



University of Venda

IMPACT OF WORKING CAPITAL MANAGEMENT ON THE PERFORMANCE OF NON-FINANCIAL FIRMS LISTED ON THE JOHANNESBURG STOCK EXCHANGE (JSE)

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Doctor of Philosophy in Economics

University of Venda

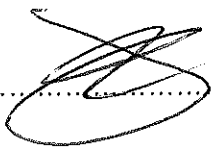
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21 November 2017



DECLARATION

I, Emmanuel K. Oseifuah, hereby declare that the thesis for the Doctor of Philosophy Degree at the University of Venda, hereby submitted by me, has not previously been submitted for a degree at this or any other university, and that it is my work in design and execution and that all reference material contained therein has been duly acknowledged.

Signature  Date: 21/11/2017

Acknowledgements

First and above all, I give the Lord God Almighty the glory for providing me this opportunity and granting me the capability to complete this work successfully. This thesis appears in its current form due to the assistance and guidance of several people. I would therefore like to offer my sincere thanks to all of them. Professor AB Gyekye, my esteemed promoter, my cordial thanks for accepting me as a Ph.D. student, your warm encouragement, thoughtful guidance, critical comments, and correction of the thesis. Also I want to express my sincere gratitude to Professor GNK Vukor-Quarshie, for the insightful discussion and valuable advice and unfettering support during the whole period of the study. A big 'thank you' to my spiritual parents, Apostle Dr/AM Masakona and his beloved wife, Pastor MF Masakona, for their constant and persistent prayers. Nobody has been more important to me in the pursuit of this study than the members of my family. I would like to thank my biological parents, Mr Godfred Oseifuah and Mrs. Louisey Oseifuah Xexemeku whose love and guidance are with me in whatever I pursue. They are the ultimate role models. Most importantly, I wish to thank my loving and supportive wife, Charity, and my two wonderful children, Abigail and Joel, who provide unending inspiration.

Abstract

This is the first study to investigate the impact of working capital management on the performance (profitability and value) of South African firms listed on the Johannesburg Securities Exchange (JSE) before, during and after the 2008/2009 global financial crisis. Richards and Laughlin's (1980) Cash Conversion Cycle (CCC) theory was used as the theoretical framework for analysing and linking working capital management to firm performance. In addition, the study investigates how the separate working capital management components impact the performance of firms. The study used both accounting and market based secondary data obtained from I-Net Bridge/BFA McGregor database and the JSE for 75 firms for the 10 year period, 2003 to 2012. Panel data regression models were used in the analyses.

The key findings from the study indicate the following. First, the average profitability (ROA) for the sample firms decreased from 27% (before the financial crisis) to 20.2% during the crisis period and increased to 25.9% after the financial crisis. Second, the average market capitalisation (firm value) decreased from R18.9 billion before the crisis to R16.3 billion during the crisis period, and thereafter increased to a high of R24.4 billion after the crisis. Third, the average firm's CCC was 28.4 days before the crisis and decreased to 12.5 days during the crisis period and later increased to 16.2 days after the crisis. Fourth, and interestingly, of the four working capital management variables, only accounts receivable conversion period is significantly negatively related to profitability during the financial crisis. Fifth, the three firm-specific variables (size, financial leverage, and current assets to total assets ratio) have no significant relation with profitability during the crisis period. Sixth, the external variable, change in GDP growth rate, has a significant positive relation with profitability. This suggests firms perform better when the economy is booming and otherwise during economic downturns, which is consistent with economic theory. Finally, and perhaps the most important contribution is that the study found an inverted U-shape relationship between working capital management (proxied by cash conversion cycle) and firm

value before the crisis. This implies that there exists an optimal level of investment in working capital for which the sampled firms' value is maximized. At this point, costs and benefits are balanced. Thus corporate managers should aim to keep as close to the optimal level as possible and try to avoid any deviations from it that destroy firm value. On the contrary, the results have not established any such relationship between working capital management and profitability for any of the three financial crisis periods. Based on the findings, it is recommended that firm managers should aim at keeping as close to the optimal working capital level as possible and try to avoid any deviations from it that may destroy firm value.

Key words: Firm value, Global financial crisis, Johannesburg Securities Exchange, Profitability, South Africa, Working Capital Management.

LIST OF ABBREVIATIONS

AP	Accounts Payable
AR	Accounts Receivable
CATA	Current Assets to Total Assets ratio
CCC	Cash Conversion Cycle
CCC ²	Cash Conversion Cycle Squared
EOQ	Economic Order Quantity
FAT	Financing Advantage Theory
FDT	Finance Distress Theory
FE	Fixed Effect
GDPGR	Gross domestic product growth rate
GWC	Gross working capital
ICP	Inventory Conversion Period
JIT	Just In Time
JSE	Johannesburg Securities Exchange
LEV	Leverage
MKTCAP	Market capitalisation
MPT	Market Power Theory
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OLS	Ordinary Least Square regression
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PQGT	Product Quality Guarantee Theory
RCP	Receivable Conversion Period
RE	Random Effect
ROA	Return on Assets
SMT	Speculative Motive Theory
TCT	Transaction Cost Theory
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WCM	Working Capital Management

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Signature Date:.....

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CHAPTER 1

INTRODUCTION

1.1 Background

Corporate finance theory contends that the primary objective of the firm is maximization of shareholders' wealth (Fabozzi and Drake, 2010; Arnold, 2012). The strong and widespread support for the shareholder wealth maximization (SWM) objective is due to the fact that shareholders possess the property rights of the firm and are thus entitled to decide what the firm should aim for. Since shareholders only have a single objective in mind, that is, wealth maximization, the goal of the firm is to maximize the firm's contribution to the financial wealth of its shareholders. In fact, it is widely accepted that shareholder wealth maximization enhances corporate decision-making and can be understood as a proxy for social welfare maximization (Boatright, 2006). According to Jensen (2001) the origins of the ideas shaping shareholder wealth maximization theory are more than 200 years old, with roots in Adam Smith's (1776) *The Wealth of Nations*.

An important catalyst for achieving the shareholder wealth maximization objective is working capital management (see for example, Smith, 1980; Soenen, 1998; Deloof, 2003). In his seminal work, Smith (1980) argued that efficient working capital management is imperative as it affects profitability, risk and ultimately firm value. Furthermore, Shin and Soenen (1998) offer the following observations about the relationship between working capital management and shareholder wealth: "efficient working capital management is an integral part of the overall corporate strategy to create shareholder value." Lastly, Deloof (2003) asserted that managers can create value for their shareholders via efficient working capital management by reducing the number of days in accounts receivable and inventory to a reasonable minimum. The above views suggest that working capital management is critically important for all businesses (regardless of

size) and analysis of its relationship with corporate performance, especially during economic crisis, requires further empirical study in the context of a developing country like South Africa.

1.2 Working capital management and shareholder wealth maximization

The implications of efficient working capital management (WCM) for value creation for shareholders has been the focus of several empirical studies. Most researchers have argued that efficient working capital management is very imperative in the realization of the shareholder wealth maximization objective because it influences a firm's risk, profitability and ultimately shareholders' wealth (Smith, 1980; Deloof, 2003; Kieschnick, Laplante, and Moussawi, 2013; Deutsche Bank, 2014; Aktas, Croci, and Petmezas, 2015). Dong and Su (2010) echoes the importance of working capital management and its consequence on shareholders wealth creation by emphasising that working capital management is a continuous function which is linked to the survival of firms and if WCM is not given due consideration, the firm cannot survive for a longer period.

In a recent study, Deutsche Bank (2014) surveyed 122 corporate treasurers (of companies with turnover of more than €1 billion) across Europe and found that working capital initiatives are frequently used element of corporate performance management, with 60% of the respondents stating that they have a programme in place. In another study, Watson and Head (2007), asserted that working capital management is a vital factor in a firm's long-term success and without the 'oil' of working capital, the 'engine' of fixed assets will not function. Consistent with the above studies is Ernst and Young's (2009) working capital study which reported that the 2000 leading companies in the USA and Europe have ample opportunities to release liquidity of about US\$ 1 trillion from working capital during the 2008/2009 financial crisis. This finding is in agreement with Lai's (2012) study which identified working capital as a catalyst for the resuscitation of most businesses worldwide after easing of the global financial crisis. In line with the above studies is REL's (2011) working capital survey which reported that most large companies in Europe increased their

revenue by 14.9% in 2010 and have either maintained or increased their margin revenue which is connected to working capital management. More recently Aktas, Croci, and Petmezas (2015) in their study of US businesses noted that at the end of 2011, the firms' total investment in working capital (i.e., inventory and receivables) amounted to \$4.2 trillion, which accounts for 24% of their total sales and about 18% of the book value of their assets (40% of this aggregate working capital was financed by accounts payable, leading to an aggregate investment in net operating working capital (NWC) of \$2.5 trillion. On the basis of the results, the authors concluded that US businesses maintained that working capital represent a significant portion of the total assets and total sales of businesses in the US. It is no surprise that Flanagan (2005) refer to working capital as the lifeblood of businesses, and therefore corporate managers must endeavour to keep working capital flowing and use the cash flows to generate profits.

It is therefore obvious to conclude that efficient management of working capital can enhance the value of businesses (de Almeida and Eid Jr., 2014). On the contrary, inefficient working capital management (WCM) has long been cited as a major cause of business failure in some developed economies like the USA, UK, Canada and Australia, (Altman, 1968; Smith, 1973; Largay and Stickney, 1980; Pike and Pass, 1984; Shin and Soenen, 1998). For example, Altman's (1968) Multivariate Discriminant Analysis (MDA) model used to determine corporate failures (based on a sample of 33 publicly-traded US manufacturing companies that failed between 1946 and 1965) includes working capital as one of the model's components. In a similar study in the UK, Taffler (1982) developed a four-variable model of failure prediction in which all the four variables include a variant on working capital as a component. It is no surprise that interest in WCM has assumed a greater significance now than ever before for businesses and researchers in the wake of the 2009 global financial crisis which had strained the financial resources of many firms (Ernst and Young, 2009; Greenberg, 2009; Correia, Flynn, Uliana & Wormald, 2011).

Based on the preceding discussions, it is argued in this thesis that WCM is undoubtedly a very important aspect of shareholders' wealth maximization process because efficient WCM not only

affects a firm's long-term survival but also profitability, liquidity and ultimately its value. Therefore, an analysis of the effect of working capital management and its components on firm performance (profitability and value) is necessary and imperative in the South African environment. Having demonstrated the critical utility of WCM in today's business, the next section proceeds to describe the problem to be investigated.

1.3 Problem statement

Ever since the seminal work by Gitman (1974) in which he presented the cash cycle concept as a means of managing a firm's current assets and current liabilities and its implications for firm liquidity, numerous studies have been conducted to measure the relationship between working capital management and performance of firms. Richards and Laughlin (1980) subsequently operationalised the cash cycle concept into the Cash Conversion Cycle (CCC) theory for analysing firms' working capital management efficiency. The central thesis for this study derives from the CCC theory which posits that, *ceteris paribus*, efficient working capital management (i.e. a short cash conversion cycle) will increase a firm's liquidity, profitability and concomitantly its value, while inefficient working capital management (i.e. a long cash conversion cycle) will lead to lower profitability and lower firm value.

So far there is no consensus in the findings in the existing empirical literature on the nature or the relationship between CCC and profitability or firm value. The findings can be classified into two broad categories: 1) linear (positive or negative) relationship between CCC and both profitability and firm value (see for example, Smith, 1980; Deloof, 2003; Erasmus, 2010; Siame, 2012; Wasiuzzaman *et al.*, 2013; Aktas *et al.*, 2015; Daisuke, 2017), and 2) non-linear relationship between CCC and both profitability and firm value (Garcia-Teruel and Martínez-Solano, 2007; Baños-Caballero, García-Teruel, and Martínez-Solano, 2014). Empirical studies carried out in South Africa have exhibited similar ambivalence in respect of the link between WCM and firm performance. With the exception of Kwenda (2014) who reported a non-linear relationship

between firm value and WCM, all other studies supported the first group (see for example Smith and Fletcher, 2009; Erasmus, 2010; Ncube, 2011; Siame, 2012; Chirume, 2013).

Further, studies on the relationship between WCM and firm performance before, during and after the global financial crisis is lacking, especially in developing countries and this gap needs to be filled (Baveld, 2012; Haron & Nomran, 2015). The present study thus aims to improve the understanding of how publicly listed firms managed their working capital to respond to the global financial crisis in the South African environment. As pointed out by Kieschnick and Rotenberg (2016), crises create opportunities to observe firm behaviour that may be difficult or impossible to observe under stable business conditions. The central problem for this thesis therefore is to *evaluate the efficacy or otherwise of Richards and Laughlin's (1980) Cash Conversion Cycle theory on working capital management for sustained financial performance in the South African environment before, during and after the 2008/2009 global financial crisis.*

1.4 Research questions

The following research questions consistent with Richards and Laughlin's (1980) CCC theory and other empirical work devoted to the analysis of the nexus between WCM and both profitability and firm value will be addressed:

1. What is the relationship among cash conversion cycle (CCC), its components (ICP, RCP, and PDP) and profitability of JSE-listed firms, before, during, and after the global financial crisis?
2. What is the relationship among cash conversion cycle (CCC), its components (ICP, RCP, and PDP) and value of JSE- listed firms before, during, and after the global financial crisis?

1.5 Aim and objectives of the study

1.5.1 Aim

The aim of the study is to assess the effect of working capital management on the performance of a sample of JSE-listed firms before, during, and after the global financial crisis.

1.5.2 Objectives

The objectives of the study are:

- i) To assess the relationship between CCC and its components (ICP, RCP and PDP) and profitability of JSE-listed firms before, during and after the global financial crisis.
- ii) To evaluate the relationship between CCC and its components (ICP, RCP, and PDP) and value (market capitalisation) of JSE- listed firms, before, during and after the global financial crisis.

1.6 Significance of the study

This research contributes to the extant literature on the relationship between WCM and performance (profitability and value) of JSE-listed firms in several ways. First, while the nexus between WCM and corporate performance has been extensively researched worldwide, few studies have been carried out in South Africa (Ncube, 2011). This study fills the gap by examining the effect of working capital management and its components (inventory, accounts receivable, and accounts payable) on profitability and also between CCC and firm value in the South African environment. Second, all previous researchers have studied the relationship between working capital management and firm performance during non-crisis periods. This study extends the literature by analysing the impact of the Global Financial Crisis on the economy at the micro-economic (firm) level. Lastly, the study investigated a possible non-linear relationship between WCM and both profitability and firm value before, during and after the global financial crisis.

1.7 Scope of the study

The study focuses exclusively on firms which have traded on the JSE over the decade 2003 - 2012. Also the theoretical framework uses the aggregate summary indicator: cash conversion cycle (CCC) (Emery, 1984) and market capitalization model to measure working capital management and firm value respectively. Furthermore, financial services firms were excluded from the sample for the following reasons. Firstly, financial services firms (e.g. banks, insurance and investment firms) have certain regulations that are somehow different from those required by nonfinancial firms. Secondly, and as argued by Falope and Ajilore (2009), financial services firms' financial characteristics and investment in working capital are largely different from non-financial firms. Thirdly, the exclusion of the financial services firms allow for easy comparability with prior studies, which also excluded financial services companies (e.g. Deloof 2003; Lazaridis and Tryfonidis 2006; Falope and Ajilore 2009; Kieschnick, Laplante, and Moussawi, 2013). Lastly, firms with missing data, newly listed firms as well as delisted firms were excluded from the study. Having presented the scope of this study, the next section proceeds to provide an overview of the 2008/2009 global financial crisis given that the crisis was characterised by severe liquidity shortages, an important element of working capital management.

