000. Financial market analysis. 2nd ed. Chichester: John Wiley & Sons Ltd.

Bloch, B. 2011. How economic reality influences the market. http://www.investopedia.com/articles/economics/10/eonomic-reality-the-market.asp#axzzluvfRYVUK Date of access: 15 May 2012.

Bodnar, G.M. & Gebhardt, G. 1999. Derivative usage in risk management by US and German non-financial firms: A comparative study. *Journal of international financial management and accounting*, 10:153-187.

Bodnar, G.M., Hayt, G.S., & Marston, R.C. 1996. 1995 Wharton survey of derivative usage by US non-financial firms. *Financial management*, 25(4):113-133.

Bodnar, G.M., Hayt, G.S., & Marston, R.C. 1998. 1998 Wharton survey of derivative usage by US non-financial firms. *Financial management*, 27(4):70-91.

Bodnar, G.M., Hayt, G.S., de Jong, A., & Macrae, V. 1995. The impact of institutional differences on derivatives usage: a comparative study of US and Dutch firms. *European financial management,* 9(3):27-297.

Bodnar, G.M., Hayt, G.S., Marston, R.C. & Smithson, C.W. 1995. Wharton survey of derivative usage by US non-financial firms. *Financial management,* 24(2):104-114.

Bollerslev, T. & Domowitz, I. 1993. Trading patterns and prices in the interbank foreign exchange market. *The journal of finance*, 48(4):1421-1433.

Boyle, G.W. & Guthrie, G.A. 2006. Hedging the value of waiting. *Journal of banking and finance,* 30(4):1245-1267.

Brand, G. & Gunnion, S. 2011. Worst currency lifts South African exports as growth slows. http://www.trademarksa.org/print/news/worst-currency-lifts-south-africa Date of access: 11 September 2012.

Brandt, J.A. 1984. Forecasting and hedging: An illustration of risk reduction in the hog industry. *American journal of agricultural economics,* 67(1):24-31.

Broll, U. 1997. Cross hedging in currency forward markets: A note. *The journal of futures markets*, 17(4):475-482.

Broll, U. & Wahl, J.E. 1997. Export flexibility and hedging. *Bulletin of economic research*, 49(3):205-211.

Broll, U., Wong, K.P. & Zilcha, I. 1999. Multiple currencies and hedging. *Economica*, 66(264):421-432.

Campello, M., Lin, C., Ma, Y. & Zou, H. 2011. The real and financial implications of corporate hedging. *The journal of finance*, 66(5):1615-1647.

Carrieri, F. & Majerbi, B. 2006. The pricing of emerging stock markets. *The journal of international business studies*, 37(3):372-391.

Carter, D.A., Rogers, D.A. & Simkins, B.J. 2006. Does hedging affect firm value? Evidence from the US Airline industry. *Financial management*, 35(1):53-86.

Celebuski, M.J., Hill, J.M. & Kilgannon, J.J. 1990. Managing currency exposure in international portfolios. *Financial analysis journal*, 46(1):16-23.

Chacholiades, M. 1990. International economics. New York: McGraw Hill Publishing.

Chang, P.H. & Osler, C.L. 1999. Methodical madness: Technical analysis and the irrationality of exchange rate forecasts. *The economic journal*, 109(458):636-661.

Chen, J. 2010. Essentials of technical analysis for financial markets. Hoboken, NJ: Wiley.

Cheung, Y.W. & Lai, K.S. 2000. On cross-country differences in the persistence of real exchange rates. *Journal of international economies*, 50:375-397.

Chong, D.J. 2009. Costs vs. benefits of standard hedging. http://www.thecsem.org/content/cost-vs-benefits-standard-hedging Date of access: 27 May 2012.

CIA, 2012.The world factbook.http://www.cia.gov/library/publications//the-world-factbook/ Date of access: 07 August 2012.

Cluchier, J. 2009. Measuring and reducing risk in financial markets. *JMC Management consulting SARL*: 1-7.

Cofnas, A. 2003. Forex trader: Fanning profits in forex. *Futures*, 32(7):32.

Cofnas, A. 2004. Forex trader: Classic tools for trading forex. *Futures*: 36, September 2004.

Cofnas, A. 2005. Forex trader: Misbehaviour of forex markets. *Futures*, 34(4):34.

Cofnas, A. 2009. Forex trader: Forex fundamentals are multidimensional. *Futures*, 38(10):20.

Colander, D.C. & Gamber, E.N. 2002. Macroeconomics. 1st ed. New Jersey: Upper Saddle River.

Colby, R.W. 2003. The encyclopaedia of technical market indicators**.** 2nded. New York: McGraw Hill Companies.

Cooper, B. 2012. What types of financial markets are there? http://www.bt.com.au/investments/... Date of access: 30 April 2012.

Copeland, L.S. 1989. Exchange rates and international finance. Workingham: Addison-Wesley Publishing Company.

Cornwell, T. 2006. Luminent says hedge accounting not worth cost. *Mortgage servicing news,* 11(4):13.

Cornwell, T. 2007. Don't let hedging fall off your radar screen. *Mortgage servicing news*, 11(4):13.

Correia, C., Holman, G. & Jahreskog, A. 2012. The corporate use of derivatives: A survey of South Africa's large listed non-financial firms. *SA journal of accounting research*, 26(1):67-94.

Cotsakos, C.M. 2000. It's your money: The E*trade step-by-step guide to online investing. New York: Harper Collins Publishers.

Coyle, B. 2000. Hedging currency exposure. Italy: Leggo Spa.

Crump, N. 1952. The abc of the foreign exchanges. London: MacMillan & Co. Ltd.

Cusatis, P. & Thomas, M. 2005. Hedging instruments & risk management. New York: McGraw-Hill Company.

De Ceuster, M.J.K., Durinck, E., Laveren, E. & Lodewyckx, J. 2000. A survey into the use of derivatives by large non-financial firms operating in Belgium. *European financial management*, 6(3):30-3187.

Dewachter, H. & Lyrio, M. 2003. The cost of technical trading rules in the forex market: A utility based evaluation. *Journal of international money and finance*, 25(7):1072-1089.

Drees, B. & Eckwert, B. 2003. Welfare effects of transparency in foreign exchange markets: the role of hedging opportunities. *Review of international economics*, 11(3):453-463.

Duca, G. 2007. The relationship between the stock market and the economy: Experience from international financial markets. *Bank of Valletta review*, 36:1-2.

Dunlap, R.A. 1999. The golden ratio and Fibonacci numbers. Singapore: World Scientific.

Edwards, S. 2001. Exchange rate regimes, capital flows and crises prevention. Cambridge: National Bureau of Economic Research (NBER). (Working paper no. 8529, October.) [Web:] http://www.nber.org/papers/w8529 Date of access: 12 August 2012.

Eichengreen, B. 1993. A retrospective on the Bretton Woods System. Chicago, iii.: University of Chicago Press.

Eichengreen, B. 2007. The real exchange rate and economic growth. *Social and economic studies*, 56(4):7-20.

Einzig, P. 1969. A textbook on foreign exchange. 2nd ed. London: Macmillan.

El-Masry, A.A. 2006. Derivatives use and risk management practices by UK non-financial companies. *Managerial finance*, 32(2):137-159.

Elmerraji, J. 2011. The financial effects of a natural disaster. http://investopedia.com Date of access: 03 February 2012

Evans, M.D.D. & Lyons, R.K. 2005. Meese-Rogoffredux: Micro-based exchange rate forecasting. *NBER Working paper*, 11:42.

Exxaro. 2009. Financial Statements 2009. http://www.exxaro.com Date of access: 20/06/2012.

Exxaro. 2010. Financial Statements 2010. http://www.exxaro.com Date of access: 20/06/2012.

Exxaro. 2011. Financial Statements 2011. http://www.exxaro.com Date of access: 20/06/2012.

Fasani, M. 2011. The types of financial markets. http://www.theindicatorguys.com/the-main-types-of-financial=market Date of access: 30 April 2012.

Fimarkets. 2012. The function of financial markets in the economy. http://www.fimarkets.com/pagesen/financial_markets.php Date of access: 24 April 2012.

Finance Learners. 2011. 8 Ways to reduce your investment risk. http://financelearners.blogspot.com/2011/05/8-ways-to-reduce-your-investment-risk.html Date of access: 18 April 2012.

Finnerty, J.D. & Grant, D. 2002. Alternative approaches to testing hedge effectiveness under SFAS no. 133. *Accounting horizons*, 16(2):95-103.

Fischer, S. 2003. The importance of financial markets in Economic Growth. (*In* International derivatives and financial market conference of the Brazilian mercantile & futures exchange conference in Campos do Jordao, Brazil, on August 20-23, 2003. Brazil.)

Ford, N. 2011. Changing the focus. *African business*, 375:44-46.

Fraser, A.J. 2001. Follow the big guys. *Inc.*:97-98.

Frestad, D. 2009. Convex costs and the hedging paradox. *Journal of corporate finance*, 16(2):236-242.

Friedman, M. 1953. The methodology of positive economics. http://www.marxists.org/reference/subject/philosophy/works/us/friedman.html Date of access: 30 April 2012.

Froot, K.A. & Stein, J.C. 1991. Exchange rates and foreign direct investment: An imperfect capital markets approach. *The quarterly journal of economics*, 106(4):1191-1217.

Frost, A.J. & Prechter, R.R. 1990. Elliott wave principle: key to stock market profits. London: McGraw Hill Book Company.

FxConsulting. 2012. A hedging scenario. http://fxconsulting.oanda.com/discover/hedging-scnario Date of access: 27 May 2012.

Gastineau, G.L. 1995. The currency hedging decision: a search for synthesis in asset allocation. *Financial analyst's journal*, 51(3):8-17.

Gittman, L.J. & Joehnk, M.D. 1990. Fundamental of investing. 4th ed. New York: Harper and Row.

Global Insight. 2012. Country intelligence: Report. 2/08/2012.

Gordon, T. 2006. Tech talk: Fibonacci ratio analysis. *Futuresmag*, 35(11):25.

Grant, K.L. 2010. Trading risk. New Jersey: John Wiley and Sons.

Gray, P & Irwin, T. 2003. Exchange rate risk: Reviewing the record for private infrastructure contracts. *The World Bank Group – Private Sector and Infrastructure Network*, June 2003 (262).

Greenblatt, J. 2006. Trading techniques: finding patterns with the Lucas time series. *Futures*, 35(11):46-49.

Hau, H., Killeen, W., Moore, M., Honohan, P. & Franks, J. 2002. How has the euro changed the foreign exchange market?.*Economic policy*, 17(34):149-191.

Hausmann, R. & Klinger, B. 2008. South Africa's export predicament. *Journal compilation – The European bank of reconstruction and development*, 16(4):609-637.

Herbst, A.F. & Swanson, P.E. 1991. Optimal currency forward market hedge ratios: hedging or concealed speculation?.*Global finance journal*, 2(1/2):89-97.

Hill, C. 1999. International business: Competing in the global marketplace. 5th ed. New York: McGraw Hill Companies.

Hill, J. & Schneeweis, T. 1982. Forecasting and hedging effectiveness of pound and mark forward and future markets. *Management international review*, 22(1):43-52.

Hodge, D. 2005. Volatility of the Real exchange rate of the rand 1990-2004. Pretoria: Unisa.

Hummel, C. 2012. What are the advantages and disadvantages of trading stock? http://www.ehow.com/about_7435761_advantages-disadvantages-trading-stock_.html Date of access:2 May 2012.

Hummels, D.L. & Schaur, G. 2010. Hedging price volatility using fast transport. *Journal of international economics*, 82:15-25.

IMF. 2010. World economic outlook database. http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weorept.aspx?pr.x=35&pr.y=18&sy=1980&ey=2010&scsm=1&ssd=1&sort=NGDPD%2CNGDPDPC%CLUR&grp=0&2= Date of access: 07 August 2012.

Investopedia Staff. 2011. How global events affect the forex market. http://www.investopedia.com/articles/forex/11/international-events-affet-forex,asp#ixzz1keo6JUOj Date of access: 03 February 2012.

ITRISA. 2000. International monetary relations. Johannesburg: International Trade Institute of South Africa.

Jalloh, M. 2009. The role of financial markets in economic growth. (*In* Waifem regional course on operations and regulation of capital market held in ACCRA, Ghana on 27 to 31 July 2009. Ghana. p.1-14.).

Jaswani, T. 2008. Function and purpose of stock market. Http://wwwarticlesbase.com/investing-articles/function-and-purpose-of-stock-market- Date of access: 18 May 2012.

Jones, E.T. & Jones, D.L. 1987. Hedging foreign exchange: converting risk to profit. Canada: John Wiley and Sons Incorporated.

Jonsson, G. 2001. Inflation, money demand and purchasing power parity on South Africa. *IMF staff papers*, 48(2):243-265.

Jorion, P. 1991. The pricing of exchange rate risk in the stock market. *The journal of financial and quantitative analysis*, 26(3):363-376.

Jorion, P. 2009. Financial risk management handbook. 5th ed. New York: John Wiley and Sons.

Kanas, A. 1996. Exchange rate economic exposure when market share matters and hedging using currency options. *Management international review*, 36(1):67-84.

Kaul, I. 2006. Balanced globalization: the role of financial markets. (*In* **Financial markets and growth.** Balancing globalization: Papers read at the OECD forum 2006 held in Paris on 23/05/2006. Paris. p.1-15.).

Kaye, P.J. & Giannone, R. 2010. Foreign exchange risk in a volatile market. http://www.picpa.org/content/41766.aspx Date of access: 15 February 2012.

Keasey, K., Hudson, R. & Littler, K. 1998. The intelligent guide to stock market investment. s.l.: John Wiley & Sons.

Kerkvliet, J. & Moffett, M.H. 1991. The hedging of an uncertain future foreign currency cash flow. *Journal of financial and quantitative analysis*, 26(4):565-578.

Kim, D. 2012. Is currency hedging necessary for emerging-market equity investment?.*Economics letters*, 116(1):67-71.

Kim, J.H. & Shamsuddin, A. 2008. Are Asian stock markets efficient? Evidence from new multiple variance ratio tests.*Journal of empirical finance*, 15:518-532.

Kim, Y.S., Mathur, I. & Nam, J. 2006. Is operational hedging a substitute for or a complement to financial hedging?.*Journal of corporate finance*, 12(4):834-853.

King, M.R. & Rime, D. 2010. The $4 trillion question: What explains FX growth since the 2007 survey?.*BIS Quarterly review*: 2-42.

Kothari, S.P. 2000. The role of financial reporting in reducing financial risks in the market. *Journal conference series*: 89-112.

Koziol, J.D. 1990. Hedging: Principles, practices and strategies for the financial markets. New York: John Wiley and Sons.

Krow, H.A. 1969. Stock market behaviour: the technical approach to understanding Wall Street. New York: Random House.

Kumba. 2009. Financial Statements 2009. http://www.angloamericankumba.com/ Date of access: 20 June 2012.

Kumba. 2010. Financial Statements 2010. http://www.angloamericankumba.com/ Date of access: 20 June 2012.

Kumba. 2011. Financial Statements 2011. http://www.angloamericankumba.com/ Date of access: 20 June 2012.

Kwon, K.Y. & Kish, R.J. 2002. Technical trading strategies and return predictability: NYSE. *Applied financial economics*, 12(9):639-653.

Laflèche, T. 1996. The impact of exchange rate movements on consumer prices. *Bank of Canada review*, Winter 1996/1997:21-28.

Lai, T.L. & Lim, T.W. 2009. Option hedging theory under transaction costs. *Journal of economic dynamics & control,* 33(12):1945-1961.

Lall, G.S. 1981. Finance of foreign trade and foreign exchange. 2nded. New Delhi: HPJ Kapoor Publishers.

Lapan, H., Moschini, G. & Hanson, S.D. 1991. Production, hedging and speculative decisions with options and futures markets. *American journal of agricultural economics*, 73(1):66-74.

Laschinger, K. 2006. Explaining fundamental analysis. *Finweek*, (5):1-4.

Lastrapes, W.D. 1992. Sources of fluctuations in real and nominal exchange rates. *Review of economics & statistics*, 74(3):530-539.

Lawler, G.F. & Limic, V. 2010. Random walk: a modern introduction. New York: Cambridge University Press.

Lee, C.J. 1987. Fundamental analysis and the stock market. *Journal of business finance and accounting*, 14(1):131-141.

Leung, M.T., Chen, A. & Daouk, H. 2000. Forecasting exchange rates using general regression neural networks. *Computers & operations research*, 27:1093-1110.

Levinson, M. 2003. The economist guide to financial markets. 3ed. Princeton, N.J.: Bloomberg Press.

Levy, R.A. 1966. Conceptual foundation of technical analysis. *Financial analyst's journal*, 22(4):83-89.

Lien, K. & Dyess, P. 2011. Trading currencies using multiple time frames. *Stock & Commodities*, 22(11):60-65.

Lioui, A. 1998. Currency risk hedging: Futures vs. forwards. *Journal of banking & finance*, 22(1):61-81.

Lipton, A. 2005. Mathematical methods for foreign exchange: a financial engineer's approach. Singapore, River Edge, N.J.: World Scientific Publishing.

Liu, T. & Parlour, C.A. 2009. Hedging and competition. *Journal of financial economics*, 94(3):492-507.

Logue, D.E. & Oldfield, G.S. 1977. Managing foreign assets when foreign exchange markets are efficient. *Financial management,*6(2):16-22.

Lothian, J.R. & McCarthy, C.H. 2009. The behaviour of money and other economic variables: Two natural experiments. *Journal of international money and finance*, (28):1204-1220.

Ludvigson, S. & Steindel, C. 1999. How important is the stock market effect on consumption? *FRBNY economic policy review*:29-51.

MacDonald, R. 1990. Regulatory responses to global financial distress. Taylor & Francis Books Lt Routledge.

Mallin, C., Ow-Yong, K. & Reynolds, M. 2001. Derivatives usage in UK non-financial listed companies. *European journal of finance*, 7(1):63-91.

Manuel, T.A. 2008. Budget Speech. Pretoria: South Africa Revenue Service.

Marshall, B.R., Young, M.R. & Rose, L.C. 2006. Candlestick technical trading strategies: Can they create value for investors? *Journal of banking and finance*, 30(8):2303-2323.

Masih, R. 2010. The economy and the stock market: How they influence each other. Http://journalofmodernsocialism.com/ms15_art3_econ_the_economu.html Date of access: 30 April 2012.

Mathur, I. 1982. Managing foreign exchange risk profitability. *Columbia journal of world business*, 26(1):7-8.

McDonald, M. 2007. Forex simplified: Behind the scenes of currency trading. s.l.: Marketplace Books.

McHugh, R. 2012. Elliott wave analysis theory: The history, philosophy, and basics. http://www.safehaven.com/article/7305/elliott-wave-analysis-theory-the-history-philosophy-and-basics#.TxgBm5OiW80.emailDate of access: 23 January 2012.

Meindel, P.J. & Primbs, J.A. 2008. Dynamic hedging of single and multi-dimensional options with transaction costs: a generalized utility maximization approach. *Quantitative finance*, 8(3):299-312.

Mel. 2012. How to make a living trading forex from home. http://SurfingThePips.com/one-dollar-offer Date of access: 01 February 2012.

Metorex.2009. Financial Statements 2009. http://www.metorex.co.za Date of access: 20 June 2012.

Metorex.2010. Financial Statements 2010. http://www.metorex.co.za Date of access: 20 June 2012.

Metorex.2011. Financial Statements 2011. http://www.metorex.co.za Date of access: 20 June 2012.

Meyers, T.A. 1989. The technical analysis course: A winning program for stock & future traders and investors. Chicago: Probus publishing company.

Monetos. 2012. Advantages and disadvantages of stock market-linked accounts. *Monetos*: 1.

Mulligan, R.F. 2000. A fractal analysis of foreign exchange markets. *IAER*, 6(1):33-49.

Mun, K. 2011. The joint response of stock and foreign exchange markets to macro-economic surprises: Using US and Japanese data. *Journal of banking and finance*, 36(2):383-394.

Murphy, J.J. 1986. Technical analysis of the futures markets: a comprehensive guide to trading methods and applications. New York: New York Institute of Finance.

Murphy, J.J. 1999. Trading secrets: John Murphy on chart analysis. s.l.: Marketplace Books.

Myers, R.J. & Thompson, S.R. 1989. Generalized optimal hedge ratio estimation. *American journal of agricultural economics,* 71(4):858-868.

Narayan, S. & Narayan, P.K. 2010. Estimating import and export demand elasticities for Mauritius and South Africa. *Australian economic papers*, 49(3):241-252.

Neely, C.J. 2011. A survey of announcement effects on foreign exchange volatility and jumps. *Federal reserve bank of St. Louis review*, 93(5):361-407.

Nesbitt, S.L. 1991. Currency hedging rules for plan sponsors. *Financial analyst's journal*, 47(2):73-81.

Newbold, P., Wohar, M.E., Rayner, T., Kellard, N. & Ennew, C. 1998. Two puzzles in the analysis of foreign exchange market efficiency. *International review of financial analysis*, 7(2):95-111.

Ngugen, H. & Faff, R. 2003. Further evidence on the corporate use of derivatives in Australia: the case of foreign currency and interest rate instruments. *Australian journal of management*, 28(3):307-318.

Nor, A.H.S.M. & Ergun, U. 2009. The role of economic development on financial markets linkages. *International research journal of finance and economics*, 24(1):2-35.

Norris, J., Gaskill, A.L. & Bell, T. 2010. Mastering the currency market: Forex strategies for high- and low-volatility markets. New York: McGraw Hill Book Companies.

Osler, C. 2000. Support for resistance: Technical analysis and intraday exchange rates. *FRBNY Economic policy review*, 6(2):53-68.

Phillips, K. 2012. What exactly do financial markets accomplish?.http://www.econosseur.com/2012/02/what-exactly-do-financial-market-accomplish.html Date of access: 24 April 2012.

Pilbeam, K. 2005. Finance and financial markets. 2nd ed. Basingstoke: Palgrave Macmillan.

Pincus, M. & Rajgopal, S. 2002. The interactions between accrual management and hedging: evidence from oil and gas firms. *The accounting review*, 77(1):127-160.

Pircheggar, B. 2006. Hedge accounting incentives for cash flow hedges of forecasted transactions. *European accounting review*, 15(1):115-135.

Potgieter, I. 2012. Mining in South Africa. http://www.projectsiq.com/mining-in-south-africa.htm Date of access: 30 April 2012.

Potgieter, J. 2005. Fundamentals of the rand/euro exchange rate: A behavioural approach. North West University: NWU. (Dissertation – M.Comm).

Prechter, R.R. 2003. Trading techniques: Fibonacci in the stock market. *Futures*, 32(7):40.

Prevost, A.K., Rose, L.C. & Miller, G. 2000. Derivative usage and financial risk management in large and small economies: a comparative analysis. *Journal of business finance & accounting*, 27(5/6):733-759.

Prindl, A.R. 1976. Foreign exchange risk. London: John Wiley & Sons.

PWC. 2007. International financial reporting standards June 2007. http://www.pwc.com/corporatereporting.com Date of access: 23 August 2012.

PWC. 2012. Investor view: Insight from the investment community. http://www.pwc.com/corporatereporting.com Date of access: 18 May 2012.

Qiu, M., Pinfold, J.F. & Rose, L.C. 2011. Predicting foreign exchange movements using historic deviations from PPP. *International review of economics and finance,* 20:485-497.

Rao, N. 2012. Economy, industry and company analysis for valuation of equity shares. http://knol.google.com/k/narayana-rao/economy-industry-and-company-analysis/2utb2lsm2k7a/3994 Date of access: 29 April 2012.

Rashty, J. & O'Shaughessy, J. 2010. Foreign currency forward contracts and cash flow hedging: Negating accounting and disclosure requirements. *The CPA journal*, 80(10):24-31.

Riechel, K. 1978. Economic effects of exchange rate changes. Lexington, Mass.: Lexington Books.

Ritchie, J. 2009. The history of the stock market. http://www.mint.com/blog/investing/the-history-of-the-stock-market/ Date of access: 31 May 2012.

