

**COMPANY VALUE: WORKING CAPITAL
AND THE CASH CONVERSION CYCLE INVESTIGATED**

M.T.S. LE ROUX

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Supervisor: Prof. I. Nel

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ABSTRACT

The primary objective of any corporation should be shareholder wealth maximisation. A firm's working capital policies have an effect on the firm's expected future returns and the risk associated with the returns, which ultimately have an impact on shareholder wealth. Efficient working capital management is a fundamental portion of the overall corporate strategy to create shareholder value.

In this study the relationship of corporate profitability and working capital management was investigated. This relationship is examined using regression analysis. A sample of 118 firms listed on the Johannesburg Securities Exchange (JSE) for the period 2003 to 2007 was used. The purpose of this study is to establish whether a relationship exists between working capital management efficiency and profitability, considering the cash conversion cycle and operating profitability of the firm.

The results of the regression analysis indicated that a statistical significance exists for three of the five years (2003 – 2005) analysed between profitability, measured with the gross operating profit, and the cash conversion cycle. It is observed (2003-2005 regression results) that a lower gross operating profit is associated with an increase in number of days accounts payable. The negative relationship between accounts receivable and firms' profitability (for 2003-2005) suggests that less profitable firms will pursue a decrease of accounts receivables in the attempt to reduce cash gap in the respective cash conversion cycles. The negative relationship between the number of days inventory and corporate profitability (for 2003-2005) suggests that a sudden decrease in sales accompanied by mismanagement of inventory, will lead to tying up excess capital at the expense of profitable operations.

Managers or owners of firms can improve profits for firms by handling correctly the cash conversion cycle and keeping each individual component (accounts receivable, accounts payable and inventory) to an optimum level. These results (for 2003-2005) suggest that managers can create value for shareholders by reducing the cash conversion cycle and its individual components.

Key terms: Corporate profitability, working capital management, cash conversion cycle.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The primary objective of any corporation should be shareholder wealth maximisation. Shareholders are the owners of a corporation, and invest by purchasing shares to earn an acceptable return on investment without undue risk exposure (Brigham et al, 2005: 7). Management of a corporation is working on behalf of the shareholders and should therefore pursue policies which enhance shareholder value (Brigham et al, 2005: 7). A firm's working capital policies have an effect on the firm's expected future returns and the risk associated with the returns, which ultimately have an impact on shareholder wealth (Moyer et al, 2001: 564).

Not much research has been done on the relationship between working capital management and firm value. Shin and Soenen (1998) have investigated the relationship between the firm's cash conversion cycle and its profitability. There is an important trade-off to be made between the dual goals of working capital management, liquidity and profitability: focusing almost entirely on liquidity will tend to reduce the potential profitability of the firm.

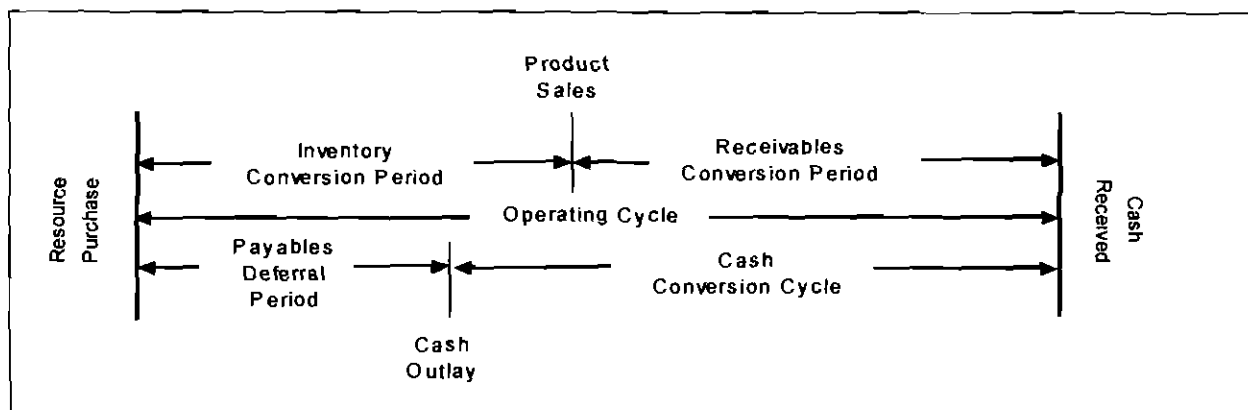
Working capital (or gross working capital) is defined as the firm's current assets. Net working capital is defined as current assets minus current liabilities. Financial managers in general have different degrees of authority over the various components of net working capital management. Decisions which affect cash, marketable securities, accounts payable, and short-term debt are strictly financial. Decisions which involve accounts receivables require consultation with the firm's marketing managers.

Financial decisions which involve inventory are subordinate to decisions made by the firm's production and marketing managers. Financial managers bear responsibilities for every component of net working capital management which include: accelerating cash inflows and slowing down cash outflows; ensuring that the firm holds minimal amounts of non-earning assets; and evaluating the effects of net working capital decisions on the

firm's cash budget and *pro forma* statements. In general the goal of working capital management is to maximise profitability by minimising the costs of the firm's current liabilities and maximising the returns from the firm's current assets.

Richards and Laughlin (1980: 32) stated: "Incorrect evaluation of the liquidity implications of a firm's working capital needs may, in turn, subject creditors and investors to an unanticipated risk of default". Gitman (1974: 80) introduced the total cash cycle concept as a crucial element in working capital management. The total cash cycle is defined as the number of days from the time the firm pays for its purchases of the most basic form of inventory to the time the firm collects money for the sale of its finished product (see figure 2.2, p.22). The cash conversion cycle (CCC) which was operationalised by Richards and Laughlin (1980: 34) as the net time interval between actual cash expenditures on a firm's purchase of productive resources and the ultimate recovery of cash receipts from product sales, establishes the period of time required to convert one dollar of cash disbursement back into a dollar of cash inflow from a firm's regular course of operations.

Figure 1.1: Cash Conversion Cycle.



Source: Adapted from Richards & Laughlin (1980: 35).

The CCC comprises the sum of the inventory conversion period and the receivables collection period, minus the payables deferral period. The inventory conversion period and the receivables collection period combined are defined as the operating cycle. "The operating cycle concept is deficient as a cash flow measurement in that it fails to consider the liquidity requirements imposed on a firm by the time dimension of its current liability commitments" (Richards & Laughlin, 1980: 34).

Brigham, *et al.* (2005: 744-745) defined the three components of the cash conversion cycle in Table 1.1.

Table 1.1: The description of the terms of the cash conversion cycle.

Number	Description	Formula
1	Inventory conversion period	Inventory/Sales per day
2	Receivables collection period (days sales outstanding - DSO)	Receivables/Sales per day
3	Payables deferral period	Payables/Purchases per day
4	Cash conversion cycle	(1) + (2) – (3)

Source: Adapted from Brigham, *et al.* (2005: 744).

The inventory conversion period is the average time required to convert materials into finished goods and then sell those goods. The inventory conversion period is calculated by dividing the inventory by the sales per day. The receivables collection period is the average length of time required to convert the firm's receivables into cash - to collect cash following a sale. The receivables collection period is also called the *days sales outstanding* (DSO), and is calculated by dividing the accounts receivable by the average credit sales per day. The payables deferral period is the average length of time between the purchase of materials and labour and the payment of cash. The payables deferral period is calculated by dividing the average accounts payable by the cost of goods sold per day.

Richards and Laughlin (1980: 36) stated: "The resulting cash conversion cycle analysis provides more explicit insights for managing a firm's working capital position in a manner that will assure the proper amount and timing of funds available to meet a firm's liquidity needs". Gentry, *et al.* (1990: 90) developed a modified version of the CCC called the Weighted Cash Conversion Cycle (WCCC), which scales the timing by the amount of funds in each step of the cycle (CCC). The weights are calculated by dividing the amount of cash tied up in each component of the cycle by the final value of the component. The WCCC includes both the number of days and the amount of funds that is tied up at each stage of the cash cycle.

Shin and Soenen (1998: 38) studied the efficiency of working capital management and corporate profitability and defined the concept of the Net Trade Cycle (NTC), which is essentially equivalent to the CCC whereby all three components, inventory; accounts receivable & accounts payable, are expressed as a percentage of net sales. The NTC is calculated using the following formula:

$$NTC = \frac{(365) \times [(Inventory) + (Accounts Receivable) - (Accounts Payable)]}{[Net Sales]}$$

It is argued that the NTC indicates the number of 'days sales' the company needs to finance its working capital under ceteris paribus conditions. The NTC can be used to estimate additional financing needs with respect to working capital expressed as a function of the projected sales. The shorter the NTC, the higher the present value of the net cash flow generated by the assets and thus the higher the value of the firm for its shareholders (Shin & Soenen, 1998: 38). It is argued that the shorter the NTC the more efficient the firm is in managing its working capital.

Consequently, the lower the need for external financing will be, the higher the financial performance of the organisation (Shin & Soenen, 1998: 38). The profitability measures utilised by Shin and Soenen (1998: 38) in their study are defined as operating income plus depreciation related to both total assets and to net sales.

Smith (1980: 549) first signalled the importance of the trade-offs between the dual goals of working capital management, which are liquidity and profitability. It is argued that decisions which tend to maximise profitability tend not to maximise the chances of adequate liquidity. Therefore a balance between the focus of liquidity and profitability of the firm should be managed. Johnson and Soenen (2003: 364) concluded that large (in terms of its total assets), profitable firms with efficient working capital management (which is a relatively short CCC) are more successful companies.

In a study by Shin and Soenen (1998: 43) correlation and regression analysis were used and strong evidence of an inverse relationship between the investment in working capital and the firm's profitability were found. For firms with a relatively short CCC, research results showed a significantly positive relationship between operating working capital and profitability. According to Shin and Soenen (1998: 43) this indicates that a

firm with a relatively short CCC can increase its profitability by liberalising its credit policy or increasing its inventory levels, while firms with relatively large cash conversion cycles should focus on reducing the investment in working capital. The traditional view of the relationship between the CCC and corporate profitability is that, *ceteris paribus*, a longer CCC may damage the profitability of the firm.

1.2 PROBLEM STATEMENT

Under the traditional view it is argued that a relationship exists between the CCC and corporate profitability that, *ceteris paribus*, a longer CCC will result in lower profitability of the firm. The problem therefore is to determine how the efficiency of working capital management, by means of the cash conversion cycle, relates to the firm's profitability.

1.3 OBJECTIVE

1.3.1 Main objective

The objective of this study is to establish whether a relationship exists between working capital management efficiency and profitability, considering the cash conversion cycle and operating profitability of the firm.

1.3.2 Sub-objectives

The study will entail the following sub-objectives during fulfilment of the main objective:

- To research efficiency of working capital management in the theoretical context.
- To investigate the relationship between the length of the CCC or NTC and operating profitability.

1.4 RESEARCH DESIGN AND METHODOLOGY

The research consists of a literature and an empirical study. The literature study contains sources that are very old, due to the fact that the original sources were utilised in this study to capture the essence of the theory of these financial management subjects. The empirical research will, among others, consist of statistical analysis

including descriptive statistics and multiple regressions. The aim is to determine a correlation between the efficiency of working capital management (the relative length of the CCC and NTC) and the profitability of the firm.

A statistical data analysis will be done for a sample of at least 118 firms listed on the Johannesburg Securities Exchange for the period 2003 to 2007 to determine the relationship and correlation between the independent (exogenous) research variables, ***cash conversion cycle (and its components), net trade cycle, financial debt ratio, fixed financial asset ratio, current ratio*** and ***natural logarithm of sales*** and the dependant (endogenous) variable ***gross operating profit***.

1.5 LIMITATIONS

A limitation in the analysis of the correlation between the dependant and independent variables for this study is that not all listed firms on the Johannesburg Securities Exchange have been included in the research sample. Certain industries' firms have been omitted due to their particular type of activity. The classification of the North American Industry Classification System (NAICS) has been followed and industries of the banking and financial institutions, insurance, rental and other services, and electricity and water have been omitted. Certain other firms have also been omitted due to insufficient information for the researched period.

1.6 EXPOSITION OF CHAPTERS

Chapter Two: Working capital management efficiency theory

The chapter starts with an introductory discussion about the content and subjects under discussion. Next the theory of working capital management is discussed in detail. Then will follow an elaborate literature review of the concepts that has been utilised in the empirical study. These concepts are working capital requirement, liquidity measures and corporate profitability.

Chapter Three: Empirical research

The chapter will empirically investigate and apply the theory described in chapter two in a South African context and will thereby address the secondary objectives of this study. The chapter begin with an introduction, then follows a methodology utilised and concludes with the respective results and discussion thereof.

Chapter Four: Conclusions and recommendations

The study comes to a close with a list of general conclusions and a list of recommendations for further research on this topic.

CHAPTER 2

WORKING CAPITAL MANAGEMENT EFFICIENCY THEORY

2.1 INTRODUCTION

"Show me how a company deals with working capital and I can tell if management really knows what it is doing" (Rutger Ford, REL Consultancy Group, from Poirters, 2004: 6).

The purpose of this Chapter is to review related literature theories concerning working capital management, liquidity measures, profitability, and how these parameters influence a firm's value. These theories will provide essential knowledge to understand the underlying measures which determine efficient working capital management (WCM) and why it matters to the firm. Previous research conducted in this area is also discussed and its relevance to this study is highlighted.

The theory of working capital management is discussed as background to this study. In the theory of working capital development, three propositions are discussed. Corporate liquidity measures are discussed, starting with the most traditional ratios used, up to new developments in this area. Profitability measures of the firm are defined for use in this study's empirical research analysis to establish a relationship between firm value and working capital management.

2.2 THEORY OF WORKING CAPITAL MANAGEMENT

The theory of working capital management and the planning thereof for a firm has been discussed by numerous authors (Glautier, 1971; Knight, 1972; Crum, et al., 1983), all of whom had separate, unique theories.

Walker (1964: 21) started his work on the theory of working capital by stating: "Because of this dearth of pertinent literature, it might be concluded that students of finance generally agree that a theory of working capital is not possible, or, perhaps, that such a theory, if developed, could not be practically applied, and therefore would be useless". Walker (1964: 22) continues to emphasise that it is possible to develop a

theory of working capital (WC), but previous experiences which are collected by empirical investigation should not be used as the basis for such a theory. Walker (1964: 22) developed three propositions that serve as the foundation of a theory of working capital which can be used in the formulation of sound policies and procedures. It was stated that the success measured by the amount or rate of profit to owners (shareholders) is almost unanimously the primary objective of business firms. The policies which affect the amount of profit are predicated on theories regarding sales volume and/or costs, whereas the policies which affect the rate of profit are influenced primarily by the amount of risk that management assumes.

In the development of the three propositions no empirical testing was done, but certain concepts were illustrated by means of financial data to formulate the point of view in this theory of working capital by Walker (1964: 26).

2.2.1 WC Theory Proposition number one

Walker (1964: 23) stated that total capital in a business enterprise consists of fixed capital and working capital, and the firm's profitability is influenced by the ratio of working capital to fixed capital. The first proposition is directly concerned with this concept, and it may be stated as follows: *"If the amount of working capital is varied relative to fixed capital, the amount of risk that a firm assumes is also varied and the opportunity for gain or loss is increased."* In this principle it is implied that a definite relationship exists between the level of risk that management assumes and the rate of return. Furthermore this principle assumes that this relationship can be changed by adjusting the level of working capital.

The level of risk that management assumes under this proposition includes:

- The risk of not maintaining adequate liquidity;
- The risk of having too much or too little inventory to maintain production and sales; and
- The risk of not granting adequate credit to support a proper level of sales.

Walker (1964: 24) explained that, in supporting the concept that the ratio of working capital to fixed capital affects the level of risk as well as profitability, factors that influence the level of fixed and working capital had to be explored. In this exploration, it

is argued that a firm's volume of fixed capital is determined by its scale of production, which has been defined as the aggregate of fixed assets with which the enterprise operates and that is not subject to alteration in the short term. Working capital on the other hand is employed only when actual production is undertaken; therefore, if the output increases, the need for working capital also increases and vice versa (Walker, 1964: 24).

The volume of production generally determines the amount of working capital that a firm needs. According to Walker (1964: 24) the precise amount is dependant upon:

- those factors which influence the amount of cash, inventories, receivables, and other current assets required to support a given volume of output; and
- management's philosophy concerning risk.