1.8 Organisation of the thesis

The study comprises six chapters and is structured as follows. The first chapter presented the background, the research problem, research questions, aim and objectives, significance and scope of the study. Brief background of the global financial crisis were also presented in this chapter. Chapter two provides a brief overview of the JSE and related Indices designed to determine the performance of listed firms as well as the overall performance of the JSE and its contribution to the larger economy. Chapter three discusses the theoretical framework and reviewed both theoretical and empirical literature on the link between working capital management and firm performance in developed and developing countries as well as South

Africa. Chapter four presents the research methodology by describing the research design, analytical framework, empirical models, variables, hypotheses, and data analysis methods employed to address the research questions. Chapter five focused on data analysis and discussion of results. The sixth and final chapter summarises the study by outlining its key findings, highlights the major conclusions drawn from the results, and provides recommendations to South African corporate managers. The conclusion offers suggestions for possible future working capital management research areas.

1.9 Chapter Summary

This chapter introduces the study by presenting the background to shareholder wealth maximization which is central to corporate financial management. This was followed by a discussion of the utility of WCM in today's businesses, problem statement, and research questions. The chapter concludes with a discussion of the scope and significance of the study.

CHAPTER 2

OVERVIEW OF JOHANNESBURG SECURITIES EXCHANGE (JSE) AND THE GLOBAL FINANCIAL CRISIS

2.1 Introduction

To understand the nexus between working capital management and performance of JSE-listed firms, including the influence of the global financial crisis, a brief overview of the JSE and its role in the South African economy as well as an overview of the global financial (GFC) crisis is in order.

2.2 JSE and its role in the South African economy

The JSE Securities Exchange (JSE), formerly known as the Johannesburg Stock Exchange (JSE), occupies a powerful position in South Africa's economic landscape, providing a Primary and a Secondary Market as well as post-trade and technology services. The JSE was founded in 1887 during the country's first gold rush. It is important to emphasise that prior to 1887, other exchanges were established in some parts of South Africa. Specifically, Pietermaritzburg (1866) though it's first listing was in 1881 and it became an official exchange only in 1888, Kimberly (1881) and Barberton (1885) all preceded the JSE yet none survived long into the 20th century (Brown, 2017).

Until 1996, the JSE used the open outcry trading system. This was subsequently replaced by an electronic clearing and settlement system, known as Shares Transactions Totally Electronic (Strate) in 1997, while the Alternative Exchange (AltX) was opened in 2003. The exchange was demutualised in 2005 and listed on itself in 2006 and changed its name from the Johannesburg Stock Exchange to the JSE Securities Exchange (JSE). In 2012 the JSE implemented the Millennium Exchange trading platform, and its trading nexus was moved from London, where it had been situated for five years, to Johannesburg.

In terms of regulation, the first Stock Exchange Control Act was published in 1947 and the second in 1985, while the Insider Trading Act was passed in 1999. The Securities Services Act followed in 2004, and was replaced in 2012 with the Financial Markets Act (FMA). The 2012 act was designed to modernise the sector and keep its supervision up to date and harmonised with international standards. The act took into account a number of factors such as International Organisation of Securities Commissions principles, IMF and World Bank recommendations, G20 proposals, the 2008/2009 financial crisis, developments in other jurisdictions, and domestic legislative changes.

The JSE is ranked as the 19th largest stock exchange in the world by market capitalisation and the largest stock exchange in Africa in terms of market capitalisation and value traded (JSE 2013 Annual Report; JSE, 2015) and is commonly classified as an emerging market. It is a member of the World Federation of Exchanges (WFE), the African Stock Exchanges Association (ASEA) as well as the SADC Committee of Stock Exchanges (COSSE). An important development in the history of the JSE is the introduction of the inward dual listing in 2003. Dual listings allows foreign companies to list on the JSE which will provide local investors with a more cost effective means to diversify their portfolios and also open opportunities for local brokers, entrepreneurs and vendors on the JSE.

In terms of liquidity, the JSE is considered as a multi-asset class securities exchange, offering investors deep liquidity across its product range. It provides: 1) a primary market – sourcing issuers to list and supporting potential and existing issuers, 2) a secondary market that facilitates trading in: equities; financial derivatives; commodity derivatives; currency derivatives; and interest rate instruments; 3) Post-trade services – through one of its divisions responsible for clearing, settlement and assurance; 4) technology services – that support the JSE's operations; and 5) information services, including market data. In addition it regulates the primary and secondary markets. The JSE's Main Board has 388 established listed companies with a total market capitalisation of R14 271 billion (at 31 December 2016), while AltX, the market for small and

medium-sized companies now boasts approximately 65 listed companies with a total market capitalisation of R33.9 billion at the end of December 2015 (JSE, 2015). The JSE's market liquidity as at the end of 2016 financial year was 80% (2015: 67%) (JSE, 2016).

Globally, the JSE is recognised for its regulatory quality; South Africa has been ranked as having the best regulated exchange for four consecutive years by the World Economic Forum. The recent World Economic Forum Global Competitiveness Report (2016) ranked South Africa as first in terms of strength of auditing and reporting standards, protection of minority shareholders' rights, and financing through the local equity market; second in terms of financial services meeting business needs and soundness of banks, and third in terms of efficiency of corporate boards and regulation of securities.

The significance of a stock exchange in economic development is evident. Basically, a stock market's chief function is to allocate resources optimally and provide liquidity. Recent studies have shown that stock markets not only match buyers with sellers and ensure trades are completed, but also measures a country's economic conditions, promote economic growth and encourage investment on a safe platform (Bell, 2015; Pujari, 2015). With specific reference to South Africa, there is no disputing the fact that the JSE's ability to attract both foreign and domestic investors makes a huge contribution on investment rate in South Africa. Investment in turn, promotes economic development through its direct and indirect impact on economic growth and job creation. Indeed, Firer *et al.*, (2012) opined that, the JSE is a magnet for foreign investment in South Africa, with more than half of the trading at times attributed to foreign investors.

2.3 SA Sector Companies Classification

According to the JSE (2015), the SA sector companies' classification (SA Resources, SA Industrials or SA Financials) is mapped directly to the global Industry Classification Benchmark (ICB) methodology. ICB is used to categorise all companies listed on the JSE, regardless of their

eligibility for the FTSE/JSE Africa Index Series, and was introduced at the JSE in January 2006. The primary purpose of the ICB is to provide a service to investors in quoted equity securities by grouping companies within homogenous subsectors. Subsectors are grouped into Sectors and Sectors are aggregated into Supersectors, which are further aggregated into Industries. The ICB uses a system of 10 industries, partitioned into 19 supersectors, which are further divided into 41 sectors, which then contain 114 subsectors (FTSE, 2017). The current full ICB/SA sector structure is provided in Appendix A.

The SA sector classification comprises three broadly representative sectors defined as follows: 1) SA Resources is composed of JSE listed companies that belong to ICB industries - oil & gas and basic materials; 2) SA Financials represents JSE listed companies that belong to ICB industry, financials; and lastly, 3) SA industrials refers to all remaining JSE listed companies that do not belong to ICB resources and financials sectors. Section 2.3.1 provides a brief analysis of the above three key sectors and their role in the South African economy, while Section 2.3.2 presents and briefly analyses the composition of the three sectors in terms of listed firms over the study period.

2.3.1 Resources

The resources sector which comprises companies operating in the oil & gas and basic materials sectors, represent about a quarter of the market capitalisation of the JSE (Hackland, 2015). This sector is the foundation on which the South African economy developed in terms of its contribution to GDP and employment (Brand South Africa, 2014). According to Government Communications and Information Systems (2015), despite the recent decline of the South African mining sector, the resources industry remains an attractive industry with the potential for further development.

2.3.2 Industrials

The industrial sector comprises companies operating in all sectors except oil & gas, basic materials, and financial services sectors. According to Mfeti (2015), the Industrial sector is currently the most represented sector on the JSE in terms of market capitalisation and the number of shares that make up the index. The All Share Index (ALSI) has 170 constituents and 53% (90) of those constituents are Industrials. Therefore the sector is the most represented in the overall index in terms of the number of counters. The industrial's market capitalisation is 64% of the All Share Index's market cap while Financials and Resources are 24% and 12% respectively as at 30 September 2015 (JSE, 2015).

2.3.3 Financials

According to the National Treasury (2011), the financial services sector is at the heart of the South African economy at both micro-economic and macro-economic levels. At the micro-economic level, financial services allow households to make daily economic transactions, save and preserve wealth to meet future aspirations and retirement needs, and insure against personal disaster. At the macroeconomic level, the financial services sector enhances business development and growth, enables economic growth, job creation, the building of vital infrastructure and sustainable development for South Africa.

The financial sector in South Africa comprises over R6 trillion in assets, contributing 10.5 per cent of the gross domestic product of the economy annually, employing 3.9 per cent of the employed, and contributing at least 15 per cent of corporate income tax (National Treasury, 2011). Since 2000, the sector has grown at an annual rate of 9.1 per cent by value added, compared to broader economic growth of 3.6 per cent. Growth in employment has also been very strong. Over the same period, the number of people employed in this sub-sector increased by 24.5 per cent, making the financial sector one of the fastest-growing employers in South Africa. The next Section

presents and briefly analyses the composition of the above sectors in terms of their constituent firms listed on the JSE over the study period.

2.4 Composition of Industry sectors used in the study

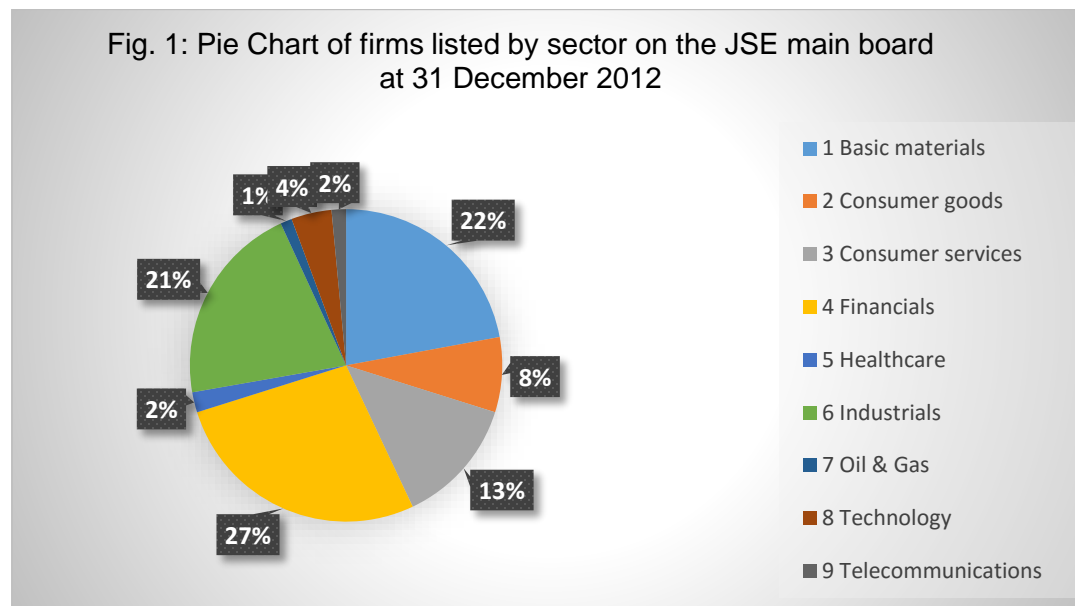
Table 1 presents the total number of firms listed on the JSE based on Industry Classification Benchmark (ICB) as at 31 December 2012.

Table 1: No. of firms listed on the JSE main board at 31 December 2012

No.	Sector (ICB Industry Long Name)	No. of firms	% of population
1	Basic materials	74	22.1%
2	Consumer goods	26	7.8%
3	Consumer services	44	13.1%
4	Financials	91	27.2%
5	Healthcare	7	2.1%
6	Industrials	70	20.9%
7	Oil & Gas	4	1.2%
8	Technology	14	4.2%
9	Telecommunications	5	1.5%
	Total	335	100%

Source: Johannesburg Stock Exchange (www.jse.co.za); Author's own calculation.

The above table is displayed on the pie chart in figure 1.



The pie chart in Figure 1 shows that about 27% of the total firms listed on the JSE at 31 December 2012 are in the financial services sector, followed by basic materials (22%), industrials (21%) and consumer services (13%) in the second, third and fourth places respectively. The fifth largest sector is consumer services (8%), followed by technology sector (4%) in the sixth position. The sample of firms selected from the population of firms listed on the JSE at 31 December 2012 is presented in Table 2, Figure 2 and Figure 3, respectively.

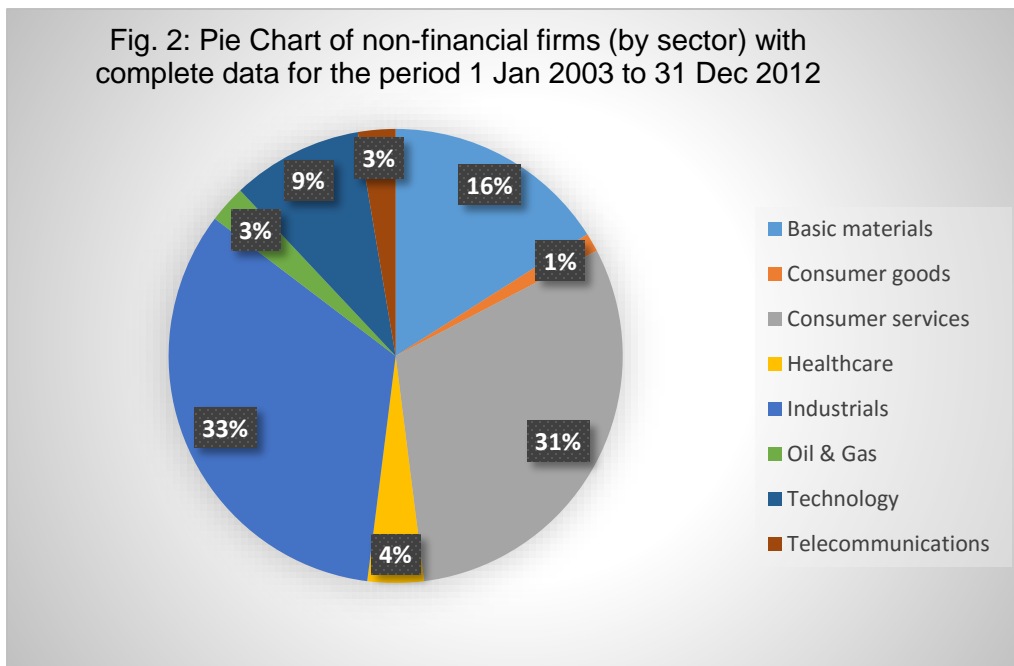
Table 2: Listed non-financial firms (by sector and market capitalisation) as at 31 Dec. 2012

	Industry	No. of firms	Percent of sample selected	Percent of population of JSE listed firms	Market CAP (R billion) at 31 December 2012
1	Basic materials	12	16.00%	3.58%	3939.49
2	Consumer goods	1	1.33%	0.30%	110.43
3	Consumer services	23	30.67%	6.87%	2756.457
4	Healthcare	3	4.00%	0.90%	515.46
5	Industrials	25	33.33%	7.46%	1635.488
6	Oil & Gas	2	2.67%	0.60%	1755.94
7	Technology	7	9.33%	2.09%	36.74
8	Telecommunications	2	2.67%	0.60%	2338.52
	Total	75	100.00	22.4%	13088.53

Source: Author's own calculation

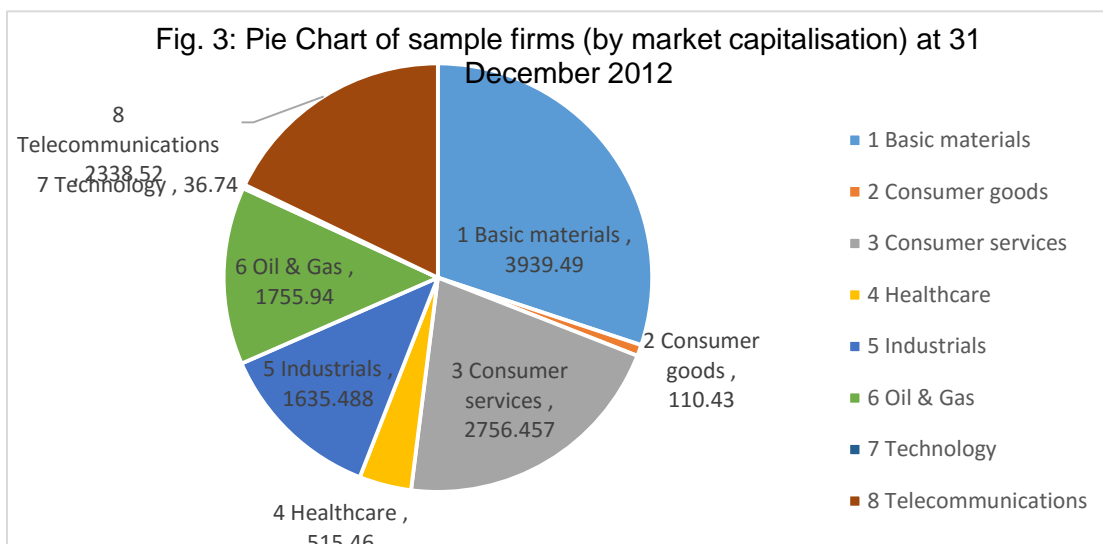
The above data is displayed in the pie chart below.