Robinson, J. 1981. Ag banks must play more active role in hedging. *Aba banking journal*, 73(9):79.

Rogova, O. 2011. Type of balance of payments as a sign of economic backwardness. *Problems of economic transition*, 54(7):85-95.

Rom, Y. 2006. What is technical analysis?.*Finweek*:1-4.

Rusydi, M. & Islam, S.M.N. 2007. Quantitative exchange rate economics in developing countries: A new-pragmatic decision-making approach. Basingstoke: Palgrave MacMillan.

SAinfo. 2012. Mineral resources, human resources. http://www.southafrica.info/pls/procs/iac.pace?p_tl=2780&p_t2=7379&p_t3=10431&p_t4=o&p Date of access: 30 April 2012.

SARB. 2012. Selected historical exchange rates and other interest rates. http://www.resbank.co.za/Research/Rates/Pages/SelectedHistoricalExchangeAndInterestRates.aspx Date of access: 7 September 2012.

Sarno, L. & Taylor, M.P. 2002. Purchasing power parity and the real exchange rate. *International monetary fund staff papers*, 49(1):65-105, 2002.

Sasol. 2010. Annual financial statements 30 June 2010. http://ebookbrowse.com/sasol-afs-2010-pdf-d351645118 Date of access: 10 July 2012.

Sasol. 2011a. Annual financial statements 30 June 2011. http://ebookbrowse.com/sasol-afs-2011-pdf-d351645118 Date of access: 10 July 2012.

Sasol. 2011b. Sasol hedges about 30% (oil equivalent) of its South African synthetic fuels and West African crude oil production. http://www.prnewswire.com/news-releases/sasol-hedges-about-30-oil-equivalent-of-its-south-african-synthetic-fuels-and-west-african-crude-oil-production-117585283.html Date of access: 11 September 2012.

Savastano, M.A. 1999. Exchange rate regimes in emerging economics. http://www.nber.org/papers/w7228 Date of access: 6 October 2012.

Schwab, C.R. 1996. Investor's business daily: Guide to the markets. s.l.: John Wiley & Sons.

Scott, J. 2004. Exchange rate volatility: An analytical risk model. Vanderbijlpark: North-West University. 108p. Mini-dissertation.

Sedlabank Islands. 2008. The importance of well-functioning financial markets. Monetary Bulletin. Iceland.

Sekirin, E. 2012. Ways to reduce risk in the globalized financial market. http://www.ehow.com/list_6799610_ways-risk-globalized-financial-market.html Date of access: 30 April 2012.

Short, R. & Radebe, B. 2008. Gold in South Africa. http://www.goldindouthafrica.com/goldinsa_2007.htm Date of access: 28 July 2012.

Sircar. S. 2008. Risk premium in foreign exchange market.*Economic and political weekly*, 43(24):66-73.

Smithson, C. & Simkins, B.J. 2005. Does risk management add value? A survey of the evidence.*Journal of applied corporate finance*, 17(3):8-17.

Soenen, L.A. & Lindvall, J.R. 1992. Benefits from diversification and currency hedging of international equity investments: different countries' view points. *Global finance journal*, 3(2):145-158.

South Africa Exports. 2012. http://www.tradingeconomics.com/south-africa/exports Date of access: 14 August 2012.

Spall, J. 2009. Investing in gold: the essential safe haven investment for every portfolio. New York: McGraw-Hill.

Spanò, M. 2004. Determinants of hedging and its effects on investment and debt. *Journal of corporate finance*, 10(1):175-197.

Spritzer, F. 2010. Principles of Random Walk. 2nd ed. New York: Springer.

Stulz, R.M. 2003. Risk management and derivatives. Mason, Ohio: Thomson South-Western.

Swannell, R. 2003. Using Elliott wave patterns for price and time forecasts. *Futures*:48-51.

Sy-Changco, J.A., Souchon, A.L. & Evangelista, F. 2005. Quality of export memory content: a conceptual framework. *Journal of marketing management*, 21:291-306.

Tarring, T. & Robbins, P. 1983. Trading in metals. Worcester Park, Surrey: Metal Bulletin Books.

Taulbee, N. 2000. Economic influences on the stock market. http://digitalcommons.iwu.edu/econ_honproj/77 Date of access: 30 April 2012.

Tesfatsion, L. 2012. Introductory notes on financial markets. http://www.econ.iastate.edu/classes/eon308/tesfatsion/ Date of access: 30 April 2012.

Thompson, C.J. & Guttmann, A.J. 2008. Trading indicators with information-gap uncertainty. *The journal of risk finance*, 9(5):467-476.

Tilkin, G. & Epstein, L. 2007. The complete idiot's guide to foreign currency trading. Indianapolis, IN: Alpha Books.

Timimi, K. 2010. Types of financial markets. http://www.economywatch.com/market/market-types/financial-market-types.html Date of access: 15 May 2012.

Torkamani, M.A., Mahmoodzadeh, S., Pourroostaei, S. & Lucas, C. 2007. Chaos theory and application in foreign exchange rates vs. IRR (Iranian Rail). *International journal of humanities and social sciences*, 1(3):130-134.

Treepongkaruna, S. & Gray, S. 2009. Information and volatility links in foreign exchange market. *Accounting and finance*, 49(2):385-405.

Tucker, I.B. 2000. Economics for today. 2nd ed. Cincinatti, USA: South-Western College Publishing.

Tufano, P. 1998. Agency costs of corporate risk management. *Financial management*, 27(1):66-77.

Tyson, E. 2003. Investing for dummies. New York: Wiley Publishing, Inc.

Umstead, D.A. 1977. Forecasting stock market prices. *The journal of finance*, 32(2):427-441.

US Commercial Service. 2011. Doing business in South Africa – 2011 Country Commercial Guide for US Companies. United States.

Valdez, S. 2007. An introduction to global financial markets. 5th ed. New York: Palgrave Macmillan.

Van Bergen, J. 2004. 6 Factors that influence exchange rates. http://www.investopedia.com/articles/basics/04/050704.asp Date of access: 28 March 2012.

Van der Merwe, E.J. 2003. The exchange rate regime and monetary arrangements in South Africa. Paper presented at the International Monetary Convention, Madrid, Spain, 14 May. http://www.reinventingbrettonwoods.org/2003/madrid/vanderMerwe.doc Date of access: 28 November 2011.

Van Heerden, P.M.S. 2010. The relationship between the forward - and the realised spot exchange rate in South Africa. Potchefstroom: NWU. (Thesis – PhD).

Walker, S. 2011. Wave theory for alternative investments. USA: McGraw Hill Book Company.

Walker, T. 1981. A guide for using the foreign exchange market. New York: John Wiley & Sons.

Wojakawski, R.M. 2012. How should firms selectively hedge? Resolving the selective hedging puzzle.*Journal of corporate finance*, 8(3):560-569.

Wong, K.P. 2003. Export flexibility and currency hedging. *International economic review,* 44(4):1295-1312.

Wreford, T. 2012. Stock trading-advantages and disadvantages. http://ezinearticles.com/?Stock-Trading---Advantages-and-Disadvantages&id=60168 Date of access: 26 July 2012.

Yao, J. & Tan, L.C. 2000. A case study on using neural networks to perform technical forecasting of forex. *Neurocomputing*, 34(1):79-98.

Yu, L., Wang, S., Keung Lai, K. & Huang, W.W. 2007. Developing and assessing an intelligent forex rolling forecast and trading decision support system for online E-service. *International journal of intelligent systems*, 22(5):475-499.

Zakamouline, V. 2009. The best hedging strategy in the presence of transaction costs. *International journal of theoretical and applied finance*, 12(6):833-860.

Zhang, Z. 2001. Real exchange rate misalignment in China: an empirical investigation. *Journal of comparative economics*, 29:80-94.

APPENDIX A

Date	Rate		Date	Rate		Date	Rate
2007-07-02	7.0175		2007-08-30	7.1811		2007-10-30	6.5728
2007-07-03	6.9635		2007-08-31	7.1094		2007-10-31	6.5353
2007-07-04	6.9853		2007-09-03	7.1783		2007-11-01	6.5278
2007-07-05	6.9829		2007-09-04	7.2559		2007-11-02	6.6032
2007-07-06	7.0356		2007-09-05	7.2453		2007-11-05	6.5941
2007-07-09	6.9833		2007-09-06	7.2319		2007-11-06	6.5253
2007-07-10	6.9705		2007-09-07	7.1898		2007-11-07	6.4739
2007-07-11	7.0237		2007-09-10	7.2491		2007-11-08	6.5265
2007-07-12	7.0275		2007-09-11	7.2283		2007-11-09	6.4639
2007-07-13	6.9611		2007-09-12	7.1741		2007-11-12	6.6787
2007-07-16	6.9672		2007-09-13	7.1424		2007-11-13	6.7828
2007-07-17	6.9774		2007-09-14	7.1928		2007-11-14	6.6627
2007-07-18	6.9815		2007-09-17	7.1954		2007-11-15	6.6136
2007-07-19	6.9172		2007-09-18	7.1914		2007-11-16	6.7297
2007-07-20	6.8839		2007-09-19	7.0900		2007-11-19	6.7025
2007-07-23	6.8328		2007-09-20	7.0730		2007-11-20	6.7089
2007-07-24	6.8233		2007-09-21	7.0496		2007-11-21	6.7532
2007-07-25	6.8505		2007-09-25	7.0157		2007-11-22	6.7763
2007-07-26	6.9249		2007-09-26	6.9712		2007-11-23	6.8168
2007-07-27	7.1051		2007-09-27	6.9112		2007-11-26	6.7983
2007-07-30	7.1022		2007-09-28	6.8839		2007-11-27	7.0127
2007-07-31	7.1094		2007-10-01	6.8904		2007-11-28	7.0221
2007-08-01	7.1949		2007-10-02	6.8979		2007-11-29	6.9153
2007-08-02	7.1177		2007-10-03	6.9066		2007-11-30	6.8119
2007-08-03	7.0590		2007-10-04	6.9402		2007-12-03	6.8042
2007-08-06	7.1122		2007-10-05	6.8994		2007-12-04	6.7889
2007-08-07	7.0494		2007-10-08	6.8320		2007-12-05	6.8050
2007-08-08	7.0392		2007-10-09	6.8679		2007-12-06	6.7914
2007-08-10	7.1707		2007-10-10	6.8328		2007-12-07	6.7253
2007-08-13	7.1789		2007-10-11	6.8681		2007-12-10	6.7104
2007-08-14	7.2452		2007-10-12	6.7536		2007-12-11	6.6639
2007-08-15	7.3914		2007-10-15	6.7249		2007-12-12	6.7556
2007-08-16	7.4774		2007-10-16	6.8820		2007-12-13	6.7478
2007-08-17	7.4840		2007-10-17	6.8235		2007-12-14	6.7725
2007-08-20	7.3412		2007-10-18	6.8059		2007-12-18	6.9026
2007-08-21	7.4603		2007-10-19	6.8069		2007-12-19	6.9005
2007-08-22	7.3376		2007-10-22	6.8591		2007-12-20	6.9695
2007-08-23	7.2370		2007-10-23	6.8175		2007-12-21	7.0220
2007-08-24	7.2869		2007-10-24	6.6965		2007-12-24	6.9986
2007-08-27	7.1828		2007-10-25	6.6201		2007-12-27	6.9265
2007-08-28	7.2473		2007-10-26	6.5374		2007-12-28	6.8429
2007-08-29	7.2838		2007-10-29	6.4691		2007-12-31	6.7862

Date	Rate		Date	Rate		Date	Rate
2008-01-02	6.8627		2008-02-28	7.4795		2008-04-30	7.5940
2008-01-03	6.8419		2008-02-29	7.6342		2008-05-05	7.6030
2008-01-04	6.8452		2008-03-03	7.9486		2008-05-06	7.5238
2008-01-07	6.9098		2008-03-04	7.7975		2008-05-07	7.5301
2008-01-08	6.8881		2008-03-05	7.8345		2008-05-08	7.6173
2008-01-09	6.8554		2008-03-06	7.7353		2008-05-09	7.6815
2008-01-10	6.8559		2008-03-07	7.9943		2008-05-12	7.6566
2008-01-11	6.8270		2008-03-10	8.0243		2008-05-13	7.5928
2008-01-14	6.7211		2008-03-11	7.9878		2008-05-14	7.6252
2008-01-15	6.7244		2008-03-12	7.8036		2008-05-15	7.6186
2008-01-16	6.8623		2008-03-13	7.9327		2008-05-16	7.5455
2008-01-17	6.9448		2008-03-14	7.9365		2008-05-19	7.4883
2008-01-18	7.0479		2008-03-17	8.0977		2008-05-20	7.5914
2008-01-21	7.1698		2008-03-18	8.0749		2008-05-21	7.6501
2008-01-22	7.3040		2008-03-19	8.0323		2008-05-22	7.7200
2008-01-23	7.1132		2008-03-20	8.1161		2008-05-23	7.6773
2008-01-24	7.0758		2008-03-25	8.0544		2008-05-26	7.6999
2008-01-25	7.0339		2008-03-26	8.1036		2008-05-27	7.6974
2008-01-28	7.1921		2008-03-27	8.0333		2008-05-28	7.7458
2008-01-29	7.1691		2008-03-28	8.0207		2008-05-29	7.6354
2008-01-30	7.2151		2008-03-31	8.1216		2008-05-30	7.5874
2008-01-31	7.3572		2008-04-01	8.1207		2008-06-02	7.6791
2008-02-01	7.4547		2008-04-02	7.9068		2008-06-03	7.7521
2008-02-04	7.3572		2008-04-03	7.7466		2008-06-04	7.7699
2008-02-05	7.4633		2008-04-04	7.7891		2008-06-05	7.7584
2008-02-06	7.6784		2008-04-07	7.7597		2008-06-06	7.8437
2008-02-07	7.6604		2008-04-08	7.8035		2008-06-09	7.8712
2008-02-08	7.6478		2008-04-09	7.7784		2008-06-10	7.9234
2008-02-11	7.8408		2008-04-10	7.9032		2008-06-11	7.9384
2008-02-12	7.7318		2008-04-11	7.7741		2008-06-12	7.9891
2008-02-13	7.7381		2008-04-14	7.8581		2008-06-13	8.0964
2008-02-14	7.6327		2008-04-15	7.8774		2008-06-17	8.0201
2008-02-15	7.5956		2008-04-16	7.9686		2008-06-18	8.0058
2008-02-18	7.6336		2008-04-17	7.9205		2008-06-19	8.0402
2008-02-19	7.5900		2008-04-18	7.8155		2008-06-20	7.9503
2008-02-20	7.8074		2008-04-21	7.7909		2008-06-23	8.0238
2008-02-21	7.8507		2008-04-22	7.7182		2008-06-24	8.0511
2008-02-22	7.7976		2008-04-23	7.6177		2008-06-25	7.9793
2008-02-25	7.7004		2008-04-24	7.7238		2008-06-26	7.8949
2008-02-26	7.6916		2008-04-25	7.6744		2008-06-27	7.9417
2008-02-27	7.4732		2008-04-29	7.5627		2008-06-30	7.8791

Date	Rate		Date	Rate		Date	Rate
2008-07-01	7.8637		2008-08-29	7.6696		2008-10-30	9.5778
2008-07-02	7.8660		2008-09-01	7.7272		2008-10-31	10.1919
2008-07-03	7.8668		2008-09-02	7.8021		2008-11-03	9.7534
2008-07-04	7.7444		2008-09-03	7.8603		2008-11-04	10.0154
2008-07-07	7.7444		2008-09-04	7.8564		2008-11-05	9.7716
2008-07-08	7.8158		2008-09-05	8.0549		2008-11-06	9.7537
2008-07-09	7.6893		2008-09-08	7.8338		2008-11-07	10.0284
2008-07-10	7.6804		2008-09-09	7.9297		2008-11-10	9.9890
2008-07-11	7.7262		2008-09-10	8.0317		2008-11-11	10.1693
2008-07-14	7.6351		2008-09-11	8.2613		2008-11-12	10.2797
2008-07-15	7.6199		2008-09-12	8.0795		2008-11-13	10.4116
2008-07-16	7.6736		2008-09-15	8.1168		2008-11-14	10.2818
2008-07-17	7.5885		2008-09-16	8.2026		2008-11-17	10.1322
2008-07-18	7.5766		2008-09-17	8.1138		2008-11-18	10.1862
2008-07-21	7.5895		2008-09-18	8.1858		2008-11-19	10.2498
2008-07-22	7.5764		2008-09-19	8.0774		2008-11-20	10.5991
2008-07-23	7.4966		2008-09-22	8.0292		2008-11-21	10.5924
2008-07-24	7.5574		2008-09-23	7.9833		2008-11-24	10.4903
2008-07-25	7.6160		2008-09-25	8.1766		2008-11-25	10.0491
2008-07-28	7.5457		2008-09-26	8.1604		2008-11-26	9.9201
2008-07-29	7.5093		2008-09-29	8.2610		2008-11-27	9.9009
2008-07-30	7.3862		2008-09-30	8.3145		2008-11-28	9.9080
2008-07-31	7.3899		2008-10-01	8.2485		2008-12-01	10.1416
2008-08-01	7.3464		2008-10-02	8.3749		2008-12-02	10.4178
2008-08-04	7.2210		2008-10-03	8.5187		2008-12-03	10.3229
2008-08-05	7.3293		2008-10-06	8.6692		2008-12-04	10.2098
2008-08-06	7.4272		2008-10-07	8.9282		2008-12-05	10.2449
2008-08-07	7.4338		2008-10-08	9.3658		2008-12-08	10.1885
2008-08-08	7.5951		2008-10-09	9.0357		2008-12-09	10.2067
2008-08-11	7.6750		2008-10-10	9.3626		2008-12-10	10.1346
2008-08-12	7.8011		2008-10-13	9.1667		2008-12-11	10.1430
2008-08-13	7.8079		2008-10-14	9.0639		2008-12-12	10.1730
2008-08-14	7.8442		2008-10-15	9.2213		2008-12-15	10.1511
2008-08-15	7.9594		2008-10-16	10.2475		2008-12-17	9.9756
2008-08-18	7.8860		2008-10-17	10.1609		2008-12-18	9.8015
2008-08-19	7.7793		2008-10-20	10.0127		2008-12-19	9.6665
2008-08-20	7.7464		2008-10-21	10.2727		2008-12-22	9.6458
2008-08-21	7.7146		2008-10-22	10.9255		2008-12-23	9.6891
2008-08-22	7.6566		2008-10-23	11.4324		2008-12-24	9.6584
2008-08-25	7.7331		2008-10-24	11.4740		2008-12-29	9.5970
2008-08-26	7.7929		2008-10-27	11.3088		2008-12-30	9.4434
2008-08-27	7.7799		2008-10-28	10.7140		2008-12-31	9.3035
2008-08-28	7.7200		2008-10-29	10.3137			

Date	Rate		Date	Rate		Date	Rate
2009-01-02	9.4580		2009-03-02	10.3636		2009-05-05	8.3035
2009-01-05	9.4616		2009-03-03	10.3676		2009-05-06	8.4971
2009-01-06	9.3825		2009-03-04	10.4685		2009-05-07	8.3476
2009-01-07	9.3163		2009-03-05	10.3311		2009-05-08	8.4474
2009-01-08	9.7231		2009-03-06	10.5948		2009-05-11	8.2949
2009-01-09	9.6866		2009-03-09	10.4947		2009-05-12	8.4591
2009-01-12	9.9077		2009-03-10	10.4767		2009-05-13	8.3711
2009-01-13	10.1414		2009-03-11	10.3161		2009-05-14	8.5443
2009-01-14	9.8713		2009-03-12	10.1863		2009-05-15	8.5493
2009-01-15	10.1813		2009-03-13	9.9109		2009-05-18	8.6961
2009-01-16	9.9291		2009-03-16	9.9155		2009-05-19	8.4676
2009-01-19	9.9753		2009-03-17	9.9629		2009-05-20	8.4105
2009-01-20	10.2219		2009-03-18	9.9163		2009-05-21	8.3498
2009-01-21	10.2088		2009-03-19	9.7631		2009-05-22	8.3173
2009-01-22	10.0266		2009-03-20	9.7388		2009-05-25	8.3234
2009-01-23	10.2549		2009-03-23	9.5635		2009-05-26	8.3319
2009-01-26	10.2284		2009-03-24	9.5436		2009-05-27	8.2699
2009-01-27	9.9905		2009-03-25	9.8500		2009-05-28	8.1463
2009-01-28	9.9485		2009-03-26	9.5484		2009-05-29	7.9795
2009-01-29	9.9684		2009-03-27	9.4816		2009-06-01	7.9721
2009-01-30	10.1333		2009-03-30	9.7111		2009-06-02	8.0914
2009-02-02	10.1880		2009-03-31	9.6266		2009-06-03	8.0181
2009-02-03	10.1417		2009-04-01	9.5260		2009-06-04	8.0303
2009-02-04	10.1008		2009-04-02	9.3611		2009-06-05	8.0412
2009-02-05	10.0405		2009-04-03	9.0943		2009-06-08	8.1379
2009-02-06	9.8822		2009-04-06	9.0160		2009-06-09	8.1470
2009-02-09	9.7300		2009-04-07	9.1435		2009-06-10	8.0365
2009-02-10	9.6721		2009-04-08	9.2523		2009-06-11	8.0633
2009-02-11	9.8709		2009-04-09	9.1395		2009-06-12	7.9929
2009-02-12	9.9357		2009-04-14	9.0005		2009-06-15	8.0867
2009-02-13	9.9352		2009-04-15	9.1615		2009-06-17	8.0424
2009-02-16	10.0648		2009-04-16	9.0585		2009-06-18	8.0674
2009-02-17	10.2298		2009-04-17	8.9202		2009-06-19	8.1337
2009-02-18	10.1746		2009-04-20	9.0417		2009-06-22	8.0898
2009-02-19	10.0709		2009-04-21	9.0896		2009-06-23	8.2684
2009-02-20	10.2224		2009-04-23	8.9091		2009-06-24	8.1379
2009-02-23	9.9854		2009-04-24	8.8234		2009-06-25	8.0716
2009-02-24	10.0718		2009-04-28	8.8489		2009-06-26	7.9981
2009-02-25	9.9459		2009-04-29	8.6305		2009-06-29	7.9096
2009-02-26	9.9558		2009-04-30	8.4291		2009-06-30	7.7756
2009-02-27	9.9498		2009-05-04	8.3929			