Walker (1964: 24) argued that, rather than evaluating the factors which influence the amount of each component of working capital, many businessmen rely on empirical studies (or rule-of-thumb) to determine working capital requirements. Examples are: cash should be equal to five percent of sales; inventory should equal sales for two months, and so forth. Whenever these techniques are used, it would be pure coincidence if the firm's (i) ratio of working capital to fixed capital, (ii) risk, and (iii) profitability corresponds with the firm's level of output.

Walker (1964: 24) stated that the factors which influence the amount of working capital required are difficult to evaluate in a dynamic economy, but informed management has been reasonably successful in making these evaluations. The factors that management has to evaluate in order to determine the level of its normal cash requirements illustrates the complexity of management's work of determining the correct level of working capital that should be maintained for each level of output. According to Walker (1964: 25) these factors that management has to evaluated are:

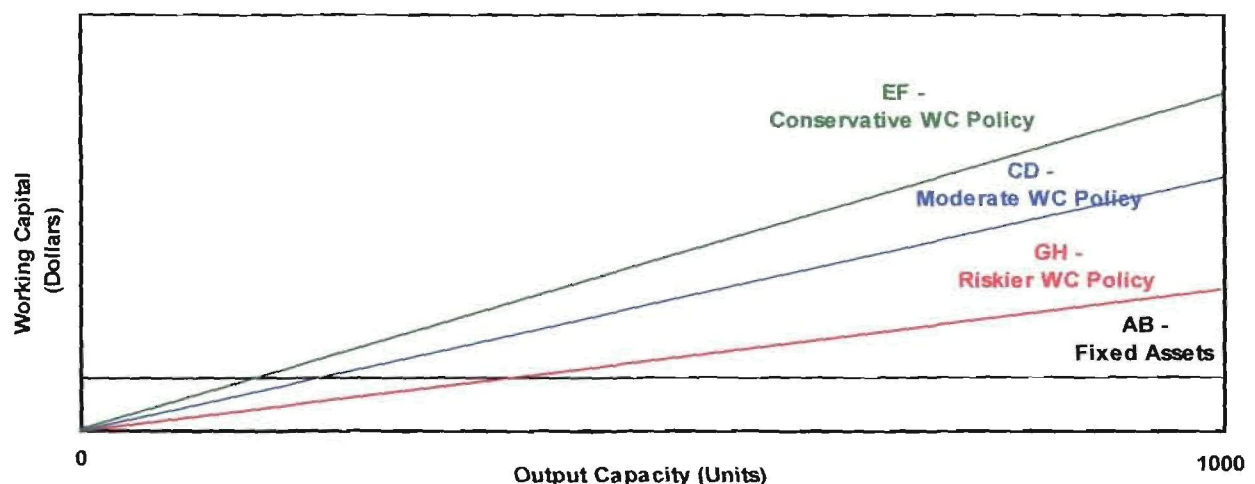
- the nature of the business enterprise;
- the size of sales in relation to fixed assets;
- the credit position of the firm;
- the status of the firm's receivables; and
- the status of the inventory account.

Walker (1964: 25) realised that a problem exists because of management's inability to evaluate working capital determinants, but a much more serious problem for

management is that of determining with objectivity the amount of risk that should be assumed at each level of output. As an illustration Walker (1964: 26) showed various levels of working capital utilised by a hypothetical firm with an output capacity of 1000 units (see figure 2.1). In figure 2.1 the firm's investment in fixed assets remains constant as long as the output does not exceed 100 percent of capacity, as represented by the horizontal line AB.

Lines EF, GH and CD (figure 2.1) represent various levels of conservatism on the part of management. The level of working capital depicted by line EF represents a conservative policy concerning risk, while line GH represents just the opposite. The level of working capital depicted by line CD represents a management policy whose objective is to equate risk with the rate of return, or, stated differently, it represents a level of working capital which allows the largest rate of return, but at the same time the risk assumed will not exceed the firm's capacity to assume risk. Walker (1964: 26) stated that *ceteris paribus*, the rate of return resulting from the policy which is represented by line EF, will be lower than that received when the policy represented by line GH is followed, but it should be emphasised that the firm is subjecting itself to more risk in the latter case.

Figure 2.1: Hypothetical firm's levels of working capital.



Source: Adapted from Walker (1964: 26).

These different levels of working capital versus output capacity (sales) by Walker (1964: 26) conceptualised the working capital investment policies for the firm. This concept is being used widely today to determine the working capital policy of the firm. Brigham, et

al. (1999: 594) define working capital policy as the firm's policies regarding target levels for each category of current assets and how current assets will be financed. Working capital management involves both setting working capital policy and carrying out that policy in day-to-day operations. Brigham, *et al.* (1999: 594) utilise a similar representation of working capital policies as in Figure 2.1. The conservative WC policy (line EF) in figure 2.1 represents a relaxed current asset investment (or "fat cat") policy, where relatively large amounts of cash, marketable securities and inventories are carried, and where sales are stimulated by the use of a credit policy that provides liberal financing to customers with a corresponding high level of receivables. The riskier WC policy (line GH) in figure 2.1 represents a restricted current asset investment (or "lean-and-mean") policy, where the holdings of cash, securities, inventories and receivables are minimised.

Correia, *et al.* (2000: 419-423) build on the concept of working capital policies in a similar manner to Walker (1964: 26). According to Correia, *et al.* (2000: 419) working capital policies are based on two basic decisions: (1) the appropriate level of investment in current assets and (2) how it should be financed. Arguments are also offered that the greater the level of working capital for a given level of output (sales), the less risky the firm's working capital policy. It is stated that this reduction of risk with higher level of working capital has an opportunity cost. The three levels of working capital policy (conservative, moderate and aggressive) all have an interaction of return against risk. The conservative working capital policy has the lowest return and risk and the aggressive working capital policy has the highest return and risk. It is argued common practice that working capital policies (conservative, moderate and aggressive policies) based on financing decisions are where long-term and short-term finance are being utilised to finance permanent and seasonal current assets. Furthermore the acceptability of the risk involved is dependable on the level of operating risk, the volatility of sales and the cost associated with short-term finance.

Walker (1964: 26) continues with an example of a hypothetical firm's financial data, where the level of working capital varies only with the firm's rate of return *ceteris paribus*, and concluded that the firm's rate of return varies inversely with the level of working capital that it maintains. Walker concluded his proposition one of the theory of working capital with real industry data, where the changes in the rate of return are shown against various levels of working capital. The first point that the data highlight is

that financial management in certain industries (for example the Chemical industry) has much more to gain or lose by following aggressive working capital policies than do financial managers in other industries (for example the Steel industry).

A second point that the data highlighted is that a decrease in working capital results in larger "gain" than the "loss" that results from a like increase in working capital. This is important to the financial manager since it shows that the opportunity for gain is present if the risk is taken (Walker, 1964: 28). Finally Walker (1964: 28) concludes with his proposition one by stating that, if conditions warrant a highly conservative working capital policy, the financial manager should know that for each additional increase in working capital, the resultant loss will be smaller than the loss resulting from the previous increase.

2.2.2 WC Theory Proposition number two

In Walker's proposition one the risk associated with the amount of working capital that a firm employs was dealt with, whereas proposition two is concerned with the risk that is directly related to the type of capital the firm uses when financing its working capital requirements. Walker's (1964: 28) proposition two states as follows: *"The type of capital used to finance working capital directly affects the amount of risk that a firm assumes as well as the opportunity for gain or loss."*

In this second proposition it is stated that, if a firm wants to reduce its risk to the minimum, it would employ only equity capital. However, in doing so the firm reduces its opportunity for higher gains or losses on equity capital since it would not be taking advantage of the leverage that results from trading on its equity.

If a firm should wish to take advantage of leverage, it would increase the amount of debt capital employed in the financing of current assets and in so doing, the firm must be prepared to accept more risk (Walker, 1964: 28).

Walker (1964: 30) stated that the problem is not whether to use debt capital, but how much debt capital to use, and answer this by the amount of risk that management can assume at any given time. According to Walker there is evidence that businessmen use certain rules-of-thumb to determine the amount of debt and equity capital employed in the financing process. For example, the most commonly applied is the debt-equity ratio. Walker (1964: 30) criticised the debt-equity ratio by stating that:

- The method by which the firm determines the debt-to-equity ratio (a influenced ratio for the specific type of business the firm conducts business in or the specific industry of the firm may be utilised).
- There would be no problem if the debt-to-equity ratio specifically reflected the amount of risk the firm could assume (which the debt-to-equity ratio does not take into account).
- The debt-to-equity ratio that is used is an average ratio and is not applicable to a particular firm (empirical studies which produced the debt-to-equity ratio include many firms which may not possess the same characteristics as the firm which intends to use the ratio).
- The data supporting the ratio are obtained over several years (financial data for these years change since the variables which influence these data are constantly changing, yet the ratio is an average, a composite of all years under the study).
- Risk is associated with the future, there is no assurance that the variables that influenced the average ratio will prevail in the future (the wrong criteria are used to predict the amount and degree of risk that the firm will encounter).
- An average ratio is not applicable to a specific firm within an industry since it is impossible to classify a firm accurately (industries are not easily divided into homogeneous categories).
- Management does not include short-term debt in its method of debt-to-equity ratio calculations, yet risk is inherent in all forms of debt.

Walker (1964: 32) concludes his second proposition with: "for the most part management resorts to rules-of-thumb which are based on empirical data when ascertaining the amount and type of capital to be used to finance working capital rather

than first analyzing the amount and kind of risk that the firm can assume and then selecting the type of capital that will best satisfy the situation".

2.2.3 WC Theory Proposition number three

The third proposition by Walker starts with the argument that the degree of risk inherent in each debt contract is influenced by the nature of the debt contract, where there are many characteristics of debt contracts which affect a firm's solvency. It is argued that the maturity of the debt contract is one of the most important which should be considered when developing a theory of working capital. This forms the basis for the third proposition of Walker (1964: 32) which stated: *"The greater the disparity between the maturities of a firm's debt instruments and its flow of internally generated funds, the greater the risk, and vice versa."*

Walker (1964: 33) stated that the degree of risk that a firm can assume is influenced by its ability to pay its obligations as it becomes due; in order to determine how much risk a firm can take, it would be necessary to ascertain the firm's ability to liquidate its obligations. It is argued that a firm's short-term debt paying ability is dependant largely upon the receipt of internally generated funds. These funds are the turnover of working capital rather than earnings reported on the income statement. Most business firms employ some form of debt to finance at least a part of working capital requirements. Walker (1964: 33) states that, unless the maturities of these debt contracts tend to coincide with the flow of internally generated funds, the firm may experience a disruption of its financing process.

Working capital transforms as it moves from one process to the next, cash changes to inventories to receivables and finally back to cash. If the starting "cash" was obtained from equity sources, the firm would not be required to payback these funds at a particular time, thus the capital does not carry cashflow risk (Walker, 1964: 34). However, if debt capital is used to finance a part of working capital, the firm would have to follow a definite repayment schedule for this debt capital. This repayment schedule is what management must be concerned with. The longer the maturity the less risk the firm would assume, but the shorter the maturity the greater the risk for the firm (Walker, 1964: 34). In the case of the shorter maturity (higher risk), the firm will have less time to

accumulate sufficient funds to liquidate the debt, or if the debt has to be refinanced, the firm will have less time to refund the loan.

In conclusion Walker (1964: 34) stated, "due to the many variables that influence the size, smoothness and speed of a firm's cash flow, financial officers should not tie debt maturities precisely to cash flow. In a dynamic economy such as the one in which most countries operate, it is difficult to predict cash flows; therefore, adequate time should be allowed between the time the funds are generated and the time the debt comes due." The three working capital theories by Walker (1964: 34) set the basis for working capital management theory. Walker (1964: 34) conceptualised the utilisation of working capital by firms and also related the utilisation of working capital to the risk the firm will be exposed to.

Smith (1973: 51) argued that current liabilities should be used instead of long-term debt whenever its usage would lower the average cost of capital to the firm. It is furthermore stated that the propositions by Walker (1964: 22), are correct in principle, but that such aggregate guidelines and propositions will probably offer little practical help for the firm. Gentry (1988: 43) noted that a shortcoming of Walker's (1964) working capital theory is that cash inflows and outflows into a single period Capital Asset Pricing Model (CAPM) valuation framework were not recognised. Gentry (1988: 43) further suggested that the incorporation of operating cash flows into a modified Capital Asset Pricing Model (CAPM) would highlight the risk and return trade-off as it relates to cash, in Walker's (1964) theory, more effectively. Gitman and Sachdeva (1982: 36) stated that Walker's (1964) working capital theory has been primarily concerned with the risk-return trade-offs in the process of establishing a working capital policy. Gitman and Sachdeva (1982: 36) indicated that Walker's working capital theory propositions have not given attention to the linkage between the production-sale process by adding value and the working capital cycle that determines the delay between the time costs are paid and the time when sales proceeds are received by the firm.

2.3 WORKING CAPITAL REQUIREMENT

In a study done by Hawawini, *et al.* (1986) the concept of working capital requirement (WCR) was formulated. WCR provides a convenient accounting measure of the amount of capital a firm has tied up in its operating cycle. This WCR might prove an improved

measure of a firm's investment in its operating cycle compared to the traditional concept of net working capital (NWC). Hawawini, *et al.* (1986: 22) concluded that there is indeed a significant and persistent industry effect on a firm's investment in working capital. Firms seem to adhere to definite industry benchmarks when setting working capital investment policies.

2.3.1 Investment in Working Capital

The traditional measure of net working capital (NWC) has been defined as the difference of current assets and current liabilities. Current assets consist of cash and short-term marketable securities (C), accounts receivable (AR) and inventories (INV), whereas current liabilities consist of short-term borrowings (STB), accounts payable (AP) and short-term net accruals (NA). Therefore the NWC is calculated as follows:

$$NWC = [C + AR + INV] - [STB + AP + NA] \quad (\text{Eq. 2.1})$$

According to Hawawini, *et al.* (1986: 15) equation 2.1 can be rearranged so that all items related to the firm's investment in current operations (operating cycle) are grouped together as follows:

$$NWC = [(AR + INV) - (AP + NA)] + [C - STB] \quad (\text{Eq. 2.2})$$

The four items in the first set of brackets are directly related to the firm's operating cycle, whereas the two items in the second set of brackets are essentially the outcome of purely financial decisions. Hawawini, *et al.* (1986: 15) defined the difference between the sum of accounts receivable and inventories (AR+ INV) and the sum of accounts payable and net accruals (AP + NA) as the firm's Working Capital Requirement (WCR), while the difference between cash and marketable securities (C) and short-term borrowings (STB) - the two items related to the firm's financial decisions – are referred to as the Net Liquid Balance (NLB). According to Hawawini, *et al.* (1986: 16) the WCR provides a convenient accounting measure of the amount of capital that a firm has tied up in its operating cycle. From equation 2.2 the relationship between the WCR and the NLB is:

$$NWC = WCR + NLB \quad (\text{Eq. 2.3})$$

or

$$WCR = NWC - NLB \quad (\text{Eq. 2.4})$$

In equation 2.4 Hawawini, *et al.* (1986: 16) defined the WCR as the difference between the traditional NWC and NLB. In 2004, Poirters investigated the relationship between the investment in working capital and shareholder value. Poirters (2004: 7) stated that working capital should be viewed as much as an operational issue as a financial one. It is claimed that operational effects of working capital investment (WCR) are as important as financial effects. The conclusion is that opportunities for operational units to contribute to more efficient working capital might be unrealised if WC is seen as only under the financial department's control. In addition to the latter argument Lazaridis and Tryfonidis (2006: 26) argue that efficient working capital management has a significant impact on the profitability of firms. The argument is based on the result of research which indicates that there is a certain level of working capital requirement (WCR) which potentially maximises a firm's returns (Lazaridis and Tryfonidis, 2006: 26).

2.3.2 Determination of Working Capital Requirement (WCR)

Hawawini, *et al.* (1986: 16) suggested that three basic variables determine the amount of WCR that a business needs: (1) the firm's technology, (2) the degree of efficiency with which the firm manages its operating cycle, and (3) the firm's level of sales. The first variable, the firm's technology, Hawawini, *et al.* (1986: 16) suggested refers to the nature of the product the firm sells and the process the firm employs to manufacture and deliver its output. It is argued that the nature of each firm's operating cycle determines the amount of WCR the firm needs to sustain its level of sales. It is further suggested that the WCR of certain firms may even be negative, in which instance the firm's operating cycle becomes a permanent source of financing rather than a use of funds.