Fig. 2: Pie Chart of non-financial firms (by sector) with complete data for the period 1 Jan 2003 to 31 Dec 2012



The pie chart above shows that industrial sectors forms about 33% of the sample of all non-financial firms. Consumer services sector comes second (31%), followed by basic materials (16%), and technology (9%).

Fig. 3: Pie Chart of sample firms (by market capitalisation) at 31 December 2012



The pie chart in Figure 3 shows that the largest five sectors (excluding financial sector) in the sample, in terms of market capitalisation, are basic materials (R3939.49 billion), consumer services (R2756.46 billion), telecommunications (R2338.52 billion), oil and gas (R1755.94 billion),

and industrials (R1635.49 billion) respectively. The next section presents and discusses key JSE Indices designed to determine the performance of companies listed firms and their relationship with the JSE's overall performance.

2.5 JSE Indices (FTSE/JSE Africa Index Series)

Stock market Indices offer a simple way to determine the overall performance of the stock market and its contribution to the economy (Visser, 2015; Sayed et al., 2017). The JSE provides market data of JSE listed companies and its major sectors via FTSE/JSE Africa Index Series. This is a joint venture between the JSE and the FTSE Group (a world leader in the management of indices). The FTSE/JSE Africa Index Series is designed to represent the performance of South African companies, providing investors with a comprehensive and complementary set of indexes, which measure the performance of the major capital and industry segments of the African market. There are different types of the FTSE/JSE Africa Index Series. For the purposes of this study, the following indices will be discussed. The market benchmark is the FTSE/JSE All Shares Index (ALSI), segmented into FTSE/JSE Top 40 Index (J200), FTSE/JSE Industrials 25 Index (J211), FTSE/JSE Resources 10 Index (J210), and FTSE/JSE 15 Financials Index (J212). According to the JSE (2015), SA Resources currently accounts for approximately 12% of the ALSI, SA Industrials for 64% and SA Financials for 24%.

2.5.1 FTSE/JSE Africa All Shares Index (ALSI)

The FTSE/JSE All Share Index is the largest index in terms of size and overall value governed by a clear set of index ground rules. One of the rules stipulates that the ALSI will be constituted by shares that make up 99% of the eligible market cap of all the shares on the JSE Main Board. The rule does not have a fixed number of constituents, but typically consists of \pm 160 companies. Therefore, although the FTSE/JSE All Share Index (ALSI) constitutes 99% of the eligible market

cap and liquidity of all the shares listed on the JSE Main Board, it consists of only about fifty percent of the listed firms (in terms of number of listings).

2.5.2 FTSE/JSE Top 40 Index (J200)

The FTSE/JSE Top 40 Index consists of the Top 40 biggest companies trading on the JSE ranked by market capitalisation. It is the flagship tradable index of the JSE comprising only 40 companies (i.e. about 25%) of those included in the ALSI. According to the JSE (2016), at the end of June 2014, the R6.06 trillion total market capitalisation of the Top 40 Index represented approximately 80% of the total R7.26 trillion market capitalisation of the ALSI (JSE, 2016).

2.5.3 FTSE/JSE Industrials 25 Index (J211)

The FTSE/JSE Industrial 25 consists of the 25 largest companies by market capitalisation in the basic industrial or general industrial economic groups. According to Mfeti (2015) of the 170 constituents that make up the All Share Index (ALSI), 90 (53%) of those constituents are Industrials. Therefore the sector is the most represented in the overall index in terms of the number of constituents. Also, J211's market capitalisation is 64% of the All Share Index's market cap while Financials and Resources are 24% and 112 respectively as at 30 September 2015 (JSE, 2016).

2.5.4 FTSE/JSE Resources 10 Index (J210)

The FTSE/JSE Resources 10 Index is composed of the 20 largest companies of the resource sector ranked by market cap (JSE Limited, 2015). This sub-index is deemed to be a good representation of the performance of the largest companies within resources sector.

2.5.5 FTSE/JSE 15 Financials Index (J212).

The FTSE/JSE 15 Financials index comprises 15 ALSI companies that are classified as Financials, when ranked by market capitalisation. This sub-index is deemed to be a good representation of the performance of the largest companies within financials sector.

2.6 Overview of the Global Financial Crisis (GFC)

The 2008/2009 global financial crisis is considered by many economists as the most severe economic crisis since the Second World War (Romer, 2009; Aiginger, 2010; Eigner and Umlauf, 2015). According to Foster and Magdoff (2009) the financial crisis started in mid-2007 when two hedge funds, belonging to the American firm Bear Stearns collapsed, and peaked with the collapse of US investment bank, Lehman Brothers, in September 2008. As a result of the ensuing panic and uncertainty, financial institutions became unwilling to lend to each other and liquidity in the interbank funding market dried up. Thus, governments worldwide were forced to provide extraordinary support to financial institutions by buying debt worth hundreds of billions of dollars and bailing out distressed companies (National Treasury, 2011).

The financial crisis rocked financial markets worldwide negatively impacting firms' ability to access funds as more stringent measures were applied by banks to borrowers. The aftermaths of the financial crisis has decreased production, sales and the availability of funds for firms. This was coupled with an increase in layoffs, bankruptcies and central banks' interventions – illustrating the serious consequences of the crisis. Indeed, the financial turmoil highlighted the importance of access to short-term financing and renewed the interest in improving working capital management (Haron & Nomran, 2015). To take a case in point, in 2008 two large United States automobile manufacturers (General Motors and Chrysler) had to request for a bailout from the government to finance their working capital to save them from collapse, which would have resulted in about 350 000 direct job losses and approximately 4.5 million indirect job losses (Healey et al., 2008). By contrast, Ford, the third largest US automobile manufacturer did not need the funds as

desperately as General Motors or Chrysler due to astute financial planning it made in anticipation of the financial crisis. Surprisingly, in 2006 the three companies were reported to be holding more than US\$7.6 billion in excess working capital.

The above cases validate the argument that companies usually care less about liquidity positions until they reach the point of bankruptcy or are on the verge of collapse (Nicholas, 1991). Further, it is widely acknowledged that firms turn to overlook the issue of working capital management during periods of economic growth and scrambled to improve when the economy contracted. Such cases serve to highlight that corporate failure has ripple effects, hence the need to address the subject of working capital financing and investment as an important area of corporate financing.

The financial crisis had severe impact on the South African economy and hence financial performance of companies operating in the country (Te Velde, 2008; Bureau for Economic Research, 2009). The National Treasury (2011) noted that even though South Africa has sound macroeconomic fundamentals and a robust financial regulatory framework, the country suffered more proportionately from the financial crisis compared to other G-20 countries, with job losses of close to 1 million jobs; foreign investments were also adversely affected (Te Velde, 2008). According to Kesimli and Gunay (2011), some firms downsized their operations, slashed capital expenditure and deferred expansion programmes. Kesimli et al (2011) emphasise that firms can cushion themselves against credit crunch and reduced access to external funds by efficiently managing their working capital. This sentiment was echoed by Siddiquee and Khan (2009) who argued that during economic downturns, companies with efficient working capital management practices can implement counter-cyclical measures to build a competitive advantage using internally generated funds to finance their programmes and expansion.

Given that efficient working capital management enables firms to withstand the impact of economic upheavals (Reason, 2008), this study tests how the global financial crisis affected working capital management and performance of JSE-listed firms. As pointed out by McGuinness

(2015), understanding the decision making process by firms under financial constraints and economic contraction is important for informing policy makers and improving our understanding of businesses. In line with previous studies, the effect of the global financial crisis on South African firms can be categorised into three phases as follows: 2003-2006 (pre-crisis period), 2007-2009 (crisis period), and 2010-2012 (post-crisis period) (Thompson, Cassie & Joseph Cotton, 2010; Haron & Nomran, 2015; Daisuke, 2017).

2.7 Chapter Summary

This chapter provided a brief overview of JSE sectors and their role in the South African economy. It also presented a brief analysis of ICB classification of firms used in this study followed by a discussion of the JSE Indices designed to measure the performance of listed firms. The chapter concluded with an overview of the global financial crisis (GFC). The next chapter presents a review of the extant literature which forms the basis for choice of methodology and development of testable hypotheses.

CHAPTER 3

LITERATURE REVIEW

3.1 Overview

This study investigated the impact of working capital management on the performance of JSE-listed firms before, during and after the 2008/2009 global financial crisis. Before delving into review of the literature on working capital management, profitability and firm value, it is necessary to situate the present study within a theoretical context which derives from the literature. Adams and White (1994) asserted that ‘without a sound theoretical framework, the thesis remains a ‘mindless...theoretical wasteland’’. In fact, Adams, Khan, Raeside and White (2007) echoed the above view and suggested that without theory, it is almost impossible to interpret data. In other words, an appropriate theoretical framework is vital for determining the kind of data required in order to answer the stated research questions. The next section presents the theoretical framework for the study.

3.2 Theoretical framework

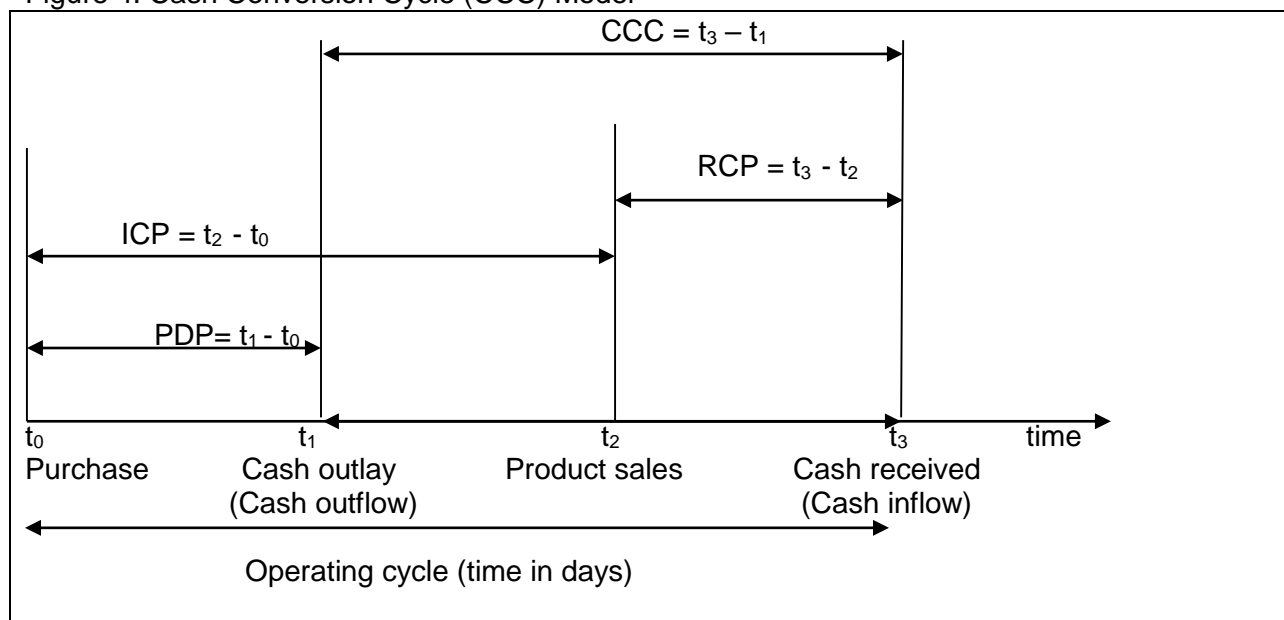
A theoretical framework provides the context for conducting research and interpreting findings (Turner, Balmer & Coverdale, 2013). This study uses the Cash Conversion Cycle (CCC) theory to develop the theoretical framework and explain how WCM and its separate components can predict a firm’s profitability and value.

3.2.1 Cash Conversion Cycle (CCC)

The Cash Conversion Cycle (CCC) was originated by Gitman in 1974 and further developed by Richards and Laughlin in 1980. Gitman (1974) defined the cash conversion cycle in terms of the cash cycle (CC) as the number of days between obtaining inventory and collecting account receivables. Richards and Laughlin (1980) subsequently revised the cash cycle by subtracting

the number of days in account payables to get the CCC. For the purpose of developing the study's theoretical framework, the CCC theory is re-stated here. The CCC theory posits that *ceteris paribus*, a short cash conversion cycle will increase a firm's liquidity, profitability and concomitantly, firm value, while a long CCC (conservative working capital policy) will lead to both lower profitability and firm value. According to Richards and Laughlin (1980), the cash conversion cycle is 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. Thus, the CCC essentially establishes the period of time required to convert a rand of cash disbursements back into a rand of cash inflow from a firm's regular course of operations. Farris and Hutchison (2002) emphasised that firms can use the cash conversion cycle to evaluate changes in circulating capital and thereby assist in the monitoring and control of its components. The CCC model (**graphically presented in figure 4**) can be expressed mathematically as: $CCC = ICP + RCP - PDP$, where ICP is the inventory conversion period, RCP refers to the receivables conversion period, and PDP is the payables deferral period. Explanation of measurement of these variables is provided in chapter 4. The underlying assumptions of the CCC theory are presented next.

Figure 4: Cash Conversion Cycle (CCC) Model



Source: Adapted from Richards and Laughlin (1980, p.33) and Lind et al., (2012, p.2)

3.2.2 Underlying assumptions of Cash Conversion Cycle (CCC) theory

The CCC theory relies on four key assumptions (Richards and Laughlin, 1980). First, managers can improve their firms' profitability and value by reducing the CCC through efficient management of inventory, accounts receivable, and accounts payable as well as adopting appropriate working capital policy (WCP) (Awopetu, 2012; Bei & Wijewardana, 2012). As an illustration, managers can reduce the average accounts receivable period through sound trade credit and collection policies or extend the accounts payable period through a strategic collaboration with suppliers (Kroes & Manikas, 2014). Business managers could also optimize the CCC by adopting an aggressive or conservative WCP that meets the firm's operational and market requirements (Weinraub & Visscher, 1998). Second, it is assumed that an optimal level of WCM and WCP exists for all firms. This means that businesses could balance the trade-offs between risk and return by manipulating the components of WCM and WCP (Awopetu, 2012; Ebben & Johnson, 2011). A longer or shorter than optimal CCC may reflect the ability or inability of managers to convert cash outflows into cash inflows quickly (Richards & Laughlin, 1980). The length of the cycle may also reflect the ability or inability of managers to formulate and implement appropriate policies (Weinraub & Visscher, 1998). The third assumption is that WCM and WCP have complementary effects on firm profitability (Bei & Wijewardana, 2012; Gill & Biger, 2013; Mathuva, 2014). As pointed out by Sabri (2012) and Yazdanfar & Ohman (2014), among others, profit maximization depends on effective WCM and WCP. Lastly, it is assumed that business leaders can influence organizational factors such as trade credits and inventory policies that may affect WCM and WCP (Talonpoika, Monto, Pirttila, & Karri, 2014).