Date	Rate		Date	Rate		Date	Rate
2009-07-01	7.7069		2009-09-01	7.7910		2009-11-02	7.8797
2009-07-02	7.8116		2009-09-02	7.8764		2009-11-03	7.9174
2009-07-03	7.9260		2009-09-03	7.7616		2009-11-04	7.7481
2009-07-06	8.0110		2009-09-04	7.6712		2009-11-05	7.6709
2009-07-07	8.0069		2009-09-07	7.5840		2009-11-06	7.5700
2009-07-08	8.1297		2009-09-08	7.5364		2009-11-09	7.4529
2009-07-09	8.1220		2009-09-09	7.5509		2009-11-10	7.4405
2009-07-10	8.1641		2009-09-10	7.5606		2009-11-11	7.3466
2009-07-13	8.3167		2009-09-11	7.6115		2009-11-12	7.3948
2009-07-14	8.1723		2009-09-14	7.5073		2009-11-13	7.4551
2009-07-15	8.2161		2009-09-15	7.3907		2009-11-16	7.3771
2009-07-16	8.1520		2009-09-16	7.3683		2009-11-17	7.4135
2009-07-17	8.0980		2009-09-17	7.3411		2009-11-18	7.4391
2009-07-20	7.9826		2009-09-18	7.4623		2009-11-19	7.5229
2009-07-21	7.8870		2009-09-21	7.5116		2009-11-20	7.5239
2009-07-22	7.8291		2009-09-22	7.4189		2009-11-23	7.5015
2009-07-23	7.6847		2009-09-23	7.3788		2009-11-24	7.5216
2009-07-24	7.7043		2009-09-25	7.4921		2009-11-25	7.3975
2009-07-27	7.7734		2009-09-28	7.4292		2009-11-26	7.3880
2009-07-28	7.7172		2009-09-29	7.3986		2009-11-27	7.5878
2009-07-29	7.9080		2009-09-30	7.4083		2009-11-30	7.4003
2009-07-30	7.8512		2009-10-01	7.6021		2009-12-01	7.3661
2009-07-31	7.8074		2009-10-02	7.7587		2009-12-02	7.2868
2009-08-03	7.7572		2009-10-05	7.6386		2009-12-03	7.2823
2009-08-04	7.8180		2009-10-06	7.4458		2009-12-04	7.3687
2009-08-05	7.9012		2009-10-07	7.4381		2009-12-07	7.4777
2009-08-06	7.9966		2009-10-08	7.3320		2009-12-08	7.4823
2009-08-07	8.1415		2009-10-09	7.4070		2009-12-09	7.5657
2009-08-11	8.0597		2009-10-12	7.4421		2009-12-10	7.5800
2009-08-12	8.1758		2009-10-13	7.3597		2009-12-11	7.5354
2009-08-13	8.0066		2009-10-14	7.2889		2009-12-14	7.4910
2009-08-14	8.0274		2009-10-15	7.2439		2009-12-15	7.4591
2009-08-17	8.1859		2009-10-16	7.3480		2009-12-17	7.4715
2009-08-18	8.0566		2009-10-19	7.3358		2009-12-18	7.5190
2009-08-19	8.0820		2009-10-20	7.3286		2009-12-21	7.6260
2009-08-20	7.9505		2009-10-21	7.3828		2009-12-22	7.7272
2009-08-21	7.8864		2009-10-22	7.5079		2009-12-23	7.7209
2009-08-24	7.7905		2009-10-23	7.4492		2009-12-24	7.5819
2009-08-25	7.8179		2009-10-26	7.4916		2009-12-28	7.5523
2009-08-26	7.7859		2009-10-27	7.5863		2009-12-29	7.4629
2009-08-27	7.8748		2009-10-28	7.7221		2009-12-30	7.3889
2009-08-28	7.7820		2009-10-29	7.8320		2009-12-31	7.3721
2009-08-31	7.7819		2009-10-30	7.7703			

Date	Rate		Date	Rate		Date	Rate
2010-01-04	7.3397		2010-03-02	7.6528		2010-05-04	7.4435
2010-01-05	7.2924		2010-03-03	7.5817		2010-05-05	7.5953
2010-01-06	7.3414		2010-03-04	7.5142		2010-05-06	7.6436
2010-01-07	7.3537		2010-03-05	7.4637		2010-05-07	7.7344
2010-01-08	7.4206		2010-03-08	7.3977		2010-05-10	7.4455
2010-01-11	7.3308		2010-03-09	7.4073		2010-05-11	7.5306
2010-01-12	7.3907		2010-03-10	7.4155		2010-05-12	7.5076
2010-01-13	7.4362		2010-03-11	7.4617		2010-05-13	7.4742
2010-01-14	7.3997		2010-03-12	7.4007		2010-05-14	7.5243
2010-01-15	7.4196		2010-03-15	7.4221		2010-05-17	7.5777
2010-01-18	7.3913		2010-03-16	7.4066		2010-05-18	7.5170
2010-01-19	7.3980		2010-03-17	7.3374		2010-05-19	7.6868
2010-01-20	7.4835		2010-03-18	7.3031		2010-05-20	7.8225
2010-01-21	7.5279		2010-03-19	7.3076		2010-05-21	7.9490
2010-01-22	7.5481		2010-03-23	7.3585		2010-05-24	7.8523
2010-01-25	7.6039		2010-03-24	7.3491		2010-05-25	7.9704
2010-01-26	7.6327		2010-03-25	7.3786		2010-05-26	7.8314
2010-01-27	7.6283		2010-03-26	7.4421		2010-05-27	7.6982
2010-01-28	7.5568		2010-03-29	7.3912		2010-05-28	7.5425
2010-01-29	7.5879		2010-03-30	7.3996		2010-05-31	7.6362
2010-02-01	7.5765		2010-03-31	7.3273		2010-06-01	7.7503
2010-02-02	7.4900		2010-04-01	7.2380		2010-06-02	7.7120
2010-02-03	7.4303		2010-04-06	7.2601		2010-06-03	7.6072
2010-02-04	7.5289		2010-04-07	7.2288		2010-06-04	7.6440
2010-02-05	7.7089		2010-04-08	7.3577		2010-06-07	7.8197
2010-02-08	7.7172		2010-04-09	7.2376		2010-06-08	7.7889
2010-02-09	7.6878		2010-04-12	7.2553		2010-06-09	7.7212
2010-02-10	7.6975		2010-04-13	7.2886		2010-06-10	7.7824
2010-02-11	7.6780		2010-04-14	7.2677		2010-06-11	7.7091
2010-02-12	7.6488		2010-04-15	7.3413		2010-06-14	7.6514
2010-02-15	7.7191		2010-04-16	7.3566		2010-06-15	7.6888
2010-02-16	7.6882		2010-04-19	7.4364		2010-06-17	7.6215
2010-02-17	7.6618		2010-04-20	7.4221		2010-06-18	7.5465
2010-02-18	7.6461		2010-04-21	7.3773		2010-06-21	7.4324
2010-02-19	7.6891		2010-04-22	7.4230		2010-06-22	7.5228
2010-02-22	7.6497		2010-04-23	7.4733		2010-06-23	7.5757
2010-02-23	7.6757		2010-04-26	7.3772		2010-06-24	7.5698
2010-02-24	7.7698		2010-04-28	7.4876		2010-06-25	7.6366
2010-02-25	7.7974		2010-04-29	7.3859		2010-06-28	7.5400
2010-02-26	7.7859		2010-04-30	7.3263		2010-06-29	7.6491
2010-03-01	7.6776		2010-05-03	7.3893		2010-06-30	7.6492

Date	Rate		Date	Rate		Date	Rate
2010-07-01	7.6998		2010-09-01	7.3826		2010-11-02	6.9576
2010-07-02	7.7008		2010-09-02	7.2784		2010-11-03	6.8809
2010-07-05	7.7378		2010-09-03	7.2191		2010-11-04	6.8325
2010-07-06	7.7110		2010-09-06	7.1908		2010-11-05	6.8028
2010-07-07	7.6772		2010-09-07	7.2662		2010-11-08	6.8285
2010-07-08	7.5980		2010-09-08	7.2819		2010-11-09	6.8711
2010-07-09	7.5659		2010-09-09	7.2306		2010-11-10	6.8635
2010-07-12	7.6119		2010-09-10	7.1912		2010-11-11	6.8709
2010-07-13	7.6114		2010-09-13	7.1448		2010-11-12	7.0107
2010-07-14	7.5297		2010-09-14	7.1474		2010-11-15	7.0062
2010-07-15	7.5406		2010-09-15	7.0994		2010-11-16	6.9822
2010-07-16	7.5620		2010-09-16	7.1011		2010-11-17	7.0677
2010-07-19	7.6198		2010-09-17	7.1276		2010-11-18	6.9978
2010-07-20	7.6014		2010-09-20	7.1179		2010-11-19	6.9527
2010-07-21	7.5606		2010-09-21	7.1076		2010-11-22	6.9760
2010-07-22	7.5623		2010-09-22	7.0368		2010-11-23	7.0563
2010-07-23	7.4386		2010-09-23	7.0584		2010-11-24	7.0973
2010-07-26	7.3998		2010-09-27	7.0101		2010-11-25	7.0560
2010-07-27	7.3483		2010-09-28	7.0276		2010-11-26	7.0917
2010-07-28	7.3566		2010-09-29	6.9705		2010-11-29	7.1185
2010-07-29	7.2965		2010-09-30	6.9621		2010-11-30	7.1267
2010-07-30	7.3477		2010-10-01	6.9529		2010-12-01	7.0517
2010-08-02	7.2564		2010-10-04	6.9581		2010-12-02	6.9788
2010-08-03	7.3183		2010-10-05	6.9930		2010-12-03	6.9293
2010-08-04	7.3118		2010-10-06	6.8853		2010-12-06	6.8875
2010-08-05	7.2815		2010-10-07	6.8497		2010-12-07	6.8865
2010-08-06	7.2461		2010-10-08	6.9308		2010-12-08	6.9620
2010-08-10	7.2278		2010-10-11	6.8718		2010-12-09	6.9026
2010-08-11	7.2590		2010-10-12	6.9039		2010-12-10	6.8981
2010-08-12	7.3082		2010-10-13	6.8356		2010-12-13	6.8520
2010-08-13	7.2573		2010-10-14	6.7780		2010-12-14	6.8175
2010-08-16	7.3164		2010-10-15	6.8076		2010-12-15	6.8424
2010-08-17	7.2391		2010-10-18	6.8919		2010-12-17	6.8211
2010-08-18	7.2818		2010-10-19	6.9086		2010-12-20	6.8614
2010-08-19	7.2826		2010-10-20	6.9508		2010-12-21	6.8167
2010-08-20	7.3024		2010-10-21	6.9225		2010-12-22	6.8016
2010-08-23	7.2830		2010-10-22	6.9614		2010-12-23	6.7680
2010-08-24	7.4004		2010-10-25	6.8877		2010-12-24	6.7407
2010-08-25	7.3496		2010-10-26	6.9037		2010-12-28	6.7007
2010-08-26	7.3213		2010-10-27	7.0089		2010-12-29	6.6908
2010-08-27	7.3228		2010-10-28	7.0575		2010-12-30	6.6224
2010-08-30	7.3065		2010-10-29	7.0269		2010-12-31	6.6224
2010-08-31	7.3763		2010-11-01	6.9661			

Date	Rate		Date	Rate		Date	Rate
2011-01-03	6.6238		2011-03-01	6.9409		2011-05-04	6.6288
2011-01-04	6.6558		2011-03-02	6.9789		2011-05-05	6.6576
2011-01-05	6.7222		2011-03-03	6.8674		2011-05-06	6.7568
2011-01-06	6.7305		2011-03-04	6.8892		2011-05-09	6.6628
2011-01-07	6.8110		2011-03-07	6.8834		2011-05-10	6.7388
2011-01-10	6.8380		2011-03-08	6.8684		2011-05-11	6.7680
2011-01-11	6.8332		2011-03-09	6.9114		2011-05-12	6.9396
2011-01-12	6.8330		2011-03-10	6.8982		2011-05-13	6.8971
2011-01-13	6.8331		2011-03-11	6.9125		2011-05-16	7.0257
2011-01-14	6.8268		2011-03-14	6.8926		2011-05-17	6.9963
2011-01-17	6.9482		2011-03-15	6.8756		2011-05-19	6.9280
2011-01-18	6.8519		2011-03-16	6.9850		2011-05-20	6.8817
2011-01-19	6.8785		2011-03-17	7.0777		2011-05-23	7.0016
2011-01-20	7.0159		2011-03-18	7.0470		2011-05-24	7.0008
2011-01-21	7.0621		2011-03-22	6.9031		2011-05-25	7.0404
2011-01-24	7.0743		2011-03-23	6.9080		2011-05-26	6.9719
2011-01-25	7.0197		2011-03-24	6.9302		2011-05-27	6.9312
2011-01-26	7.0863		2011-03-25	6.8768		2011-05-30	6.9016
2011-01-27	7.0919		2011-03-28	6.8772		2011-05-31	6.8907
2011-01-28	7.1002		2011-03-29	6.8629		2011-06-01	6.7821
2011-01-31	7.1817		2011-03-30	6.8347		2011-06-02	6.7965
2011-02-01	7.1477		2011-03-31	6.7820		2011-06-03	6.7183
2011-02-02	7.1021		2011-04-01	6.7665		2011-06-06	6.7019
2011-02-03	7.1705		2011-04-04	6.7203		2011-06-07	6.7434
2011-02-04	7.2700		2011-04-05	6.7378		2011-06-08	6.7486
2011-02-07	7.2498		2011-04-06	6.6925		2011-06-09	6.7113
2011-02-08	7.2228		2011-04-07	6.6872		2011-06-10	6.7625
2011-02-09	7.2164		2011-04-08	6.6479		2011-06-13	6.7759
2011-02-10	7.2748		2011-04-11	6.6517		2011-06-14	6.7524
2011-02-11	7.2853		2011-04-12	6.6978		2011-06-15	6.7878
2011-02-14	7.2713		2011-04-13	6.7404		2011-06-17	6.8672
2011-02-15	7.2952		2011-04-14	6.7903		2011-06-20	6.8219
2011-02-16	7.3116		2011-04-15	6.8468		2011-06-21	6.7590
2011-02-17	7.2195		2011-04-18	6.8556		2011-06-22	6.7287
2011-02-18	7.1982		2011-04-19	6.8464		2011-06-23	6.8066
2011-02-21	7.1349		2011-04-20	6.7924		2011-06-24	6.8913
2011-02-22	7.2105		2011-04-21	6.7663		2011-06-27	6.9267
2011-02-23	7.1257		2011-04-26	6.7385		2011-06-28	6.8596
2011-02-24	7.1221		2011-04-28	6.5962		2011-06-29	6.8270
2011-02-25	7.0260		2011-04-29	6.6227		2011-06-30	6.7791
2011-02-28	6.9880		2011-05-03	6.6532			

Date	Rate		Date	Rate		Date	Rate
2011-07-01	6.7631		2011-09-01	7.0067		2011-11-01	8.0746
2011-07-04	6.7174		2011-09-02	7.0016		2011-11-02	8.0053
2011-07-05	6.7528		2011-09-05	7.0805		2011-11-03	8.0476
2011-07-06	6.7537		2011-09-06	7.0810		2011-11-04	7.8702
2011-07-07	6.7237		2011-09-07	7.0930		2011-11-07	7.9827
2011-07-08	6.6917		2011-09-08	7.1315		2011-11-08	7.9401
2011-07-11	6.7487		2011-09-09	7.2444		2011-11-09	7.9062
2011-07-12	6.8991		2011-09-12	7.3321		2011-11-10	8.0327
2011-07-13	6.8423		2011-09-13	7.4272		2011-11-11	7.9640
2011-07-14	6.8604		2011-09-14	7.3989		2011-11-14	7.9100
2011-07-15	6.9019		2011-09-15	7.4081		2011-11-15	8.0468
2011-07-18	6.9460		2011-09-16	7.4261		2011-11-16	8.1689
2011-07-19	6.9606		2011-09-19	7.5486		2011-11-17	8.1491
2011-07-20	6.9114		2011-09-20	7.6659		2011-11-18	8.2205
2011-07-21	6.8729		2011-09-21	7.7977		2011-11-21	8.2594
2011-07-22	6.7559		2011-09-22	8.1412		2011-11-22	8.2783
2011-07-25	6.8129		2011-09-23	8.2825		2011-11-23	8.4388
2011-07-26	6.7080		2011-09-26	8.1599		2011-11-24	8.5423
2011-07-27	6.6466		2011-09-27	7.9481		2011-11-25	8.5187
2011-07-28	6.6425		2011-09-28	7.8612		2011-11-28	8.3998
2011-07-29	6.7708		2011-09-29	7.8728		2011-11-29	8.3478
2011-08-01	6.6771		2011-09-30	8.0268		2011-11-30	8.4278
2011-08-02	6.7228		2011-10-03	8.0783		2011-12-01	8.1708
2011-08-03	6.7808		2011-10-04	8.2609		2011-12-02	8.0872
2011-08-04	6.7998		2011-10-05	8.1359		2011-12-05	8.0065
2011-08-05	6.9480		2011-10-06	7.9270		2011-12-06	8.0703
2011-08-08	6.9307		2011-10-07	7.9464		2011-12-07	7.9702
2011-08-10	7.1558		2011-10-10	7.8572		2011-12-08	8.0633
2011-08-11	7.1815		2011-10-11	7.9217		2011-12-09	8.2529
2011-08-12	7.2318		2011-10-12	7.8063		2011-12-12	8.1606
2011-08-15	7.1370		2011-10-13	7.8589		2011-12-13	8.2528
2011-08-16	7.1646		2011-10-14	7.8465		2011-12-14	8.3294
2011-08-17	7.1295		2011-10-17	7.8026		2011-12-15	8.3659
2011-08-18	7.1260		2011-10-18	8.0360		2011-12-19	8.3672
2011-08-19	7.2207		2011-10-19	7.9980		2011-12-20	8.3381
2011-08-22	7.1971		2011-10-20	8.0721		2011-12-21	8.1128
2011-08-23	7.1685		2011-10-21	8.1913		2011-12-22	8.1876
2011-08-24	7.2109		2011-10-24	8.0186		2011-12-23	8.1730
2011-08-25	7.2464		2011-10-25	7.9143		2011-12-28	8.1478
2011-08-26	7.2105		2011-10-26	7.9700		2011-12-29	8.1578
2011-08-29	7.0912		2011-10-27	7.8408		2011-12-30	8.1319
2011-08-30	7.0575		2011-10-28	7.6993			
2011-08-31	7.0220		2011-10-31	7.8180			

APPENDIX B

Before the technical tools can be drawn on the graphs, the swing highs and lows should be determined for the general trend of a period as well as the trend used to calculate the time zones of the periods in question. For this Table B.1 shows the prices used for the trends and Table B.2 shows the prices used to determine the trend lines applicable on the time zones:

Table B.1	Trends			
Years of the figures are drawn	**Swing low date**	**Rate**	**Swing high date**	**Rate**
2007/07/01-2009/06/30	2007/11/09	6.46	2008/06/13	8.10
2008/07/01-2009/06/30	2008/08/04	7.22	2008/10/24	11.50
2008/07/01-2010/06/30	2008/08/04	7.22	2008/10/24	11.50
2008/01/01-2009/12/31	2008/01/15	6.72	2008/10/24	11.50
2009/07/01-2010/06/30	2009/12/02	7.29	2009/07/13	8.32
2009/07/01-2011/06/30	2009/12/02	7.29	2009/07/13	8.32
2009/01/01-2009/12/31	2009/06/23	8.27	2009/03/11	10.32
2009/01/01-2010/01/31	2009/06/23	8.27	2009/03/11	10.32
2010/07/01-2011/06/30	2011/04/02	6.60	2010/07/05	7.74
2010/01/01-2010/12/31	2010/02/03	7.43	2010/05/25	7.97
2010/01/01-2011/12/31	2010/02/03	7.43	2010/05/25	7.97
2011/01/01-2011/12/31	2011/04/28	6.60	2011/02/16	7.31

Table B.2	Time zone's trends			
Years of the figures are drawn	**Swing low date**	**Rate**	**Swing high date**	**Rate**
2007/07/01-2009/06/30	2007/11/09	6.46	2007/11/28	7.02
2008/07/01-2009/06/30	2008/08/04	7.22	2008/08/15	7.96
2008/07/01-2010/06/30	2008/08/04	7.22	2008/08/15	7.96
2008/01/01-2009/12/31	2008/01/15	6.72	2008/02/07	7.66
2009/07/01-2010/06/30	2009/07/22	7.83	2009/07/13	8.32
2009/07/01-2011/06/30	2009/07/22	7.83	2009/07/13	8.32
2009/01/01-2009/12/31	2009/03/24	9.54	2009/03/11	10.32
2009/01/01-2010/12/31	2009/03/24	9.54	2009/03/11	10.32
2010/07/01-2011/06/30	2010/08/10	7.23	2010/07/05	7.74
2010/01/01-2010/12/31	2010/02/03	7.43	2010/03/02	7.65
2010/01/01-2011/12/31	2010/02/03	7.43	2010/03/02	7.65
2011/01/01-2011/12/31	2011/03/18	7.05	2011/02/16	7.31

It is these trend lines that are indicated on the graphs below. The following part is the figures with the technical tools indicated on them. The calculations of the technical analysis will be done one year before the financial statement year and six months into the financial statement year.

The calculations will start with the trend and ellipse, followed by the time zones, retracement levels and the Fibonacci spiral drawn on one chart and lastly the arcs and fans will follow. This will be done separately for each period.

ARM and SASOL's graphs: the periods 1st July 2008 to 30th June 2009 and 1st July 2008 to 30th June 2010.

These periods are drawn and discused together, due to their trend lines being drawn from exactly the same points. In Figure B.1 to Figure B.6 the trend line is drawn from a swing low of ZAR 7.22 at the 4th of August 2008 (point a) to a swing high of ZAR 11.5 at the 24th of October 2008 (point b).