The second variable that Hawawini, *et al.* (1986: 16) employs to determine the WCR of the firm is managerial efficiency. Different levels of WCR are still possible for firms with similar technologies and equal level of sales. An increase in the efficiency with which a firm manages its operating cycle can, to some extent, reduce that firm's investment in working capital. This, according to Hawawini, *et al.* (1986:16), is mainly due to tighter control over inventories and receivables

The third variable that Hawawini, *et al.* (1986: 16) suggests to determine the WCR of the firm is the level of sales, which is the major determinant of a firm's WCR. In industry sectors where WCR is positive, increased sales require additional investment in working capital, assuming that technology and managerial efficiency remain the same.

Hawawini, *et al.* (1986: 16) argued that the degree of managerial efficiency and technology is the same for all the firms making up an industry, and calculated the WCR to Sales ratio for the sampled firms. This WCR to sales ratios were used to calculate industry benchmarks, where all firms in a certain industry were compared. Hawawini, *et al.* (1986: 17) conducted two statistical analyses: (1) on means of working capital requirements-to-sales ratios and (2) pairwise analysis of industries' means of working capital requirements-to-sales ratios. The study showed that there is a significant industry effect on firms' investment in working capital. It also showed that there are specific industry benchmarks (for the working capital requirements-to-sales ratio) within industries to which other firms in a particular industry adhere (industry benchmark firms are imitated by other firms in an industry). The empirical results of the study indicated that a significant industry effect exists regarding a firms' investment in working capital and that this effect persisted over all the years covered by the study. The latter is consistent with the notion that industry benchmarks exist within industry groups to which firms adhere, when setting working capital investment policies.

Correia, *et al.* (2000: 423) confirmed the approach used by Hawawini, *et al.* (1986: 17) to forecast working capital requirements when the percentage-of-sales method is used. This percentage-of-sales method expresses the various current assets as a percentage of sales to identify the future working capital requirements. This model (Correia, *et al.*, 2000: 423) is based on the assumption that there is a direct relationship between the level of sales and certain current assets, current liabilities or working capital.

These assets and liabilities are described by the term spontaneous, due to their interrelationship with the level of sales.

The working capital requirement of a firm forms an integral part of a firm's financing requirements. A firm's financing requirements can be separated into a permanent and a seasonal (temporary) need (Gitman, 1997: 691). The permanent need (of a firm's

financing requirements) consists of fixed assets plus the permanent portion of the firm's current assets (for example marketable securities) which remains unchanged over the financial year. The seasonal (temporary) need is attributable to the existence of certain temporary current assets (for example inventory changes due to seasonal sales and purchases of products), which varies over the financial year.

Correia, *et al.* (2000: 421) stated that most firms experience seasonal or cyclical fluctuations, where retail firms generate high sales towards the end of a calendar year and manufacturing firms (which supply the retail firms) follow a similar pattern of peaking in sales early in a calendar year. It is argued that management has to aim to match the maturity of the finance with the life of the asset being financed, which will minimise the risk that a firm would be unable to meet its maturing obligations. Uncertainty will always be present in forecasting a firm's movement in working capital components. Therefore a firm must make an attempt to match working capital investment and financing maturities based on expected movements.

Kolb (1983: 155) stated that working capital policy arose from the fluctuations of temporary (seasonal), as well as permanent, working capital requirements. Working capital policy is where management discretion has to be exercised as to the amount of net working capital that the firm will maintain relative to its gross working capital requirements (permanent and temporary). Pinches (1994: 643) stated that the size of both the permanent and temporary (seasonal) current assets is determined by how aggressive a firm is toward the level of current assets it maintains (working capital policy). Furthermore it is argued that *ceteris paribus*, an aggressive working capital policy leads to lower current assets, a shorter cash conversion cycle, lower expenses, higher risk and higher required returns to compensate for the increased risk, whereas a conservative working capital policy has the opposite effects.

Pinches (1994: 644) introduced a moderate working capital policy by means of the matching principle, where a firm establishes a target for its net working capital position that takes into account risks, the returns required and the appropriate current asset and current liability positions.

Hampton (1983: 220) stated that a firm's working capital consists of two components, permanent working capital and variable working capital, where a cyclical business

activity will give rise to the variable working capital section. It is argued that a firm's working capital policy should be designed around three goals:

- (1) adequate liquidity,
- (2) minimisation of risk (to being unable to settle bills and other obligations) and
- (3) to contribute to maximising the value of the firm.

Hampton (1983: 222) identified four factors by which a firm's requirements for working capital are determined:

- (1) the sales volume,
- (2) seasonal and cyclical factors,
- (3) changes in technology and
- (4) the policies of the firm (credit policies, production policies and safety level of cash on hand).

It is concluded that with the determination of the working capital requirement of a firm that five factors have to be included in the analysis:

- (1) the size of the firm,
- (2) the activities of the firm,
- (3) the availability of credit,
- (4) the attitude toward risk and
- (5) the attitude toward profitability.

Moyer, *et al.* (1992: 664) expanded on the two categories of current assets, permanent current assets and fluctuating (seasonal) current assets and also on the working capital policy with profitability versus risk trade-off. According to Moyer, *et al.* (1992: 670) working capital decisions affect both the expected profitability and the risk of a firm, where risk refers to the probability that the firm will encounter financial difficulties such as the inability to meet current financial obligations. It is further argued that, when the level of working capital is increased, both the expected profitability and the risk are lowered and vice versa. Moyer, *et al.* (1992: 664) concluded that no single working capital policy is optimal for all firms. The working capital policy that maximises shareholder wealth should consider additional factors including the inherent variability in sales and cash flows and the degree of operating and financial leverage employed.

Chiou, *et al.* (2006: 151) used the WCR as one of the dependant variables in a study of determinants of working capital management. The empirical results show that debt ratio

and operating cashflow, evaluated by WCR, exerted influence on the working capital management of the firm.

2.4 LIQUIDITY MEASURES

The most conventional measures of corporate liquidity are the current ratio and the quick ratio. The current ratio is calculated by the current assets divided by current liabilities, and the quick (or acid test) ratio is calculated by deducting inventories from current assets and then dividing the remainder by current liabilities (Brigham & Ehrhardt, 2005: 444). Due to the static nature of the mentioned variables, the adequacy in examining a firm's efficiency in managing its working capital has been questioned (Kamath, 1989: 24). This section on liquidity will introduce other options for evaluating the liquidity of the firm.

Shin & Soenen (1998: 38) argued that liquidity for the dynamic firm is not really dependant on the liquidation value of its assets but rather on the operating cash flow generated by those assets. The liquidity measures in this section will build on the Shin & Soenen argument linked with the profitability of the firm, with the aim to test the relationship between WCM efficiency and profitability.

2.4.1 The total cash cycle

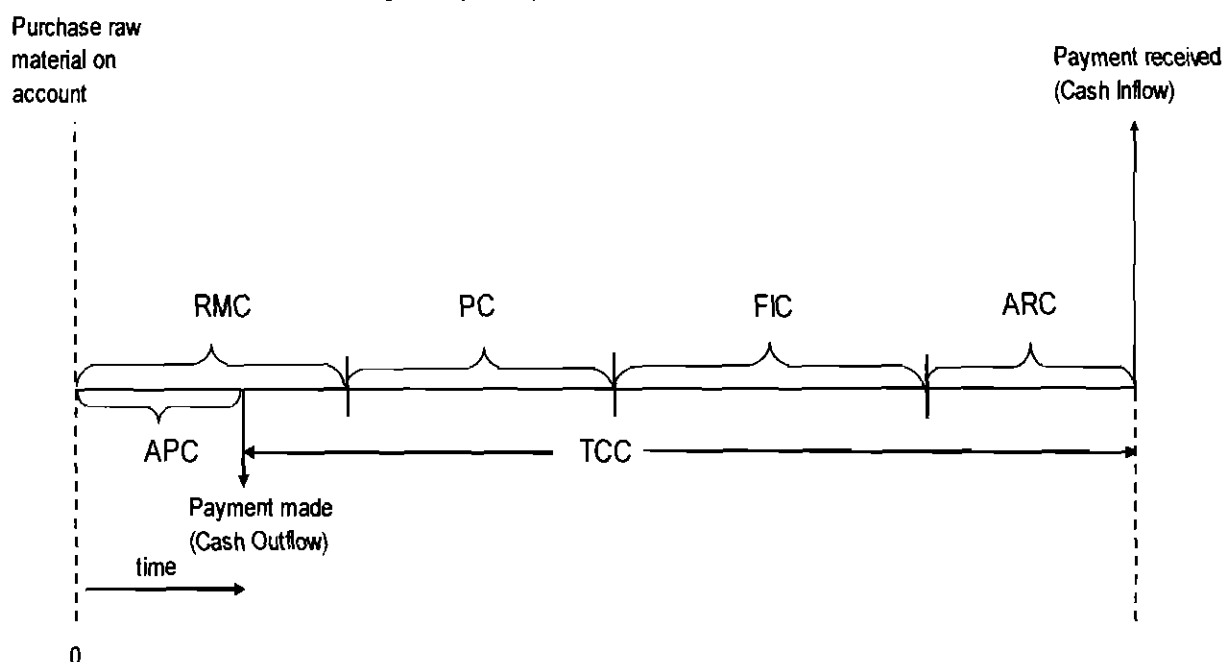
Gitman (1974: 82) introduced the cash cycle concept as a crucial element in working capital management. It is stated that the estimation of corporate liquidity requirements, which refers to cash and marketable securities, is an important aspect of short-term financial planning. Gitman (1974: 79-83) developed simplified techniques for determining the minimum level of liquidity necessary for a given firm. In the development of the total cash cycle model Gitman (1974: 79) made the following assumptions:

- Seasonality – the model is aimed at estimating a firm's peak liquidity requirements (which are cash and marketable securities), cash flows associated with the firm's busiest period should be used to estimate this peak requirement.
- Credit basis – all sales and purchases are assumed to be on credit basis.

- Cash discounts – the cash discounts extended or received by the firm are not expected to change from the previous period.
- Operating estimates – the expected values of certain variables have been estimated based upon the previous period's operations adjusted for any expected changes in operations.

The total cash cycle is defined as the amount of time (days) that elapses between the first outflow associated with production and the ultimate inflow of cash generated when the item is sold and cash is received (Gitman, 1974: 82). The total cash cycle developed is presented schematically in figure 2.2.

Figure 2.2: Total cash cycle (TCC).



Source: Adapted from Gitman (1974: 82).

The relationship shown in figure 2.2 is defined in the equation:

$$TCC = RMC - APC + PC + FIC + ARC \quad (\text{Eq. 2.5})$$

Where (all variables, RMC, APC, PC, FIC, and ARC are in units of days):

$$\text{Raw material cycle (RMC)} = \frac{[360 \times \text{Average Raw Material Inventory}]}{\text{Expected Annual Raw Material Purchases}}$$

(Eq. 2.6)

$$\text{Accounts payable cycle (APC)} = \frac{[360 \times \text{Average Accounts Payable}]}{\text{Expected Annual Credit Purchases}}$$

(Eq. 2.7)

$$\text{Production cycle (PC)} = \frac{[360 \times \text{Average Work in Process Inventory}]}{[\text{Expected Annual Cost of Goods Sold} + \text{Expected Change in Finished Inventory}]}$$

(Eq. 2.8)

$$\text{Finished inventory cycle (FIC)} = \frac{[360 \times \text{Average Finished Goods Inventory}]}{\text{Expected Annual Cost of Goods Sold}}$$

(Eq. 2.9)

$$\text{Accounts receivable cycle (ARC)} = \frac{[360 \times \text{Average Accounts Receivable}]}{\text{Expected Annual Net Sales}}$$

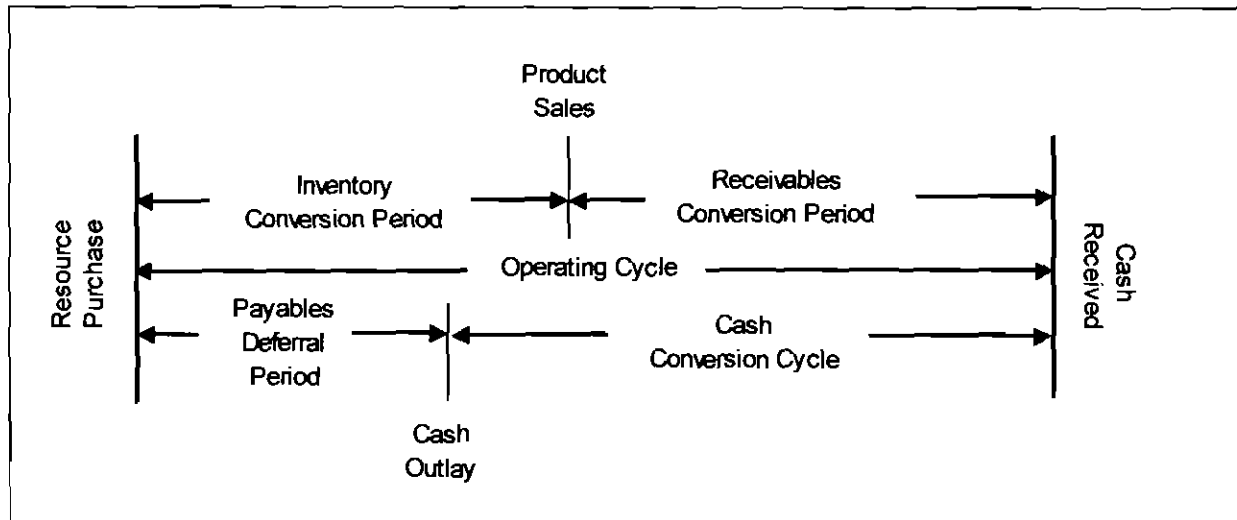
(Eq. 2.10)

Gitman (1974: 87) suggested that this approach is not aimed at replacing the use of traditional budgeting techniques, but rather to be used as a tool for making quick estimates of a firm's liquidity requirements. This TCC is a tool for making quick estimates of a firm's liquidity requirements. This short cut or supplementary nature of the model presented by Gitman provides adequate justification for its use by the financial decision-maker.

2.4.2 The Cash Conversion Cycle (CCC)

Richards and Laughlin (1980: 35) operationalised the cash cycle concept by reflecting the net time interval between cash expenditures on purchases and the ultimate recovery of cash receipts from product sales.

Figure 2.3: Cash Conversion Cycle.



Source: Adapted from Richards & Laughlin (1980: 35).

Figure 2.3 illustrates the operating cycle of a typical firm. The operating cycle is equal to the length (in days) of the inventory conversion period plus the receivables conversion period (Richards & Laughlin, 1980: 33):

$$\text{Operating cycle} = \text{Inventory conversion period} + \text{Receivables conversion period}$$

(Eq. 2.11)

The inventory conversion period is the length (in days) of time required to produce and sell the product, and is defined as follows (Richards & Laughlin, 1980: 33):

$$\text{Inventory conversion period} = \frac{[365 \times \text{Average Inventory}]}{\text{Cost of Goods Sold}} \quad (\text{Eq. 2.12})$$

The receivables conversion period, or average collection period, represents the length (in days) of time required to collect the sales receipts, and is calculated as follows (Richards & Laughlin, 1980: 33):

$$\text{Receivables collection period} = \frac{[365 \times \text{Accounts Receivable}]}{\text{Annual Credit Sales}} \quad (\text{Eq. 2.13})$$

The payables deferral period is the length (in days) of time the firm is able to defer payment on its various resource purchases (e.g. materials, wages and taxes), and is calculated as follows (Richards & Laughlin, 1980: 34):

$$\text{Payables deferral period} = \frac{[365] \times [(Accounts Payable) + (Salaries, benefits \& Payroll Taxes Payable)]}{[(Cost of Goods Sold) + (Selling, general \& administrative expense)]} \quad (\text{Eq. 2.14})$$

The cash conversion cycle represents the net time interval between the collection of cash receipts from product sales and the cash payments for the firm's various resource purchases, and is calculated as follows (Richards & Laughlin, 1980: 34):

$$\text{Cash conversion cycle} = \text{Operating cycle} - \text{Payables deferral period} \quad (\text{Eq. 2.15})$$

The cash conversion cycle shows the time interval over which additional non-spontaneous sources of working capital financing must be obtained to carry out the firm's activities (Richards & Laughlin, 1980: 35). Spontaneous sources of financing (such as trade credit offered by suppliers) automatically expand (contract) as the firm's volume of purchases increases (decreases), whereas non-spontaneous sources of financing (such as bank loans), in contrast, do not automatically expand or contract with the volume of purchases (Moyer, *et al.*, 2001: 568).

Richards & Laughlin (1980: 36) conclude that the cash conversion cycle analysis provides more explicit insights for managing a firm's working capital position in a manner that will assure the proper amount and timing of funds available to meet a firm's liquidity needs.