It is important to emphasise, however, that the above assumptions are not without limitations. For example, reducing the terms of credit for customers would lead to a reduction of the product's attractiveness from a customer's perspective and lead to a reduction in sales volume and revenue. Similarly delaying payment to suppliers will not be well received and is likely to lead to

an increase in the cost of goods supplied (Banomyong, 2005). Having presented the underlying assumptions of the CCC theory, the following section briefly discusses the application of the cash conversion cycle theory to working capital management.

3.2.3 Cash Conversion Cycle theory and working capital management

The practical implications of the CCC theory and its assumptions is that companies should generally aim to have the shortest possible cycle as it means capital is tied up for less time. This means that the efficiency of internal operations of the firm will eventually result in an increase in the firm's returns on investment, a rise in the net present value (NPV) of associated cash flows, and higher firm value (Gentry et al, 1990; Farris and Hutchison, 2002). Indeed, the CCC is cited by several scholars as one of the accurate measures of companies' financial health, particularly during periods of growth (e.g. Shin and Soenen, 1998; Deloof, 2003; Hutchison et al., 2007; Ulbrich et al., 2008).

Prior studies relating to WCM and performance of firms have demonstrated that both firm-specific (internal) variables and macroeconomic (external) variables affect the efficiency of WCM which in turn influence profitability, liquidity and firm value (see for example, Banos-Caballero et al., 2014; Padachi et al., 2006; Raheman et al., 2007; Stephen and Elvis, 2011; Wasiuzzaman, 2013). Internal variables are those that influence a firm's operational capacity and the capability of firms to access external finance. For the purposes of this study, three internal variables (firm size, leverage, and current assets to total assets ratio) and one external (macroeconomic) variable - gross domestic product (GDP), are considered as significant explanatory variables. According to Bartov *et al* (2000), failure to recognize these variables can cause a hypothesis to be spuriously rejected or accepted. The next section present the concept of working capital management, followed by a discussion of its evolution over the years. The section concludes with analysis of the schools of thought on WCM definition.

3.3 The Concept of Working capital management

Working capital management has been defined in different ways. For example, Talekar (2005) defines WCM as the application of management principles to current assets and current liabilities to maintain profitability and liquidity of the firm through planning and control techniques. Parrino and Kidwell (2009) define working capital management as the management of current assets (accounts receivable, cash, and inventory) and their financing. Lastly, Sagner (2007) defines WCM as the art and science of organizing a company's short-term resources to sustain ongoing activities, mobilize funds, and optimize liquidity. Sagner (2007) further states that WCM is characterised by the following features: 1) the efficient utilization of a firm's current assets and current liabilities throughout each phase of the business operating cycle; 2) the planning, monitoring and management of the firm's collections, disbursements, and bank account balances; 3) the management of receivables, inventories, payables, and international transactions to minimize the investment in idle resources; and 4) the gathering and management of information to effectively use available funds and identify risk. All the above definitions stress the utilisation of scientific and management principles to manage working capital efficiently to ensure a healthy equilibrium between profitability and liquidity.

For the purpose of this study, WCM refers to the application of economic and management principles to managing short-term assets and short-term liabilities, as well as the management of all the relationships that exist between them in order to enhance liquidity, profitability and concomitantly firm value (Smith, 1973; Pike and Pass, 1984). Generally, WCM involves two vital decisions. The first entails determining the optimum (desirable) level of investment in short-term assets, while the second focuses on determining the appropriate mix of short-term and long-term financing needed to finance this investment in short-term assets (Parrino and Kidwell, 2009). Essentially, WCM is an integral part of a firm's financial management, and it attempts to manage and control current assets and current liabilities in order to maximise the profitability and firm value. Thus the proper management of working capital is very important for the success of an

enterprise and that is the main reason it has become a basic and broad measure of judging the performance of a firm.

3.3.1 Origins and evolution of working capital concept

To provide a general backdrop to the study, this section proceeds to discuss the origins of working capital concept and its evolution. According to Besley and Brigham (2000) the concept of working capital originated with the so-called *Old Yankee peddler* (itinerant salesman) in the 17th century. The peddlers normally load their wagons with merchandize and travel long distances to sell them. The merchandise was called 'working capital' because it was what the peddler actually sold or 'turned over' to produce his profits. The wagons and horses were regarded as 'fixed assets'. The peddler generally owned the horse and wagon, so they were financed with owner's capital, but he borrowed the funds to buy the merchandise. The borrowed money was called working capital loans. The loans had to be repaid after each trip to demonstrate to the bank that credit was sound. If the peddler was able to repay the loan, then the bank would make another loan, and banks that followed this procedure were said to be employing 'sound banking practices'. The days of the old Yankee peddler's working capital requirements have long passed, but its basic principles are still valid and applicable to businesses in the twenty-first century. In fact, the administration of current assets and the financing needed to support current assets are still the two fundamental elements of working capital management which occupy a significant portion of financial managers' time and attention (Gitman and Charles, 1985; Weston and Brigham, 2005).

The working capital concept was later developed as a coherent short-term financial planning concept by eminent economists, Adam Smith (1776) and Karl Marx (1867). In his book, *The Wealth of Nations*, Adam Smith distinguished between circulating and fixed capital (Fazzari and Peterson, 1993). Adam Smith defined *circulating capital* as capital which is turned over and in the process of being turned over yields profit or loss. Fixed capital, on the other hand, is capital invested in the improvement of land, the purchase of useful machines and instruments of trade,

or in such things that yield a profit by increasing productivity, without the capital changing hands. Thus, Adam Smith's notion of circulating capital is close to the concept of working capital.

Karl Marx (1867) expanded Adam Smith's definition by providing a comprehensive exposition of the working capital concept (Bhattacharya, 2006). Marx used the term 'variable capital' to refer to that part of capital which is transformed into labour-power, and which consequently undergoes a quantitative increase in its value in production. He contrasted this with 'constant capital', which according to him, is that part of capital which is turned into means of production, and which undergoes no quantitative alteration of value in production. To Marx, 'constant capital' or 'variable capital' is nothing but 'dead labour', i.e. outlays for raw materials and other instruments of production produced by labour in earlier stages which are now needed by live labour to work with in the present stage. The 'variable capital' was the wage fund which remains blocked in terms of financial management, in work-in-process along with other operating expenses until it is released through sale of finished goods.

3.3.2 Schools of thought on the definition of working capital

Ever since the evolution of the concept of working capital, a remarkably diverse group of scholars in the fields of accounting, finance and economics have studied the role of working capital in organizations. This has led to the 'working-capital-definition' schools of thought controversy (Bhattacharya, 2006; Van Horne and Wachowicz, 2006). Two schools of thought have emerged in the literature. These are net working capital (NWC) and gross working capital (GWC).

3.3.2.1 Net working capital school of thought

From the perspective of net working capital school of thought, working capital may be defined in a narrow sense as the difference between current assets and current liabilities (Brealey and Myers, 2002; Filberg and Krueger, 2005). According to Emery and Finnerty (1997) the term

'current' in this context means a time horizon of one year or less. Thus, current assets are those assets which can be converted into cash within an accounting year or less. Current assets include inventory (raw materials, work-in-progress, and finished goods), accounts receivable, prepayments, cash and cash equivalents, while current liabilities include accounts payable, accruals, taxes payable, dividends payable, short-term loans, among others. NWC can be positive or negative. Generally, firms desire to have a positive NWC because a positive NWC indicates that the firm is able to pay-off its short-term liabilities. However, a negative NWC means that the firm currently is unable to meet its short-term financial obligations. The existence of adequate NWC to the firm cannot be overstated. In fact, Bhattacharyya (2017, p.585) argued that working capital may be regarded as a reservoir, the level and content of which is constantly being changed by business transactions. Thus, the condition of the reservoir at any time can be shown as a summary of the current assets and current liabilities. Furthermore, the NWC concept has been called the accountants' definition of working capital.

According to Walker (1974), the NWC concept is useful to a firm's stakeholders, especially, creditors interested in determining the amount and nature of assets that may be used to pay current liabilities. The theoretical underpinning of the use of net working capital to measure a firm's liquidity is based on the premise that the greater the margin by which a firm's current assets cover its short-term obligations (current liabilities) the more able it will be to pay its bills as they come due. It has been argued that the accountant's view of working capital is based on a 'gone concern approach', where both the current assets and current liabilities have a dynamic stability. Therefore, the primary purpose of working capital management is to maintain and/or improve upon this dynamic stability. It is important to note, however, that in a business that is a 'going concern', market practices follow a pattern by which a portion of both sales and supplies are not paid for, and a minimum level of inventory never leaves the system (Bhattacharya, 2006). Consequently, the job of the modern finance manager has become enlarged from merely securing finance as in the olden days to the management of all current assets and current liabilities in order

to ensure intra-dynamic stability among them and inter-dynamic relationship between them (Bhattacharya, 2006). This has led to the development of the alternative working capital concept, based on the 'going concern approach'. This is referred to as the gross working capital (GWC).

3.3.2.2 Gross working capital school of thought

Unlike NWC, gross working capital may be defined in a broad sense as the total amount of current assets (Weston and Brigham, 2005). The GWC concept, also referred to as the financial analysts' definition (Van Horne and Wachowicz, 2006, p. 206), takes a total view of the business and considers gross current assets as the gross working capital requirement of a business, and management of working capital as management of current assets and current liabilities to ensure a dynamic stability between generation of current assets and their funding operations.

Proponents of the GWC concept argued that the concept is superior to NWC because, from a management perspective, it makes little sense to talk about trying to actively manage a net difference between current assets and current liabilities, particularly when that difference is continually changing (Van Horne and Wachowicz, 2006). Moreover, Fernandez-Corugedo, McMahon, Millard and Rachel (2011) asserted that it is the economic effect rather than the accounting definition (NWC) that matters because firms have a financing gap between payment for their inputs to production (such as raw materials and labour) and receipt of the revenue from sales of output, which typically comes much later. Additionally, Guerard and Schwartz (2007) argued that net working capital is a dynamic item which expands and contracts with the level of the firm's operations.

3.3.2.3 Own thought on WCM concept

Between the two working capital concepts – NWC and GWC – the logic of the NWC definition is more persuasive than GWC, because the focus of this study is on analysis of WCM and profitability relationship which is part of liquidity of the firm. Thus, the NWC definition is adopted

in this study. That is, net working capital is defined as the difference between current assets and current liabilities (Filberg and Krueger, 2005; Knauer & Wohrmann, 2013). This means that by shortening the time for collecting receivables, deferring payments and keeping minimum inventory, a company can reduce its net working capital. This choice of definition is also consistent with many studies that analysed the impact of WCM on liquidity, profitability and firm value (Deloof, 2003, Lazaridis & Tryfonidis, 2006; Rehn, 2012).

The obvious benefits of using NWC instead of gross working capital are that the current liabilities are, to some extent, causally linked to the existence of inventories and to the future transformation of inventories into accounts payables. Furthermore, excess of current assets over current liabilities will indicate whether or not the business will be able to meet its current liabilities when they fall due. GWC does not disclose this fact. Lastly, it is on the basis of this concept that short-term creditors, bankers etc. calculate the safety margin regarding the timely repayment of their debt. The following section examines the theories explaining the link between WCM components (inventory, accounts receivable and accounts payable) and profitability. As stressed by Knauer and Wöhrmann (2013), decomposing WC into its constituents is important when considering the causal relationship between WCM and corporate profitability.

3.4 Relationship between WCM components and profitability

This section is structured as follows. Sections 3.4.1 discusses the theories on the relationship between inventory management and profitability. Sections 3.4.2 focuses on accounts receivable management theory and profitability, while section 3.4.3 addresses the nexus between accounts payable and profitability.

3.4.1 Inventory management and profitability

Inventory constitutes a major portion of current assets and its efficient management is important for businesses as it generates revenue. Drury (2006) defined inventory as the stock of goods that is maintained by a business in anticipation of some future demand. The inventory according to the above definition includes raw materials, work-in-progress and finished goods. Three theories have been proposed to explain why firms keep (hold) inventories and their effect on profitability. These are transaction motive, precautionary motive, and speculative motive (Christiano and Fitzgerald, 1989; Bhattacharya, 2006).

3.4.1.1 Transaction motive theory (TMT)

The transaction motive theory (TMT), according to Minner (2003), emanates from the fact that ordering and production decisions are made at certain points of time instead of being performed continuously. Since outflows are not synchronized (balanced) with inflows, inventories are needed to bridge these gaps. The TMT identifies two factors that influence the inventory holding period (IHP) and profitability. First it is assumed that businesses can increase profitability through a reduction of IHP by keeping the minimum required inventory in order to satisfy the expected demand for production. A reduction in IHP, in turn, will lead to a reduction in the various inventory-related costs (holding and order costs), thereby resulting in higher profitability. Second, it is assumed that there is a relationship between IHP and profitability through bulk purchases. This has two implications. On the one hand, it will increase inventory size thereby increasing inventory holding cost. On the other hand, bulk purchases reduce procurement cost of production. The bulk purchases cost savings will also result in a decrease in the cost of sales which will in turn reduce the overall price of the product and concomitantly higher profitability.

3.4.1.2 Precautionary Motive Theory (PMT)

The PMT arises from uncertainty where lead-time (the time it takes for ordering and receiving inventory), demand and production yield are unknown at the time when decisions are made. This theory predicts a positive association between inventory holding period and profitability; based on the assumption that higher inventory holding period will prevent the possibility of a stock-out situation, which could result in the decline of profitability (Christiano and Fitzgerald 1989). Inventory stock-out will have adverse effect on a company's profitability because a company without inventory may lose its customers' goodwill (Bhattacharya 2006).

3.4.1.3 Speculative Motive Theory (SMT)

The speculative motive theory postulates that a longer inventory holding period may lead to higher profitability because of the prospect of realising abnormal profit in the future (Christiano and Fitzgerald, 1989) through expected higher changes in product prices. However, the expected rise in future prices should be sufficient to compensate for the various costs associated with higher inventory holding period. Despite the future benefits of a speculative motive for holding inventory, Christiano and Fitzgerald's (1989) study found that the magnitude of the speculative motive for increasing the inventory holding period is quantitatively negligible. In other words, the speculative motive of higher inventory holding period may increase profitability of firms if the expected future price increases occur. On the other hand, speculative motive theory of higher inventory holding period may result in profitability minimisation if the expected future price increases do not manifest or it is not able to offset the cost of holding the inventory.

3.4.2 Accounts receivable (AR) management and profitability

Accounts receivable may be defined as money that customers owe the firm because they have purchased goods or services on credit (Gallagher and Andrews, 2007). AR often represents large investment in current assets and involves significant volume of transactions and decisions. Given

the significant investment in accounts receivable, the choice of credit management policies could have important implications for firm profitability, liquidity risk, and consequently its value (Martínez-Sola, García-Teruel and Martínez-Solano, 2011). The fundamental theories underlying accounts receivable-profitability relationship are: 1) financial distress theory, 2) product quality guarantee theory, 3) product differentiation theory, and 4) market power theory (Mian and Smith; 1992; Petersen and Rajan, 1997).