FIGURE B.1: TREND AND ELLIPSE FOR THE YEAR-END 2009

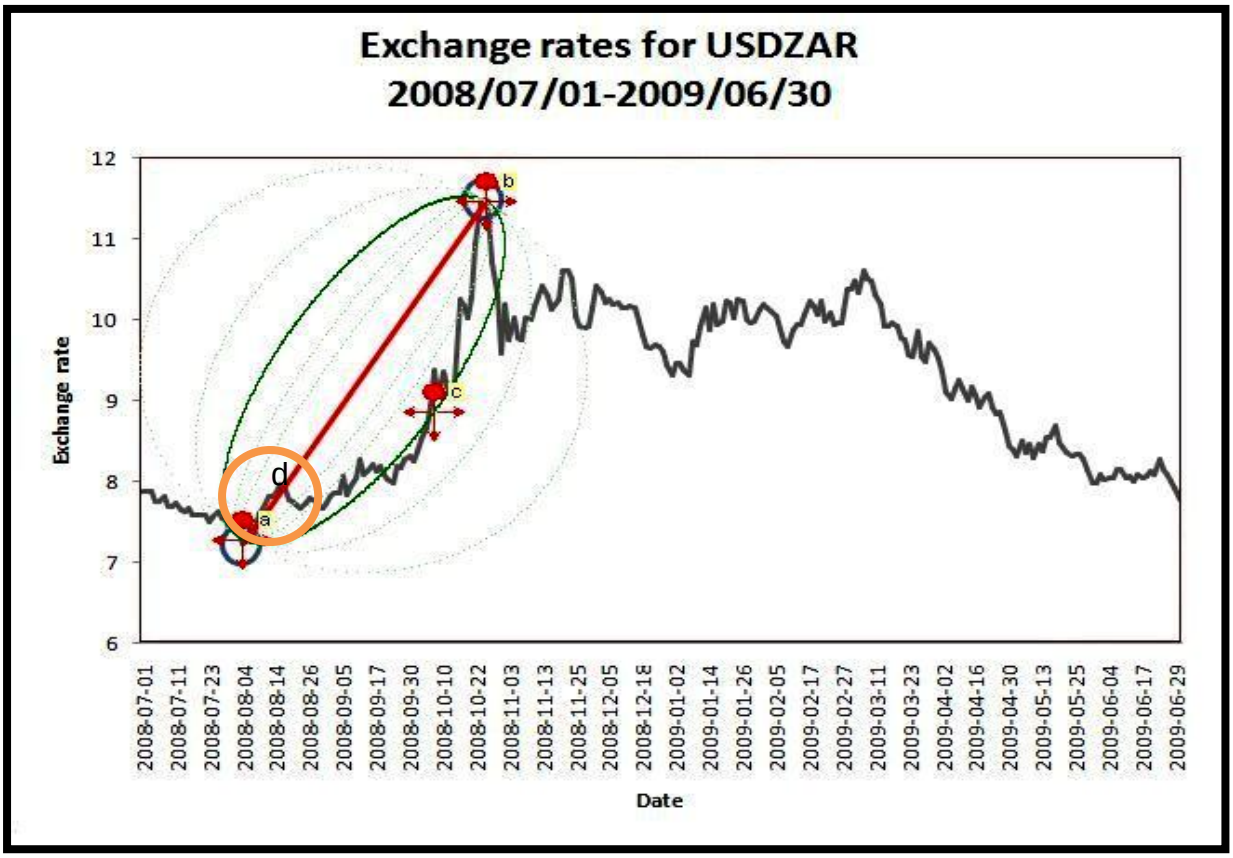


FIGURE B.2: TREND AND ELLIPSE FOR THE YEAR-ENDS 2009 AND 2010

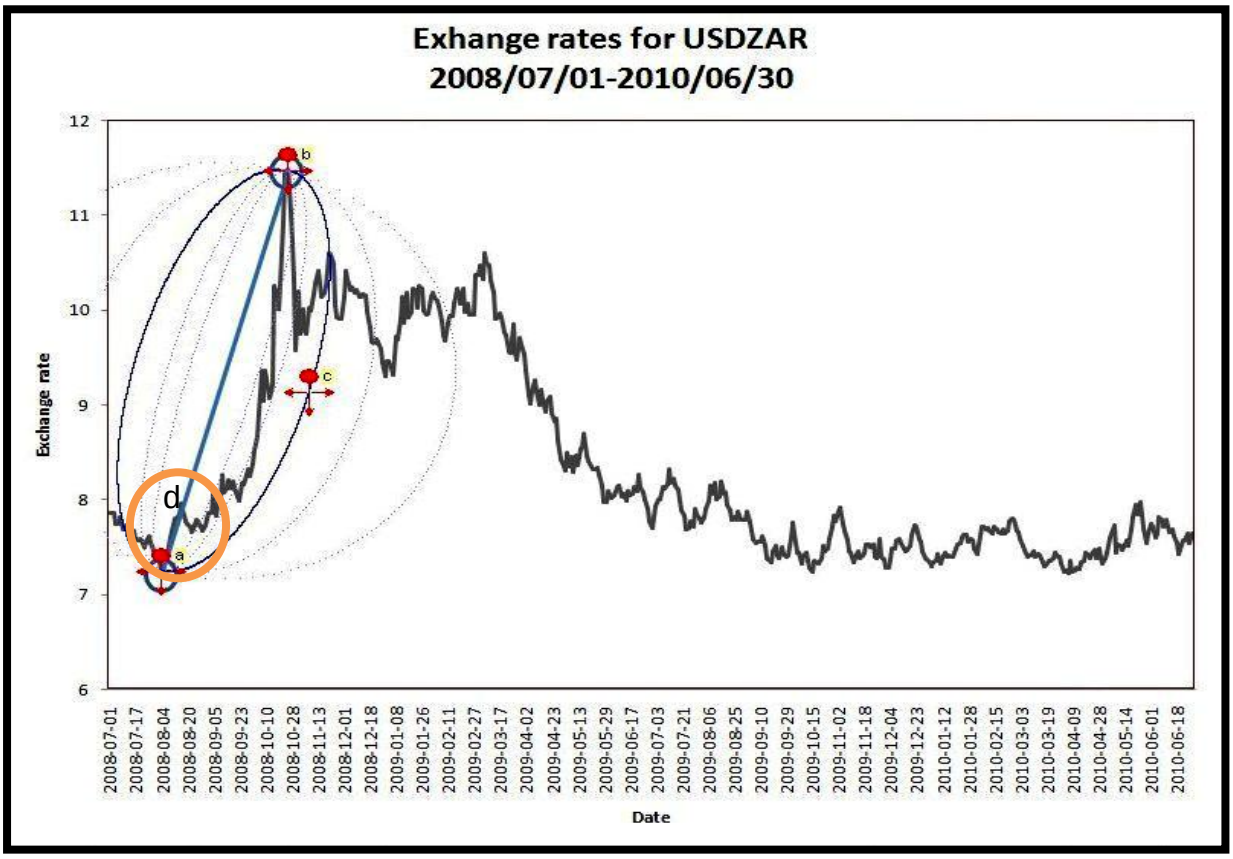
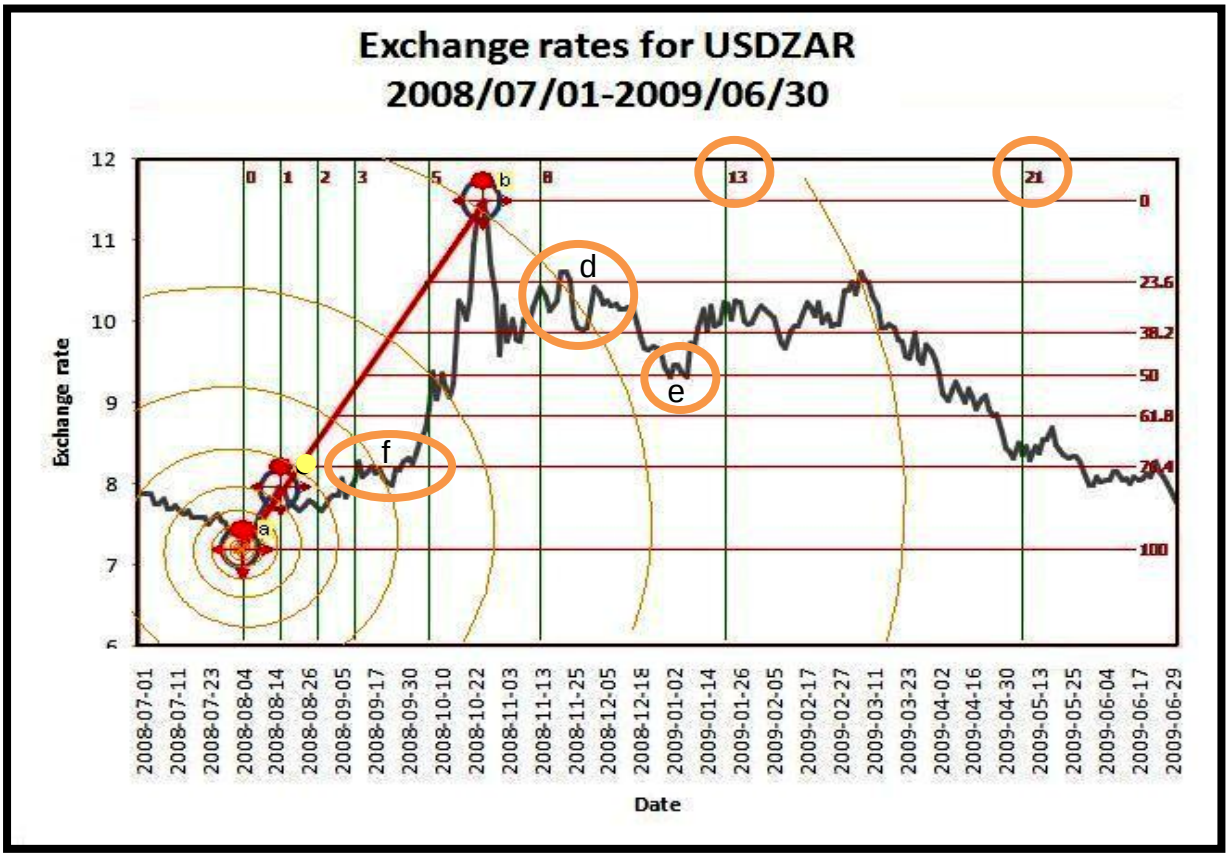


Figure B.1 and Figure B.2 shows a trend applicable on both the 2009 and 2010 financial periods and is to estimate the predictive power over a longer time span. The trend is drawn from a swing low at point a on the 4th of August 2008 to a swing high at point b on the 24th of October 2008, causing an uptrend. This trend has been tested consistently from 2008/08/04 (point a) until 2008/08/20 (point d) as depicted in Figure B.1 and Figure B.2. This trend was highly unstable due to the sudden movement or the USDZAR rate and almost falls out of the ellipse's 38.2% parameter. The market went from a trading area (mostly consistent and expected moves by the market) to a trending area (caused by significant peaks and troughs) which created a nullified trend.

FIGURE B.3: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2009

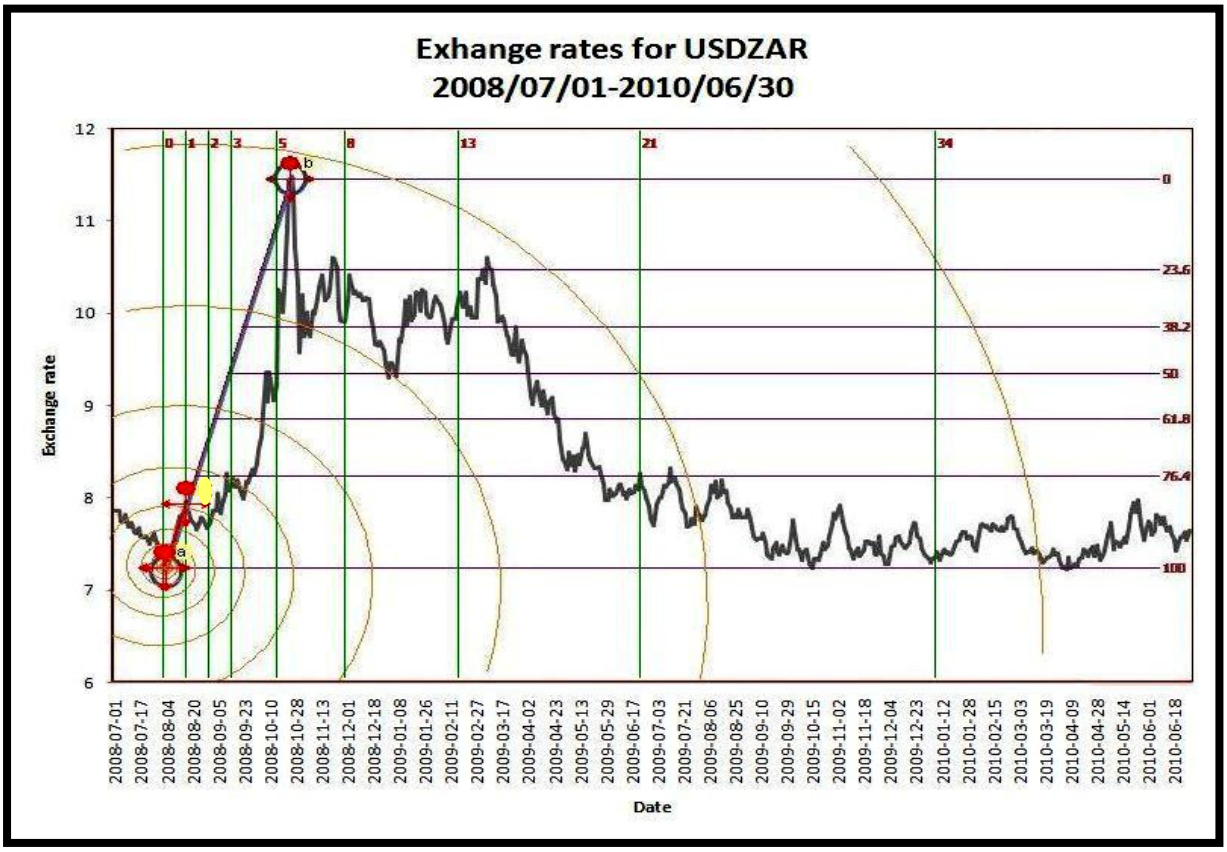


The time zones for Figure B.3 were drawn off of another trend line set at 2008/08/04 which is point a on the chart and on 2008/08/16 at point c. This indicated movement after 2008/12/31, which will occur at 2009/01/20, which is the Fibonacci number 13 and at 2009/05/07, indicative of the Fibonacci number 21. Taking a look at the exchange rate's real movement at these levels, there is an indication of a high at the Fibonacci number of 13 and a trough occurred at the Fibonacci 21 time zone. This may allow a company to set a relative time to fix their contract rates at.

Significant retracements that occurred were the 23.6%, 38.2% and the 50% levels. These levels were tested on 2008/11/19, 2008/11/25 and at 2009/01/01, indicated by points d and e respectively. These levels are then used to predict the year-end rate. Another significant rate was the 76.4% retracement level which was tested at the periods of 2008/09/01 until 2008/09/30 and this can be seen by the point f encircling the trading area.

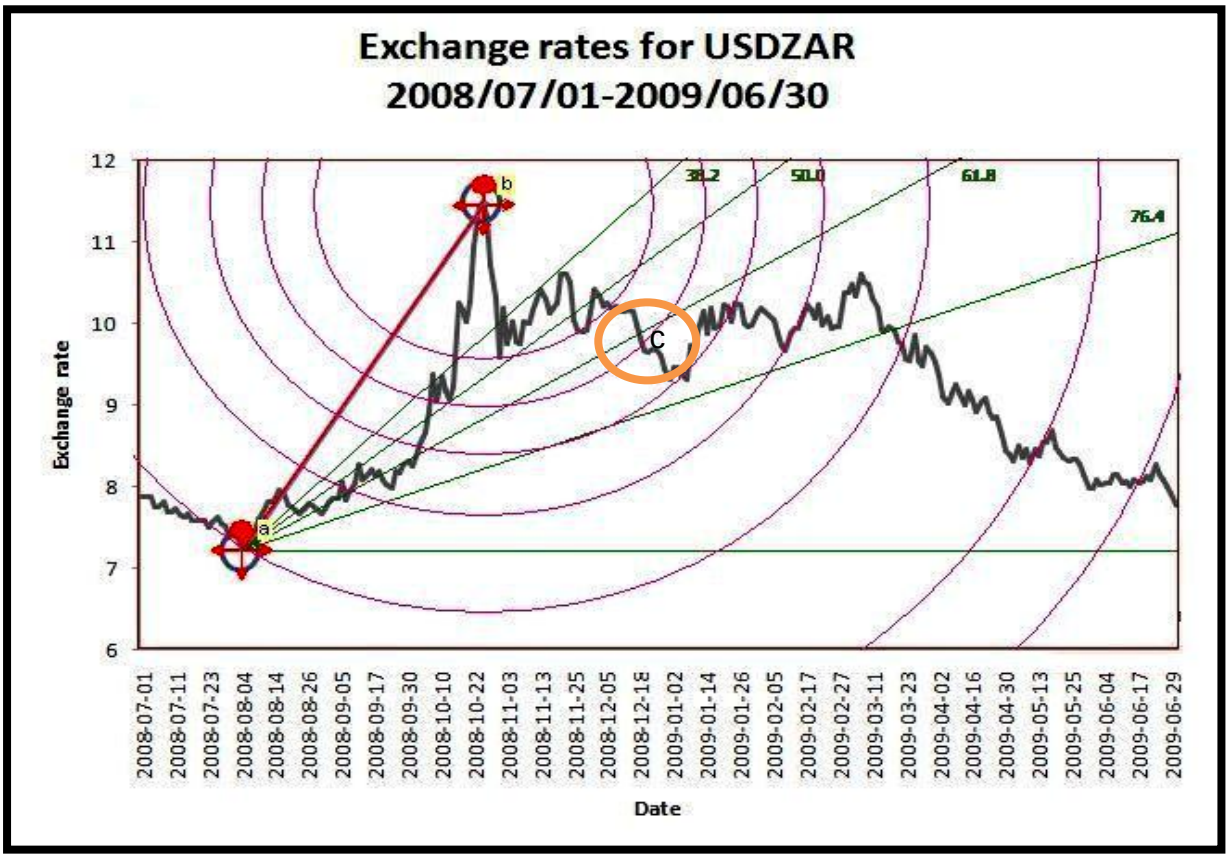
The spiral (turning to the left) indicated movement at the major peak of the exchange rate and also intersected with the 23.6% at point d and the 76.4% retracement level at point f, which led to another high peak in exchange rates after its ultimate high in October.

FIGURE B.4: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2009 AND 2010



As shown in Figure B.4, after the spike in the exchange rate, the market was made into a trending market for the 2010 financial year with all its movement fading away and darting around between the 76.4% and 100% retracement levels. The 76.4% retracement level has been influenced and tested in the beginning with rates never moving higher than the ZAR 8.34 mark. The spiral and time zones drawn do not indicate much seeing as though the trend from which they are drawn was still in the trending market and has an inaccurate effect on the trading part of the market. Therefore the time zones and Fibonacci spiral is futile.

FIGURE B.5: ARCS AND FANS FOR THE YEAR-END 2009

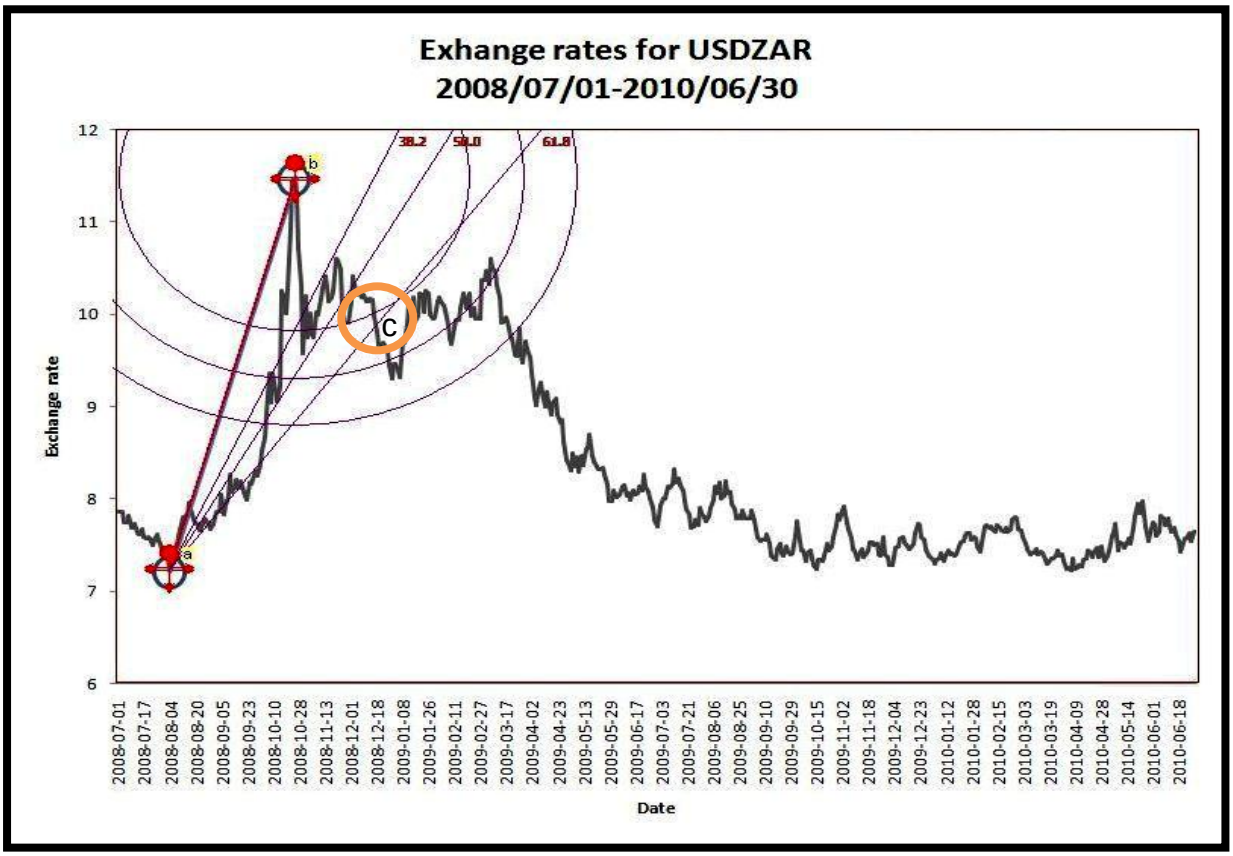


The arcs and fans predicted in Figure B.5 indicate important rates and dates from 2008/12/05 to 2008/12/18, which is depicted by the circle at point c. The most important predictive levels are the 61.8% arc and fan, because of the movement the market underwent from 2008/09/05 to 2008/09/30.

The arcs and fans for Figure B.6 are drawn on the same trend as before which also leads them to indicate very little movement in the future creating inaccurate determinants for the 2010 year-end.

Had traders and companies combine the Figures from B.1 to B.6, they would have predicted for the 2009 year-end that the exchange rate would have been set at the retracement level of 76.4% intersecting the Fibonacci spiral at point f on Figure B.4. This leads to an exchange rate of ZAR 8.25. Had the companies made use of the historical information of the exchange rate for the Fibonacci arcs and fans, the exchange rate would have been ZAR 9.95 as determined by the intersection of the two technical tools at point c on Figure B.5 and Figure B.6.

FIGURE B.6: ARCS AND FANS FOR THE YEAR-ENDS 2009 AND 2010



Combining these two estimated exchange rates will lead traders and companies to the average predicted exchange rate of ZAR 9.10 with which they can hedge their exports.

ARM and SASOL's graphs: the periods 1st July 2009 to 30th June 2010 and 1st July 2009 to 30th June 2011

Making a trend line more into the trending area of the charts, turns out to be more accurate than just placing it in the trading area. The trend shown here in Figure B.7 and Figure B.8 is a downtrend from the swing high at point a of ZAR 8.32 to the swing low at point b of ZAR 7.29. The trend has been tested from the periods 2009/08/10, to 2009/08/20, 2009/10/01 and the periods 2009/10/23 to 2009/11/04, indicate respectively by the points d, e and f on Figures B.7 and B.8. The USDZAR also falls adequately within the 38.2% ellipse indicating a strong trend and high-quality historic information.