Johnson and Soenen (2003: 364) conducted a study to determine the financial success of firms. The results showed that large, profitable firms with efficient working capital management (short cash conversion cycles) outperform the sample average on the three performance measures (Sharpe index, Jensen's alpha and Economic value added). The Sharpe index is defined as the rate of return on a particular stock (share) in excess of the risk-free rate divided by the standard deviation (measure of total risk) of the returns on that stock during a certain time period. Jensen's alpha is the intercept in a Capital Asset Pricing Model (CAPM) regression of excess returns. Economic value

added (EVA) focuses on managerial effectiveness in a given financial year and is a financial tool that emphasises the importance of maximising incremental earnings above capital costs.

2.4.3 Net Trade Cycle (NTC)

Gentry, *et al.* (1990: 92) developed a modified version of the cash conversion cycle called the Weighted Cash Conversion Cycle (WCCC) which scales the timing by the amount of funds in each step of the cycle. The weights are calculated by dividing the amount of cash tied up in each component by the final value of the component. Therefore, the WCCC includes both the number of days and the amount of funds that is tied up at each stage of the cycle.

Although the WCCC provides a better appreciation of the complexities of the cash cycle, it will be omitted in this study as some of the information required (e.g. raw materials, work-in-process and finished goods) is not readily available for outside investigators (analysts) of firms.

The Net Trade Cycle (NTC) is basically equal to the CCC. The three components, inventory, receivables and payables are expressed as a percentage of sales in the NTC. In the NTC equation, all three components' denominators are net sales, whereas in the CCC equation the three components' denominators are all different, which makes the NTC more useful for comparison than the CCC. The Net trade cycle (NTC) is defined by Bernstein and Wild (1999: 127) as follows:

$$NTC = \frac{(365) \times [(Inventory) + (Accounts Receivable) - (Accounts Payable)]}{[Net Sales]} \quad \text{Eq. 2.16}$$

According to Bernstein and Wild (1999: 128), the net trade cycle concept increases uniformity and simplicity of calculation since it uses net sales instead of cost of goods sold and purchases to compute the average age of inventory and average age of accounts payable.

Shin and Soenen (1998: 38) stated that the NTC actually indicates the number of "days sales" the firm has to finance its working capital under *ceteris paribus* conditions. Shin

and Soenen (1998: 38) further related the NTC to the issue of firm valuation and creation of shareholder value. The shorter the NTC, the higher the present value of the net cash flow generated by the assets and therefore the higher the value of the firm for its shareholders. The shorter the NTC, the more efficient the firm is in managing its working capital and the lower the need for external financing and in turn the higher its financial performance. Shin and Soenen (1998: 43) concluded that there is a strong negative relation between the length of a firm's NTC and its profitability, and shorter net trade cycles are associated with higher risk-adjusted stock returns.

In a study conducted by Kamath (1989: 24) six measures of liquidity were used and compared in a sample of retail firms to ascertain the relationships between these liquidity measures and a measure of firm profitability. The six liquidity measures used are:

- the current ratio,
- the quick ratio,
- the CCC,
- the NTC,
- net liquid balance (NLB) and
- Emery's Lambda.

The traditional measures of liquidity, the current ratio and the quick ratio, exhibit no inverse relationship with an operating profit measure, as to what was expected. It is established that the CCC and the NTC, were negatively correlated with the profitability measure, indicating the expected relationship between benefits and costs of maintaining liquidity. The other two liquidity measures, the net liquid balance (NLB) and Emery's Lambda were only used as control measures to indicate the liquidity of the firms in comparison to the previous four liquidity measures.

2.4.4 Emery's Lambda

In a 1984 study Emery developed a new liquidity measurement, lambda, after the fact that traditional liquidity measures were found to be deficient in several respects. Liquidity measurement is recognised as an important part of treasury management. Emery (1984: 26) stated that liquidity measurement has become more important recently due to changes in financial reporting requirements.

Emery (1984: 26) stated that an ideal liquidity measure must contain all of the following characteristics:

- Is known to be related to the likelihood the firm will be able to meet its cash requirements.
- Includes all of the liquid resources available to the firm but does not include illiquid resources.
- Incorporates the firm's anticipated net cash flows.
- Is adaptable to different time horizons.

Emery (1984: 27) asserted that traditional liquidity measures are of limited value because they do not recognise uncertainty and are not adaptable to different time horizons. Emery (1984: 28) listed the following factors, defined as factors that affect a firm's liquidity:

- The size of the liquid reserve.
- The direction of the net cash flow.
- The variability of the net cash flow.
- The length of the analysis horizon.

Emery (1984: 29) defined a new liquidity index, Lambda, as follows:

$$Lambda = \frac{[(Initial\ liquid\ reserve) + (Total\ anticipated\ net\ cash\ flow\ during\ analysis\ horizon)]}{(Uncertainty\ about\ net\ cash\ flow\ during\ analysis\ horizon)}$$

(Eq. 2.17)

The individual parameters of the liquidity index (lambda) are:

- *Initial liquid reserve*: Cash, marketable securities and cash as line of credit.
- *Total anticipated net cash flow during analysis horizon*: Cash flow from operations and net cash flow is the arithmetic mean over the analysis horizon (period in financial years).
- *Uncertainty about cash flow during analysis horizon*: The standard deviation of the net cash flow of the analysis horizon (period in financial years).

The larger the value of lambda, the more liquid is the firm. For example, a firm with a lambda value of 3.0 has liquid resources equal to three times its typical unexpected requirement for cash (Emery, 1984: 29).

2.4.5 Net Liquid Balance (NLB)

In the 1989 study conducted by Kamath about the retail industry (sample of 90 firms over a fifteen year period) about the usefulness of common liquidity measures, the objective of this study was fourfold:

- To compare and contrast the information content of the conventional liquidity ratios with that of the cash conversion cycle.
- To ascertain if the net trade cycle (NTC) can serve as a good approximation of the cash conversion cycle (CCC).
- To evaluate if, within the framework of cross-sectional industry analysis, the traditional ratios in fact give rise to results contradictory to those provided by the CCC.
- To ascertain the relationships between these liquidity measures and a measure of firm profitability.

It is argued that, when the current ratio, the quick ratio and the cash conversion cycle are used simultaneously, a more complete insight into a firm's liquidity condition as well as its working capital management efficiency can be obtained. It is concluded that the traditional liquidity measures, the current ratio and the quick ratio were not found to exhibit the inverse relationship with an operating profit measure whereas the CCC and the NTC were found to be negatively correlated with the operating profit measure, indicating the expected relationship between the benefits and the costs of maintaining liquidity. The study of Kamath (1989: 28) and the corresponding conclusions were done with respect to retail firms, but given the underlying rationale, there is no reason to expect that contrary results would be obtained in other industries.

Kamath (1989: 28) discussed the Net Liquid Balance (NLB) measure that Shulman and Cox developed in 1985, but did not utilise this NLB measure in the study. The NLB measure developed by Shulman and Cox in 1985 is basically the same as the NLB (see paragraph 2.3.1) that Hawawini, *et al.* (1986: 16) developed (see paragraph 2.3.1) and is defined as:

$$NLB = [(Cash) + (Marketable securities)] - [All liquid financial obligations including short-term notes payable and the current portion of long-term debt]$$

(Eq. 2.18)

This NLB measure is useful as a financial indicator due to its components, such as cash and marketable securities as well as overdrafts and short-term borrowings, which are all decision variables that are purely financial in nature and not directly related to a firm's investments in its current operations. Chiou, *et al.* (2006: 151) used the NLB as a dependant variable in a study of determinants of working capital management. The empirical results from this study show that the debt ratio and operating cash flow, as evaluated by NLB, have an influence on the working capital management of the firm.

2.5 CORPORATE PROFITABILITY

Shin and Soenen (1998: 38) used two profitability measures of the firm in a study conducted to determine the efficiency of working capital management and corporate profitability. In this case profitability is measured by operating income plus depreciation related to:

- (1) total assets (IA) and
- (2) net sales (IS):

$$IA = \frac{[Operating\ Income + Depreciation]}{Total\ Assets} \quad (Eq. 2.19)$$

$$IS = \frac{[Operating\ Income + Depreciation]}{Net\ Sales} \quad (Eq. 2.20)$$

Johnson and Soenen (2003: 364) conducted a study towards the success of firms where ten different firm specific characteristics were utilised as potential indicators of superior performance. In the search for the success of firms, Johnson and Soenen (2003: 365) used return on assets (ROA) as the profitability measure of the firm:

$$ROA = \frac{Net\ Income}{Total\ Assets} \quad (Eq. 2.21)$$

Johnson and Soenen (2003: 365) argued that return on assets is an assets utilisation ratio which indicates how effectively or efficiently a firm uses its assets. Furthermore it is stated that the effectiveness with which fixed assets, working capital and other assets

are employed is a driver of growth of the firm. Johnson and Soenen (2003: 365) explained that the greater the return on assets the higher the growth potential of the firm. In the 1980 study, Smith utilised that the relationship between firm liquidity and profitability and used net profit before tax (EBT = Earnings before tax, but after interest) as profitability measure in an analysis to determine profitability versus liquidity tradeoffs in working capital management.

Deloof (2003: 573) studied the affect of working capital management on profitability of Belgian non-financial firms. In this study, Deloof (2003: 585) found a strong negative relationship between gross operating income and the components of the cash conversion cycle (number of days accounts receivable, inventories and accounts payable). The gross operating income (profit) used by Deloof (2003: 576) is defined as:

$$\text{Gross operating profit} = \frac{[\text{Sales} - \text{Cost of sales}]}{[\text{Total Assets} - \text{Financial Assets}]} \quad (\text{Eq. 2.22})$$

Lazaridis and Tryfonidis (2006: 26) conducted a study of the relationship between working capital management and profitability of listed firms in the Athens Stock Exchange. The study confirmed the negative relationship between profitability (measured by gross operating profit) and the cash conversion cycle (and its components), which was used as a measure of working capital management efficiency. The measure of profitability (gross operating profit) used by Lazaridis and Tryfonidis (2006: 29) is identical to that of Deloof (2003: 576), Equation 2.22. Gross Operating Profit (GOP) will be used in this study to determine the association of operating gain or loss, and relate GOP with the operating variables of the cash conversion cycle (the individual components of the CCC).

CHAPTER 3

EMPIRICAL RESEARCH

3.1 INTRODUCTION

There seems to be a strong relationship between the cash conversion cycle of a firm and its profitability. The three components of the CCC (accounts payable, accounts receivable and inventory) can be managed in different ways to maximise profitability or to enhance the growth of a firm.

Cheng & Pike (2003: 26) suggested that trade credit can be utilised as a vehicle to attract new customers for firms. Many firms change the standard credit terms to win new customers and to gain large orders. In addition to this "marketing strategy" credit can stimulate sales because it allows the customers to assess the product quality before paying. It should be up to the individual firm whether this "marketing" approach should be followed when managing the working capital through credit extension. The financial department of a firm which follows this credit extension approach will face cash flow and liquidity problems since the capital will be invested in customers (accounts receivable) and inventory respectively. In order to achieve maximum value, equilibrium should be maintained in receivables-payables and inventory.

According to Lazaridis and Tryfonidis (2006: 27) the significant investment in accounts receivable by most large firms and the credit management policy choices and practices, could have important implications on corporate value. It is argued that successful management of resources will lead to corporate profitability, and the question posed: "How can management success be measured since a period of credit granting might lead to increased sales and market share whilst accompanied by decreased profitability or the opposite?".

Working capital management is best described by the cash conversion cycle (CCC) or the net trade cycle (NTC) and this study will aim to establish a link between profitability and management of the CCC. The simple equation of CCC (eq. 2.15) encompasses all three very important aspects of working capital management.

It is an indication of how long a firm can continue if it were to cease operations or it indicates the time period between purchase of goods and collection of sale of final product.

The optimum level of inventories will have a direct effect on profitability since it will release working capital resources which in turn will be invested in the business cycle, or it will decrease inventory levels in order to respond to higher product demand. Similarly both credit policy from suppliers and credit period granted to customers will have an impact on profitability. In order to understand the way working capital is managed, the CCC and its components will be statistically analysed to determine a relationship with corporate profitability.

In this study the relationship is investigated between working capital management and firms' profitability for 118 listed firms on the Johannesburg Securities Exchange (JSE) for the period 2003 to 2007. The purpose of this study is to establish whether there exists a relationship that is statistically significant between profitability, the CCC and its components for listed firms on the JSE.

3.2 METHODOLOGY USED

3.2.1 Data Collection

The data collected was from listed firms in the Johannesburg Securities Exchange (JSE) Market. The reason this market was chosen for this study is primarily due to the reliability of the financial data. Firms listed in the securities (shares) market have an incentive to produce profits, in order to attract more investors, and in turn improve the value of the shares. Contrary to listed firms, non-listed firms' financial statements probably do not possess the level of accuracy as listed firms, due to indifferent accounting practices used.

For the purpose of this study, certain industries have been omitted due to the type of activity. The classification of the North American Industry Classification System (NAICS) industries was followed from which electricity and water (utility), banking and financial institutions, insurance, rental and other services have been omitted.

The original sample consisted of 472 firms per year which was narrowed down to 118 firms per year. A five year period was selected for analysis and the most recent period for which complete data was available was 2003 to 2007. From the filtered sample (originally 472 firms per year, before above-mentioned omissions), certain firms were further omitted in the final sample of 118 firms per year, due to incomplete information for the certain period (2003 - 2007). The financial data was obtained from the *McGregor BFA* database. The analysis uses data for the individual years, 2003 to 2007, which results in 590 total observations (118 observations per year).

3.2.2 Variables

The cash conversion cycle (CCC), together with the net trade cycle (NTC), are used as measures to gauge profitability, as discussed in section 2.4.2 (Eq. 2.15) and section 2.4.3 (Eq. 2.16) respectively. The three components of the CCC are also used individually as independent variables. The three variables are the Inventory (INV) conversion period (Eq. 2.12), the Receivables (AR) conversion period (Eq. 2.13), and the Payables (AP) deferral period (Eq. 2.14).

Another independent variable used for the regression specification is company (firm) size, which is measured by the natural logarithm of net sales. Fixed financial assets were approximated by the difference of total assets and operating assets, due to the lack of more accurate data. The independent variable used for the regression specification is fixed financial assets related to total assets in the following:

$$\text{Fixed Financial Assets Ratio} = \frac{\text{Fixed Financial Assets}}{\text{Total Assets}} \quad (\text{Eq. 3.1})$$

The Fixed Financial Assets Ratio is used since for many listed firms financial assets comprise a significant portion of total assets. Fixed financial assets consist of financial instruments, such as stocks (shares), bonds, notes and mortgages (Brigham, *et al.*, 2005: 12). The shares portion of the fixed financial assets is mainly shares in other firms. The Fixed Financial Assets Ratio will be used in order to obtain an indication of how the relationship and participation of one firm to other firms affect its profitability.

Financial debt ratio is another independent variable to be utilised in the regression analyses by the following equation:

$$\text{Financial Debt Ratio} = \frac{(\text{Short term loans} + \text{Long term loans})}{\text{Total Assets}} \quad (\text{Eq. 3.2})$$

The Financial debt ratio is used to establish a relationship between the external financing of the firm and its total assets. The dependant variable (profitability) used is the gross operating profit. The gross operating profit used is the difference between the total sales and cost of goods sold (COGS), and the result divided by the total assets minus the financial assets (thus the operating assets), as follows:

$$\text{Gross Operating Profit} = \frac{(\text{Sales} - \text{COGS})}{(\text{Total Assets} - \text{Financial Assets})} \quad (\text{Eq. 3.3})$$

The gross operating profit is used instead of the earnings before interest, tax, depreciation and amortization (EBITDA) or profit before (or after) interest and taxes (PBIT or NOPAT), because the association of operating "success" or "failure" with an operating ratio will be established. Gross operating profit will be related with other operating variables (i.e. cash conversion cycle variables). The participation of any financial activity will be excluded from operational activity, which might affect overall profitability (therefore financial assets are subtracted from total assets).

3.2.3 Descriptive Statistics

The descriptive statistics of the collective variables can be seen in Table 3.1. The total observations sums to 590 (n). On average 9.8 per cent of total assets are financial assets (including participation to other subsidiaries). Total sales have a mean of 33.23 billion Rand, while the median is 1.37 billion Rand. The firms included in the sample had an average of 61.01 per cent gross operating profit (GOP). The credit period granted to customers is 60 days on average (median 57 days), while creditors are paid in 119 days on average (median 93 days). Inventory takes an average of 70 days to be sold (median 63 days). Overall the average cash conversion cycle (CCC) is 12 days (median 23 days) and the average net trade cycle (NTC) is 34 days (median 33 days).