3.4.2.1 Financial Distress Theory (FDT)

The financial distress theory is premised on the principle of 'buyer opportunism' which suggests that a supplier in financial distress is compelled to offer more trade credit to its customers (Petersen and Rajan 1997; Wilner 2000). A company in financial distress will have a weaker bargaining position to effectively follow its trade credit policy. Such a company will be desperate for sales because it would not be able to even afford the various costs associated with holding inventories. A financially distressed company may not have the financial resources to sue a customer for overdue trade credit. Due to this weakness, customers of a financially distressed company will take an undue advantage to ask for more credit, which will negatively affect the firm's profitability.

3.4.2.2 Product Quality Guarantee Theory (PQGT)

The PQGT is based on information asymmetry between the seller and the buyer (Ng *et al.* 1999; Pike and Cheng 2001; Pike *et al.* 2005). The theory contends that businesses offer trade credit to allow customers, particularly, newer ones who do not have knowledge about a product's quality, to verify the extent of the quality of the product (Long *et al.* 1993; Danielson and Scott 2004; Bhattacharya, 2006). Bhattacharya (2006) stress that trade credit is an effective tool to circumvent this knowledge gap. Bastos and Pindado (2007) alluded to the above sentiment and suggest that the product-quality-guarantee theory is particularly important to sellers as it will help facilitate

future purchases, increased sales and concomitantly, higher profits. Other scholars support the theory and opine that trade credit will help to reduce the confusion over a product's price by allowing customers to be satisfied with the product before payment is made, which helps to avoid future contentions (Long, Malite and Ravid, 1993). Trade credit is obviously a catalyst for boosting sale and profitability, and consequently firm value.

3.4.2.3 Product Differentiation Theory (PDT)

PDT is based on the premise that trade credit is similar to other sales promotional tools, like advertising, which can be used to increase sales and therefore profitability (Nadiri 1969). Two arguments have been put forward to support the PDT. First, by offering trade credit, a company is able to convince customers that its products offer more value for money and that more benefits can be derived from patronising the products or services. Second, is suppliers' ability to maintain their long-term relationships with customers, which may improve profitability. For example, by offering trade credit, companies are able to retain and keep a number of loyal customers. The maintenance of loyal customers, in turn, has future benefit to a company in the form of improved profitability through higher future sales. In this case, trade credit is considered as an investment in customers that are not expected to generate immediate returns, but rather like other sales promotional tools, to generate future cash flows.

3.4.2.4 Market Power Theory (MPT)

The market power theory postulates that in a competitive market the customer is king. Thus, tastes may dictate the prices which prevail in the market. It is in this sense that "the customer has more power in relation to the supplier". A customer that has more power will demand more credit from its suppliers, which may help improve profitability. Customer power over supplier arises from different sources. The first source is where the customer is relatively large, compared to the supplier, such that the business of the customer forms a major part of supplier's revenue

(Banerjee et al. 2008). The second source is where there are numerous suppliers but very few customers so that the customer has many alternatives to choose from. In such cases, the competitiveness of suppliers' market will help to push trade credit upwards. Clearly, the market power relationship between a customer and its supplier may affect profitability in the sense that, a customer with more power over its supplier can demand favourable credit terms, which will in turn enhance profitability. However, a customer with weak market power relationship with suppliers may see a decline in profitability because the supplier may propose unfavourable terms of credit or even demand upfront payment. An unfavourable credit term may reduce profitability because it will force a company to forgo other profit enhancement commitments or embark on expensive borrowings.

3.4.3 Accounts payable (AP) management and profitability

Accounts payable may be defined as an arrangement between a buyer and seller by which the seller allows delayed payment for its products, instead of cash payment (Emery, 1984; Mian and Smith, 1992). According to Lee and Nahmias (1993), AP is part of a joint commodity and financial transaction in which a firm sells goods or services and simultaneously extends credit for the purchase to the customer. In this way, trade credit plays an important role in a firm's financing policy. For the buyer, it is a source of financing through accounts payable, and for the seller, trade credit is an investment in accounts receivable (Long, Malitz and Ravid, 1993). A variety of theories attempt to explain why suppliers provide trade credit to their clients, and why these customers are willing to use trade credit instead of bank finance. These include financing advantage theory, transaction cost theory, and price discrimination theory (Petersen and Rajan, 1997; Bhattacharyya, 2006).

3.4.3.1 Financing Advantage Theory (FAT)

The financing advantage theory postulates that due to capital market imperfections, suppliers may have an advantage over traditional lenders in investigating the credit worthiness of their clients, as well as a better ability to monitor and force repayment of the credit. This may give suppliers a cost advantage over financial institutions in offering credit to a buyer (Kohler et al. 2000). Petersen and Rajan (1997) identified three sources of cost advantage. These are advantage in information acquisition, controlling the buyer, and salvaging value from existing assets. Information acquisition advantage occurs because the supplier has more information on the customer than banks because of the frequent business transactions between them. The size and timing of the buyer's orders also give the supplier an idea of the condition of the buyer's business. The buyer's inability to take advantage of early payment discounts may alert the supplier of deterioration in the buyer's creditworthiness. While financial institutions may also collect similar information, the supplier may be able to get it faster and at lower cost because it is obtained in the normal course of business.

Advantage in controlling the buyer may be in the nature of the goods being supplied from the perspective that there are few economical alternative procurement sources other than the supplier. In this case, the supplier can threaten to cut off future supplies in the event of borrower actions that reduce the chances of repayment. This threat may be especially credible if the buyer accounts for a small portion of the supplier's sales. By contrast, where a financial institution has more limited powers the threat to withdraw future finance may have little immediate effect on the borrower's operations. Lastly, if the buyer defaults, the supplier can seize the goods that are supplied. The more durable the goods supplied the better collateral they provide and the greater the credit the supplier can provide (Mian and Smith, 1992). Financial institutions can also reclaim the firm's assets to pay off the firm's loan. However, if the supplier already has a network for selling its goods, its costs of repossessing and resale will be lower than that of an institution.

The advantage of suppliers over financial institutions will vary depending upon the type of goods the supplier is selling and how much the customer transforms them. The less the goods are transformed by the buyer, the greater the advantage the supplier will have over financial institutions in finding an alternative buyer.

3.4.3.2 Transaction Costs Theory (TCT)

The transaction cost theory which was developed by Ferris (1981), contends that trade credit might be used as a possibility to facilitate the exchange of goods between two firms and to reduce the costs arising from the uncertainty of delivery. By using trade credit, the buyer is able to separate the delivery of goods from the payment for these goods. Thus, what is normally one transaction (goods for money) is now divided into two different transactions (goods for loan; loan for money). These two transactions are needed to complete the delivery process. The uncertainty of delivery leads to one major problem for the buyer. It might not be clear when and how much of the ordered product is delivered by the supplier. Thinking of immediate payment, this would force the buyer to always hold a sufficient amount of money on stock, allowing him to be able to pay for the goods as soon as they are delivered. This very capital obviously cannot be used in any other way, giving the buyer opportunity costs in the form of not realized interests.

The use of trade credit allows the buyer to predefine fixed dates of payment, changing the uncertain dates of payment into a sequence that can be known with greater certainty (Ferris, 1981). This sequence could be a month, or one quarter, during which all obligations are cumulated and paid at the end of this period. Emery (1984) highlights another aspect of the transaction cost theory. Specifically, for industries which are exposed to seasonality in demand, trade credit is used by both suppliers and customers to reduce warehousing costs. By receiving a credit line from a supplier, the customer is able to order directly on demand, resulting in the lowering of the customer's warehousing costs.

3.4.3.3 Price discrimination Theory (PDT)

Price discrimination theory states that trade credit may be offered even if the supplier does not have a financing advantage over financial institutions because credit may be used to price discriminate in order to increase sales and hence profitability (Mian and Smith, 1992; Petersen *et al.*, 1997). In addition, the theory suggests that a seller can sell to two different buyers at entirely different prices without altering the original price of the product or services (Petersen and Rajan 1997; Ng *et al.* 1999). By offering different levels of trade credit, a company is ultimately selling at different prices. A customer that is given a longer credit period is in effect paying at a lower price as compared to other customers (Garcia-Teruel and Martinez-Solano 2007). Having discussed the underlying theories proposed to explain the association between working capital management, its components and profitability, the next section focuses on working capital policies and working capital financing strategies.

3.5 Working capital policies and financing strategies

This section focuses on two important aspects of working capital – 1) working capital policies and 2) working capital financing strategies.

3.5.1 Working capital policies

Correia *et al.* (2011) define working capital policy as short-term financial management decisions regarding the optimal level of investments in, and optimal financing of, current assets. There are three alternative policies that are used to determine the level of current assets. These are: aggressive policy (also known as restricted or strict current asset investment policy), conservative policy (relaxed, liberal or flexible current asset investment policy), and moderate policy (or middle-of-the-road current asset investment policy) (Mathur, 2007; Arnold, 2008). These terms are discussed in the following paragraphs.

3.5.1.1 Aggressive working capital policy

Under the aggressive policy, the firm chooses to operate with relatively low levels of current assets and high levels of current liabilities. Thus the firm would have a tight credit policy, even though there is a potential risk of losing sales. Aggressive policy generally provides the highest profitability and return on investment, but it entails the greatest liquidity risk because the possibility of cash shortages and stock-outs is increased. In terms of the cash conversion cycle (CCC), aggressive policy tends to reduce the inventory conversion period (ICP) and receivable conversion period (RCP), which would result in a relatively short cash conversion cycle (Besley et al., 2000), therefore, higher profitability and firm value.

3.5.1.2 Conservative working capital policy

A conservative policy, by contrast, refers to the firm holding relatively high levels of current assets and low levels of current liabilities. According to Parrino and Kidwell (2009) this policy is generally perceived to be a low-risk and low-return course of action. An important goal of this policy is to stimulate sales by the use of a credit policy that provides liberal financing to customers and a corresponding high level of receivable. Such a policy will give rise to a lower liquidity risk and inventory problems but at the cost of reduced profitability. The implications of this policy is that it creates higher levels of inventories and receivables, as well as both longer inventory conversion period (ICP) and receivables conversion period (RCP), a relatively long CCC and concomitantly lower profitability and firm value.

3.5.1.3 Moderate working capital policy

The moderate policy is a balance between aggressive and conservative policies. Essentially, this policy produces a CCC somewhere between aggressive and conservative policies. The next section outlines the three alternative strategies for financing working capital requirements.

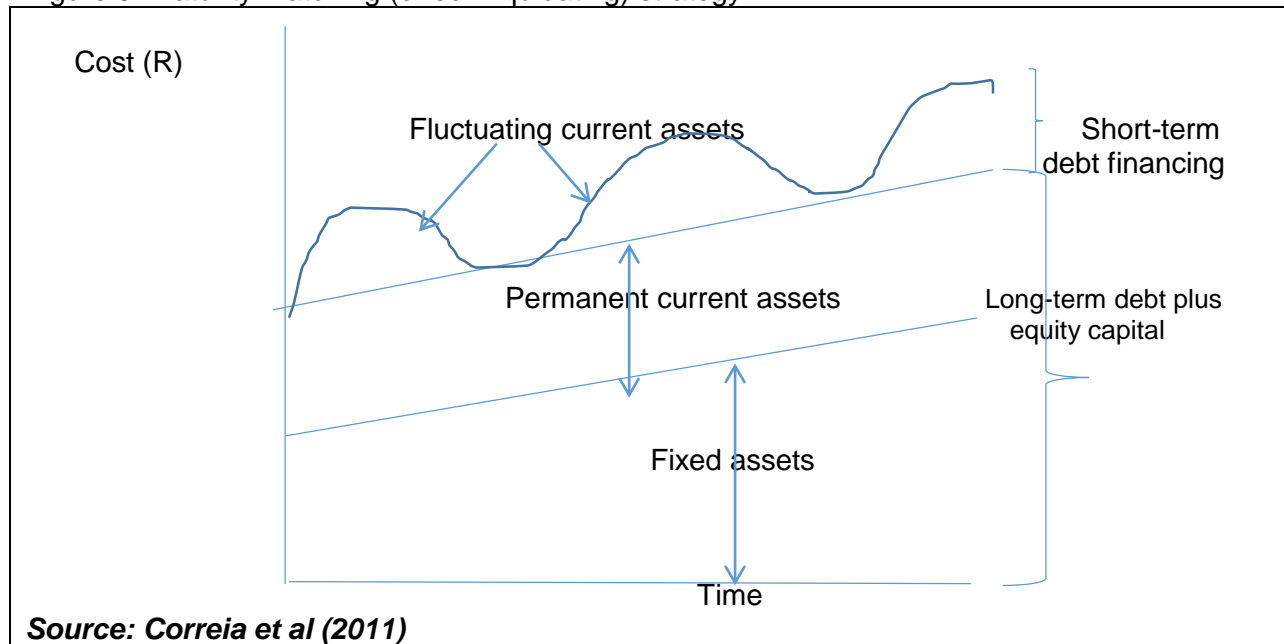
3.5.2 Working capital financing strategies

This section extends the idea of working capital policies by linking them with the various working capital financing strategies. The strategies used to finance working capital requirements are maturity matching (or self-liquidating) strategy, conservative financing strategy, and aggressive financing strategy. In order to fully understand the above strategies, it is important to explain two basic concepts that are closely linked to working capital financing. These are seasonal and permanent working capital. Permanent working capital is the amount needed to maintain current assets at the minimum level and this amount is usually financed with long term funds (long term debt and equity). This is consistent with finance theory which states that only the permanent portion of working capital should be supported by long-term financing (Gitman, 1974). Temporary working capital on the other hand, is any amount over and above the permanent working capital and is largely due to seasonal fluctuations in the level of business activity. The way permanent and temporary current assets are financed is called the firm's working capital financing strategy. As noted above, the three alternative financing strategies commonly used are maturity matching (or self-liquidating), conservative (or long-term), and aggressive (or short-term) financing strategies.

3.5.2.1 Maturity matching strategy

This strategy involves matching asset and liability maturities. In other words, all of the fixed assets plus the permanent current assets are financed with long-term capital, but temporary current assets are financed with short-term debt. For example, inventory expected to be sold in 30 days would be financed with a 30-day bank loan; a machine expected to last for 3 years would be financed with a 3-year loan; and a 15-year building would be financed with a 20-year mortgage bond. This strategy is illustrated in figure 5.

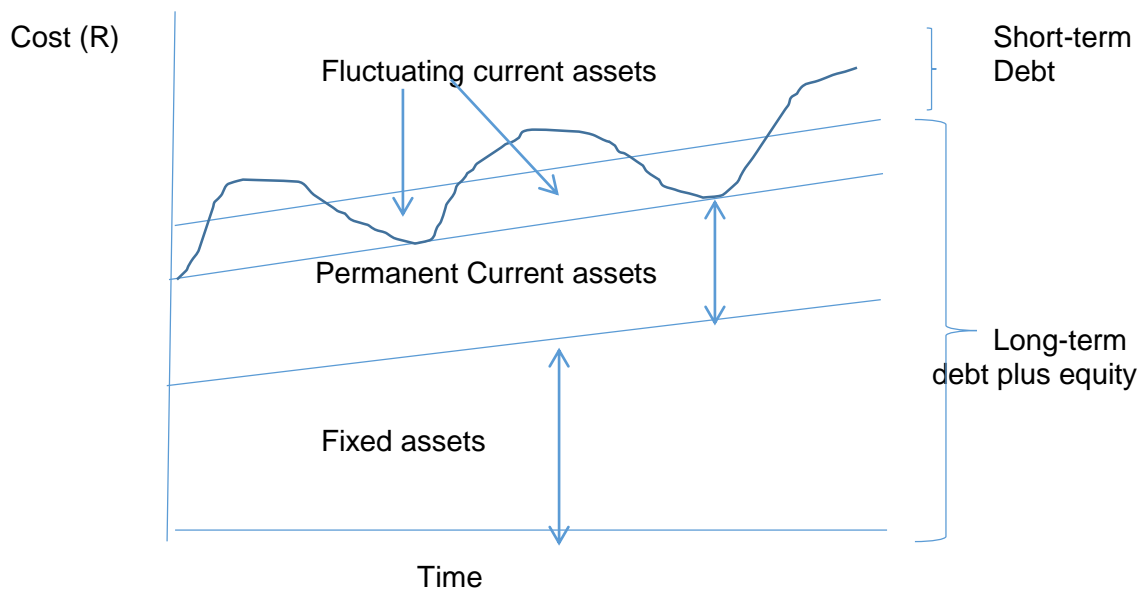
Figure 5: Maturity matching (or self-liquidating) strategy



3.5.2.2 Conservative financing strategy

Under the conservative financing strategy, only a portion of temporary current assets are financed with short-term sources. Long-term financing is used to fund the other portion of temporary current assets along with the permanent current assets and fixed assets. Figure 6 illustrates this genre of financing strategy.