FIGURE B.7: TREND AND ELLIPSE FOR THE YEAR-END 2010

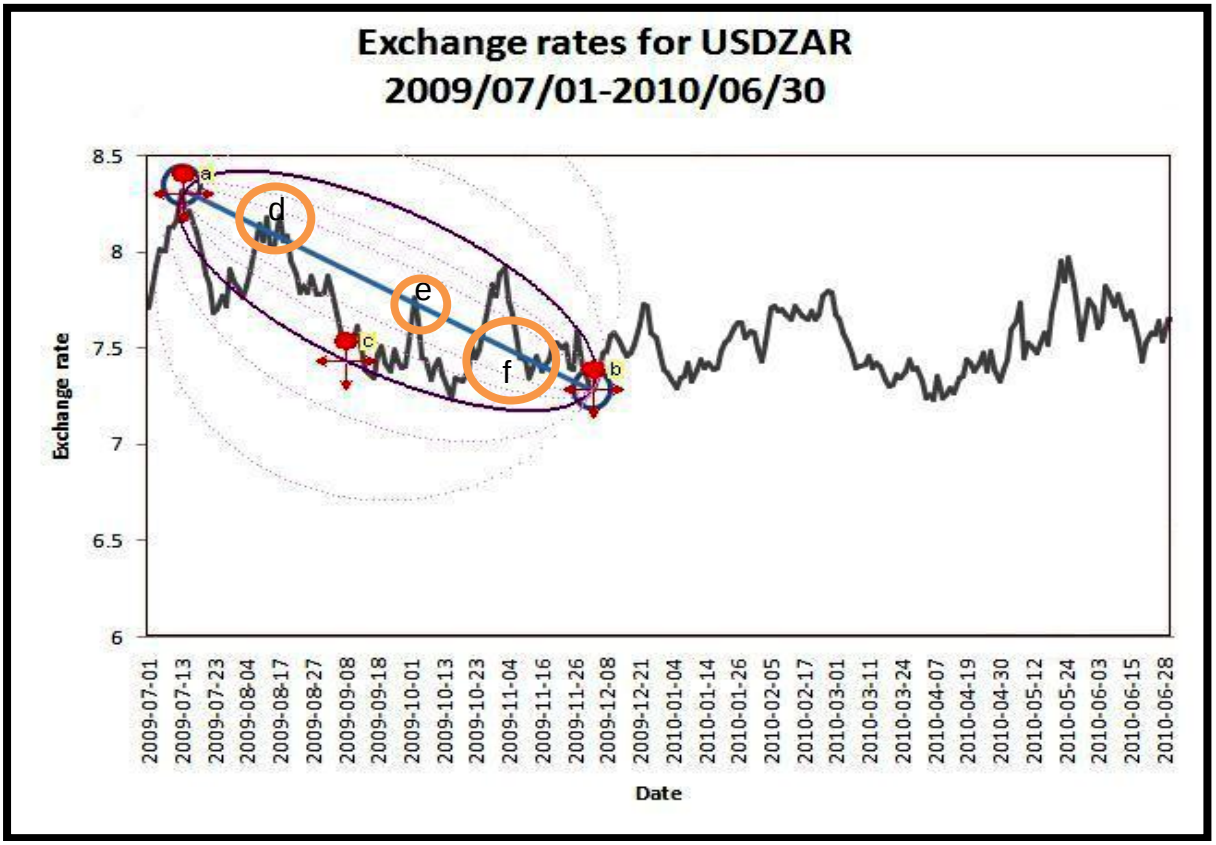


FIGURE B.8: TREND AND ELLIPSE FOR THE YEAR-ENDS 2010 AND 2011

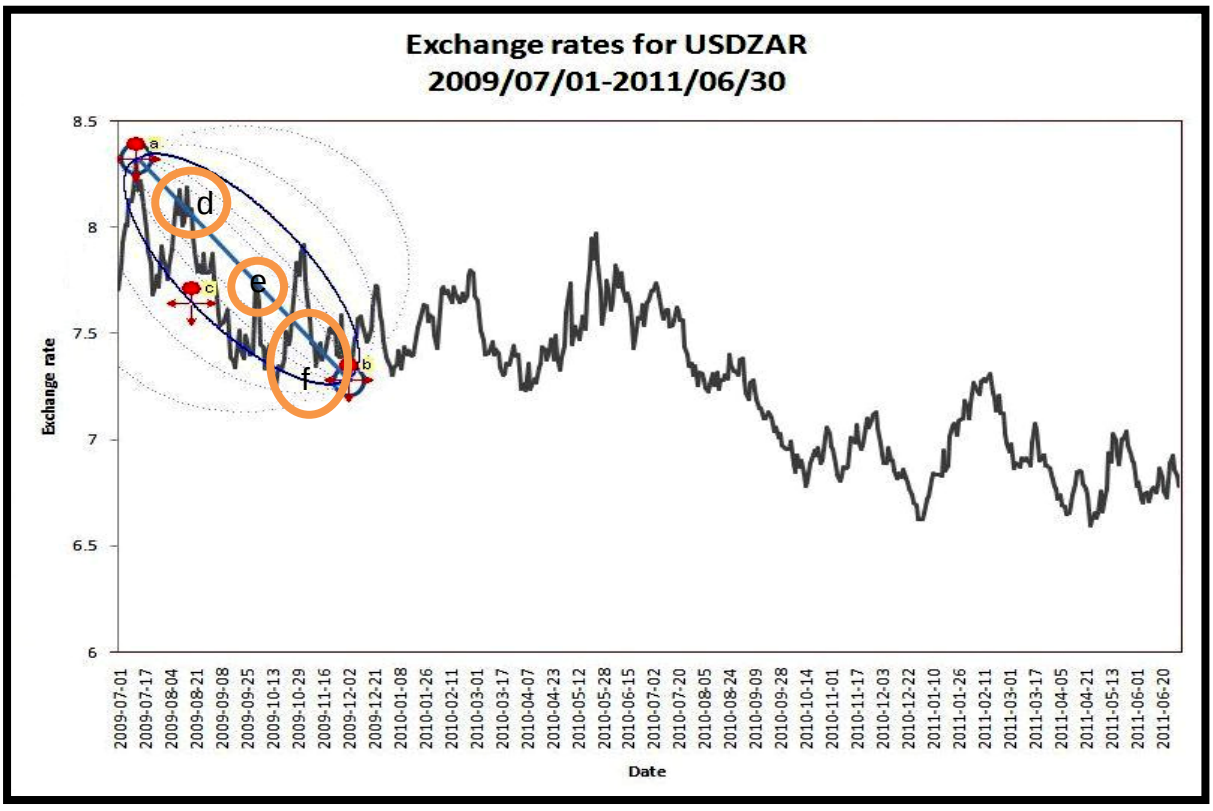


FIGURE B.9: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2010

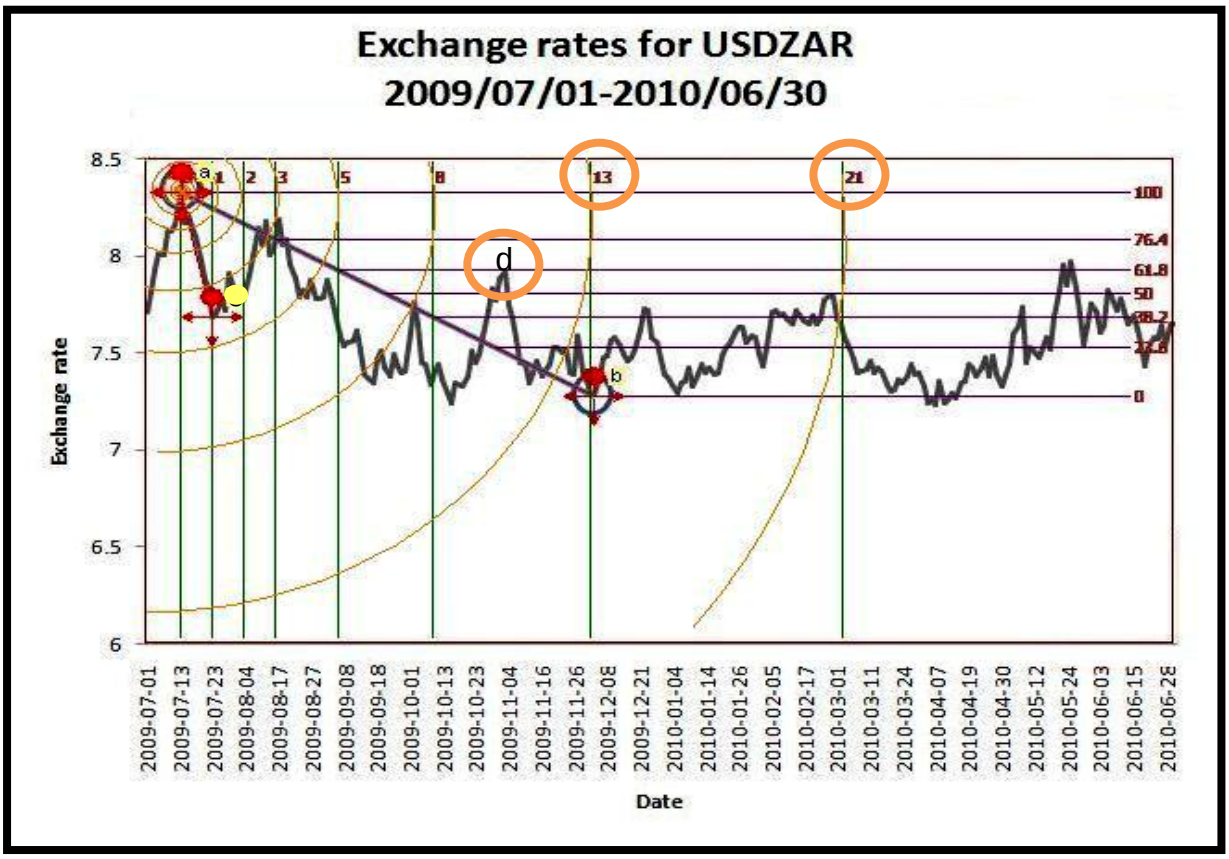
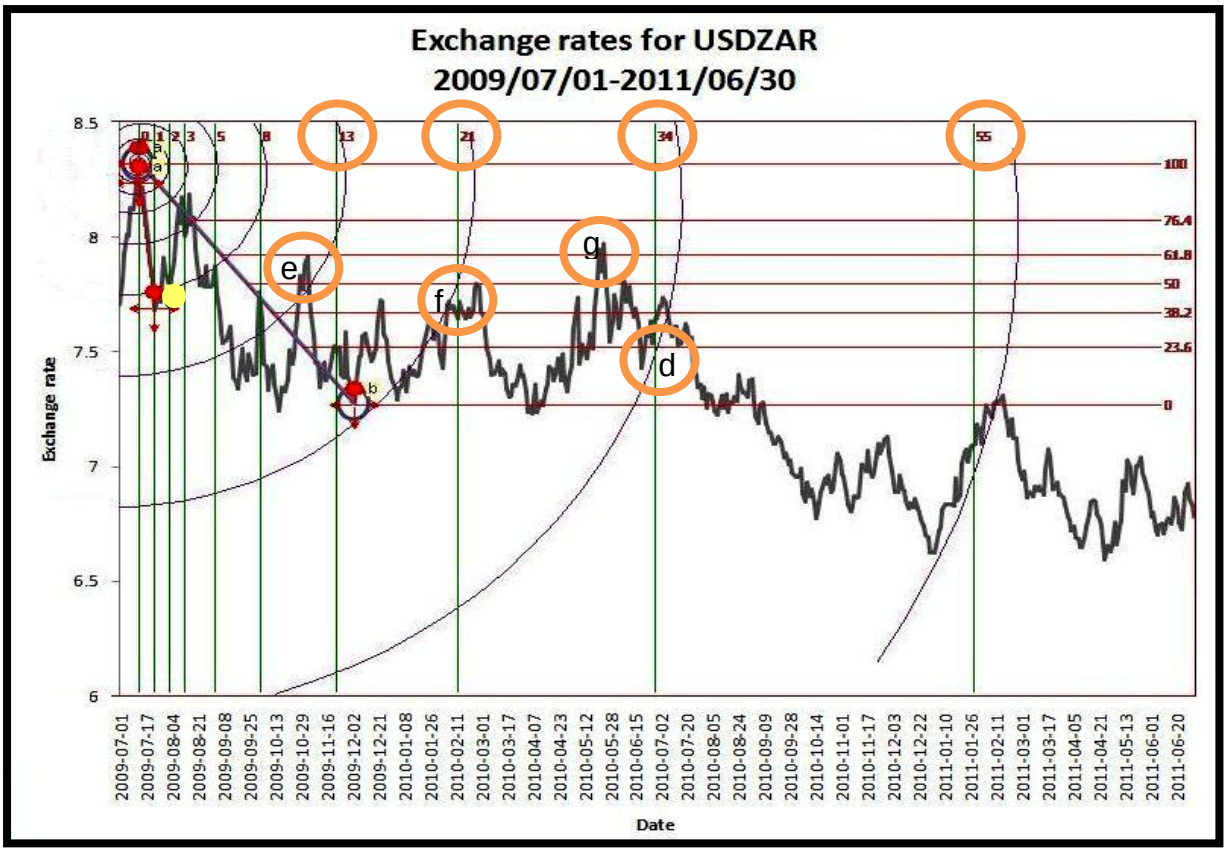


FIGURE B.10: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2010 AND 2011



The time zones and spirals (turning to the right) intersect various times as depicted on Figures B.9 and B.10. Taking this into account for the future movements of the markets lead to a prediction of movement on 2009/11/29; the Fibonacci number 13; and 2010/03/02, the Fibonacci number 21 as seen on Figure B.9 and Figure B.10.Figure B.10 also predicts movement for 2010/06/28; Fibonacci number 34 and 2011/01/28, which is the Fibonacci number 55. The spiral (turning to the right) intersects the time zones at the USDZAR rate of ZAR 7.49 as shown by point d on Figure B.10.

The retracement levels of 38.2%, 50% and 61.8% levels would be excellent stop-loss order levels for companies to undertake, due to the multiple times they have been tested (see point d of Figure B.9 and points e, f and g on Figure B.10). These levels would also be the most likely rates that companies would use to hedge at.

FIGURE B.11: ARCS AND FANS FOR THE YEAR-END 2010

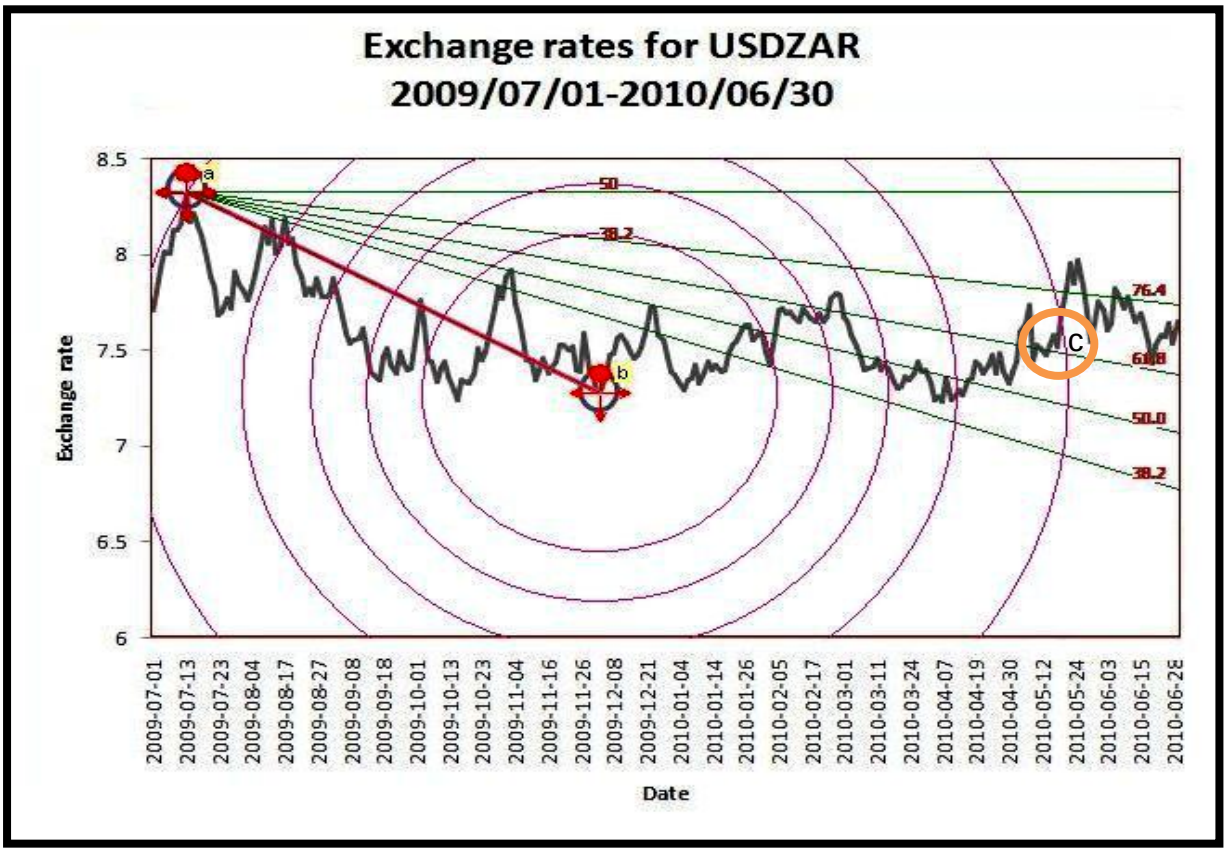
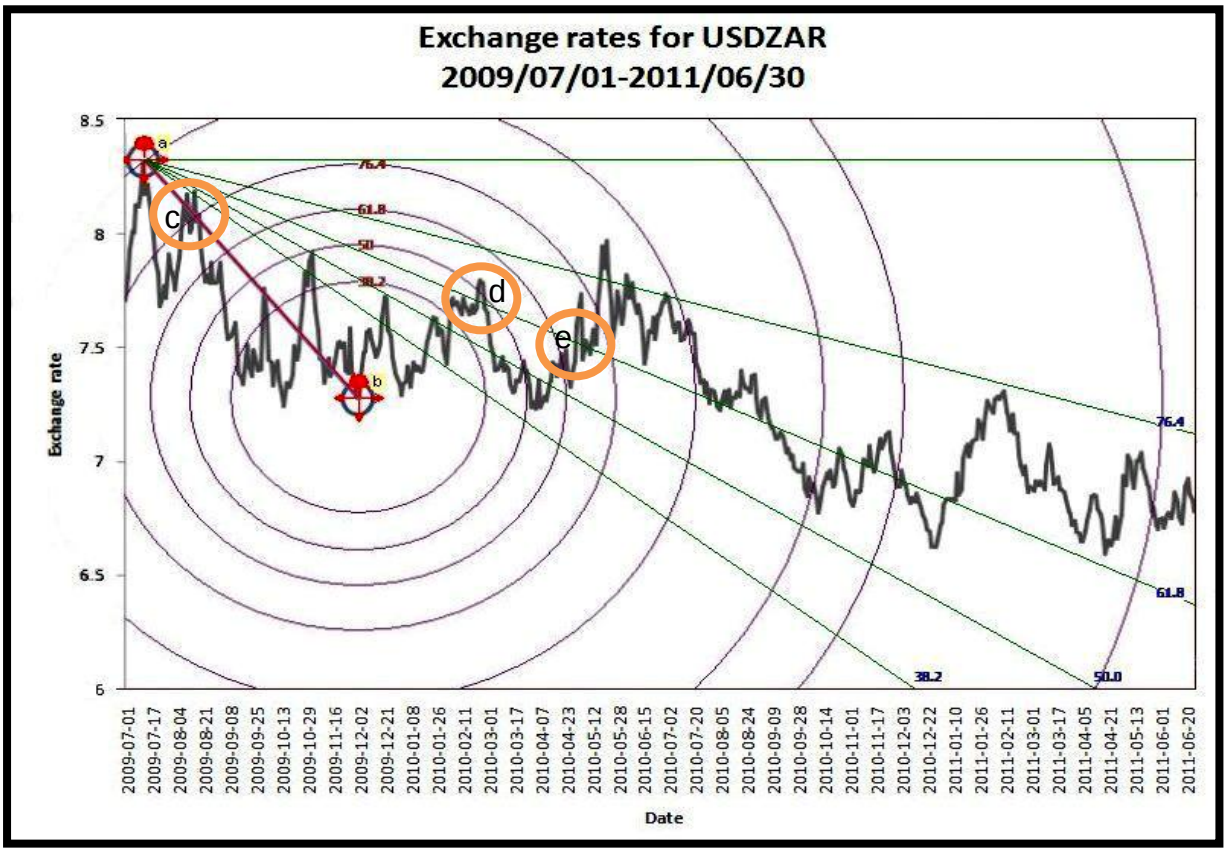


FIGURE B.12: ARCS AND FANS FOR THE YEAR-ENDS 2010 AND 2011



According to Figure B.11 and Figure B.12, depicting the arcs and fans, the market is moving steady and traders should use the three most common Fibonacci levels of the arcs and fans to hedge at, which are the 38.2%, 50% and 61.8% levels.

The arcs and fans for these charts indicate a great deal of accuracy for the 76.4% arc level, which has been tested various times along, as depicted by point c on Figure B.12,along with the 61.8% fan level (points d and e). Where these Fibonacci levels intersect the hedge price will be set at its optimum level.

According to the above performance of the technical analysis tools, the following outcomes have been determined. For the retracement levels and the Fibonacci spiral and time zones, the exchange rate has been determined at ZAR 7.49, which was the point where the 23.6% retracement level, the Fibonacci spiral and the Fibonacci number 34 combined, indicated by Figure B.10. For the arcs and fans the exchange rate was determined at ZAR 7.65 as shown by point c on Figure B.11 and point e on Figure B.12.

ARM and SASOL's graphs: the period 1st July 2010 to 30th June 2011

A downtrend is still enforced in Figure B.13 on the USDZAR exchange rate and this still indicates the appreciation of the ZAR. The trend was drawn from point a at ZAR 7.74 to point b at ZAR 6.60 and has been tested consistently throughout the trending period. The ellipse also indicates an excellent trend which is also verified by the gentleness of the slope of the trend.

Time zones at the 2011/01/03 date and the Fibonacci number 5 indicated the key decrease in movement and the Fibonacci number 8 indicated the slight peak of 2011/04/20. The best retracement levels are set at the 38.2% and the 50% retracement levels (point d) which both intersect the Fibonacci spiral (turning to the left).