The descriptive statistics of the individual years (2003 - 2007) are presented Appendix A.

Table 3.1: Descriptive statistics of collected variables - stacked data for 2003 - 2007.

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
Fixed FA	590	0.09828	0.04541	0.13056	0.00000	0.85423
LNSALES	590	13.911	14.133	2.280	7.716	23.308
SALES (R'000)	590	33231089	1373144	551380246	2244	13258615530
FIN DR	590	0.21256	0.14750	0.26315	0.00000	2.74678
GOP (%)	590	61.010%	56.455%	36.311%	-127.810%	246.606%
CR	590	1.583	1.374	1.636	0.421	37.000
AR (days)	590	60.060	56.862	33.633	0.000	365.526
AP (days)	590	118.634	93.122	138.480	9.992	2372.500
INV (days)	590	70.407	62.864	47.559	0.000	307.263
CCC (days)	590	11.834	22.538	135.673	-2073.445	296.698
NTC (days)	590	34.066	32.662	62.957	-708.529	285.803

The Pearson correlation table (correlation coefficient) for the variables included in the regression model can be seen in Table 3.2. The Pearson product moment coefficient of correlation (also called the correlation coefficient or correlation) has been calculated for pairs of variables as shown in Table 3.2. This correlation coefficient (Pearson) is a measure of the degree of linear relationship between two or more variables. The gross operating profit (GOP) is negatively correlated with the variables of number of days accounts receivables (A/R), number of days accounts payable (A/P; actually positively correlated, but A/P is negative in CCC equation) and cash conversion cycle (CCC). These results are consistent with the view that the shorter the period between production and sale of products, the larger the firm's profitability (if the margins are correct).

Table 3.2: Correlation of collected variables – stacked data 2003-2007.

	GOP	A/R	A/P	INV	CCC	NTC	Fin DR	Fix FA	LNSALES	CR
GOP	1.000	-0.094	0.109	-0.077	-0.161	-0.039	0.080	0.112	-0.059	-0.085
A/R	-0.094	1.000	0.333	0.038	-0.078	0.171	0.060	0.008	-0.030	0.083
A/P	0.109	0.333	1.000	0.090	-0.907	-0.601	0.053	0.131	-0.133	-0.083
INV	-0.077	0.038	0.090	1.000	0.268	0.387	-0.107	-0.025	-0.035	0.054
CCC	-0.161	-0.078	-0.907	0.268	1.000	0.792	-0.077	-0.141	0.116	0.124
NTC	-0.039	0.171	-0.601	0.387	0.792	1.000	-0.050	-0.138	0.117	0.192
Fin DR	0.080	0.060	0.053	-0.107	-0.077	-0.050	1.000	0.047	-0.047	-0.148
Fix FA	0.112	0.008	0.131	-0.025	-0.141	-0.138	0.047	1.000	0.125	-0.075
LNSALES	-0.059	-0.030	-0.133	-0.035	0.116	0.117	-0.047	0.125	1.000	-0.142
CR	-0.085	0.083	-0.083	0.054	0.124	0.192	-0.148	-0.075	-0.142	1.000

It is also apparent that firms with cash in hand can purchase raw materials from suppliers with better prices, this is possibly why the gross operating profit (GOP) is positively related with financial debt. This means that listed firms on the JSE take advantage of financial debt in order to decrease their CCC and increase profitability. The negative relation between accounts payable (A/P; actually positively correlated, but A/P is negative in CCC equation) and gross operating profit (GOP) indicate that more profitable firms delay payment towards creditors (suppliers). The correlations of the collected variables for the individual years (2003-2007) are in Appendix B.

The two set of variables that are highly correlated (close to -1 or 1) are the CCC-A/P pair (with a correlation value of -0.907) and the CCC-NTC pair (with a correlation value of 0.792).

3.2.4 Regression Analysis

In order to shed more light on the relationship of working capital management on firms' profitability, regression analysis will be used. The following proposed models examine the dependant (endogenous) variable, which is the profitability (as defined in Eq. 3.3), against the independent (exogenous) variables. The nine independent variables are:

- fixed financial assets (Eq. 3.1),
- the natural logarithm of sales,
- financial debt ratio (Eq. 3.2),
- *current ratio* (= *current assets/current liabilities*),
- cash conversion cycle (Eq. 2.15),
- the 3 individual components of the CCC (INV-Eq. 2.12, AR-Eq. 2.13 and AP-Eq. 2.14), and
- the net trade cycle (Eq. 2.16).

Different variations of the regression model will be tested against the dependant variable (profitability). The gross operating profit is regressed against the nine independent variables in different combinations to test the relationship of individual variable on the firm's operating profit. The total number of observations is 590, which represents stacked data for the period 2003 to 2007 for listed firms on the Johannesburg Securities Exchange (JSE). The resulting regression models are shown

in Tables 3.3 to 3.7. The regression results for all the models are summarised in Appendix C.

REGRESSION EQUATION A (GOP vs. CCC):

The first set of regression analyses were done for the individual years (2003-2007), where the gross operating profit (GOP) is regressed against fixed financial assets (Fix FA), financial debt (Fin DR), the natural logarithm of sales (LNSALES), current ratio (CR) and the cash conversion cycle (CCC), as is presented in Table 3.3 the A equations.

Table 3.3: Regression models for the individual years (2003 – 2007).

Independent variable tested	2003: GOP =	2004: GOP =	2005: GOP =	2006: GOP =	2007: GOP =
A. CCC	0.771 + 0.481Fix FA + 0.147Fin DR - 0.000695CCC - 0156LNSALES - 0.000177CR	0.620 + 0.758Fix FA + 0.0456Fin DR - 0.000996CCC - 0107LNSALES + 0.0487CR	1.163 + 0.181Fix FA + 0.0643Fin DR - 0.00154CCC - 0.0352LNSALES - 0.0175CR	0.773 - 0.498Fix FA + 0.0467Fin DR + 0.000117CCC - 00302LNSALES - 0.0687CR	0.490 + 0.308Fix FA - 0.101Fin DR - 0.000159CCC + 0.00607LNSALES - 0.00463CR

The regression equation for 2003 (GOP vs. CCC from Table 3.3) shows that there is a negative relationship between cash conversion cycle (CCC) and profitability, which is consistent with the view that a decrease in the CCC will generate more profits for the firm. The F test equals 3.795 (see Table C1 in Appendix C) and is highly significant up to a 0.5 per cent level ($\alpha = 0.005$). The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C1 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there exists a medium effect ($R^2_{\text{GOP, CCC}}$ is close to 0.1 – see Table C1 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2004 (GOP vs. CCC from Table 3.3) shows that there is a negative relationship between cash conversion cycle (CCC) and profitability, which is consistent with the view that a decrease in the CCC will generate more profits for the firm. The F test equals 6.106 (see Table C2 in Appendix C) and is highly significant up

to a 0.5 per cent level ($\alpha = 0.005$). The independent (explanatory) variables are also not correlated, since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C2 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there exists a large effect ($R^2_{\text{GOP, CCC}}$ is close to 0.25 – see Table C2 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2005 (GOP vs. CCC from Table 3.3) shows that there is a negative relationship between cash conversion cycle (CCC) and profitability, which is consistent with the view that a decrease in the CCC will generate more profits for the firm. The F test equals 4.269 (see Table C3 in Appendix C) and is highly significant up to a 0.5 per cent level ($\alpha = 0.005$).

The independent (explanatory) variables are also not correlated, since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C3 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there exists a medium to large effect ($R^2_{\text{GOP, CCC}}$ is close to 0.20 – see Table C3 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2006 (GOP vs. CCC from Table 3.3) shows that there is a positive relationship between cash conversion cycle (CCC) and profitability, which is inconsistent with the view that a decrease in the CCC will generate more profits for the firm. The F test equals 1.293 (see Table C4 in Appendix C) and is not significant for any confidence level, thus this model should not be used since it is not statistically significant. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C4 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there only exists a small effect ($R^2_{\text{GOP, CCC}}$ is close to 0.05 – see Table C4 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2007 (GOP vs. CCC from Table 3.3) shows that there is a negative relationship between cash conversion cycle (CCC) and profitability, which is consistent with the view that a decrease in the CCC will generate more profits for the firm. The F test equals 0.664 (see Table C5 in Appendix C) and is not significant for

any confidence level, thus this model should not be used since it is not statistically significant. The independent (explanatory) variables are also not correlated, since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C5 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there only exists a small effect ($R^2_{\text{GOP, CCC}}$ is close to 0.03 – see Table C5 in Appendix C) on the proportion variance for this regression model.

REGRESSION EQUATION B (GOP vs. AR):

In the second set of regression, the dependant variable, gross operating profit (GOP) and the same variables are used as in the first regression. The only difference is that the CCC is substituted with the accounts receivables (AR) for the individual years' (2003-2007) regression analyses.

Table 3.4: Regression models for the individual years (2003 – 2007).

Independent variable tested	2003: GOP =	2004: GOP =	2005: GOP =	2006: GOP =	2007: GOP =
B. AR	0.885 + 0.656Fix FA + 0.157Fin DR - 0.000189AR - 0.0216LN SALES - 0.0361CR	0.790 + 0.900Fix FA + 0.0662Fin DR - 0.000585AR - 0.0170LN SALES - 0.0000233CR	1.186 + 0.379Fix FA + 0.140Fin DR - 0.00130AR - 0.0364LN SALES – 0.0173CR	0.827 - 0.501Fix FA + 0.0581Fin DR - 0.000942AR - 0.00328LN SALES - 0.0634CR	0.656 + 0.364Fix FA - 0.0956Fin DR - 0.00155AR + 0.00132LN SALES - 0.0138CR

The regression model in Table 3.4 for 2003 indicates that there is a negative relationship between gross operating profit (GOP) and accounts receivables (A/R). This indication is highly significant, as the F test statistic of 2.299 (see Table C6 in Appendix C) is significant for the slope at alpha (α) of 0.025 level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C6 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there exists a medium effect ($R^2_{\text{GOP, AR}}$ is close to 0.1 – see Table C6 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.4 for 2004 indicates that there is a negative relationship between gross operating profit (GOP) and accounts receivables (A/R). This indication is highly significant, as the F test statistic of 2.598 (see Table C7 in Appendix C) is significant for the slope at alpha (α) of 0.05 level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C7 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there exists a medium effect ($R^2_{\text{GOP, AR}}$ is close to 0.1 – see Table C7 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.4 for 2005 indicates that there is a negative relationship between gross operating profit (GOP) and accounts receivables (A/R). This indication is highly significant, as the F test statistic of 2.356 (see Table C8 in Appendix C) is significant for the slope at alpha (α) of 0.05 level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C8 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there exists a medium effect ($R^2_{\text{GOP, AR}}$ is close to 0.1 – see Table C8 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.4 for 2006 indicates that there is a negative relationship between gross operating profit (GOP) and accounts receivables (A/R). This indication is not significant, as the F test statistic of 1.372 (see Table C9 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C9 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, AR}}$ is close to 0.06 – see Table C9 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.4 for 2007 indicates that there is a negative relationship between gross operating profit (GOP) and accounts receivables (A/R). This

indication is not significant, as the F test statistic of 1.052 (see Table C10 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C10 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, AR}}$ is close to 0.04 – see Table C10 in Appendix C) on the proportion variance for this regression model.

REGRESSION EQUATION C (GOP vs. AP):

In the third set of regressions, the same variables are used as in the second regressions except that the accounts receivables (AR) are replaced by the accounts payables (AP) for the individual years' (2003-2007) regression analyses.

Table 3.5: Regression models for the individual years (2003 – 2007).

Independent variable tested	2003: GOP =	2004: GOP =	2005: GOP =	2006: GOP =	2007: GOP =
C. AP	0.724 + 0.528Fix FA + 0.128Fin DR + 0.000712AP - 0.0168LNSALES - 0.0197CR	0.573 + 0.769Fix FA + 0.0501Fin DR + 0.000929AP - 0.0131LNSALES + 0.0238CR	1.049 + 0.284Fix FA + 0.0938Fin DR + 0.00104AP - 0.0384LNSALES - 0.0190CR	0.801 - 0.497Fix FA + 0.0457Fin DR - 0.000132AP - 0.00385LNSALES - 0.0671CR	0.643 + 0.365Fix FA - 0.141Fin DR - 0.000297AP + 0.000385LNSALES - 0.0271CR

The regression model in Table 3.5 for 2003 indicates that there is a negative relationship between gross operating profit (GOP) and accounts payables (A/P), from the negative term in the CCC equation. This indication is significant, as the F test statistic of 3.699 (see Table C11 in Appendix C) is significant for the slope at alpha (α) of 0.005 level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C11 in Appendix C (Levine *et al.*, 2005: 632). This result makes economic sense since the longer the firm delays its payments the higher the level of working capital levels it reserves and uses in order to increase profitability. According to the guidelines set out

by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, AP}}$ is close to 0.14 – see Table C11 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.5 for 2004 indicates that there is a negative relationship between gross operating profit (GOP) and accounts payables (A/P), from the negative term in the CCC equation. This indication is significant, as the F test statistic of 5.476 (see Table C12 in Appendix C) is highly significant for the slope at alpha (α) of 0.005 level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C12 in Appendix C (Levine *et al.*, 2005: 632). This result makes economic sense since the longer the firm delays its payments the higher the level of working capital levels it reserves and uses in order to increase profitability. According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium to large effect ($R^2_{\text{GOP, AP}}$ is close to 0.2 – see Table C12 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.5 for 2005 indicates that there is a negative relationship between gross operating profit (GOP) and accounts payables (A/P), from the negative term in the CCC equation. This indication is significant, as the F test statistic of 3.066 (see Table C13 in Appendix C) is significant for the slope at alpha (α) of 0.025 level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C13 in Appendix C (Levine *et al.*, 2005: 632). This result makes economic sense since the longer the firm delays its payments the higher the level of working capital levels it reserves and uses in order to increase profitability. According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, AP}}$ is close to 0.12 – see Table C13 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.5 for 2006 indicates that there is a positive relationship between gross operating profit (GOP) and accounts payables (A/P) from the negative term in the CCC equation. This indication is not significant, as the F test statistic of 1.340 (see Table C14 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112 degrees of freedom. The independent (explanatory)

variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C14 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, AP}}$ is close to 0.06 – see Table C14 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.5 for 2007 indicates that there is a positive relationship between gross operating profit (GOP) and accounts payables (A/P), from the negative term in the CCC equation. This indication is not significant, as the F test statistic of 0.799 (see Table C15 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112 degrees of freedom. The independent (explanatory) variables are also not correlated since the variance inflationary factor (VIF) is less than 5 and all close to 1.0 (uncorrelated), as is evidenced from Table C15 in Appendix C (Levine *et al.*, 2005: 632). According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, AP}}$ is close to 0.03 – see Table C15 in Appendix C) on the proportion variance for this regression model.

REGRESSION EQUATION D (GOP vs. INV):

In the fourth set of regression analyses the numbers of days for inventory (INV) are added (in place of accounts payables for the third set of regressions).

Table 3.6: Regression models for the individual years (2003 – 2007).

Independent variable tested	2003: GOP =	2004: GOP =	2005: GOP =	2006: GOP =	2007: GOP =
D. INV	0.887 + 0.648Fix FA + 0.160Fin DR - 0.000282INV - 0.0216LN SALES - 0.0308CR	0.787 + 0.908Fix FA + 0.0495Fin DR - 0.000562INV - 0.0169LN SALES + 0.00383(CR)	1.198 + 0.370Fix FA + 0.115Fin DR - 0.000424INV - 0.0397LN SALES - 0.0208CR	0.740 - 0.516Fix FA + 0.0502Fin DR - 0.000146INV - 0.000706LN SALES - 0.0599CR	0.628 + 0.386Fix FA 0.143(Fin DR - 0.00109INV + 0.00247LN SALES - 0.00913CR

The regression model in Table 3.6 for 2003 indicates that there is a negative relationship between gross operating profit (GOP) and days of inventory (INV). This indication is significant, as the F test statistic of 2.319 (see Table C16 in Appendix C) is significant for the slope at alpha (α) of 0.05 level of significance with 5 and 112 degrees

of freedom. This result can be translated that the longer the inventory is tied up, the less working capital is available. According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, INV}}$ is close to 0.1 – see Table C16 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.6 for 2004 indicates that there is a negative relationship between gross operating profit (GOP) and days of inventory (INV). This indication is significant, as the F test statistic of 2.619 (see Table C17 in Appendix C) is significant for the slope at alpha (α) of 0.05 level of significance with 5 and 112 degrees of freedom. This result can be translated that the longer the inventory is tied up, the less working capital is available. According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, INV}}$ is close to 0.1 – see Table C17 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.6 for 2005 indicates that there is a negative relationship between gross operating profit (GOP) and days of inventory (INV). This indication is not significant, as the F test statistic of 2.111 (see Table C18 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112 degrees of freedom. According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, INV}}$ is close to 0.1 – see Table C18 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.6 for 2006 indicates that there is a negative relationship between gross operating profit (GOP) and days of inventory (INV). This indication is not significant, as the F test statistic of 1.204 (see Table C19 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112 degrees of freedom. According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, INV}}$ is close to 0.05 – see Table C19 in Appendix C) on the proportion variance for this regression model.