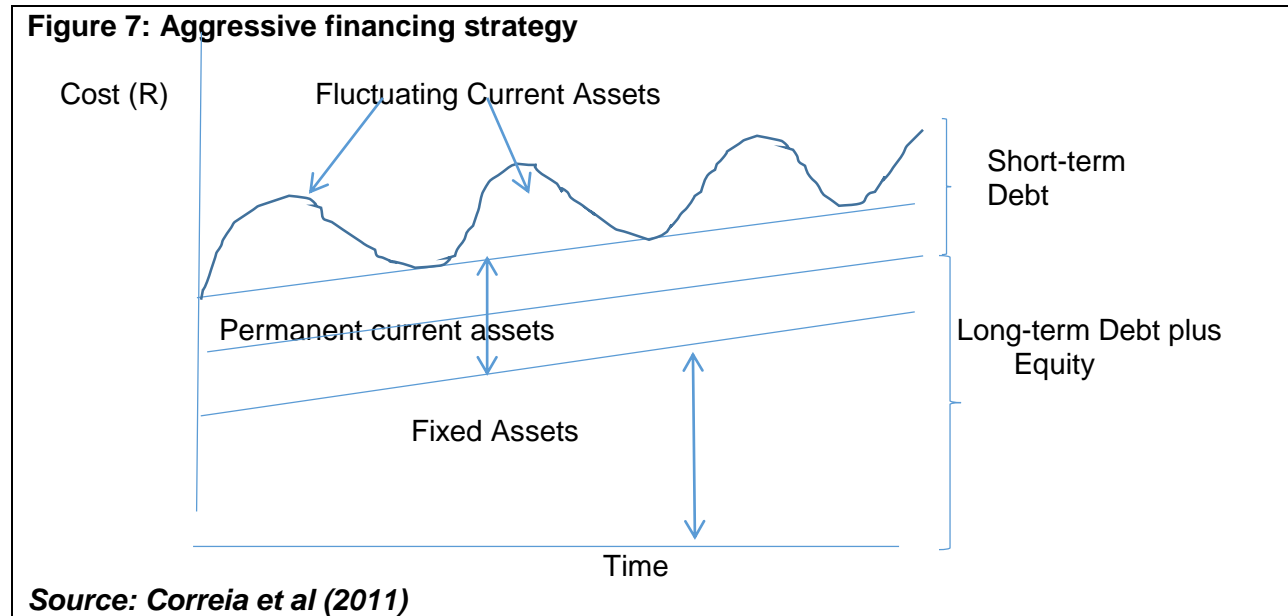
Figure 6: Conservative financing strategy



Source: Correia et al (2011)

3.5.2.3 Aggressive financing strategy

This strategy dictates that a firm should finance a portion of permanent current assets and all temporary current assets with short-term sources. Long-term financing is used to fund the other portion of permanent current assets and fixed assets. Figure 7 provides an illustration of aggressive financing strategy.



3.6 Techniques for managing working capital components

The previous section focused on the policies and strategies employed to manage and finance working capital. This Section deals with the techniques that are commonly employed in managing and controlling the three components of working capital (inventories, accounts receivable and accounts payable).

3.6.1 Inventory management techniques

Drury (2006) defined inventory as the stock of goods that is maintained by a business in anticipation of some future demand. According to International Accounting Standard 2, *Inventories*, inventory is a current asset. In particular, inventory include assets held for sale in the ordinary course of business (finished goods), assets in the production process for sale in the ordinary course of business (work in process), and materials and supplies that are consumed in production (raw materials). Inventory has important economic significance from both micro-and macroeconomic perspectives.

As explained by Whitin (1953) over 60 years ago, the behaviour of economic aggregates at the macroeconomic level depends on the behaviour of the components of the aggregates, which, in turn, depend heavily on inventory investment. For example, at the macroeconomic level, particularly, National Income accounting, inventory is defined as the change in the stocks of materials, works-in-progress, and finished goods within a firm, industry, or entire economy over a specified period of time. Studies have shown that as a share of GDP, inventory investment is not significant but highly volatile (*Stanback, Jr.*, 1962; Flood and Lowe, 1993). For example, Flood and Lowe (1993) found that the overall inventory investment accounted for just 0.7% of Australia's Gross Domestic Product (GDP). However, on average, quarterly changes in the level of inventory investment accounted for 59% of the change in GDP. This finding is consistent with Blignaut *et al's* (2007) observation that inventory investment contributes significantly to changes in gross domestic expenditure and gross domestic product, not through its size but as a result of its rate of change.

At the microeconomic level (i.e. firm level) inventory represent a significant component of total assets investment in most firms. In manufacturing firms, for example, the overall inventory investment accounts for 20 to 60% of total invested capital (Balakrishnan, Render and Stair, 2014). Generally, firms hold inventory in order to ensure smooth production and also meet customers' requirements and expectations (Rushton, Croucher and Baker, 2010). Therefore, the primary objective of inventory management is to maximize a company's profitability by minimizing the cost tied up with inventory and at the same time meeting customers' needs (Lambert, Stock, and Ellram, 1998). However, the two objectives are conceptually antagonistic to each other when considered separately.

To minimise inventory costs, the firm may simply hold no stock and reorder only when customers place an order. This will result in low inventory costs. The down side of this approach, however, is that it can lead to customer dissatisfaction due to the potential risk of stock-outs and interruption

in production. On the other hand, if the firm keeps a high level of inventory in anticipation of customer needs, it could be incurring huge costs that may eventually put the firm out of business. It is obvious that a delicate balancing act is needed to achieve these two objectives simultaneously. This calls for use of appropriate strategies to manage inventory.

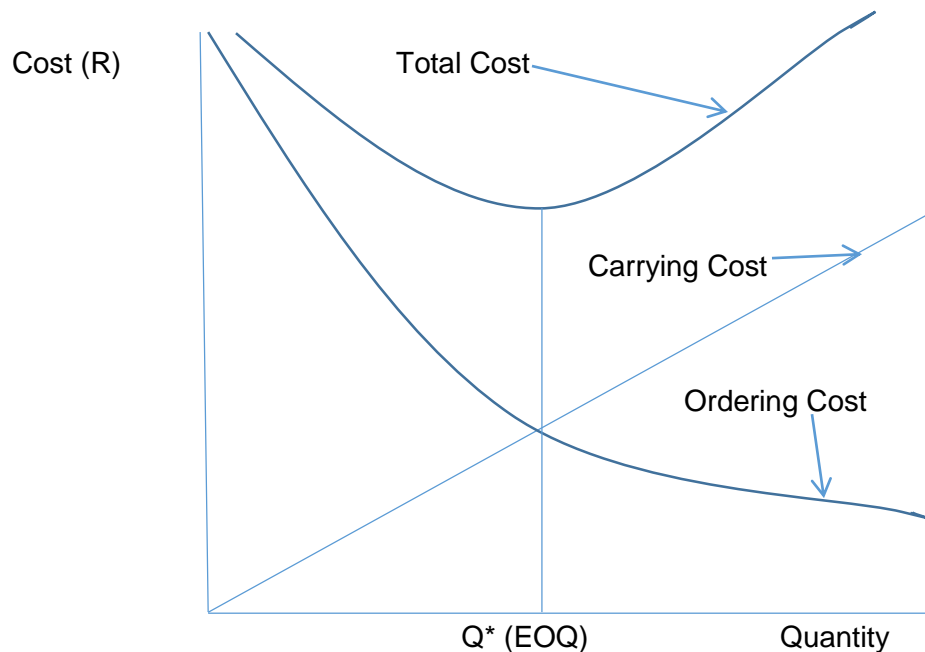
The American Production and Inventory Society (APICS) define inventory management as the branch of business management concerned with planning and controlling inventories (Toomey, 2000). Inventory planning refers to decisions regarding the amount of inventory that a firm should hold and its location within its logistics network (Rushton et al 2006). Inventory control, on the other hand, refers to the mechanism within a firm that is used for efficient management of the movement and storage of goods and the related flow of information. Thus inventory management is a function of two basic questions: 1) **when** should a replenishment order be placed? (Re-order point) and 2) **how much** should the order quantity be? (Economic Order Quantity) (Lee and Nahmias, 1993). Numerous models have been developed to address these questions. For the purposes of this study, the most common inventory management systems, that is, the Economic Order Quantity (EOQ) Model and Just-in-Time (JIT) System are discussed.

3.6.1.1 Economic Order Quantity (EOQ) model

One of the most common models for determining the optimal order size for inventory items is the economic order quantity (EOQ) model. Ford Whitman Harris (Harris, 1913) is credited with developing the EOQ model which was published in *Factory, The Magazine of Management* in 1913. The EOQ model is based on the assumption that there are two major types of costs associated with inventories: holding (carrying) and order costs. Carrying costs include warehousing, handling, insurance, depreciation, spoilage, obsolescence, and opportunity costs. Order costs, on the other hand, are the costs of placing an order and receiving the merchandise. They include freight charges and the clerical costs to place an order, and in the case of produced

items, they also include the scheduling cost. Ordering costs decrease as the size of the order increases. Carrying costs, however, increase with increases in the order size. Thus the EOQ model analyzes the tradeoff between order costs and carrying costs to determine the order quantity that minimizes the total inventory cost. The relationship between carrying costs, ordering costs and total inventory costs is shown in figure 8.

Figure 8: Relationship between holding cost, ordering cost and total inventory cost.



Source: Correia et al (2011)

Given certain assumptions (discussed below), it can be shown that the order quantity that minimises the total cost curve in figure 10, can be found by the use of the following formula:

$$EOQ = \sqrt{\frac{2DO}{C}}$$

where

D is the annual demand or usage in units for the product or item.

O is the fixed cost of placing and receiving an order.

C is the annual carrying (holding) cost per unit of the product or item.

The EOQ model is based on the following assumptions:

- 1) Demand is known with certainty and fixed at D per unit time (which can be a year, a month or a week).
- 2) Shortages are not permitted.
- 3) Lead time for delivery is instantaneous
- 4) There is no time discounting of money. The objective is to minimise average costs per unit time over an infinite time horizon.
- 5) Costs include O per order, and C per unit held per unit time.

3.6.1.2 Just-In-Time (JIT) approach

An important development in the management of raw material inventories is 'just-in-time' (JIT) inventory management. Just-in-Time (JIT) was pioneered and perfected by Toyota Motors Corporation of Japan in the 1960s and 1970's to minimise inventory investment in order to survive and be competitive in local and international markets. The JIT system was later adopted and adapted since the early 1980's by other companies in Japan and the rest of the world after it was proven to radically improve corporate performance in terms of better quality, faster delivery, lower costs, higher productivity and profitability. Other names given to JIT are: World-class Manufacturing, Lean-and-Mean Production System, Pull Production System, and Zero Inventory System. The JIT approach advocates the elimination of waste by simplifying production processes. Thus, reductions in setup times, controlling material flows, and emphasizing preventive maintenance are seen as ways by which excess inventories can be reduced or eliminated, and resources utilized more efficiently. The basic principle of JIT is that, materials should arrive 'just-in-time' for them to be used in the production line. This system, which requires

high-quality raw materials from suppliers, involves extensive coordination between a firm's employees, its suppliers, and shipping companies to ensure that material inputs are delivered timeously. The major advantage of the JIT system is that a firm using it has essentially no raw materials costs and no risk of obsolescence or loss through theft. On the other hand, firms using it tend to be heavily dependent on suppliers. If a supplier fails to make deliveries, then the production shuts down until materials are delivered.

The next section discusses the various techniques for managing the other two elements of working capital - accounts receivable and accounts payable management techniques.

3.6.2 Accounts receivable (AR) management

Gallagher and Andrews (2007) define accounts receivable as money that customers owed the firm because they have purchased goods or services on credit. This is a measure of the unpaid claims a firm has over its customers at a given time. It usually comes in the form of operating line of credit and is mainly due within a relatively short time period, generally, up to one year. According to Michalski (2007), the decision of granting trade credit is a compromise between limiting risk of non-payment and gaining new customers. To maximise a firm's value, accounts receivable must be managed efficiently, by collecting accounts receivable timeously without losing sales. This goal can be accomplished using three policies: credit standards, credit terms, and receivables (credit) monitoring (Gitman et al., 1985). The three policies are discussed in the following paragraphs.

3.6.2.1 Credit standards

According to Megginson and Smart (2006), the first and most important aspect of accounts receivable management is setting credit standards. This involves application of the 5Cs of

credit framework: character (reputation), capacity (earnings volatility), capital (leverage), collateral, and cycle (macroeconomic) conditions (Edwards, 1997).

Bumacov, Ashta, and Singh (2014) opined that the history of credit setting (scoring) can be traced to the pioneering work of David Durand in the area of *consumer instalment financing* published in 1941 by the National Bureau of Economic Research in the USA. The study pioneered the use of statistics in analysing credit risk factors in consumer financing. Durand (1941) tested credit experience and intuition of 37 lending companies in identifying *bad* credit risks. The purpose was to identify consistent and time-proof credit practices. The study essentially established the credit scoring framework further research. The application of this framework ensures that the firm's customers will pay, without being pressured, within the stated credit terms. Character refers to the applicant's record of meeting past obligations. Capacity focuses on the applicant's ability to repay the requested credit, as judged in terms of financial statement analysis focused on cash flows available to repay debt obligations. Capital deals with the applicant's debt relative to equity. Collateral is the amount of assets the applicant has available for use in securing the credit. The larger the amount of available assets, the greater the chances that firms will recover funds if the applicant defaults. Conditions refer to current general and industry-specific economic conditions, and any unique conditions surrounding a specific transaction.

3.6.2.2 Credit terms

Credit terms are the terms of sale for customers who have been extended credit by the firm. Ng et al (1999) identified two basic forms of trade credit. The simpler form, net terms, specifies that full payment is due within a certain period after delivery, generally, 30 days after the invoice date. For example, 'net 30' means full payment is due 30 days after the invoice date; after that date, the buyer is in default. The more complex form of trade credit, two-part terms, has three basic elements: (1) the discount percentage; (2) the discount period; and (3) the effective interest rate. The two-part term may be stated as '3/10 net 30.' This combination of a 3 percent discount for

payment within 15 days and a net period ending on day 30 means that, the buyer is entitled to a discount of 3% on the invoice value if the full amount is paid 15 days, otherwise, the full amount is due 30 days after the invoice date. As with net terms, the buyer is in default if payment is not made by the end of the net period.