FIGURE B.13: TREND AND ELLIPSE FOR THE YEAR-END 2011

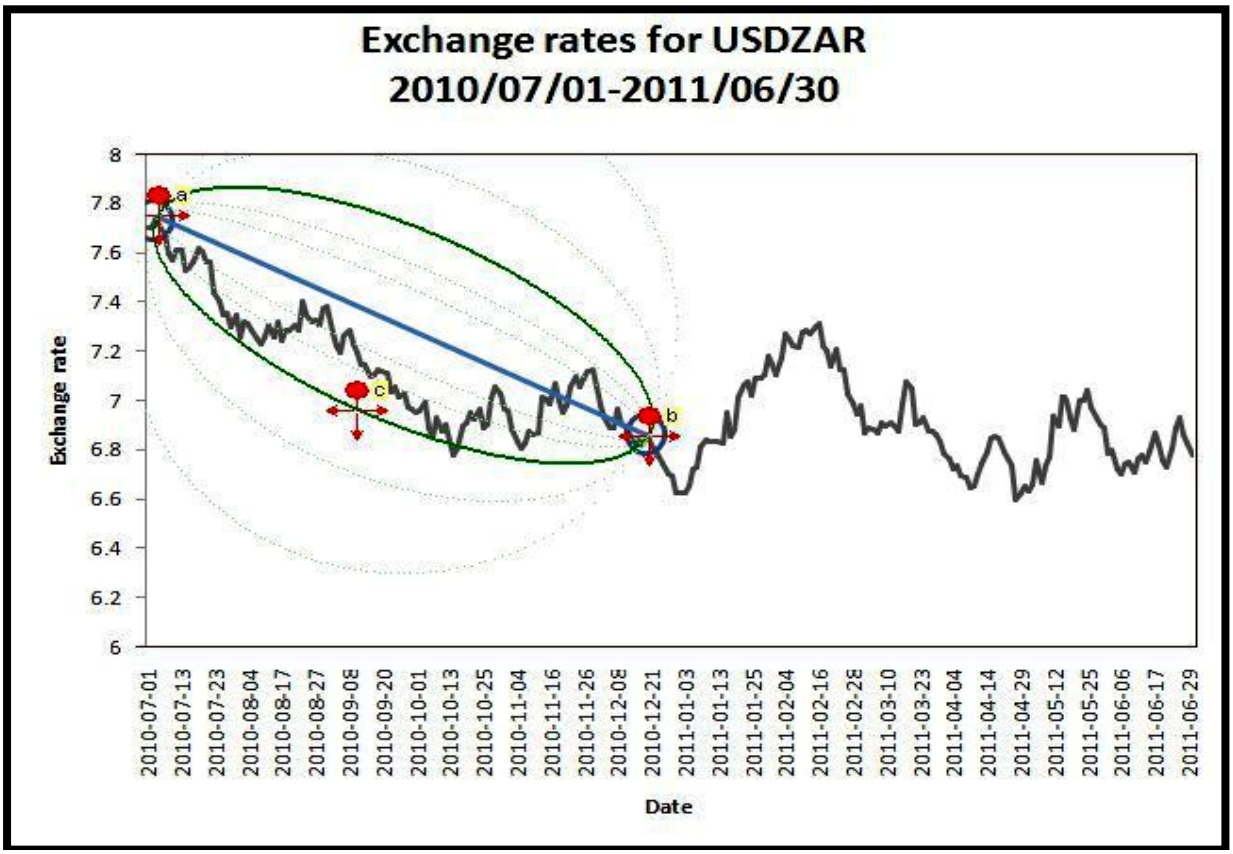


FIGURE B.14: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2011

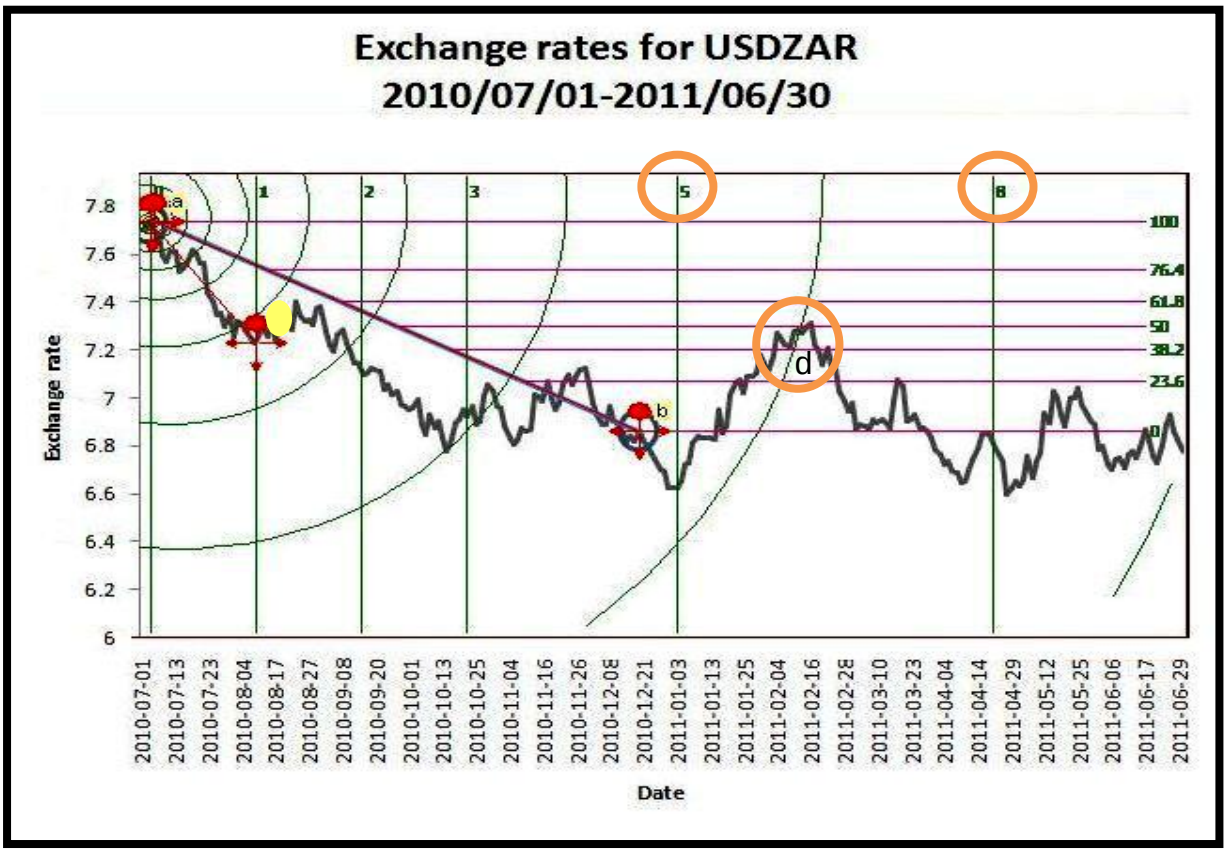
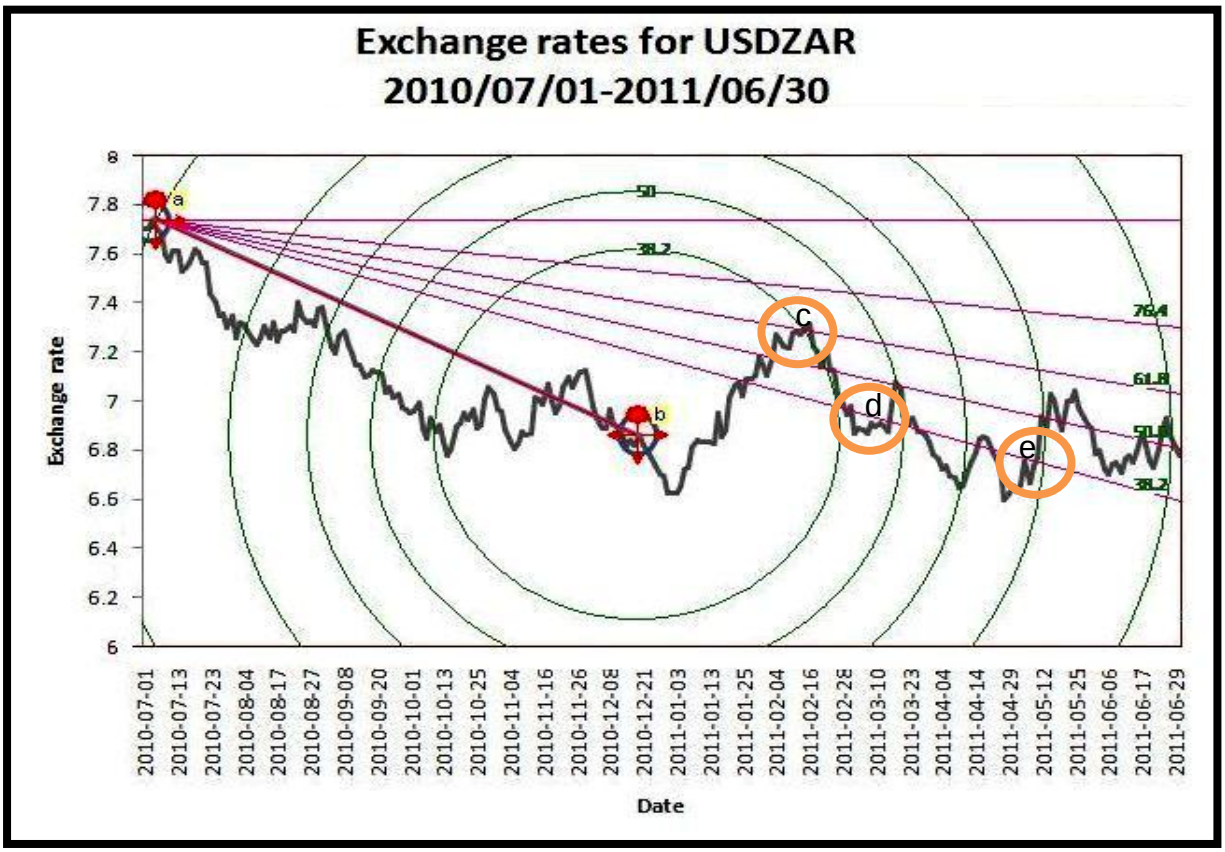


FIGURE B.15: ARCS AND FANS FOR THE YEAR-END 2011



The arcs and fans on Figure B.15 again show the best prediction and can be used where the fans and arcs collide which is at the 38.2%, 50% and 61.8% fan levels, shown by point c, d and e.

Therefore after companies have made use of the technical tools as shown above, the exchange rate for the Fibonacci retracement level would have been set at ZAR 7.01 at the 23.6% retracement level as shown in Figure B.14. The exchange rate for the Fibonacci arcs and fans would be set at the 38.2% fan and the arc of 50% leading to an estimated exchange rate of ZAR 6.89. Combining the exchange rates for all the tools produces an exchange rate of ZAR 6.95

Exxaro, Kumba and Metorex's graph: the periods 1st January 2008 to 31st December 2009

The trend was drawn from point a on 2008/01/1 to b on 2008/10/24 and was tested on 2008/02/23, 2008/03/28 and 2008/01/26 indicated by point d on Figure B.16.

FIGURE B.16: TREND AND ELLIPSE FOR THE YEAR-ENDS 2008 AND 2009



The ellipse indicates that the trend line is drawn to steep due to the rapid increase in the USDZAR exchange rate. This causes most of the exchange rate to fall outside of the 38.2% level of the ellipse making it an unlikely trend and causes difficulty in determining its future movements.

In Figure B.17 the retracement levels and spirals are drawn off of the same trend as indicated in Figure B.16, but the time zones are drawn from a different trend. The time zones indicate dates at which to place stop-loss orders at 2009/01/07 and 2009/08/17, which are the Fibonacci numbers 13 and 21 respectively. Bear in mind that 2009/08/17 is a very important date seeing as though the retracement and spiral levels both meet on this date at point d.

FIGURE B.17: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2008 AND 2009

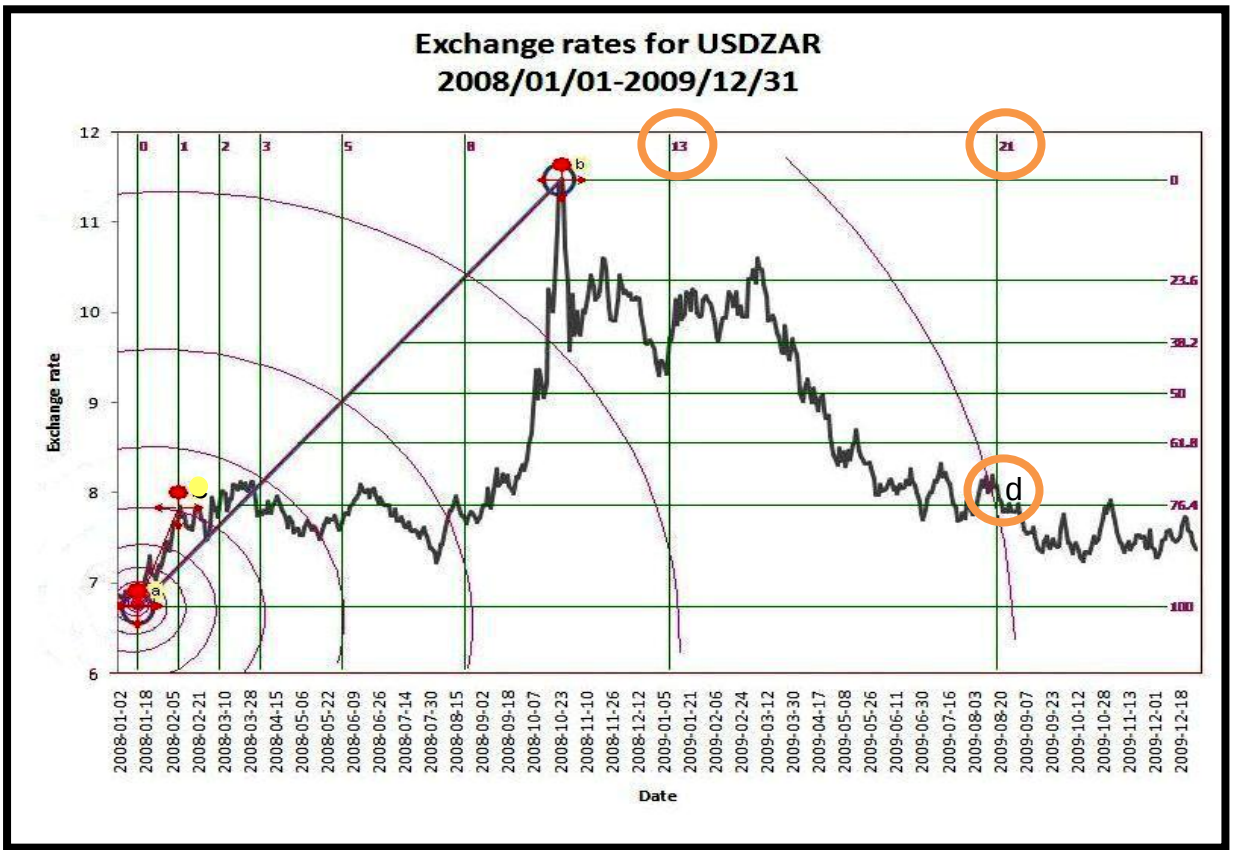
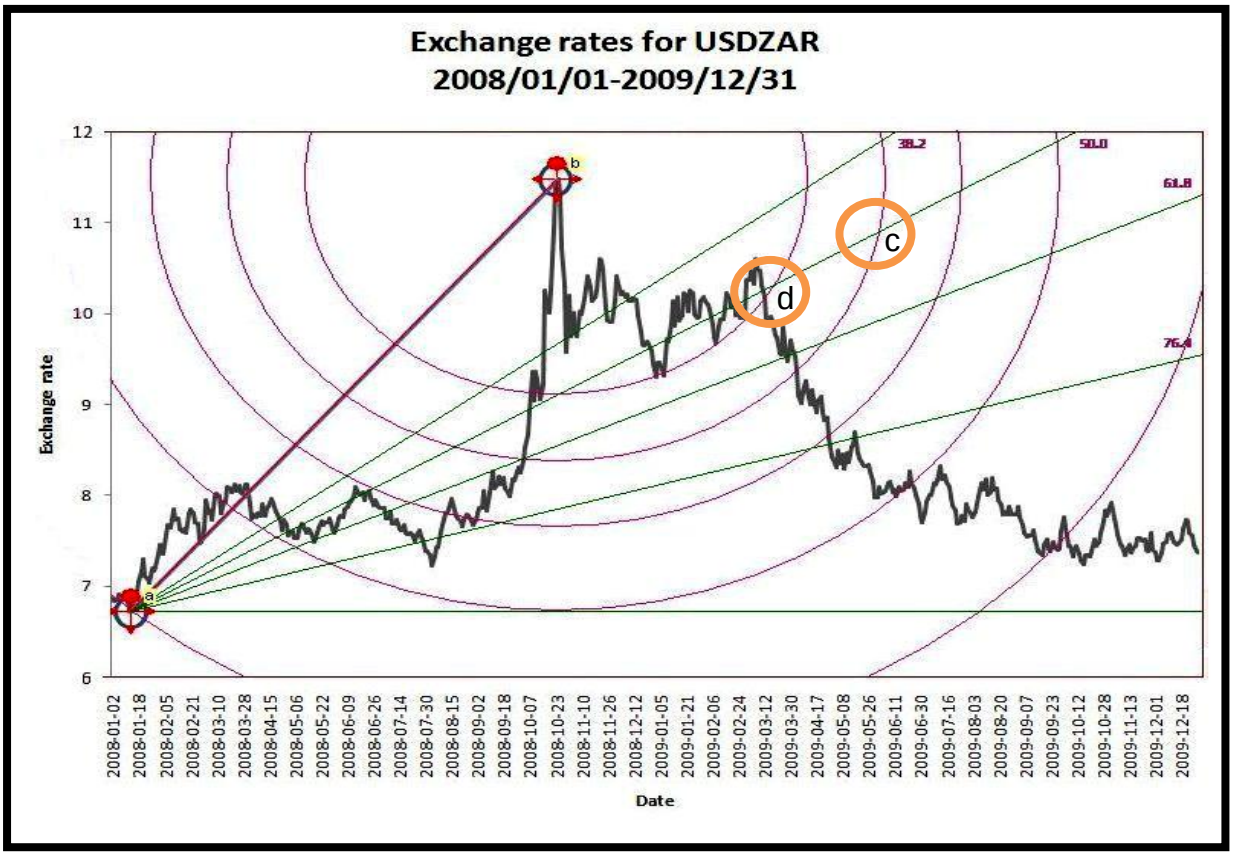


FIGURE B.18: ARCS AND FANS FOR THE YEAR-END 2008 AND 2009



Using the arcs and fans together will help to determine the rates further on in the financial year. The important fan levels are 38.2%, 50% and 61.8%, because they are the rates at which most movement occurred in the trend line period. This would lead to investors placing orders at the 50% fan level and the 38.2 arc level at about ZAR10.34, indicated by point c on Figure B.18, or ZAR 9.75, which is the 50% fan intersecting the 23.6% arc as depicted by point d.

Taking the above calculations into consideration, the companies could have estimated the exchange rates as indicated by Figure B.17 at ZAR 8.85; signified by the intersection of the 61.8% retracement level and the Fibonacci spiral. Figure B.18 estimates the exchange rate at ZAR 10.16 where the 23.6% arc and 50 % fan meets, shown by point d. Combining the outcomes of Figure B.16, B.17 and B.18's predictions the companies could have set their exchange rates used for hedging at the average rate of ZAR 9.51.

Exxaro, Kumba and Metorex's graphs: the periods 1st January 2009 to 31st December 2009

The ellipse in Figure B.19 and Figure B.21 is drawn over a more stable trend which is validated by the point a and b and the exchange rate of 2009/03/11, depicted by point d. For the year period before the 2010 year, the exchange rate moves more into the 38.2% level of the ellipse making it more reliable to determine the exchange rate at the end of the 2010 financial year (see the green oval moving along the exchange rate in Figure B.19 and Figure B.20).