The regression model in Table 3.6 for 2007 indicates that there is a negative relationship between gross operating profit (GOP) and days of inventory (INV). This indication is not significant as the F test statistic of 1.295 (see Table C20 in Appendix C) is not significant for the slope at any alpha (α) level of significance with 5 and 112

degrees of freedom. According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, INV}}$ is close to 0.05 – see Table C20 in Appendix C) on the proportion variance for this regression model.

REGRESSION EQUATION E (GOP vs. NTC):

The fifth set of regression analyses are the individual years (2003-2007), where the gross operating profit (GOP) is regressed against fixed financial assets (Fix FA), financial debt (Fin DR), the natural logarithm of sales (LNSALES), current ratio (CR) and the net trade cycle (NTC) instead of the CCC.

Table 3.7: Regression models for the individual years (2003 – 2007).

Independent variable tested	2003: GOP =	2004: GOP =	2005: GOP =	2006: GOP =	2007: GOP =
E. NTC	0.806 + 0.556Fix FA + 0.140Fin DR - 0.00114NTC - 0.0161LNSALES - 0.00211CR	0.657 + 0.813Fix FA + 0.0824Fin DR - 0.00140NTC - 0.0107LNSALES + 0.0426CR	1.170 + 0.335Fix FA + 0.121Fin DR - 0.000876NTC - 0.0377LNSALES - 0.0180CR	0.813 - 0.458Fix FA + 0.0297Fin DR + 0.000656NTC - 0.00551LNSALES - 0.0859CR	0.615 + 0.329Fix FA - 0.163Fin DR + 0.000658NTC + 0.000144LNSALES - 0.0374CR

The regression model for 2003 (GOP vs. NTC from Table 3.7) shows that there is a negative relationship between net trade cycle (CCC) and profitability, which is consistent with the view that a decrease in the NTC will generate more profits for the firm. The F test equals 2.843 (see Table C21 in Appendix C) and is significant up to a 2.5 per cent level ($\alpha = 0.025$). According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, NTC}}$ is close to 0.1 – see Table C21 in Appendix C) on the proportion variance for this regression model.

The regression model for 2004 (GOP vs. NTC from Table 3.7) shows that there is a negative relationship between net trade cycle (CCC) and profitability which is consistent with the view that a decrease in the NTC will generate more profits for the firm. The F test equals 2.843 (see Table C22 in Appendix C) and is significant up to a 2.5 per cent level ($\alpha = 0.025$). According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, NTC}}$ is close to 0.125– see Table C22 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2005 (GOP vs. NTC from Table 3.7) shows that there is a negative relationship between net trade cycle (CCC) and profitability which is consistent with the view that a decrease in the NTC will generate more profits for the firm. The F test equals 2.278 (see Table C23 in Appendix C) and is not significant for any level of significance of alpha (α), thus the resulting regression is not statistically significant. According to the guidelines set out by Cohen (1988: 5-10), there only exists a medium effect ($R^2_{\text{GOP, NTC}}$ is close to 0.1 – see Table C23 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2006 (GOP vs. NTC from Table 3.7) shows that there is a positive relationship between net trade cycle (CCC) and profitability, which is not consistent with the view that a decrease in the NTC will generate more profits for the firm. The F test equals 1.694 (see Table C24 in Appendix C) and is not significant for any level of significance of alpha (α). This means that this regression result is not statistically significant. According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, NTC}}$ is close to 0.07 – see Table C24 in Appendix C) on the proportion variance for this regression model.

The regression equation for 2007 (GOP vs. NTC from Table 3.7) shows that there is a positive relationship between net trade cycle (CCC) and profitability which is not consistent with the view that a decrease in the NTC will generate more profits for the firm. The F test equals 1.091 (see Table C25 in Appendix C) and is not significant for any level of significance of alpha (α), thus this resulting regression is not statistically significant. According to the guidelines set out by Cohen (1988: 5-10), there only exists a small to medium effect ($R^2_{\text{GOP, NTC}}$ is close to 0.05 – see Table C25 in Appendix C) on the proportion variance for this regression model.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL CONCLUSIONS

This dissertation studied the establishment of a relationship between working capital management, by means of the cash conversion cycle, on firm profitability. The scope of the work of this study was organised around the achievement of the three objectives.

The primary objective of this study is to establish a relationship between working capital management efficiency, by means of the cash conversion cycle, on firm profitability. This primary objective is achieved by means of the two sub-objectives.

The secondary objectives were both satisfied. The first sub-objective, the efficiency of working capital management, was investigated in depth by means of the theoretical study (chapter two). The second sub-objective, the empirical research on the relationship of the length of the cash conversion cycle on firm profitability, was investigated and several regression models developed (chapter three).

This study confirms what previous researchers have proven: that a strong negative relationship exists between the cash conversion cycle and corporate profitability. Shin and Soenen (1998: 40) proved that this strong negative relationship between the cash conversion cycle (and net trade cycle) and corporate profitability existed in a study of listed USA firms for the period 1975-1994. Deloof (2003: 581) proved that this strong negative relationship between the cash conversion cycle components and corporate profitability exists in a study of Belgian firms for the period 1992-1996. Lazaridis and Tryfonidis (2006: 30) confirmed this strong negative relationship between the cash conversion cycle (and its components) and corporate profitability exists in a study of listed firms in Athens for the period 2001-2004.

The regression analyses of 2003, 2004 and 2005 financial years have confirmed that this negative relationship between the cash conversion cycle (and net trade cycle) and corporate profitability exists without a doubt.

The regression analyses of 2006 and 2007 financial years have not confirmed that this negative relationship between the cash conversion cycle (and net trade cycle) and corporate profitability exists (see Tables 3.6 & 3.7), and the reasons for these deviations are:

- The CCC mean of 2006 is almost zero (0.897 days, see Table A4). This is due to the high mean value of AP (136.5 days, see Table A4) compared to the other 2 CCC components mean values, AR (63.7 days, see Table A4) and INV (73.7 days, see Table A4). Therefore the contribution of the CCC to the regression model against profitability (GOP) was basically zero.
- The AP mean for 2006 and 2007 are much higher than those of 2003-2005 as in Tables A4 and A5, compared to Tables A1, A2 and A3. This resulted in the inverse relation of AP for 2006 and 2007 as was expected against GOP (see Tables 3.6 & 3.7).
- The NTC mean for 2006 and 2007 are much lower than those of 2003-2005 as in Tables A4 and A5, compared to Tables A1, A2 and A3. This resulted in the inverse relation of NTC for 2006 and 2007 as was expected against GOP (see Tables 3.6 & 3.7). This lower mean NTC of 2006 and 2007 is due to the fact that these two years' mean Sales (R118.6 billion for 2006 and R21.3 billion for 2007) are much larger than 2003-2005 mean sales (R4.8 billion for 2003, R7.8 billion for 2004 and R13.6 billion for 2005). These larger sales figures for 2006 and 2007 directly lowered the mean NTC values. This resulted in the inverse relation of NTC against GOP for 2006 and 2007.
- The GOP mean for 2006 (58.8%) and 2007 (57.7%) as in Tables A4 and A5 are lower than those of 2003-2005 (62.5%, 62.2% & 63.8%) in Tables A1, A2 and A3. This lower mean GOP also contributed to these inverse relations of CCC (for 2006), AP (2006 and 2007) and NTC (2006 and 2007) as to what was expected against GOP (see Tables 3.6 & 3.7).
- The Pearson correlation tables (Table B4 and B5) for 2006 and 2007 confirm the inverse relations. The CCC, AP and NTC for 2006 all have inverse relations to that of the other years' correlations and AP and NTC for 2007 have inverse relations to that of the other years' correlations, as to what were expected.

The above arguments confirm that 2006 and 2007 regression results do not support the previous researchers' conclusions that a strong negative relationship exists between the cash conversion cycle and corporate profitability (measured by gross operating profit).

The results from the regression analyses for 2003-2005 confirmed the conclusions that a negative relationship exists between the cash conversion cycle and corporate profitability (measured by gross operating profit).

Therefore it seems that operational profitability dictates how managers or owners of firms will act in terms of managing the working capital of the firm. It is observed (2003-2005 regression results) that a lower gross operating profit (GOP) is associated with an increase in number of days accounts payable (AP). This could lead to the conclusion that less profitable firms wait longer to pay bills, thus taking advantage of the credit period granted by suppliers. The negative relationship between accounts receivable (AR) and firms' profitability (for 2003-2005) suggests that less profitable firms will pursue a decrease of accounts receivables in the attempt to reduce cash gap in the respective cash conversion cycles (CCC). The negative relationship between the number of days inventory and corporate profitability (for 2003-2005) suggests that a sudden decrease in sales accompanied by mismanagement of inventory, will lead to tying up excess capital at the expense of profitable operations. Managers or owners of firms can create profits for firms by handling correctly the cash conversion cycle and keeping each individual component (accounts receivable, accounts payable and inventory) to an optimum level. These results (for 2003-2005) suggest that managers can create value for shareholders by reducing the cash conversion cycle and its individual components.

4.2 RECOMMENDATIONS FOR FURTHER RESEARCH

The following are general recommendations for further research and are mainly aimed at improving the explanatory power of the derived equations through better validation of underlying trends amongst a larger sample of explanatory parameters. More specifically the following is recommended:

- The use of a time series spanning more samples (more than 10 years' data) could potentially improve the explanatory power of individual variables. This should be investigated in another study as well.
- The inclusion of dummy variables, for the individual industries covered and financial years in the sample, could also potentially improve the explanatory power of individual variables. This could be investigated in another study as well.

- The adjustment of the accounting measures used for risk could be done with the Treynor Index, Jensen's alpha or the Sharpe ratio. The explanatory variables (and more as the dummy variables and others that were excluded due to statistical reasoning) could be tested against risk-adjusted stock (share) returns. This could be investigated in another study as well.
- The industry affiliation could also be tested empirically by means of regression across all industries to test for industry effects and also the existence of industry benchmarks as suggested by Hawawini *et al.* (1986: 20).

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APPENDIX A: Descriptive Statistics of collected variables for 2003 – 2007

Table A1: Descriptive statistics of the collected variables - 2003.

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
Fixed FA	118	0.10178	0.05560	0.12359	0.00000	0.65041
LNSALES	118	13.689	13.964	2.204	7.716	17.983
SALES (R'000)	118	4791351	1159737	10159014	2244	64555000
FIN DR	118	0.22441	0.14093	0.30832	0.00000	2.74678
GOP (%)	118	62.532%	57.048%	35.914%	-26.236%	201.768%
CR	118	1.543	1.347	0.762	0.427	4.313
AR (days)	118	59.362	57.176	38.221	5.570	365.526
AP (days)	118	110.880	87.536	117.255	10.871	1202.788
INV (days)	118	70.855	59.668	46.241	0.000	244.233
CCC (days)	118	19.337	23.577	129.055	-1097.476	214.216
NTC (days)	118	39.745	35.235	52.219	-139.006	285.803

Table A2: Descriptive statistics of the collected variables - 2004.

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
Fixed FA	118	0.09585	0.04308	0.12638	0.00000	0.62976
LNSALES	118	13.750	14.005	2.273	8.060	19.740
SALES (R'000)	118	7821097	1215686	35293642	3164	374194693
FIN DR	118	0.20576	0.12744	0.25989	0.00000	2.07699
GOP (%)	118	62.166%	59.601%	36.436%	-31.591%	233.225%
CR	118	1.499	1.378	0.696	0.436	4.663
AR (days)	118	59.079	55.286	33.167	0.000	233.875
AP (days)	118	116.812	91.001	124.978	12.574	1188.879
INV (days)	118	63.243	59.185	40.543	0.108	204.181
CCC (days)	118	5.510	21.495	131.360	-1071.514	156.578
NTC (days)	118	33.617	31.655	48.046	-177.609	185.717

Table A3: Descriptive statistics of the collected variables - 2005.

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
Fixed FA	118	0.09491	0.03834	0.12794	0.00000	0.61246
LNSALES	118	13.885	14.101	2.260	8.666	20.712
SALES (R'000)	118	13602440	1331330	91185412	5800	988933644
FIN DR	118	0.20544	0.14504	0.27223	0.00000	2.23675
GOP (%)	118	63.777%	57.516%	40.347%	-6.555%	246.606%
CR	118	1.846	1.445	3.325	0.421	37.000
AR (days)	118	58.422	52.862	34.288	5.263	226.387
AP (days)	118	106.076	90.646	75.529	9.992	549.397
INV (days)	118	69.931	60.870	47.077	0.739	231.474
CCC (days)	118	22.277	22.538	75.410	-405.877	180.377
NTC (days)	118	37.532	32.263	44.078	-154.457	187.601

Table A4: Descriptive statistics of the collected variables - 2006.

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
Fixed FA	118	0.10023	0.04814	0.13606	0.00000	0.85423
LNSALES	118	14.026	14.250	2.376	8.132	23.308
SALES (R'000)	118	118598749	1546416	1220044870	3400	13258615530
FIN DR	118	0.22142	0.16656	0.25356	0.00000	1.87618
GOP (%)	118	58.839%	54.233%	36.838%	-127.810%	210.015%
CR	118	1.501	1.305	0.766	0.449	6.037
AR (days)	118	63.654	59.787	33.805	7.591	246.912
AP (days)	118	136.484	98.682	222.755	23.799	2372.500
INV (days)	118	73.726	65.514	53.161	0.655	307.263
CCC (days)	118	0.897	19.151	207.973	-2073.445	296.698
NTC (days)	118	31.091	33.611	85.254	-708.529	269.823

Table A5: Descriptive statistics of the collected variables - 2007.

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
Fixed FA	118	0.09865	0.04896	0.14020	0.00000	0.62382
LNSALES	118	14.208	14.459	2.284	8.988	21.221
SALES (R'000)	118	21341806	1903390	151570574	8008	1645362456
FIN DR	118	0.20575	0.16135	0.21732	0.00000	1.23093
GOP (%)	118	57.737%	54.419%	31.750%	-17.768%	221.121%
CR	118	1.528	1.347	0.823	0.530	4.978
AR (days)	118	59.786	59.134	28.250	6.413	147.413
AP (days)	118	122.917	101.739	106.225	33.249	716.727
INV (days)	118	74.281	67.040	49.841	0.771	256.390
CCC (days)	118	11.149	25.158	97.400	-565.987	214.003
NTC (days)	118	28.345	32.215	74.969	-554.018	180.006

APPENDIX B: Correlation of the collected variables for 2003 – 2007

Table B1: Correlation of the collected variables – 2003.

	GOP	A/R	A/P	INV	CCC	NTC	Fin DR	Fix FA	LNSALES	CR
GOP	1.000	-0.041	0.300	-0.079	-0.313	-0.246	0.189	0.217	-0.072	-0.108
A/R	-0.041	1.000	0.152	-0.027	0.148	0.490	0.031	-0.070	0.024	0.079
A/P	0.300	0.152	1.000	-0.071	-0.889	-0.237	0.181	0.189	-0.057	-0.177
INV	-0.079	-0.027	-0.071	1.000	0.415	0.627	-0.024	-0.132	-0.093	0.338
CCC	-0.313	0.148	-0.889	0.415	1.000	0.585	-0.164	-0.239	0.026	0.305
NTC	-0.246	0.490	-0.237	0.627	0.585	1.000	-0.261	-0.209	0.063	0.441
Fin DR	0.189	0.031	0.181	-0.024	-0.164	-0.261	1.000	0.099	-0.049	-0.334
Fix FA	0.217	-0.070	0.189	-0.132	-0.239	-0.209	0.099	1.000	0.217	-0.067
LNSALES	-0.072	0.024	-0.057	-0.093	0.026	0.063	-0.049	0.217	1.000	-0.233
CR	-0.108	0.079	-0.177	0.338	0.305	0.441	-0.334	-0.067	-0.233	1.000

Table B2: Correlation of the collected variables – 2004.