3.6.2.3 Receivables (Credit) monitoring

Lastly, receivables monitoring policy refers to the process of evaluating the credit policy to determine if a change in the customer's payment patterns has occurred. The traditional techniques used for credit monitoring as well as evaluating a firm's accounts receivable balance are the days sales outstanding (DSO) and the aging schedule (Gentry and De La Garza, 1985; Gallinger and Ifflander, 1986). The DSO (also known as the average collection period or receivable turnover ratio), is the number of times in each accounting period, typically a year, that a firm converts credit sales to cash. The DSO is computed by dividing the accounts receivable balance by the average daily credit sales (Carpenter and Miller, 1979). This can be represented mathematically as follows:

$$\text{DSO} = \text{Accounts receivable (annual credit sales)} / \text{Average daily credit sales}$$

The formula suggests that a high turnover figure is desirable, because it indicates that a company collects revenues effectively, and that its customers pay bills promptly. A high figure also indicates that a firm's credit and collection policies are sound (efficient). In addition, the measurement is a reasonably good indicator of cash flow, and of overall operating efficiency. However, very high values of this ratio may not be favourable, if achieved by extremely strict credit terms since such policies may deter potential customers. The second technique for credit monitoring, the aging schedule, breaks down accounts receivable by age of the account. The breakdown is typically made on a month-by-month basis, going back 3 or 4 months (that is, 90 or 120 days). The

resulting schedule indicates the percentages of the total accounts receivable balance that have been outstanding for specified periods of time. The purpose of the aging schedule is to enable the firm to pinpoint problems with collections of AR.

3.6.3 Accounts payable (AP) management

Accounts payable are created when firms buy on credit from each other. It is a major source of unsecured short-term financing for businesses accounting for about 40% of the current liabilities for the average non-financial firm (Besley and Brigham, 2000). Accounts payable management is concerned with the management of the time that elapses between the firm's purchase of raw materials and its mailing payment to the supplier. The firm's goal is to delay the payment of AP as long as possible without damaging its credit rating. This means that accounts should be paid on the last day possible, given the suppliers' stated credit term. In terms of the cash conversion cycle (CCC), the longer the AP period, the smaller the size of the CCC, *ceteris paribus*. Having discussed working capital policies and financing strategies, the next section outlines the significance of working capital management for businesses.

3.7 Importance of Working Capital Management

The importance of WCM for a company's success has long been acknowledged. As Lough (1917, p. 355) observed nearly a century ago in *Business Finance: A Practical Study of Financial Management in Private Business Concerns*, 'Sufficient working capital must be provided in order to take care of the normal process of purchasing raw materials and supplies, turning out finished products, selling the products, and waiting for payments to be made. If the original estimates of working capital are insufficient, some emergency measures must be resorted to or the business will come to a dead stop.' This principle is still relevant today because inefficient working capital management has been cited as one of the primary causes of business failure (see for example, Altman, 1968; Smith, 1980; Largay and Stickney, 1980; Pike and Pass 1984). Berman et al (1994)

and Berger (2007) add that fixed and long-term assets such as buildings and equipment cannot be productive or produce revenue unless working capital in the form of inventory (raw materials, work-in-progress, and finished goods) is introduced. In the production process for instance, labour, inventory, buildings, and equipment are consumed and converted to accrued wages payable, accounts payable, and depreciation, and ultimately firm's sales of goods and services (Berman *et al*, 1994; Berger, 2007).

Chan (2010) and Fernandez-Corugedo *et al* (2011) support the above argument and suggested that working capital is needed to cover costs of operations before revenue is received. The authors noted, for example that, in the manufacturing sector a firm must buy raw materials and pay labour costs before delivering the goods. Similarly, in the agricultural sector, the farmer needs to purchase seeds and fertilizer before the crops are harvested. In the view of Chan (2010), the need for sound working capital management arises from the difference in the timing of when costs are incurred and when revenue is received. Indeed, working capital is indispensable and it is rightly said to be the lifeblood and controlling nerve centre of a business; it is affected directly and indirectly by almost every aspect of the business (Gries and Healy, 2010). Without doubt, a firm cannot function without adequate working capital and, if mismanaged, can severely impede the firm's growth and profitability, or can even be a significant contributor to its demise. In this context, Gries and Healy (2010) state that working capital is the 'oil' in a business' economic engine – too little and the business stalls; too much and the business cannot operate at maximum efficiency or profitability. Watson and Head (2007) echoed this sentiment and pointed out that without the 'oil' of working capital, the 'engine' of non-current assets will not function. Tully (1994) adds that working capital is 'the grease' that keeps the operations of the business entity running.

3.8 Empirical literature

This section reviews the empirical literature on the association between working capital management and its separate components and firm performance (profitability and firm value) under the following three sub-headings – (1) evidence from developed countries, 2) evidence from developing countries, and 3) evidence from South Africa.

3.8.1 Evidence from developed countries

This section is structured in line with the theoretical framework presented in Section 3.2.3. First a review of previous studies on the relationship between CCC and profitability is discussed in Section 3.8.1.1, followed by analysis of the nexus between inventory management and profitability in Section 3.8.1.2. Additionally, Section 3.8.1.3 provides evidence on the association between accounts receivables management and profitability. A discussion of the relation between accounts payable management and profitability is given in Section 3.8.1.3. The last part (Section 3.8.1.4) focuses on the association between WCM and firm value.

3.8.1.1 Empirical studies on Cash Conversion Cycle and profitability

Numerous studies have been conducted on the association between working capital management (proxied by CCC or its variants, e.g. NTC, WCCC, etc.) and corporate performance in developed countries. According to Faden (2014) the first empirical study to be published in this research area was conducted by Kamath (1989) for 99 large U.S. listed firms over a time frame from 1970 to 1984. The study tested the hypothesis of conflicting signals between current and quick ratio analysis and cash conversion cycle analysis. It also examined whether the net trade cycle (NTC) is a good approximation of the cash conversion cycle and the relationships between the above three liquidity measures and a measure of firm's profitability. The analysis showed that: 1) Current and quick ratios are negatively correlated with the cash conversion cycle; 2) Current and quick ratios were not negatively related to the profitability; 3) the net trade cycle provided the same

information as the cash conversion cycle; and 4) both cycles were found to be negatively correlated with the profitability measure. Four years on, Soenen (1993) investigated the relationship between working capital management (measured by NTC) and profitability (ROA) for a sample of 2000 US listed firms over the 20 years period, 1970 to 1989. The results revealed that there is a significant negative correlation between working capital management and profitability. Shin and Soenen (1998) extended Soenen's (1993) study. Their database contained 58,985 firm years in the period from 1975 to 1994. The results confirmed Soenen's previous conclusions that there is a significant negative relationship between NTC and firm performance. Departing from NTC as the measure of working capital used by Soenen (1993), a large number of researchers subsequently studied the relationship between CCC and firm performance. Jose, Lancaster and Stevens (1996) were at the forefront when they published their article titled *Corporate Returns and Cash Conversion Cycles*. In line with other empirical research in the US, they used the Compustat database with a sample size of 2,718 listed firms. Profitability was measured by return on assets and the return on equity. Their results confirmed conclusions by previous studies that there is significant negative correlation relationship between WCM and profitability. After these studies in the US, other researchers replicated this approach in other developed countries and developing countries. The evidence from some developing countries is discussed later in Section 3.8.2.

Again, according to Faden (2014), Wang (2002) was the first researcher to replicate the above studies outside the United States. Using a sample of 1934 firms and with the methodology used by Jose *et al* (1996) Wang (2002) he investigated whether the latter's conclusion could also be applied to Taiwanese and Japanese markets. The results indicated a significant negative correlation between WCM and both ROA and ROE. In an often cited study, Deloof (2003) analysed a sample of 1009 Belgian firms using the same working capital management variables (CCC, ICP, RCP, PDP) and profitability variables (return on assets and return on sales). Like previous studies, Deloof investigated the correlation between CCC and firm performance as well

as each component of CCC in isolation. The results confirmed previous studies that there is a significant negative relationship between profitability and both inventory conversion period and accounts receivable. Surprisingly, accounts payable correlate negatively with profitability despite the fact that payables are presumed to reduce the cash gap. Based on the results, Deloof concluded that his findings, which appears contradictory, can be attributed to a shortcoming in Pearson correlations, which do not allow causes to be distinguished from consequences. A negative correlation is thus consistent with the view that highly profitable firms usually afford their suppliers shorter payment periods, as they have the financial resources to do so. In another study carried out in Europe, Lazaridis and Tryfonidis (2006), investigated the relationship between working capital management and profitability (gross operating profit) for a sample of 131 firms listed on the Athens Stock Exchange for the period of 2001 – 2004. Using correlation and regression tests, they found a significant negative relationship between WCM and profitability. The authors concluded that managers can create profits for their firms by correctly handling the CCC and by keeping each component of the CCC at an optimal level.

Gill, Biger and Mathur (2010) extended Lazaridis and Tryfonidis's (2006) study in the USA. Using correlation and regression analyses non-experimental research design they examined the relationship between working capital management and profitability for a sample of 88 American manufacturing firms listed on the New York Stock Exchange for a period of 3 years from 2005-2007. The results revealed that there is a significant positive relationship between cash conversion cycle and profitability. They also found a significant negative correlation between profitability and accounts receivables. Regarding inventory and accounts payables, the study found no statistically significant relationships between these variables and profitability. Based on these findings, the authors recommended that firms' profitability and shareholders value can be enhanced by managing CCC efficiently and also by maintaining accounts receivables at an optimum level. To test the relationship between WCM and profitability, Nobanee, Abdullatif and AlHajjar (2011) used a sample of 34,771 Japanese non-financial firms listed on the Tokyo

Stock Exchange for a period of 1990 - 2004. By using panel data regression and correlation tests, they reported a significant negative association between cash conversion cycle and profitability in all the samples studied apart from consumer goods and services firms. On the basis of the findings, Nobanee et al concluded that profitability of a Japanese firm can be enhanced by reducing the CCC via reduction in the inventory conversion period or by shortening the receivable collection period or by deferring the payment period to suppliers. Therefore, reduction in the CCC brings improvement on firm's profitability based as higher CCC incurs costly external financing.

Rehn (2012) investigated the relationship between working capital management (using both CCC and NTC) and firms' profitability based on data for 612 Finnish and Swedish companies for the nine years, 2002 - 2009. Data was collected from Bureau van Dijk "Orbis" database. Correlation and panel data regression analyses were used to analyse the data. The results showed that there is a significant negative relationship between profitability and both CCC and NTC for the sample of Finnish and Swedish firms. Also, by analysing the separate components of CCC in isolation, the results suggest that accounts receivable and accounts payable have the greatest effect on profitability for both Finnish and Swedish firms. Lastly, the study found no statistically significant difference in working capital levels between the sampled Finnish and Swedish firms.

In addition to the above literature which focused mainly on working capital management and firm performance during stable economic (non-crisis) periods, recent studies (e.g Lamberg and Vålming, 2009; Kesimli and Gunay, 2011; Rehn, 2012; Duggal and Budden, 2012; Enqvist, Graham, and Nikkinen, 2014; Yenice, 2015; Daisuke 2017) have focused on periods of financial crisis and its impact on the relationship between working capital management and firm performance. In their study, Lamberg and Vålming (2009) used panel data regression techniques to investigate the effect of the global financial crisis on liquidity practices for a sample of 34 Small and Mid-Cap Swedish firms listed on Stockholm's NASDAQ OMX stock exchange. Lamberg et al

also investigated the relation between liquidity (measured by CCC) and profitability measured by return on assets (ROA). For the purposes of their study, Lamberg et al compared the WCM and firm performance variables before the crisis (identified as quarter 1 on 2008) and during the crisis (identified as first quarter of 2009). Using correlation and regression analyses, the findings suggested that the adaptation of liquidity strategies do not have a significant impact on profitability. Only increased use of liquidity forecasting and short-term financing during financial crisis had a positive impact on profitability, measured as ROA. Moreover, it was found that the importance of key ratios, which monitors companies' liquidity did not change between the two periods. Lastly, the results revealed that working capital ratio is the most commonly used liquidity measurement and in addition the use of working capital and accounts payable deferral metrics increased most during the financial crisis.

In a related study, Duggal and Budden, (2012) analysed a sample of 422 non-financial S&P 500 firms for two different periods, recession period (2007) and post-recession period (2010). The results showed that US firms retained more cash and short-term investments in the post-recession period than during the recession, an indication that the recession has shifted the efficient frontier. On the basis of the results, Duggal *et al* suggested it appears firms in general held more net working capital in order to face new economic challenges.

Using a unique methodological approach, Yenice (2015) employed neural network modelling to investigate the relationship between working capital management and macroeconomic variables for 128 Turkish firms listed on the Borsa Istanbul for the 11 years, 2003 – 2013. The level of working capital, return on working capital (measured by Net Profit/Total Current Assets), and cash conversion cycle were used as dependent variables and analysed separately. Macroeconomic variables including inflation, export index, import index, foreign exchange rate, interest rate, stock market index, gross domestic product (GDP), and gold prices were used as independent variables. The research findings show that working capital is influenced by macroeconomic variables. In particular, the level of working capital is influenced most by export index and stock

market index. Return on working capital is influenced most by import index and stock market index, and cash conversion cycle, is influenced most by benchmark interest rate, gold prices, and foreign exchange rate.

Enqvist, Graham, and Nikkinen (2014) also tested the role of business cycles on the working capital–profitability relationship using a sample of Finnish listed companies over an 18-year period. They found that the impact of business cycle on the working capital–profitability relationship is more pronounced in economic downturns relative to economic booms. Enqvist *et al.*, further showed that the significance of efficient inventory management and accounts receivables conversion periods increase during periods of economic downturns. Based on the findings, Enqvist *et al.*, concluded that active working capital management matters and, thus, should be included in firms’ financial planning. Lastly, Daisuke (2017) investigated the relationship between working capital requirements and firm performance for Japanese firms during the global financial crisis. Data for the crisis period includes the period 2007 - 2010, compared to the non-crisis period data which covered the period, 2003 – 2006. The data generated 568,492 and 278,634 firm-quarter observations for 89,777 and 53,333 firms for the periods 2003 – 2010 and 2007–2010, respectively. Using correlation and panel data regression analyses, the results revealed the following. First, the level of excessive working capital increased during the financial crisis after 2008. However, it decreased after late 2009 and returned to its pre-crisis level. Second, the adjustment speed in working capital requirement in late 2008 and early 2009 was slower than that in other periods, an indication that firms faced some constraints in adjusting their working capital level to its target during the financial crisis. Conversely, the adjustment speed after late 2009 was similar to that before the crisis, so firms could adjust their working capital requirements in only a year after the occurrence of the financial crisis. Third, the estimated negative relationship between firm performance and excessive working capital requirement is larger during the crisis. This implies that firms were unable to reduce their working capital during the crisis period.

Contrary to the research conclusions presented above, other authors have argued that the relationship between working capital management and corporate performance is nonlinear captured through an inverted U-shape relation (Sasabuchi, 1980) between WCM and profitability, showing that firms pursue an optimal working capital level that maximizes profitability (see for example Baños-Caballero, et al., 2010; 2012; 2014; Khan and Ghazi; 2013; Gomes and Venâncio, 2013). The non-linear relationship is positive when firms hold low levels of investment in working capital and becomes negative for higher levels. Banos-Caballero, *et al.* (2014) reported a non-linear relationship between profitability and working capital management using panel data regression model. The authors investigated the association between working capital management and corporate performance for a sample of non-financial UK companies. The findings provide strong support for an inverted U-shaped relation (Sasabuchi, 1980) between investment in working capital and firm performance. The authors concluded that the findings imply the existence of an optimal level of investment in working capital that balances costs and benefits and maximizes a firm's value. The results further suggest that managers should avoid negative effects on firm performance because of lost sales and lost discounts for early payments or additional financing expenses.