FIGURE B.19: TREND AND ELLIPSE FOR THE YEAR-END 2009

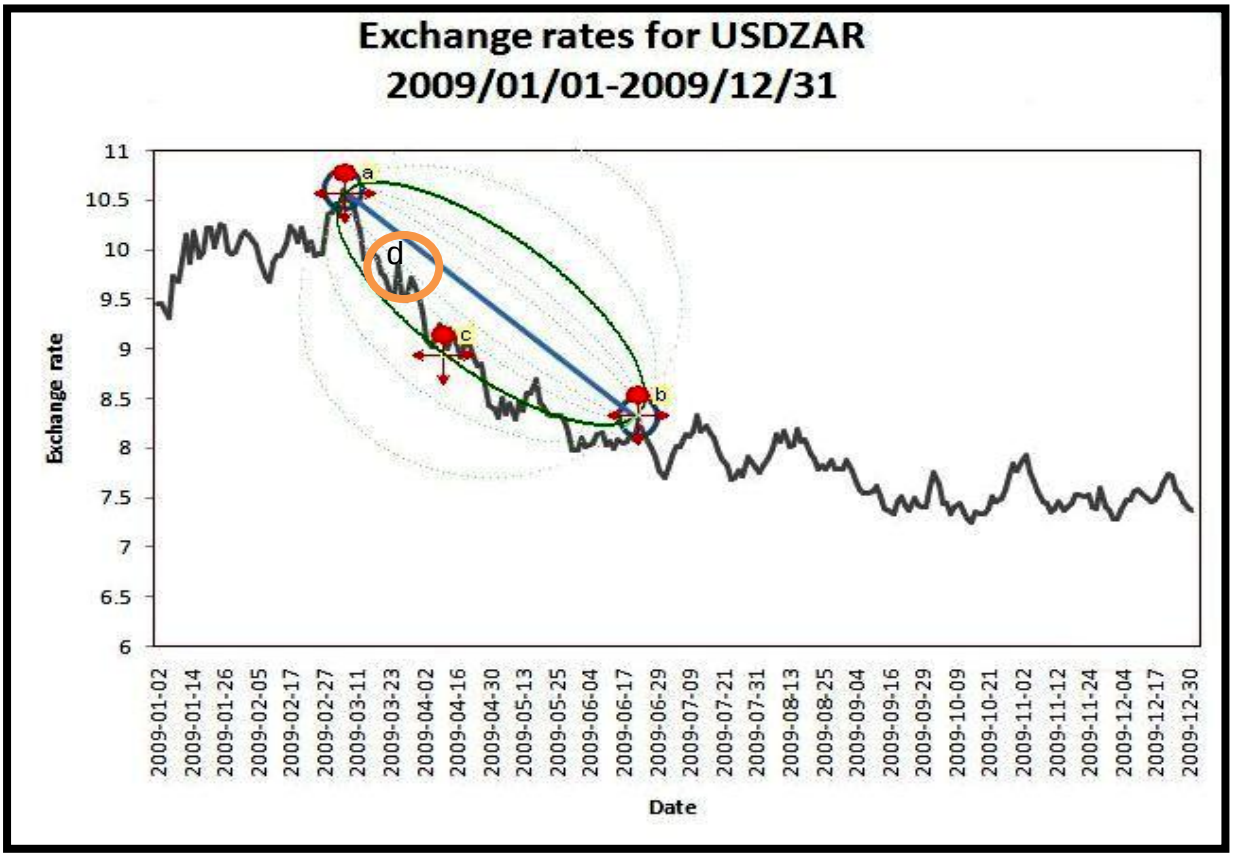


FIGURE B.20: TREND AND ELLIPSE FOR THE YEAR-ENDS 2009 AND 2010

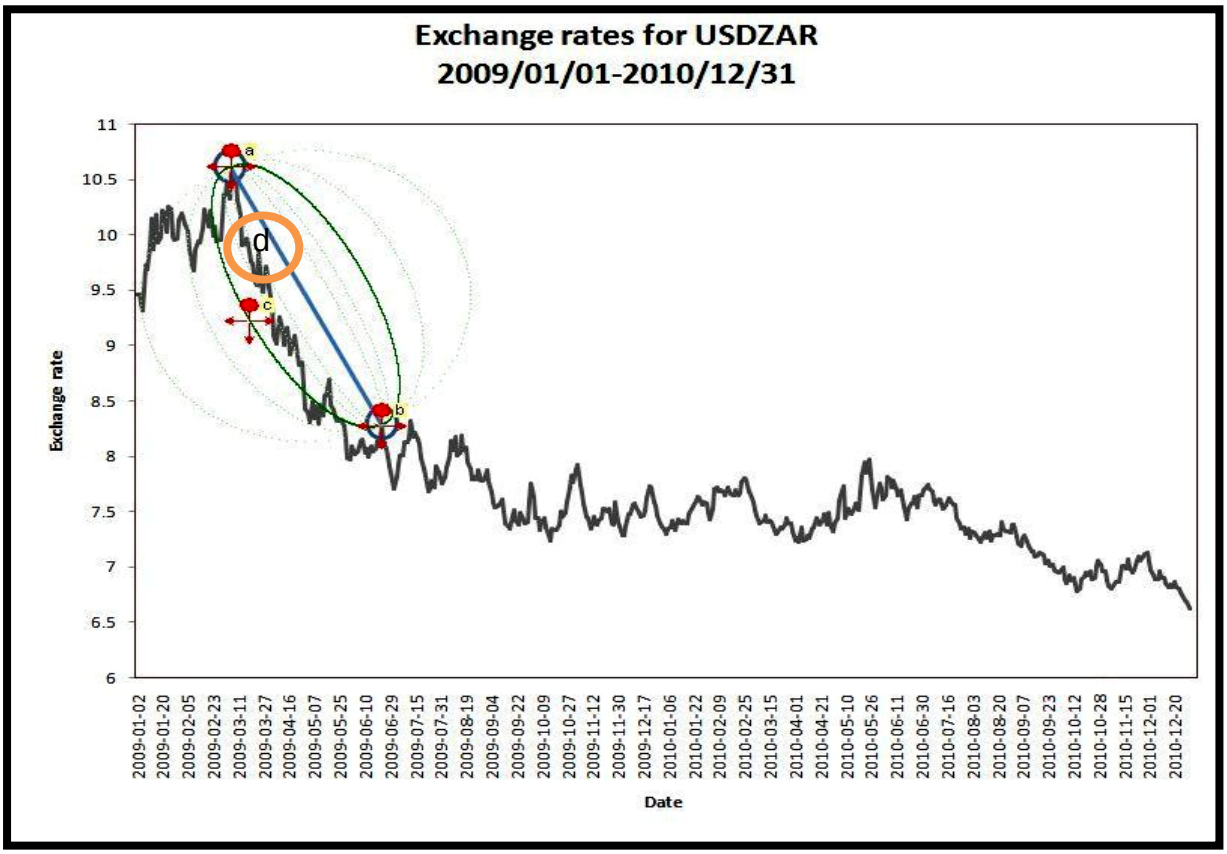


FIGURE B.21: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2009

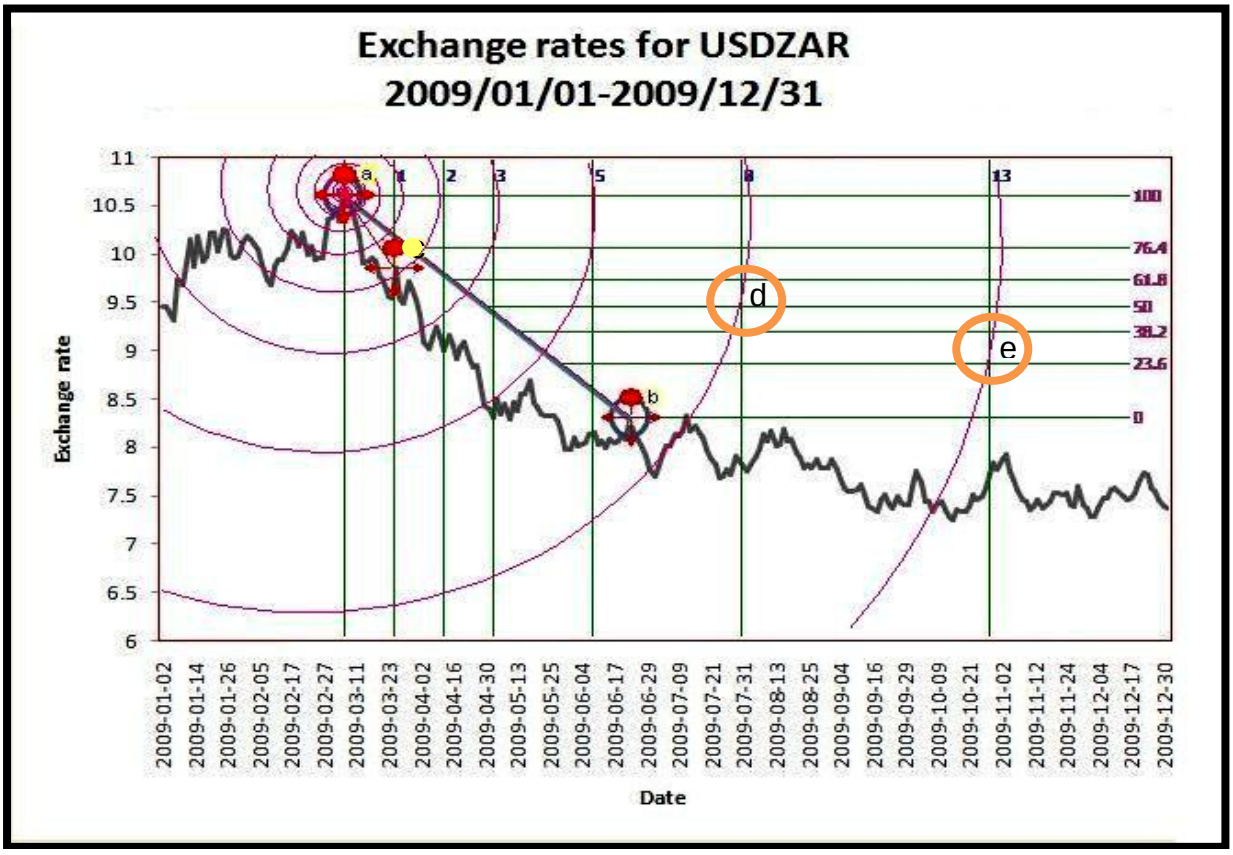
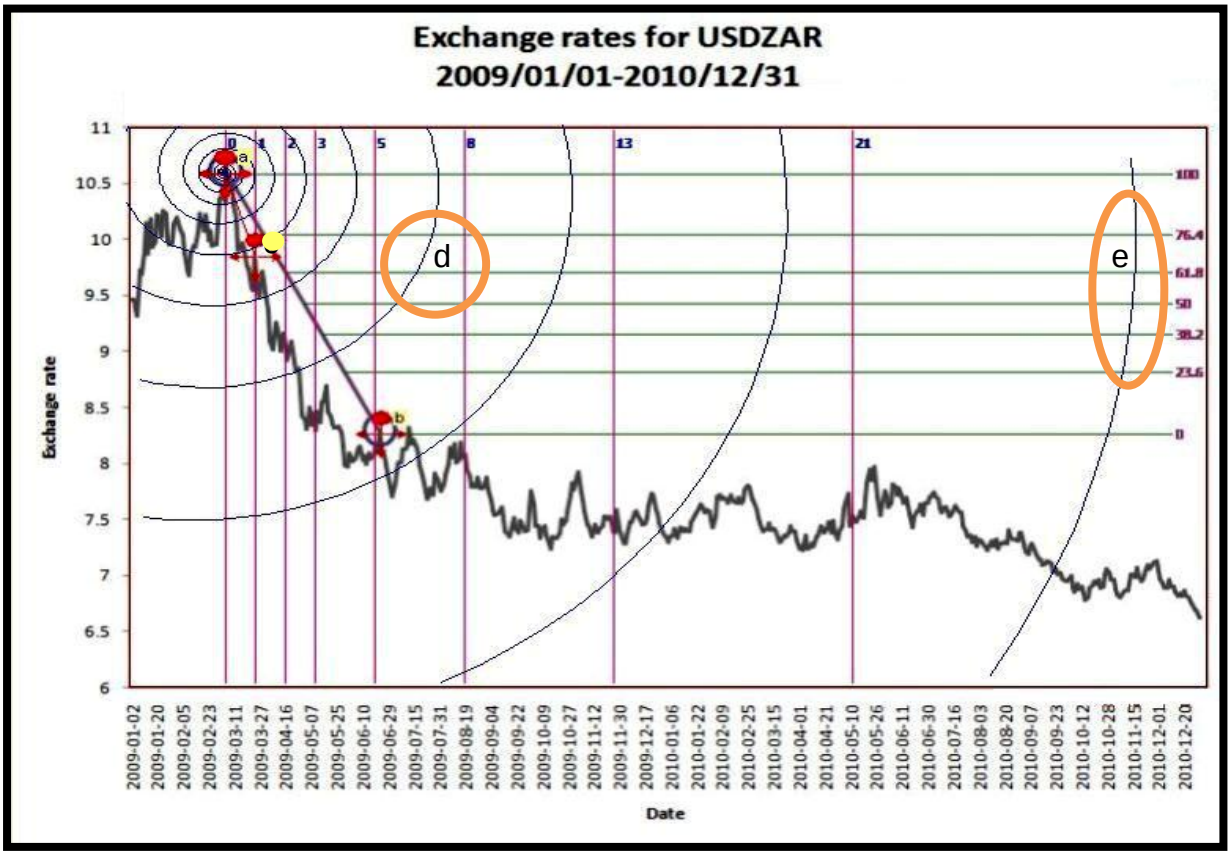
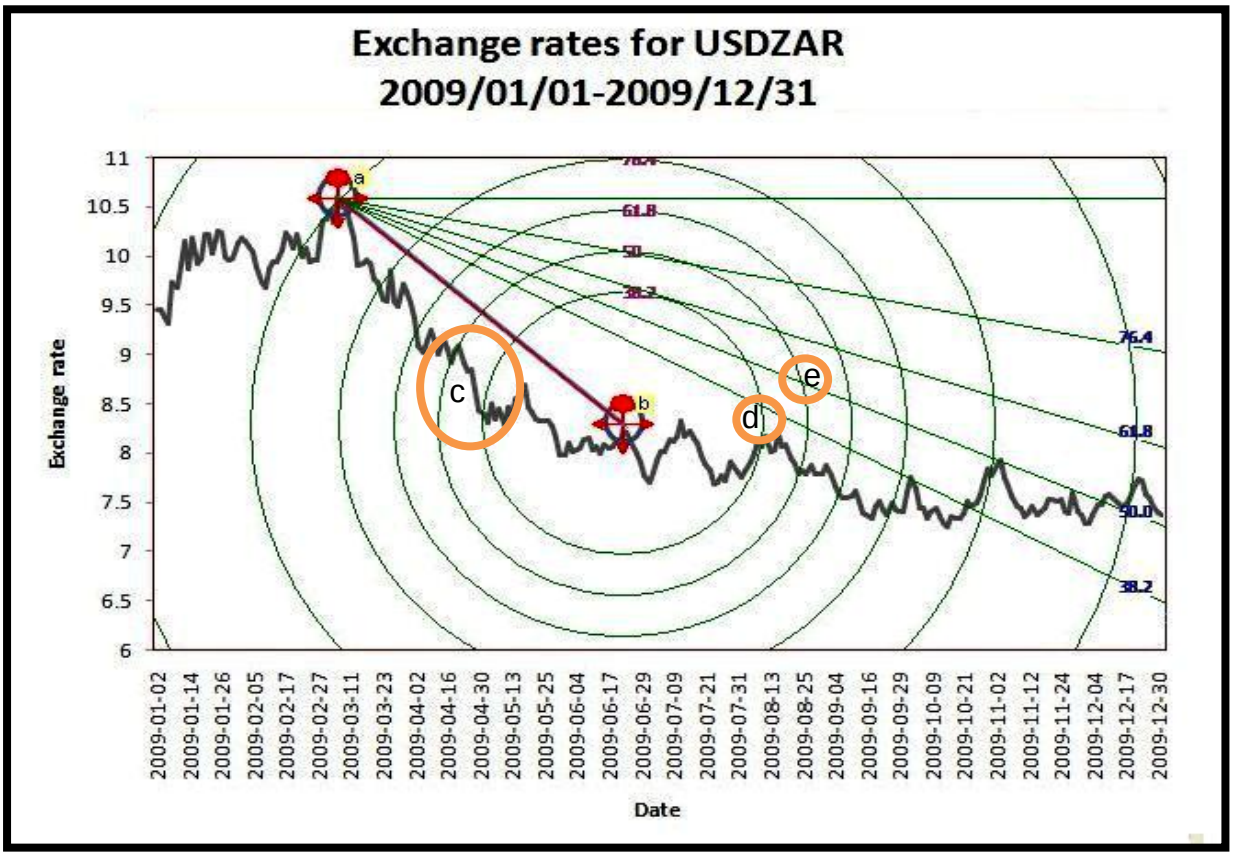


FIGURE B.22: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2009 AND 2010



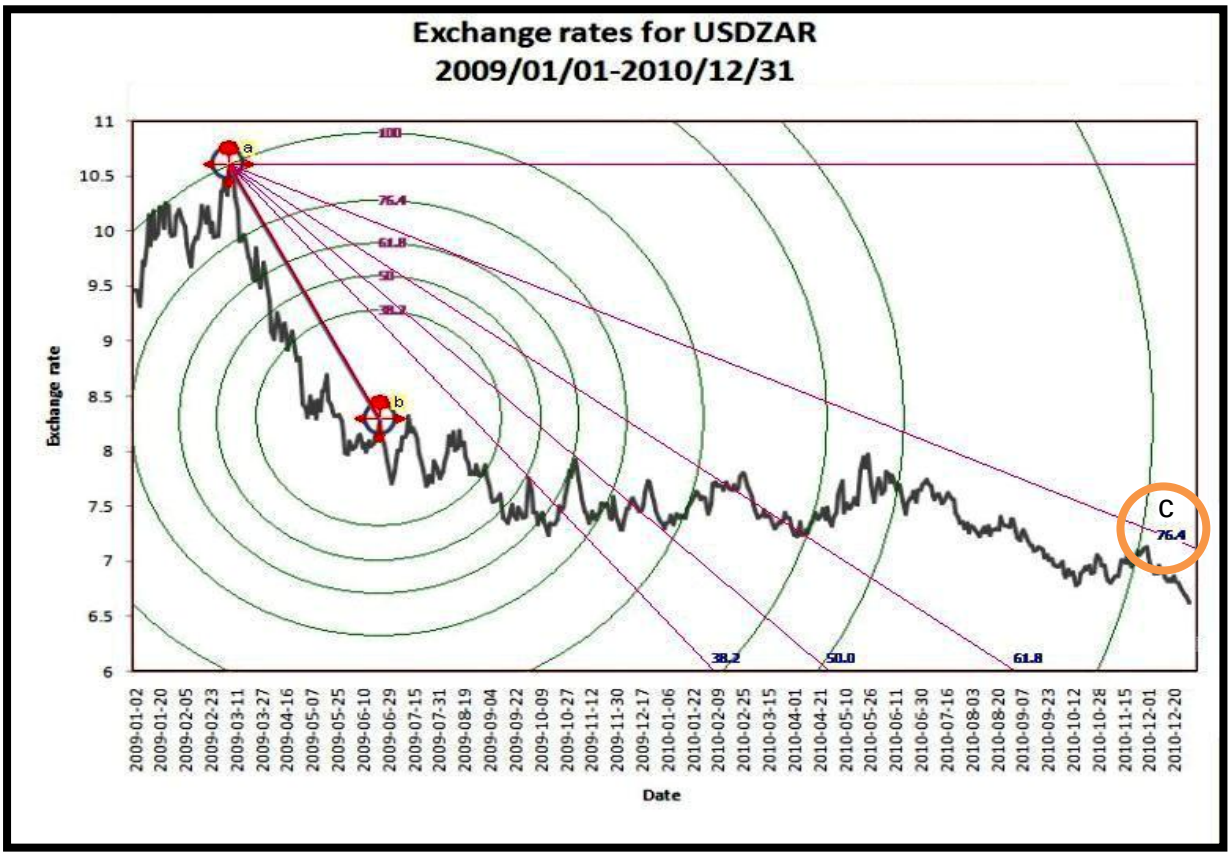
These periods use the same trend which leads them both to have the same outcomes in the market that moved to a trending area. The trend was drawn in a trading area and caused great difficulty in predicting the market for the year end 2009, because the exchange rate started to move in a direction different from the previous trading area which led to it becoming a trending area. Still the companies could use the rates to predict the hedging contact rate at, because the Fibonacci tools move in the general direction that the exchange rate is meant to move in. Using the tools the rate would be set at the general level of 38.2% or 23.%, which can be seen by the points d and e on Figure B.21 and B.22, because these are the levels at which the retracement levels, time zones and spirals meet. The retracement levels intersect the time zones and the spiral at the 2009/07/30 and 2009/10/30.

FIGURE B.23: ARCS AND FANS FOR THE YEAR-END 2009



In Figure B.23 the arcs and fans are used for the trending period and this causes traders to make use of the 38.2% and 50% fan levels, these are the level that are traded as a norm, even though there is no previous market movement for the trader to work from. With the arcs the level will be the 50% level (point c). The most likely places that the market will move are where the arcs and fans intersect after the trend line and therefore the predictions will be at either the 38.2% fans and arc intersecting which is at point d or it will be at point e which is the 50% fans and arcs intersecting.

FIGURE B.24: ARCS AND FANS FOR THE YEAR-ENDS 2009 AND 2010



The year before the 2010 year gives a better indication of the market's movements to the end of the 2010 financial year and this increases the accuracy of the Fibonacci tools. It is for the year-end date, point c in Figure B.24, that the 76.4% level of the fans and the 238% arcs is used as forecasting levels.

Had traders and companies combine the Figures from B.19 to B.25, they would have predicted for the 2009 year-end that the exchange rate would have been set at the retracement level of 23.6% intersecting the Fibonacci spiral at point e on Figure B.21 and Figure B.22. This leads to an exchange rate of ZAR 8.27. Had the companies made use of the historical information of the exchange rate for the Fibonacci arcs and fans, the exchange rate would have been ZAR 8.52 as determined by the intersection of the two technical tools at point e on Figure B.23.

Combining these two estimated exchange rates will lead traders and companies to the average predicted exchange rate of ZAR 8.40 with which they can hedge their exports.

Exxaro, Kumba and Metorex's graphs: the periods 1st January 2010 to 31st December 2010 and 1st January 2010 to 31st December 2011

FIGURE B.25: TREND AND ELLIPSE FOR THE YEAR-END 2010

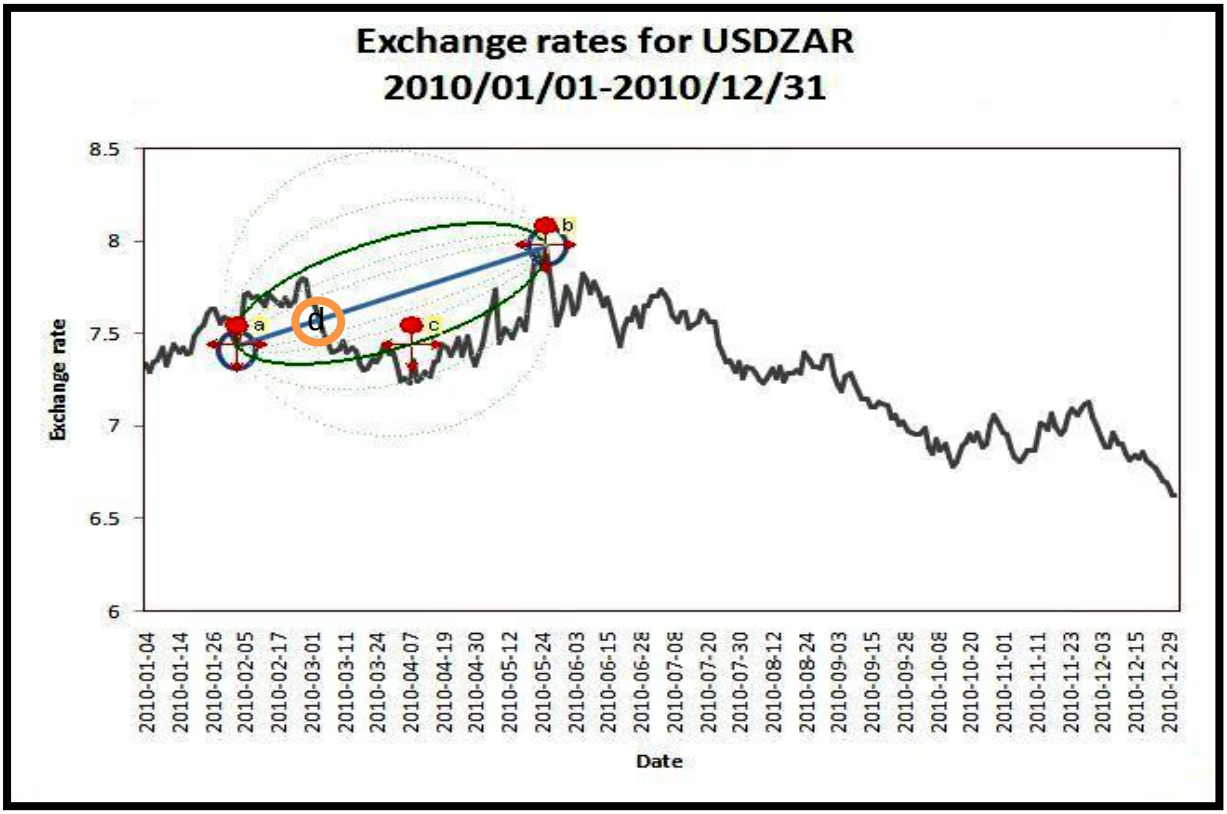
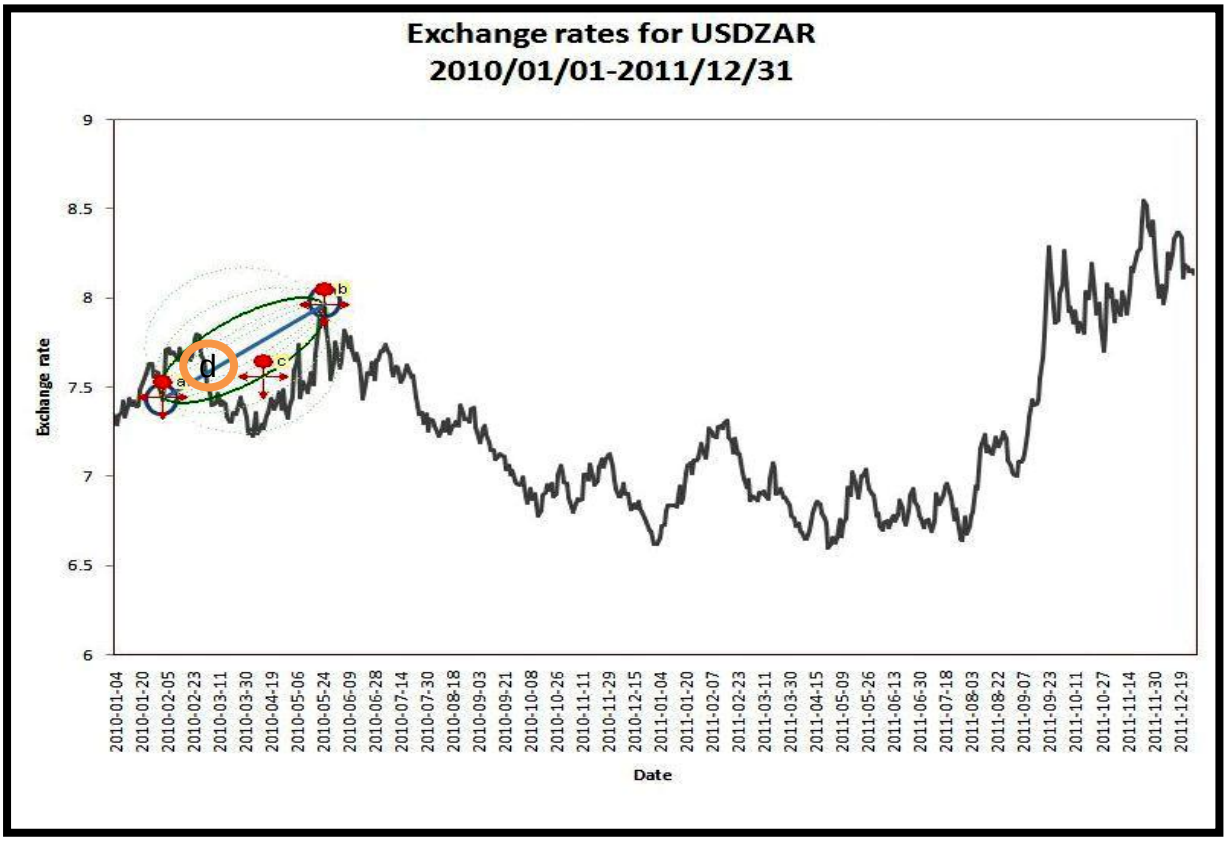
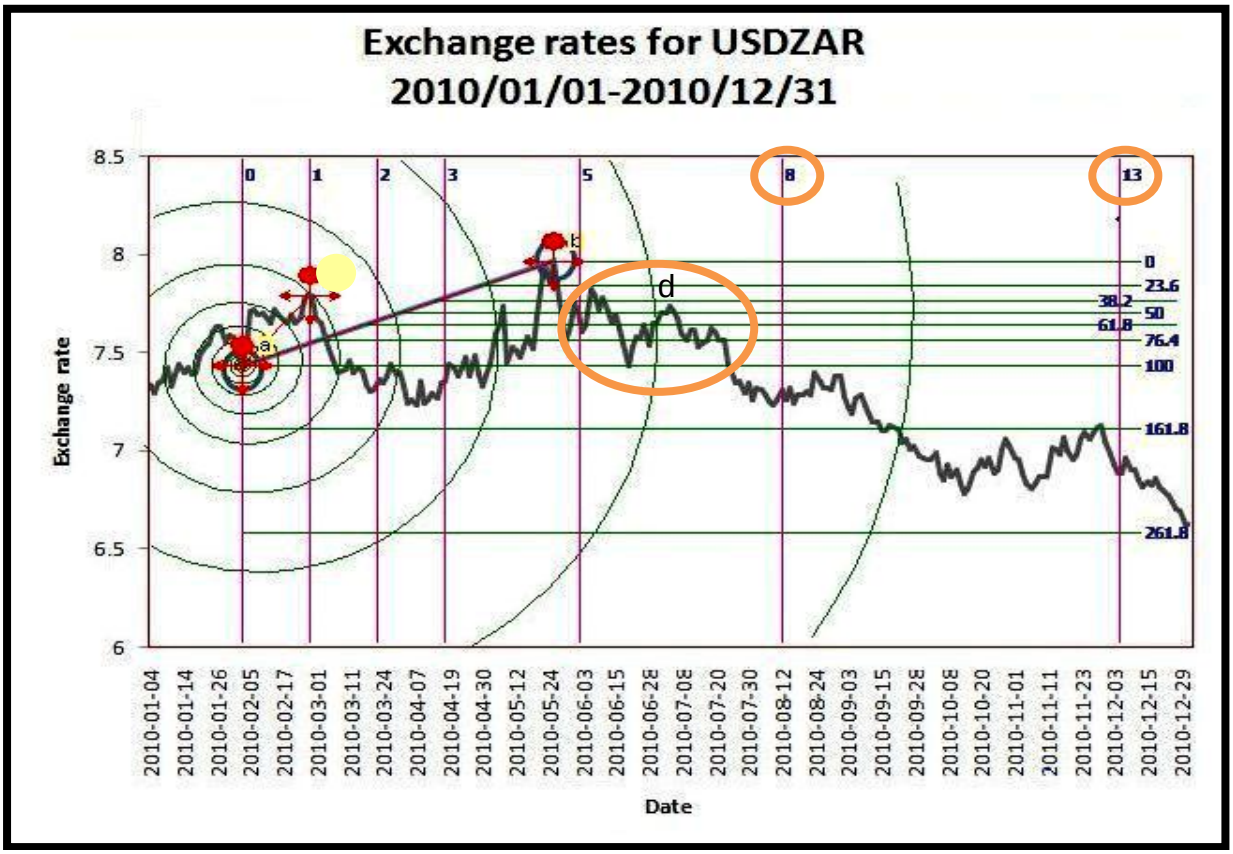


FIGURE B.26: TREND AND ELLIPSE FOR THE YEAR-ENDS 2010 AND 2011



This trend in Figure B.25 and Figure B.26 indicates an increase in the exchange rate, in other words a depreciation of the ZAR making it more alluring for the companies to sell products to foreign buyers. The trend was drawn for both periods from point a at 2010/02/03 with a rate of ZAR 7.43 to point b at 2010/05/25 with a rate of ZAR 7.97. It has been tested on 2010/03/02 (point d on Figure B.25 and B.26) and it's not too steep to make the trend inaccurate. The 38.2% level of the ellipse is mostly met in the beginning of the trend line, but still shows a good trend.