	GOP	A/R	A/P	INV	CCC	NTC	Fin DR	Fix FA	LNSALES	CR
GOP	1.000	-0.070	0.358	-0.073	-0.381	-0.218	0.042	0.294	-0.060	-0.058
A/R	-0.070	1.000	0.158	-0.053	0.086	0.413	0.035	-0.042	0.048	0.133
A/P	0.358	0.158	1.000	-0.034	-0.922	-0.353	0.083	0.151	-0.064	-0.193
INV	-0.073	-0.053	-0.034	1.000	0.328	0.558	-0.206	0.007	0.074	0.294
CCC	-0.381	0.086	-0.922	0.328	1.000	0.612	-0.134	-0.152	0.096	0.308
NTC	-0.218	0.413	-0.353	0.558	0.612	1.000	-0.100	-0.190	0.192	0.474
Fin DR	0.042	0.035	0.083	-0.206	-0.134	-0.100	1.000	-0.045	-0.097	-0.361
Fix FA	0.294	-0.042	0.151	0.007	-0.152	-0.190	-0.045	1.000	0.170	-0.110
LNSALES	-0.060	0.048	-0.064	0.074	0.096	0.192	-0.097	0.170	1.000	-0.004
CR	-0.058	0.133	-0.193	0.294	0.308	0.474	-0.361	-0.110	-0.004	1.000

Table B3: Correlation of the collected variables – 2005.

	GOP	A/R	A/P	INV	CCC	NTC	Fin DR	Fix FA	LNSALES	CR
GOP	1.000	-0.150	0.229	-0.052	-0.331	-0.154	0.105	0.120	-0.175	-0.131
A/R	-0.150	1.000	0.412	0.139	0.129	0.431	0.075	-0.019	0.100	0.172
A/P	0.229	0.412	1.000	0.243	-0.663	-0.326	0.112	0.165	-0.010	-0.063
INV	-0.052	0.139	0.243	1.000	0.444	0.490	-0.118	-0.082	-0.006	-0.087
CCC	-0.331	0.129	-0.663	0.444	1.000	0.829	-0.152	-0.225	0.052	0.087
NTC	-0.154	0.431	-0.326	0.490	0.829	1.000	-0.044	-0.168	0.049	0.176
Fin DR	0.105	0.075	0.112	-0.118	-0.152	-0.044	1.000	0.012	-0.025	-0.085
Fix FA	0.120	-0.019	0.165	-0.082	-0.225	-0.168	0.012	1.000	0.073	-0.081
LNSALES	-0.175	0.100	-0.010	-0.006	0.052	0.049	-0.025	0.073	1.000	-0.237
CR	-0.131	0.172	-0.063	-0.087	0.087	0.176	-0.085	-0.081	-0.237	1.000

Table B4: Correlation of the collected variables – 2006.

	GOP	A/R	A/P	INV	CCC	NTC	Fin DR	Fix FA	LNSALES	CR
GOP	1.000	-0.086	-0.075	-0.045	0.055	0.121	0.063	-0.174	-0.002	-0.119
A/R	-0.086	1.000	0.599	0.122	-0.448	-0.222	0.063	0.043	-0.198	-0.014
A/P	-0.075	0.599	1.000	0.074	-0.955	-0.822	-0.010	0.066	-0.246	-0.079
INV	-0.045	0.122	0.074	1.000	0.196	0.365	-0.121	-0.087	-0.081	0.291
CCC	0.055	-0.448	-0.955	0.196	1.000	0.938	-0.010	-0.086	0.211	0.157
NTC	0.121	-0.222	-0.822	0.365	0.938	1.000	0.000	-0.151	0.160	0.281
Fin DR	0.063	0.063	-0.010	-0.121	-0.010	0.000	1.000	0.049	-0.016	-0.280
Fix FA	-0.174	0.043	0.066	-0.087	-0.086	-0.151	0.049	1.000	0.075	-0.112
LNSALES	-0.002	-0.198	-0.246	-0.081	0.211	0.160	-0.016	0.075	1.000	-0.122
CR	-0.119	-0.014	-0.079	0.291	0.157	0.281	-0.280	-0.112	-0.122	1.000

Table B5: Correlation of the collected variables – 2007.

	GOP	A/R	A/P	INV	CCC	NTC	Fin DR	Fix FA	LNSALES	CR
GOP	1.000	-0.123	-0.037	-0.139	-0.066	0.104	-0.054	0.140	0.055	-0.041
A/R	-0.123	1.000	0.265	-0.027	-0.013	0.090	0.118	0.143	-0.152	-0.040
A/P	-0.037	0.265	1.000	0.322	-0.849	-0.748	-0.062	0.212	-0.214	-0.319
INV	-0.139	-0.027	0.322	1.000	0.152	0.157	-0.106	0.144	-0.069	0.068
CCC	-0.066	-0.013	-0.849	0.152	1.000	0.922	0.048	-0.116	0.154	0.371
NTC	0.104	0.090	-0.748	0.157	0.922	1.000	0.108	-0.047	0.130	0.336
Fin DR	-0.054	0.118	-0.062	-0.106	0.048	0.108	1.000	0.123	-0.046	-0.239
Fix FA	0.140	0.143	0.212	0.144	-0.116	-0.047	0.123	1.000	0.104	-0.156
LNSALES	0.055	-0.152	-0.214	-0.069	0.154	0.130	-0.046	0.104	1.000	-0.142
CR	-0.041	-0.040	-0.319	0.068	0.371	0.336	-0.239	-0.156	-0.142	1.000

APPENDIX C: Regression analysis results for individual years 2003 – 2007

Table C1: Multiple regression analysis for 2003, GOP vs. CCC.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.381	0.145	0.107	0.339			
Analysis of variance (ANOVA)							
Model	Squares	df	Mean Square	F	p		
Regression	2.186	5	0.437	3.795	0.003		
Residual	12.904	112	0.115				
Total	15.091	117					
Model	Unstandardised Coefficients		Standardised Coefficients	t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta			Tolerance	VIF
Constant	0.771	0.245		3.153	0.002		
CCC	-0.000695	0.000266	-0.250	-2.615	0.010	0.836	1.20
Fix FA	0.481	0.271	0.165	1.775	0.079	0.879	1.14
Fin DR	0.147	0.110	0.127	1.342	0.182	0.859	1.16
LN Sales	-0.0156	0.0153	-0.0959	-1.019	0.311	0.861	1.16
CR	-0.000177	0.0475	-0.000375	-0.004	0.997	0.752	1.33

Table C2: Multiple regression analysis for 2004, GOP vs. CCC.

Model Summary							
	R	R Square	Adjusted R Square	Estimate			
	0.463	0.214	0.179	0.330			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	Sig.		
Regression	3.327	5	0.665	6.106	0.000		
Residual	12.206	112	0.109				
Total	15.532	117					
	Unstandardised Coefficients		Standardised	t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta			Tolerance	VIF
Constant	0.620	0.214		2.891	0.005		
CCC	-0.000996	0.000	-0.359	-4.014	0.000	0.876	1.14
Fix FA	0.758	0.250	0.263	3.032	0.003	0.933	1.07
Fin DR	0.0456	0.127	0.033	0.359	0.720	0.855	1.17
LN Sales	-0.0107	0.014	-0.067	-0.778	0.438	0.948	1.05
CR	0.0487	0.049	0.093	0.988	0.325	0.791	1.26

Table C3: Multiple regression analysis for 2005, GOP vs. CCC.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.400	0.160	0.123	0.378			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	p		
Regression	3.049	5	0.610	4.269	0.001		
Residual	15.998	112	0.143				
Total	19.046	117					
	Unstandardised Coefficients		Standardised	t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta			Tolerance	VIF
Constant	1.163	0.2329		4.992	0.000		
CCC	-0.00154	0.0005	-0.288	-3.190	0.00184	0.918	1.09
Fix FA	0.181	0.2817	0.057	0.642	0.522	0.940	1.06
Fin DR	0.0643	0.1303	0.043	0.493	0.623	0.970	1.03
LN Sales	-0.0352	0.0160	-0.197	-2.197	0.030	0.933	1.07
CR	-0.0175	0.0109	-0.144	-1.603	0.112	0.926	1.08

Table C4: Multiple regression analysis for 2006, GOP vs. CCC.

Table 6.11 Multiple Regression Analysis for CCC, CR, and DR							
Model Summary							
	R	R Square	Adjusted R Square	Estimate			
	0.234	0.0546	0.0124	0.366			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	p		
Regressi	0.866	5	0.173	1.293	0.272		
Residual	15.011	112	0.134				
Total	15.878	117					
	Unstandardised Coefficients		Standardised Coefficients	t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta			Tolerance	VIF
Constant	0.773	0.240		3.227	0.00164		
CCC	0.000117	0.000170	0.0658	0.684	0.495	0.912	1.10
Fix FA	-0.498	0.252	-0.184	-1.978	0.0504	0.976	1.03
Fin DR	0.0467	0.139	0.0321	0.335	0.739	0.916	1.09
LN Sales	-0.00302	0.015	-0.0195	-0.203	0.839	0.921	1.09
CR	-0.0687	0.047	-0.143	-1.447	0.151	0.867	1.15

Table C5: Multiple regression analysis for 2007, GOP vs. CCC.

Model Summary							
	R	R Square	Adjusted R Square	Estimate			
	0.170	0.0288	-0.0146	0.320			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	p		
Regression	0.340	5	0.0679	0.664	0.652		
Residual	11.455	112	0.102				
Total	11.795	117					
	Unstandardised Coefficients		Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	0.490	0.225		2.183	0.031		
CCC	-0.000159	0.000343	-0.0488	-0.465	0.643	0.785	1.27
Fix FA	0.308	0.216	0.136	1.422	0.158	0.949	1.05
Fin DR	-0.101	0.144	-0.0691	-0.702	0.484	0.896	1.12
LN Sales	0.00607	0.0136	0.0437	0.446	0.656	0.905	1.11
CR	-0.00463	0.0416	-0.0120	-0.111	0.912	0.747	1.34

Table C6: Multiple regression analysis for 2003, GOP vs. A/R.

Table 6. Multiple Regression Analysis for 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 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2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684, 2685, 2686, 2687, 2688, 2689, 2690, 2691, 2692, 2693, 2694, 2695, 2696, 2697, 2698, 2699, 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2707, 2708, 2709, 2710, 2711, 2712, 2713, 2714, 2715, 2716, 2717, 2718, 2719, 2720, 2721, 2722, 2723, 2724, 2725, 2726, 2727, 2728, 2729, 2730, 2731, 2732, 2733, 2734, 2735, 2736, 2737, 2738, 2739, 2740, 2741, 2742, 2743, 2744, 2745, 2746, 2747, 2748, 2749, 2750, 2751, 2752, 2753, 2754, 2755, 2756, 2757, 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2767, 2768, 2769, 2770, 2771, 2772, 2773, 2774, 2775, 2776, 2777, 2778, 2779, 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, 2789, 2790, 2791, 2792, 2793, 2794, 2795, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2838, 2839, 2840, 2841, 2842, 2843, 2844, 2845, 2846, 2847, 2848, 2849, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869, 2870, 2871, 2872, 2873, 2874, 2875, 2876, 2877, 2878, 2879, 2880, 2881, 2882, 2883, 2884, 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 2960, 2961, 2962, 2963, 2964, 2965, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 2974, 2975, 2976, 2977, 2978, 2979, 2980, 2981, 2982, 2983, 2984, 2985, 2986, 2987, 2988, 2989, 2990, 2991, 2992, 2993, 2994, 2995, 2996, 2997, 2998, 2999, 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3166, 3167, 3168, 3169, 3170, 3171, 3172, 3173, 3174, 3175, 3176, 3177, 3178, 3179, 3180, 3181, 3182, 3183, 3184, 3185, 3186, 3187, 3188, 3189, 3190, 3191, 3192, 3193, 3194, 3195, 3196, 3197, 3198, 3199, 3200, 3201, 3202, 3203, 3204, 3205, 3206, 3207, 3208, 3209, 3210, 3211, 3212, 3213, 3214, 3215, 3216, 3217, 3218, 3219, 3220, 3221, 3222, 3223, 3224, 3225, 3226, 3227, 3228, 3229, 3230, 3231, 3232, 3233, 3234, 3235, 3236, 3237, 3238, 3239, 3240, 3241, 3242, 3243, 3244, 3245, 3246, 3247, 3248, 3249, 3250, 3251, 3252, 3253, 3254, 3255, 3256, 3257, 3258, 3259, 3260, 3261, 3262, 3263, 3264, 3265, 3266, 3267, 3268, 3269, 3270, 3271, 3272, 3273, 3274, 3275, 3276, 3277, 3278, 3279, 3280, 3281, 3282, 3283, 3284, 3285, 3286, 3287, 3288, 3289, 3290, 3291, 3292, 3293, 3294, 3295, 3296, 3297, 3298, 3299, 3300, 3301, 3302, 3303, 3304, 3305, 3306, 3307, 3308, 3309, 3310, 3311, 3312, 3313, 3314, 3315, 3316, 3317, 3318, 3319, 3320, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 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3664, 3665, 3666, 3667, 3668, 3669, 3670, 3671, 3672, 3673, 3674, 3675, 3676, 3677, 3678, 3679, 3680, 3681, 3682, 3683, 3684, 3685, 3686, 3687, 3688, 3689, 3690, 3691, 3692, 3693, 3694, 3695, 3696, 3697, 3698, 3699, 3700, 3701, 3702, 3703, 3704, 3705, 3706, 3707, 3708, 3709, 3710, 3711, 3712, 3713, 3714, 3715, 3716, 3717, 3718, 3719, 3720, 3721, 3722, 3723, 3724, 3725, 3726, 3727, 3728, 3729, 3730, 3731, 3732, 3733, 3734, 3735, 3736, 3737, 3738, 3739, 3740, 3741, 3742, 3743, 3744, 3745, 3746, 3747, 3748, 3749, 3750, 3751, 3752, 3753, 3754, 3755, 3756, 3757, 3758, 3759, 3760, 3761, 3762, 3763, 3764, 3765, 3766, 3767, 3768, 3769, 3770, 3771, 3772, 3773, 3774, 3775, 3776, 3777, 3778, 3779, 3780, 3781, 3782, 3783, 3784, 3785, 3786, 3787, 3788, 3789, 3790, 3791, 3792, 3793, 3794, 3795, 3796, 3797, 3798, 3799, 3800, 3801, 3802, 3803, 3804, 3805, 3806, 3807, 3808, 3809, 3810, 3811, 3812, 3813, 3814, 3815, 3816, 3817, 3818, 3819, 3820, 3821, 3822, 3823, 3824, 3825, 3826, 3827, 3828, 3829, 3830, 3831, 3832, 3833, 3834, 3835, 3836, 3837, 3838, 3839, 3840, 3841, 3842, 3843, 3844, 3845, 3846, 3847, 3848, 3849, 3850, 3851, 3852, 3853, 3854, 3855, 3856, 3857, 3858, 3859, 3860, 3861, 3862, 3863, 3864, 3865, 3866, 3867, 3868, 3869, 3870, 3871, 3872, 3873, 3874, 3875, 3876, 3877, 3878, 3879, 3880, 3881, 3882, 3883, 3884, 3885, 3886, 3887, 3888, 3889, 3890, 3891, 3892, 3893, 3894, 3895, 3896, 3897, 3898, 3899, 3900, 3901, 3902, 3903, 3904, 3905, 3906, 3907, 3908, 3909, 3910, 3911, 3912, 3913, 3914, 3915, 3916, 3917, 3918, 3919, 3920, 3921, 3922, 3923, 3924, 3925, 3926, 3927, 3928, 3929, 3930, 3931, 3932, 3933, 3934, 3935, 3936, 3937, 3938, 3939, 3940, 3941, 3942, 3943, 3944, 3945, 3946, 3947, 3948, 3949, 3950, 3951, 3952, 3953, 3954, 3955, 3956, 3957, 3958, 3959, 3960, 3961, 3962, 3963, 3964, 3965, 3966, 3967, 3968, 3969, 3970, 3971, 3972, 3973, 3974, 3975, 3976, 3977, 3978, 3979, 3980, 3981, 3982, 3983, 3984, 3985, 3986, 3987, 3988, 3989, 3990, 3991, 3992, 3993, 3994, 3995, 3996, 3997, 3998, 3999, 4000, 4001, 4002, 4003, 4004, 4005, 4006, 4007, 4008, 4009, 4010, 4011, 4012, 4013, 4014, 4015, 4016, 4017, 4018, 4019, 4020, 4021, 4022, 4023, 4024, 4025, 4026, 4027, 4028, 4029, 4030, 4031, 4032, 4033, 4034, 4035, 4036, 4037, 4038, 4039, 4040, 4041, 4042, 4043, 4044, 4045, 4046, 4047, 4048, 4049, 4050, 4051, 4052, 4053, 4054, 4055, 4056, 4057, 4058, 4059, 4060, 4061, 4062, 4063, 4064, 4065, 4066, 4067, 4068, 4069,							
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Table C7: Multiple regression analysis for 2004, GOP vs. A/R.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.322	0.104	0.0639	0.353			
Analysis of variance (ANOVA)							
	Squares	df	Mean Square	F	p		
Regression	1.614	5	0.323	2.598	0.0290		
Residual	13.918	112	0.124				
Total	15.532	117					
	Unstandardised Coefficients		Standardised	t	p	Collinearity	
	Coefficients	Std. Error	Beta			Toleranc	VIF
Constant	0.790	0.228		3.470	0.00074		
A/R	-0.000585	0.000998	-0.0533	-0.586	0.559	0.970	1.03
Fix FA	0.900	0.264	0.312	3.407	0.00091	0.953	1.05
Fin DR	0.0662	0.136	0.047220928	0.486	0.628	0.848	1.18
LN Sales	-0.0170	0.0146	-0.106	-1.160	0.249	0.959	1.04
CR	-2.33E-05	0.0513	-4.45E-05	-0.000455	1.000	0.833	1.20

Table C8: Multiple regression analysis for 2005, GOP vs. A/R.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.308	0.0952	0.0548	0.392			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	p		
Regression	1.813	5	0.363	2.356	0.0450		
Residual	17.234	112	0.154				
Total	19.046	117					
	Unstandardised Coefficients		Standardised	t	p	Collinearity Statistics	
	Coefficients	Std. Error	Beta			Tolerance	VIF
Constant	1.186	0.243		4.887	3.43E-06		
A/R	-0.00130	0.00109	-0.110	-1.189	2.37E-01	0.940	1.06
Fix FA	0.379	0.285	0.120	1.329	1.86E-01	0.990	1.01
Fin DR	0.140	0.135	0.0947	1.043	2.99E-01	0.981	1.02
LN Sales	-0.0364	0.0168	-0.204	-2.171	3.20E-02	0.917	1.09
CR	-0.0173	0.0116	-0.142	-1.496	1.37E-01	0.891	1.12

Table C9: Multiple regression analysis for 2006, GOP vs. A/R.

Table 60: Multiple Regression Analysis for E200, Cell Ver 10.0K1

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.240	0.0577	0.0157	0.365			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	p		
Regressi	0.917	5	0.183	1.372	0.240		
Residual	14.961	112	0.134				
Total	15.878	117					
	Unstandardised Coefficients		Standardised Coefficients			Collinearity Statistics	
	Coefficients	Std. Error	Beta	t	p	Tolerance	VIF
Constant	0.827	0.254		3.260	0.00148		
A/R	-0.000942	0.00102	-0.0864	-0.920	0.360	0.954	1.05
Fix FA	-0.501	0.251	-0.185	-1.997	0.0482	0.980	1.02
Fin DR	0.0581	0.139	0.0400	0.418	0.677	0.916	1.09
LN Sales	-0.00328	0.0147	-0.0212	-0.223	0.824	0.939	1.07
CR	-0.0634	0.047	-0.132	-1.361	0.176	0.898	1.11

Table C10: Multiple regression analysis for 2007, GOP vs. A/R.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.212	0.0449	0.00222	0.317			
Analysis of variance (ANOVA)							
	Squares	df	Mean Square	F	p		
Regression	0.529	5	0.106	1.052	0.391		
Residual	11.266	112	0.101				
Total	11.795	117					
	Unstandardised Coefficients		Standardised	t	p	Collinearity Statistics	
	Coefficients	Std. Error	Beta			Tolerance	VIF
Constant	0.656	0.229		2.868	0.00494		
A/R	-0.00155	0.00107	-0.138	-1.450	0.150	0.943	1.06
Fix FA	0.364	0.216	0.161	1.686	0.0946	0.939	1.06
Fin DR	-0.0956	0.141	-0.0654	-0.680	0.498	0.920	1.09
LN Sales	0.00132	0.0133	0.00948	0.0995	0.921	0.938	1.07
CR	-0.0138	0.0374	-0.0357	-0.368	0.713	0.907	1.10

Table C11: Multiple regression analysis for 2003, GOP vs. A/P.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.376	0.142	0.103	0.340			
Analysis of variance (ANOVA)							
	Squares	df	Mean Square	F	p		
Regression	2.139	5	0.428	3.699	0.00400		
Residual	12.952	112	0.116				
Total	15.091	117					
	Unstandardised Coefficients		Standardised Coefficients	t	p	Collinearity	
	Coefficient	Std. Error	Beta			Toleranc	VIF
Constant	0.724	0.249		2.908	0.00439		
A/P	0.000712	0.000281	0.232	2.531	0.0128	0.909	1.10
Fix FA	0.528	0.268	0.182	1.974	0.0508	0.904	1.11
Fin DR	0.128	0.110	0.110	1.156	0.250	0.852	1.17
LN Sales	-0.0168	0.0153	-0.103	-1.097	0.275	0.867	1.15
CR	-0.0197	0.0459	-0.0417	-0.428	0.670	0.807	1.24

Table C12: Multiple regression analysis for 2004, GOP vs. A/P.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.443	0.196	0.161	0.334			
Analysis of variance (ANOVA)							
	Squares	df	Mean Square	F	p		
Regression	3.051	5	0.610	5.476	0.000		
Residual	12.481	112	0.111				
Total	15.532	117					
	Unstandardized Coefficients		Standardized Coefficients	t	p	Collinearity	
	Coefficient	Std. Error	Beta			Toleranc	VIF
Constant	0.573	0.220		2.602	0.0105		
A/P	0.000929	0.000255	0.319	3.644	0.000408	0.938	1.07
Fix FA	0.769	0.253	0.267	3.041	0.00294	0.933	1.07
Fin DR	0.0501	0.128	0.0357	0.390	0.697	0.855	1.17
LN Sales	-0.0131	0.0139	-0.0814	-0.940	0.349	0.955	1.05
CR	0.0238	0.0486	0.0454	0.489	0.626	0.832	1.20

Table C13: Multiple regression analysis for 2005, GOP vs. A/P.

Model Summary								
	R	R Square	Adjusted R Square	Std. Error of the Estimate				
	0.347	0.120	0.0811	0.387				
Analysis of variance (ANOVA)								
	Squares	df	Mean Square	F	p			
Regression	2.293	5	0.459	3.066	0.0120			
Residual	16.754	112	0.150					
Total	19.046	117						
	Unstandardised Coefficients		Standardised Coefficients		t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta				Tolerance	VIF
Constant	1.049	0.244			4.299	3.68E-05		
A/P	0.00104	0.000484	0.196		2.160	3.29E-02	0.958	1.04
Fix FA	0.284	0.285	0.0900		0.997	3.21E-01	0.964	1.04
Fin DR	0.0938	0.133	0.0633		0.707	4.81E-01	0.979	1.02
LN Sales	-0.0384	0.0163	-0.215		-2.348	2.06E-02	0.938	1.07
CR	-0.0190	0.0112	-0.157		-1.706	9.08E-02	0.930	1.08

Table C14: Multiple regression analysis for 2006, GOP vs. A/P.

Model Summary								
	R	R Square	Adjusted R Square	Std. Error of the Estimate				
	0.238	0.0564	0.0143	0.366				
Analysis of variance (ANOVA)								
	Sum of Squares	df	Mean Square	F	p			
Regression	0.896	5	0.179	1.340	0.253			
Residual	14.982	112	0.134					
Total	15.878	117						
	Unstandardised Coefficients		Standardised Coefficients		t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta				Tolerance	VIF
Constant	0.801	0.246			3.254	0.00151		
A/P	-0.000132	0.000158	-0.0796		-0.831	0.408	0.919	1.09
Fix FA	-0.497	0.251	-0.184		-1.978	0.0504	0.977	1.02
Fin DR	0.0457	0.139	0.0315		0.328	0.743	0.916	1.09
LN Sales	-0.00385	0.0149	-0.0248		-0.258	0.797	0.909	1.10
CR	-0.0671	0.0469	-0.140		-1.431	0.155	0.886	1.13

Table C15: Multiple regression analysis for 2007, GOP vs. A/P.

Model Summary							
	R	R Square	Adjusted R Square	Std. Error of the Estimate			
	0.186	0.0344	-0.00866	0.319			
Analysis of variance (ANOVA)							
	Sum of Squares	df	Mean Square	F	p		
Regression	0.406	5	0.0812	0.799	0.553		
Residual	11.388	112	0.102				
Total	11.795	117					
	Unstandardised Coefficients		Standardised Coefficients	t	p	Collinearity Statistics	
	Coefficient	Std. Error	Beta			Tolerance	VIF
Constant	0.643	0.246		2.612	0.0102		
A/P	-0.000297	0.000318	-0.0994	-0.934	0.352	0.761	1.31
Fix FA	0.365	0.220	0.161	1.656	0.101	0.910	1.10
Fin DR	-0.141	0.144	-0.0965	-0.979	0.329	0.888	1.13
LN Sales	0.000385	0.0139	0.00277	0.0277	0.978	0.868	1.15
CR	-0.0271	0.0406	-0.0702	-0.667	0.506	0.777	1.29

Table C16: Multiple regression analysis for 2003, GOP vs. INV.

Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.306	0.0938	0.0534	0.349	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	1.416	5	0.283	2.319	0.0480
Residual	13.675	112	0.122		
Total	15.091	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.887	0.249		3.562	0.000541
INV	-0.000282	0.000752	-0.0363	-0.375	0.708
Fix FA	0.648	0.272	0.223	2.385	0.0188
Fin DR	0.160	0.114	0.137	1.407	0.162
LN Sales	-0.0216	0.0156	-0.133	-1.386	0.169
CR	-0.0308	0.0497	-0.0653	-0.620	0.537

Table C17: Multiple regression analysis for 2004, GOP vs. INV.

Table 017: Multiple Regression analysis for 2004, Cor. for INV.					
Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.324	0.105	0.0647	0.352	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	1.626	5	0.325	2.619	0.0280
Residual	13.907	112	0.124		
Total	15.532	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.787	0.227		3.473	0.001
INV	-0.000562	0.000848	-0.0625	-0.662	0.509
Fix FA	0.908	0.264	0.315	3.440	0.001
Fin DR	0.0495	0.136	0.0353	0.363	0.717
LN Sales	-0.0169	0.0146	-0.105	-1.156	0.250
CR	0.00383	0.0523	0.00731	0.073	0.942

Table C18: Multiple regression analysis for 2005, GOP vs. INV.

Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.293	0.0861	0.0453	0.394	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	1.640	5	0.328	2.111	0.0690
Residual	17.406	112	0.155		
Total	19.046	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	1.198	0.253		4.740	6.33E-06
INV	-0.000424	0.000787	-0.0495	-0.539	0.591
Fix FA	0.370	0.287	0.117	1.288	0.201
Fin DR	0.115	0.136	0.0776	0.848	0.398
LN Sales	-0.0397	0.0167	-0.222	-2.384	0.0188
CR	-0.0208	0.0114	-0.172	-1.825	0.0707

Table C19: Multiple regression analysis for 2006, GOP vs. INV.

Table 07: Multiple Regression analysis for 2005, CO ₂ Ver Inv.					
Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.226	0.0510	0.00864	0.367	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	0.810	5	0.162	1.204	0.312
Residual	15.068	112	0.135		
Total	15.878	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.740	0.236		3.139	0.002169866
INV	-0.000146	0.000669	-0.0211	-0.219	0.827
Fix FA	-0.516	0.252	-0.191	-2.052	0.0425
Fin DR	0.0502	0.140	0.0346	0.360	0.720
LN Sales	-0.000706	0.0144	-0.00456	-0.0489	0.961
CR	-0.0599	0.0483	-0.125	-1.240	0.218

Table C20: Multiple regression analysis for 2007, GOP vs. INV.

Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.234	0.0547	0.0125	0.316	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	0.645	5	0.129	1.295	0.271
Residual	11.150	112	0.100		
Total	11.795	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.628	0.217		2.899	0.00450
INV	-0.00109	0.000600	-0.171	-1.813	0.0725
Fix FA	0.386	0.216	0.171	1.791	0.0760
Fin DR	-0.143	0.140	-0.0978	-1.018	0.311
LN Sales	0.00247	0.0131	0.0177	0.189	0.850
CR	-0.00913	0.0373	-0.0237	-0.245	0.807

Table C21: Multiple regression analysis for 2003, GOP vs. NTC.

Table 2: Multiple regression analysis for LSS, CCR, VCR, NTC.					
Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.336	0.113	0.0730	0.346	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	1.699	5	0.340	2.843	0.0190
Residual	13.391	112	0.120		
Total	15.091	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.806	0.250		3.229	0.00163
NTC	-0.00114	0.000720	-0.166	-1.586	0.115
Fix FA	0.556	0.275	0.191	2.025	0.0453
Fin DR	0.140	0.112	0.120	1.245	0.216
LN Sales	-0.0161	0.0159	-0.0988	-1.016	0.312
CR	-0.00211	0.0512	-0.00447	-0.0411	0.967

Table C22: Multiple regression analysis for 2004, GOP vs. NTC.

Table 6.22: Multiple regression analysis for 2004, 2007, and 2010					
Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.354	0.125	0.0859	0.348	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	1.941	5	0.388	3.199	0.0100
Residual	13.591	112	0.121		
Total	15.532	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.657	0.232		2.830	0.00552
NTC	-0.00140	0.000801	-0.184	-1.746	0.0836
Fix FA	0.813	0.266	0.282	3.056	0.00281
Fin DR	0.0824	0.135	0.0587	0.612	0.542
LN Sales	-0.0107	0.0150	-0.0666	-0.713	0.477
CR	0.0426	0.0569	0.0813	0.748	0.456

Table C23: Multiple regression analysis for 2005, GOP vs. NTC.

Model Summary						
	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	0.304	0.0923	0.0518	0.393		
Analysis of variance (ANOVA)						
	Sum of Squares	df	Mean Square	F	p	
Regression	1.758	5	0.352	2.278	0.0520	
Residual	17.288	112	0.154			
Total	19.046	117				
	Unstandardised Coefficients		Standardised Coefficients		t	p
	Coefficient	Std. Error	Beta			
Constant	1.170	0.242			4.830	4.368E-06
NTC	-0.000876	0.000853	-0.0957		-1.028	0.306
Fix FA	0.335	0.289	0.106		1.159	0.249
Fin DR	0.121	0.134	0.0816		0.902	0.369
LN Sales	-0.0377	0.0167	-0.211		-2.258	0.0259
CR	-0.0180	0.0115	-0.149		-1.566	0.120

Table C24: Multiple regression analysis for 2006, GOP vs. NTC.

Table 02.11. Multiple Regression Analysis for 2008, CO ₂ Variations						
Model Summary						
	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	0.265	0.0703	0.0288	0.363		
Analysis of variance (ANOVA)						
	Sum of Squares	df	Mean Square	F	p	
Regression	1.117	5	0.223	1.694	0.142	
Residual	14.761	112	0.132			
Total	15.878	117				
	Unstandardised Coefficients		Standardised Coefficients		t	p
	Coefficient	Std. Error	Beta			
Constant	0.813	0.236		3.453	0.000784	
NTC	0.000656	0.000425	0.152	1.541	0.126	
Fix FA	-0.458	0.251	-0.169	-1.821	0.0713	
Fin DR	0.0297	0.139	0.0205	0.214	0.831	
LN Sales	-0.00551	0.0146	-0.0355	-0.376	0.707	
CR	-0.0859	0.0486	-0.179	-1.766	0.0801	

Table C25: Multiple regression analysis for 2007, GOP vs. NTC.

Model Summary					
	R	R Square	Adjusted R Square	Std. Error of the Estimate	
	0.216	0.0465	0.0039	0.317	
Analysis of variance (ANOVA)					
	Sum of Squares	df	Mean Square	F	p
Regression	0.548	5	0.110	1.091	0.369
Residual	11.247	112	0.100		
Total	11.795	117			
	Unstandardised Coefficients		Standardised Coefficients	t	p
	Coefficient	Std. Error	Beta		
Constant	0.615	0.218		2.818	0.00572
NTC	0.000658	0.000434	0.155	1.515	0.133
Fix FA	0.329	0.213	0.145	1.542	0.126
Fin DR	-0.163	0.144	-0.112	-1.134	0.259
LN Sales	0.000144	0.0134	0.00104	0.0108	0.991
CR	-0.0374	0.0408	-0.0970	-0.918	0.361