FIGURE B.27: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2010



The trend as determined in Figure B.25 and Figure B.26 is better because it moves along the trending market making it more accurate. This retracement levels which are important are the 50%, 61.8% and 76.4% level where the market moves along these rates (circle d on Figure B.27 and Figure B.28). The time zone at Fibonacci number 8 indicated that the 2010/08/12 is a very important date in the markets movement times and this held true seeing as though the rate made a slight decline in its movements after this date. The time zone, at Fibonacci number 13, intersects the retracement level of 161.8% at 2010/12/06 making it another level to bear in mind.

FIGURE B.28: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-ENDS 2010 AND 2011

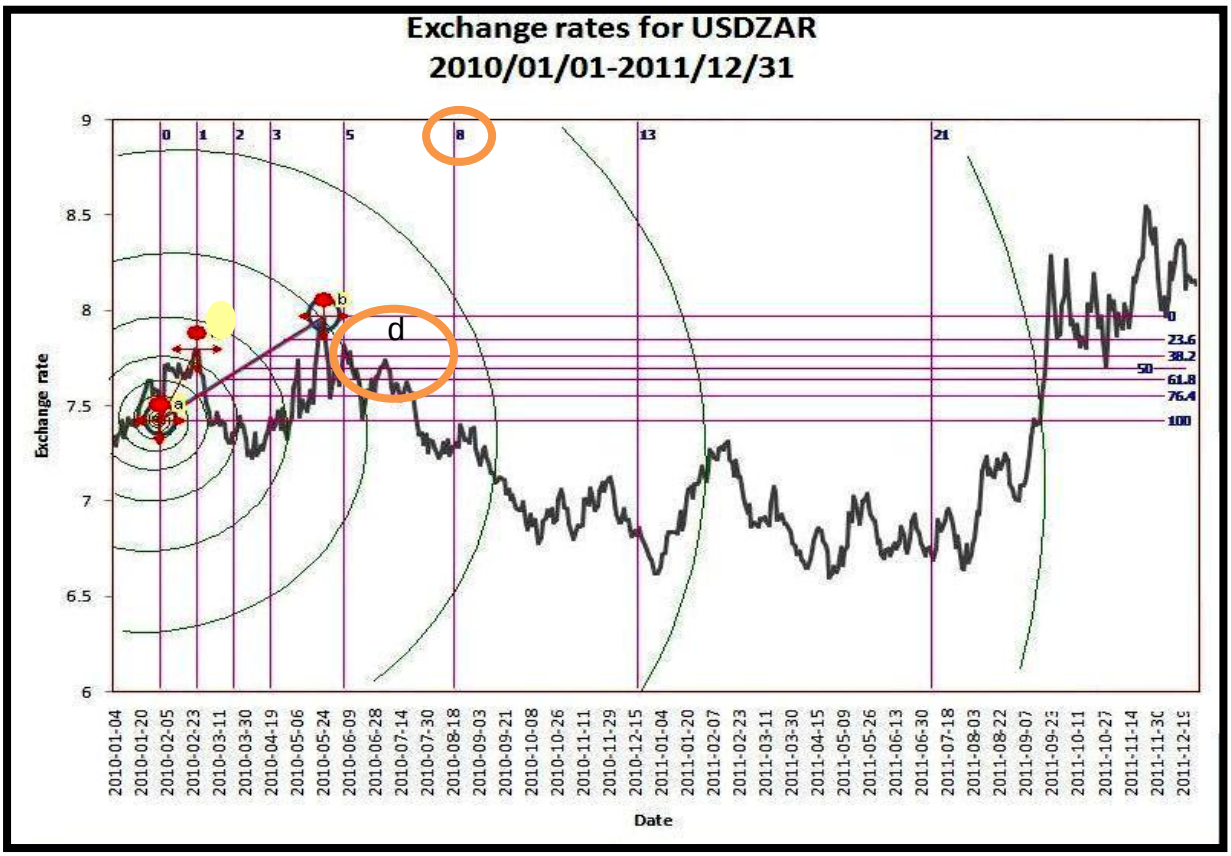


FIGURE B.29: ARCS AND FANS FOR THE YEAR-END 2010

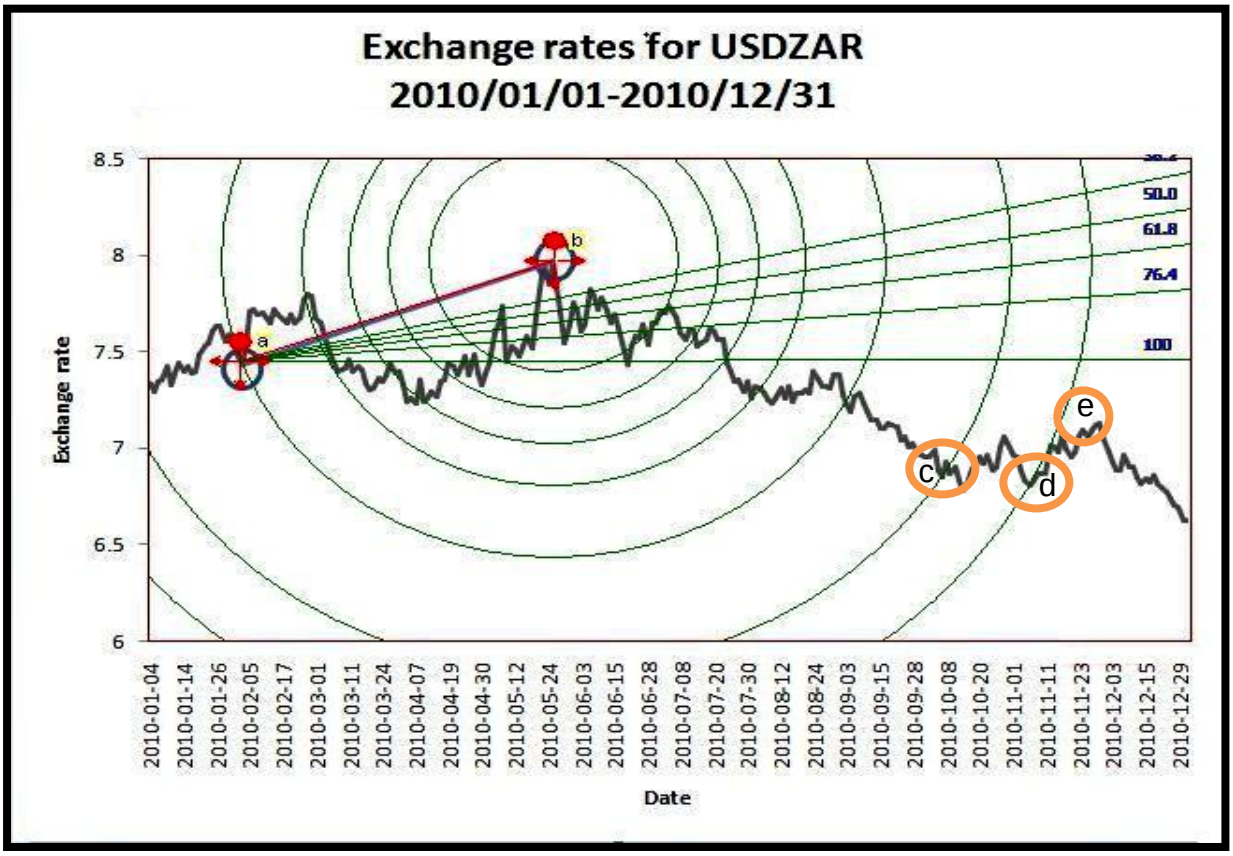
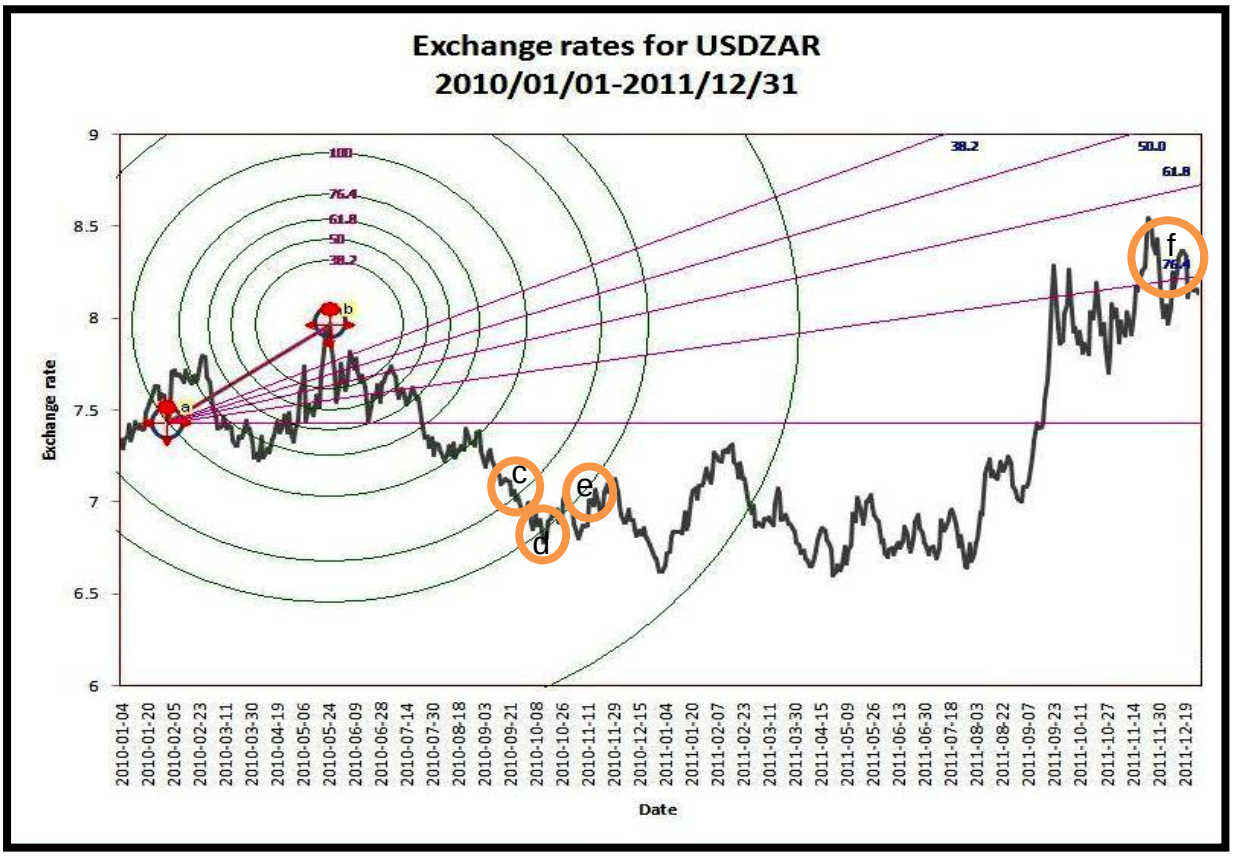


FIGURE B.30: ARCS AND FANS FOR THE YEAR-ENDS 2010 AND 2011

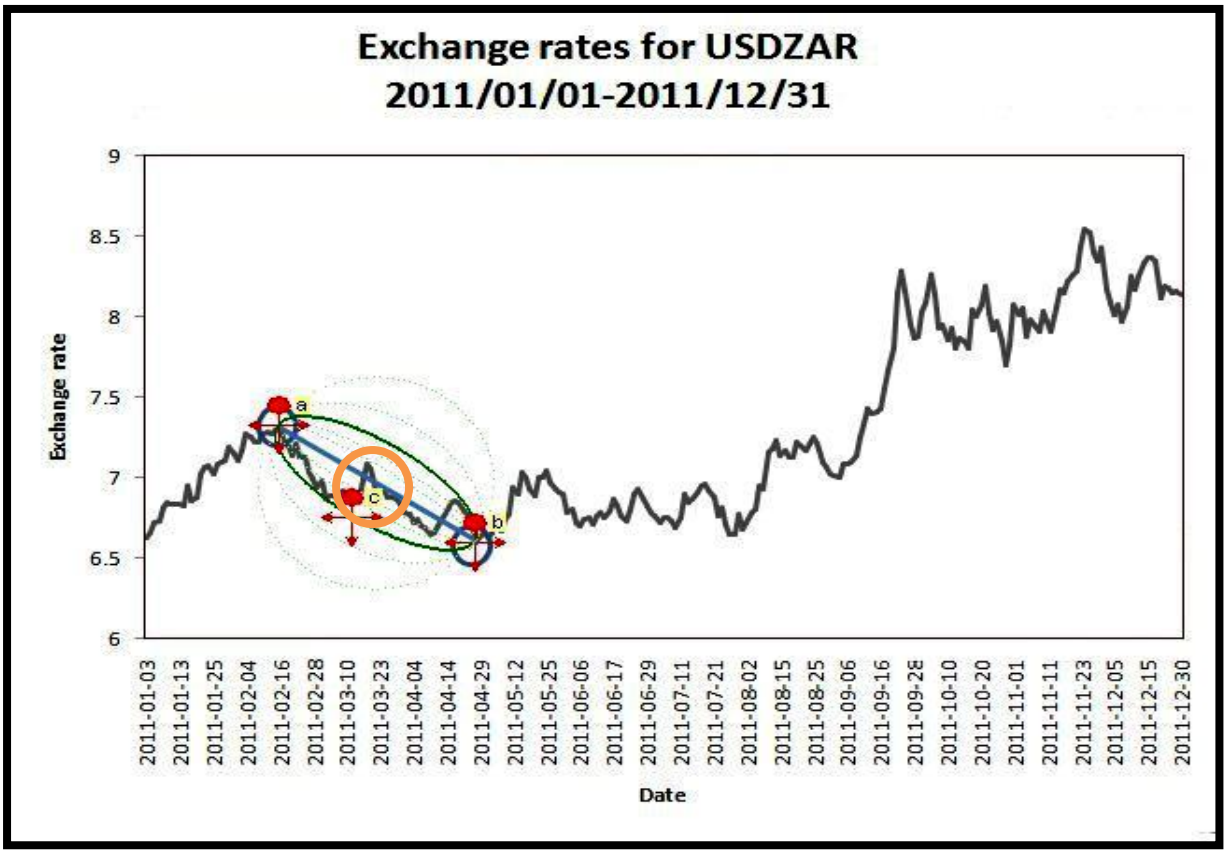


These arcs and fans of Figure B.29 and Figure B.30 indicate great movement such as the 138.2% and 161.8% arcs moving with the market on the following dates: 2010/10/02 (point c), 2010/11/05 (point d) and 2010/11/12 (point e). The important fans are again the 61.8% and the 76.4% level along with the 38.2% and the 50% level due to their intersections in the past with regards to the exchange rate.

According to the above performance of the technical analysis tools, the following outcomes have been determined. For the retracement levels and the Fibonacci spiral and time zones, the exchange rate has been determined at ZAR 7.43, which was the point where the 100% retracement level met the Fibonacci spiral, indicated by Figure B.27. For the arcs and fans the exchange rate was determined at ZAR 8.03 as shown by point f on Figure B.30.

Exxaro, Kumba and Metorex's graphs: the period 1st January 2011 to 31st of December 2011

FIGURE B.31: TREND AND ELLIPSE FOR THE YEAR-END 2011



This trend is symptomatic of a downtrend and is validates by the points a and b and the 2011/03/15 (point c) exchange rate and has also been tested on various dates such as 2011/03/13, 2011/03/18 to 2011/03/29 and 2011/04/08.

The exchange rate started to move more rapidly in the end of this period (see Figure B.32) and it caused another trading period to start. The trend was still drawn in a trending period and this made the Fibonacci tools more difficult to use and implement. This is seen in the inaccurate retracement levels all staying between the ZAR 6.50 and ZAR 7.50 prices.

FIGURE B.32: RETRACEMENT LEVELS, TIME ZONES AND FIBONACCI SPIRAL FOR THE YEAR-END 2011

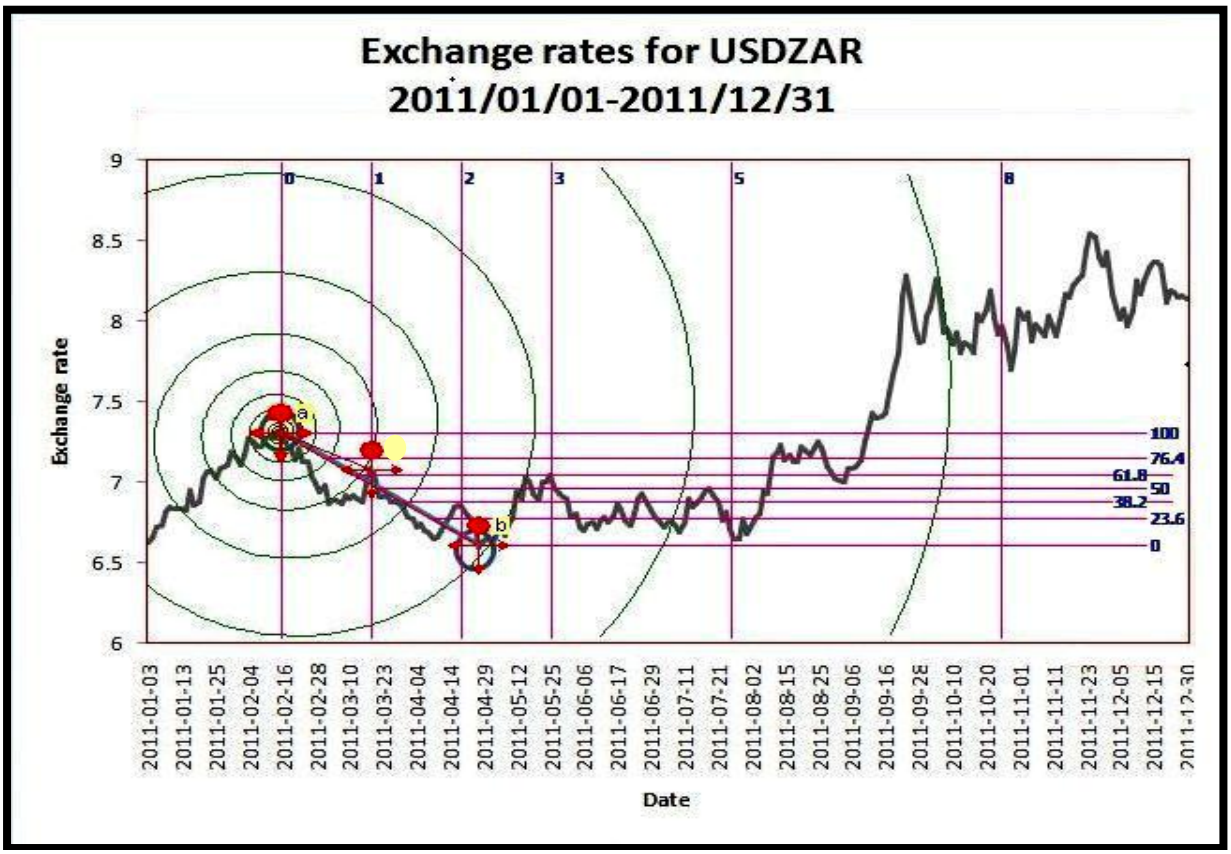
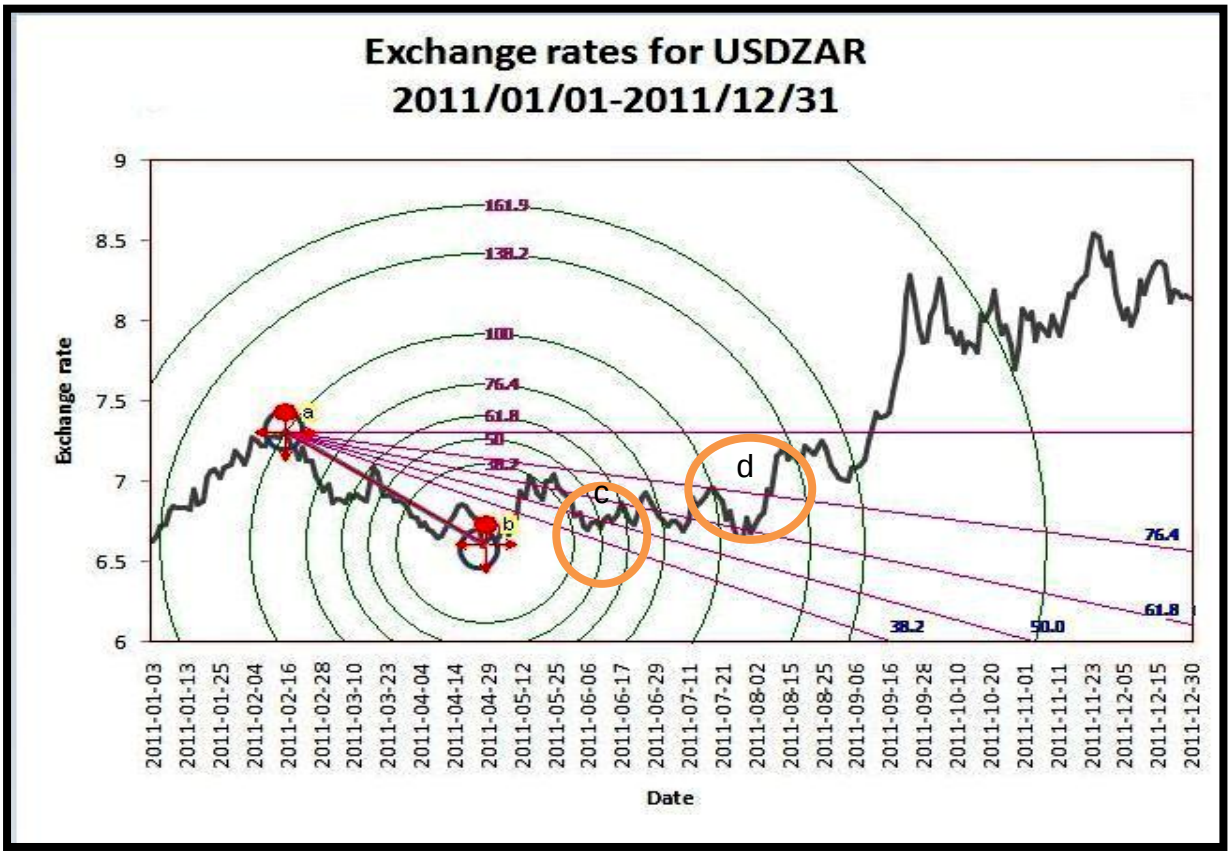


FIGURE B.33: ARCS AND FANS FOR THE YEAR-END 2011



The trend for this chart is a downtrend which causes all the fans to cast downward which makes the fans less accurate and correct in the movement of upward trends. The arcs are drawn with their centres emitting from point b. Where the arcs and fans join, the market makes its volatile moves. In this chart the movements will occur at the 76.4% level of the fans and the 50% level also of the fans because most of the movement in the trend line period occurred in those ranges as shown by point c and d.

Therefore after companies have made use of the technical tools as shown above, the exchange rate for the Fibonacci retracement level would have been set at ZAR 7.87 shown in Figure B.32. The exchange rate for the Fibonacci arcs and fans would be set at the 38.2% fan and the arc of 50% (point c) leading to an estimated exchange rate of ZAR 6.49. Combining the exchange rates for all the tools produces an exchange rate of ZAR 7.18 for the 2011 year-end.