In another study, Silva (2012) used longitudinal financial database obtained from *Instituto Nacional de Estatística* (Portuguese Statistical Office), covering the 1996-2006 period to test for a non-linear relationship between WCM and profitability for a sample of Portuguese manufacturing firms. Panel data methodology was used to analyse the data. In line with previous research, the results provide evidence that there is a negative linear relationship between profitability and net trade cycle. Moreover, a reduction in the average number of days of accounts receivable and in the average number of days of inventories leads to an increase in firm's profitability. Also a decrease in the average number of days of accounts payable tends to increase profitability. More importantly, the study reported a non-linear (inverted U-shape) relationship between working capital management (measured by Net Trade Cycle) and profitability (proxied

by return on assets), an indication that there is an optimum net trade cycle level that maximizes profitability of the sample firms. In another Portuguese study, Gomes et al (2013) used fixed effects and random effects panel data regression models to investigate the existence of a non-linear relationship between working capital management (proxied by CCC) and firm's profitability (measured by return on assets) for a sample of 41,536 Portuguese firms covering the six years period, 2004 to 2009. The results revealed that there is an inverted U-shape relationship between WCM and profitability, indicating that there is an optimal working capital level that maximizes profitability. This further indicates that both high and low working capital levels are associated with a lower profitability. Such relationship between WCM and profitability, behaves positively for low levels of investment in working capital and negatively for high levels of investment in working capital.

Thapa (2013) analysed efficiency of working capital management and profitability for a sample of 30 top food and beverage listed firms in the U.S.A. and Canada during the 10 years study period from year 2000 to 2009. Unlike previous US studies, secondary data for the study was obtained from OSIRIS database. Working capital management efficiency was measured using performance index, utilization index and efficiency index rather than using the conventional turnover ratios. Also the distribution of working capital measure (i.e. cash conversion cycle and factors affecting it, viz. leverage, growth, size, age, cash flow and fixed assets to total assets ratio) were studied. The results revealed the existence of a non-linear relationship between working capital management (measured by CCC) and profitability. Similar correlations between working capital management (measured by NTC) and profitability have been analysed for Turkish firms as well. Soykan and Ulucak (2016) based their statistical analysis on a panel data for companies listed on the Borsa Istanbul for the period 2009 – 2014. The results confirmed the non-linear relationship between NTC and profitability. The authors concluded that there is an optimal NTC value where firm value is maximised. At this optimal working capital level, costs and advantages

are poised. This implies that corporate executives should carefully manage their working capital investment and strive to be close to the optimal level as much as possible.

3.8.1.2 Empirical evidence on inventory management and profitability

Empirical evidence on inventory management-performance relationship suggest that efficient inventory management may influence firm performance. For example, Huson and Nanda (1995) proved that the improvement of inventory turnover (following Just-In-Time (JIT) adoption) by a sample of 55 U.S. firms led to an increase in earnings per share. Deloof (2003) documents a significant negative relation between gross operating income and the number of inventories days for a sample of non-financial Belgian firms during the period 1992-1996, suggesting that managers can create value for their shareholders by reducing the number of inventories days to a reasonable minimum. Another study carried out in Belgium by Boute et al. (2006) found no overall decrease of inventory ratios despite any increased focus on inventory reduction. The authors concluded that companies with very high inventory ratios have more possibilities to be bad financial performers. This finding is consistent with the Shin and Soenen's (1998) study which reported a strong negative relation between the inventory conversion period and corporate profitability for a large sample of U.S. listed firms.

Shah and Shin (2007) examined the empirical associations among three constructs – inventory, IT investments and financial performance – using longitudinal data that span four decades, where they conclude that reducing inventories has a significant and direct relationship with financial performance. In their study, Lieberman and Demeester (1999) analysed the impact of Just-In-Time (JIT) processes on manufacturing productivity in the Japanese automotive industry. The results suggested that reduction in inventory brought about by JIT practices enabled the firms to improve their productivity and concomitantly, profitability. In a related study, Maiga and Jacobs (2009) analysed a sample of 131 US listed firms which adopted just-in-time (JIT) procedures and their matched non-JIT firms. Tobin's Q and return on assets (ROA) were used to measure firm

performance. Statistically significant differences in Tobin's Q and ROA were observed in a pre- and post-test of JIT adopters and between matched non-JIT adopters. In an attempt to study the link between inventory and long-term stock returns of US manufacturing firms Chen *et al.* (2005) conducted an analysis on 20 years (1981-2000) data. The findings suggested that, while firms with abnormally high inventory levels have poor long-term stock returns, firms with slightly lower than average inventory do better than firms with extremely low Inventory.

In Greece, Koumanakos (2008) studied the effect of inventory management on performance of 135 manufacturing firms operating in three industrial sectors in Greece. Food, textiles and chemicals were used in the study covering 2000 – 2002 period. Using the ordinary least squares (OLS) procedure the results suggest that a positive strong linear association exists between lean inventories management and accounting based performance only for sporadic periods of time in only two out of three industries analysed.

Roumiantsev and Netessine (2007) also examined the association between inventory management policies and performance of 722 manufacturing, retailing and wholesaling firms in the U.S. Using a statistical methodology that links managerial decisions related to inventory with accounting returns, the authors reported that superior earnings are associated with the speed of change/responsiveness in inventory management, after controlling for industry-and firm-specific effects. The results further revealed that in the pooled sample, inventory elasticity with respect to sales, lead times and sales uncertainty is consistently positively associated with both current and future returns on assets. The authors argued, on the basis of the findings that listed companies that are more responsive in inventory management are, on average, more profitable. In another study, Rummyantsev and Netessine (2007a) analysed the impact of responsive inventory management on financial performance. Responsive inventory management refers to a close match between sale and inventory dynamics—a responsive firm will maintain constant relative inventory levels. The results showed that high deviations from constant inventory days are associated with a lower profitability. Moreover, Singhal (2005) examined the impact of public

inventory-surplus announcements on shareholder value. The results showed that firms which experience excess inventory situations underperform their peers, and that the stock market partially anticipates the negative effects of holding surplus inventory.

Also Eroglu and Hofer (2011) analysed the nexus between various inventory types and performance for a sample of US manufacturing firms. The results indicate that the magnitude of the inventory–performance relationship varies by type of inventory and across industries. Specifically, raw materials inventories have a greater impact on firm performance than work-in-process and finished goods inventories. Lastly, Isaksson and Seifert (2014) investigated the financial consequences that inventory leanness has on firm performance. Econometric analysis was performed on data from 4324 publicly traded US manufacturing companies for the period 1980–2008. The authors observed a nonlinear relationship between inventory leanness and financial performance. However, it was noted that the maximum point of this inverted U-shaped relationship often lies at the extreme end of the investigated sample – suggesting a decreasing return from leanness rather than an optimal level.

In the case of Turkey, Sekerolgu and Altan (2014) investigated the effect of inventory management on the profitability of Turkish firms which operated in the weaving, eatables, wholesale and retail industries, over the period 2003-2012. The data consists of profitability ratios and inventory turnovers ratio calculated by using balance sheets and income statements of firms which operated in Borsa Istanbul (BIST). Using regression and correlation analyses, the results suggest that there is a significant positive relationship between inventory management and profitability in eatable industry. However, it was found that there is no significant relationship between inventory management and profitability in the weaving industry and wholesale and retail industry

The aforementioned studies were conducted in periods of relative economic stability. However, for the purposes of this study, it is necessary to review studies carried out during crisis periods. In a recent study, Kesavan and Kushwaha (2014), examined retail inventory investment during

macroeconomic expansions and contractions. They reported that the service level of retailers has significant explanatory power on inventory investment. In periods of contraction, low service level retailers decrease their inventory investment more than high service level retailers. Rogers, Schatzberg and Schatzberg (2010), analysed effect of inventory on firm profitability before and after two catastrophic supply chain disruptions in the United States. These are the September 11, 2001 terrorist attack (popularly known as 9/11) and the 2005 Hurricane Katrina. The purpose of the study was two-fold. First to determine whether there is evidence that inventory was used as a means of developing supply chain resiliency and second to examine the stability of any such relationship. Data was collected from Compustat database for a sample of 3612 firms (1865 for the September 11, 2001 event and 1747 for the Hurricane Katrina event) for separate three-year periods, 1998 to 2000 and 2002 to 2004, before and after the 9/11 and 2002-2004 and 2006 to 2008, three-year periods surrounding Hurricane Katrina. The correlation and regression analyses indicated the effect of inventory on firm profitability revealed a significant decline for manufacturing firms in the post- September 11 period with no significant change in the post Katrina period.

Hoberg, Udenio and Fransoo (2015) used firm-level empirical data from 1,278 public U.S. manufacturing firms for the period 2005-2011 to understand the drivers behind inventory responsiveness and explore the link between responsiveness and profitability, market performance, and financial health during the global financial crisis. Quarterly financial data from Standard & Poor's Compustat database was used to analyze the performance of 1,278 firms in the period between 2005 and 2011. The results showed that, on average, firms required six quarters to adapt to the crisis situation. However, the responsiveness varies across sectors. In particular, firms in chemical and electronics sectors required the most time to align inventories to the new realities. The study further identified key firm-level factors associated with a responsive adaption of inventory levels to changes in demand. These factors are lower liquidity, lower gross

margins, and higher inventory predictability. Firm size, often associated with superior inventory management capabilities, was found not to have a significant impact. Furthermore, the results showed that the impact of deviations from the normal inventory levels is not symmetric—inventory reductions appear to be more critical than inventory excesses. Inventory reductions were reported to be associated with a decrease in the return on sales, an increase in the probability of bankruptcy, and a decline in short-term stock performance. In the long-term, however, inventory reductions are associated with an increase in a firm's stock performance. On the basis of the results, the authors concluded that managing inventories efficiently is indeed critical during crisis periods. The findings, however, suggest that the short-term view of inventory reduction as an instrument of liquidity needs to be gauged carefully against the tradeoffs between different dimensions of short- and long-term financial performance.

3.8.1.3 Empirical evidence on accounts receivable management and profitability

Like inventory, accounts receivable is another important part of working capital. Accounts receivables often represent a large investment in short-term assets and involve significant volume of transactions and decisions. Demirgüç-Kunt and Maksimovic (2001) presented evidence that in countries such as France, Germany, and Italy accounts receivable exceeds a quarter of firms' total assets, while Rajan and Zingales (1995) reported that 18% of the total assets of US firms consists of receivables. Accounts receivable management is important in corporate finance because of its effects on a firm's profitability and risk, and consequently its value. The goal of accounts receivables management is to maximize shareholders wealth. Researchers have studied accounts receivable individually, but mostly as a part of working capital management, from various points of view. Bougheas et al. (2009), for example, focused their study on the response of accounts receivable to changes in the cost of inventories, profitability, risk and liquidity. Other authors explored the impact of an optimal receivables management (i.e. the optimal way of managing accounts receivables) that leads to profit maximization. Studies

conducted by Deloof (2003), Laziridis and Tryfonidis (2006), Gill et al (2010), Garcia-Teruel and Martinez-Solano (2007), Samiloglu and Demirgunes (2008) in Belgium, Greece, USA, Spain, and Turkey respectively all point out to a negative relation between accounts receivables and firm profitability. In other words, having an accounts receivable policy which leads to a low as possible accounts receivables enhances profitability.

Grzegorz (2008) used portfolio management theory to determine the level of accounts receivable in a firm. The results showed that an increase in the level of accounts receivables in a firm increases both net working capital and the costs of holding and managing accounts receivables. Both of these decrease the value of the firm, but a liberal policy in accounts receivable coupled with the portfolio management approach could increase firm value. In his study, Baveld (2012) analysed the effect of the 2008/2009 global financial crisis on the association between accounts receivable and profitability for a sample of 37 large publicly listed firms in The Netherlands. The study compared the relation between accounts receivables and profitability in the two periods – non-crisis period and crisis period. The regression and correlation results reported a statistically significant negative relation between accounts receivables and gross operating profit during the non-crisis period but no significant relation between these two variables was observed during the crisis period.

Denčić-Mihajlov (2012) investigated how public companies listed on the stock market in the Republic of Serbia manage their accounts receivables during recession times. A sample of 108 Serbian firms listed on the Belgrade Stock Exchange was used for this study. The accounts receivables policies were examined in the crisis period of 2008-2011. In order to explore the relation between accounts receivable and firm's profitability, the short-term effects were tested. The study found a positive but insignificant relation between profitability and accounts receivable. Based on the findings, Denčić-Mihajlov concluded that the impact of accounts receivable on firms' profitability changes in crisis periods.

3.8.1.4 Empirical evidence on accounts payable management and profitability

Another component of working capital management is the accounts payable turnover period. The primary objective of accounts payable management is to optimise it by extending the time of payment and to make the most of the temporary funds which actually belong to creditors. This allows the firm to make most efficient use of the money it already has. Most of the studies carried out to determine the association between accounts payable and profitability were done in the context of WCM. For example, Deloof (2003) investigated the relationship between profitability and the three discrete components of WCM - accounts receivables, inventories and accounts payables - of 1009 Belgian listed firms over the five-year period, 1992 to 1996. He found a significant negative relation between gross operating income and accounts receivables. He also argued that the negative relationship between accounts payable and profitability is inconsistent with the view that less profitable firms wait longer to pay their bills.

Garcia, Martins and Brandão (2011) studied the effect of working capital management and its components on the profitability of 2,974 non-financial companies listed on eleven European Stock Exchanges¹ for the 12 years period, 1998 - 2009. Gross operating profitability was used as a measure for profitability. The results of the of GLS and OLS regression analyses found a significant negative relationship between profitability and accounts payable period. Based on their findings, Garcia et al (2011) concluded that companies can improve their profitability by reducing the time span during which working capital is tied up within the company. Nobanee, Abdullatif, and AlHajjar (2011) also analyzed a sample of 2,123 Japanese non-financial companies listed in the Tokyo Stock Exchange for the period 1990-2004 and concluded that extending the payables deferral period could increase profitability. However, managers should be careful because

¹ The stock exchanges are Euronext Amsterdam, Euronext Paris, Euronext Lisbon, Madrid Stock Exchange (MAD), Euronext Brussels, Frankfurt Stock Exchange, Athens Stock Exchange, London Stock Exchange, Warsaw Stock Exchange (GPW), Helsinki Stock Exchange, and Milan Stock Exchange

extending the payables deferral period could damage the company's credit reputation and harm its profitability in the long run.

3.8.1.5 Empirical evidence on working capital management and firm value

In addition to investigating the nexus between WCM and its separate components on profitability, a large body of studies have investigated the relationship between WCM and firm value. A good practical evidence of how important working capital management is for a company was provided by Largay and Stickney (1980) who reported that the bankruptcy of United States firm, W.T. Grant, a nationwide chain of department stores, should have been anticipated because the company was running a deficit cash flow from operations for eight of the last ten years of its corporate life. In a related study, Shin and Soenen (1998) showed that although two United States retail firms – Wal-Mart and Kmart – had comparable capital structures in 1994, Kmart went bankrupt partly due to the financial costs of its poor working capital management as these costs contributed to its losses. In fact Kmart had a cash conversion cycle of about 61 days, whereas Wal-Mart had a shorter conversion cycle of 40 days; consequently, Kmart faced an extra \$193.3 million per year in financing costs that was difficult to handle.

Striscek (2003) in his study: *The Impact of working capital Investment on the value of a company*, used Rappaport's (1998) value model to examine how better working capital management increases cash flow that, in turn, adds value to a company's equity (value). The results show that higher cash flows from better working capital management resulted in lower cost of capital and higher value of equity. Striscek (2003) concluded that "efficient working capital management means more cash flow to repay bankers and more value to reward investors. Thus, working capital just may be the most interesting and fertile subject of finance". In another study, Luo, Lee and Hwang (2009) reported that aside from the level of working capital efficiency, improvement in working capital management significantly affects future operating earnings and firm value. In fact, the study found that the value of highly leveraged firms is positively affected by changes in working

capital management policy meaning that the market actually views working capital management efficiency positively although it also under-reacts to working capital changes.

Filbeck and Krueger (2005) adopted a unique approach by investigating whether efficient working capital management has a positive impact on annual share market closing price returns and dividends. A database covering approximately 1,000 companies served as the basis for their statistical analysis. The results of the statistical analysis (ANOVA) revealed that a positive correlation exists between efficient working capital management and the return to shareholders in terms of annual stock market closing prices and dividends. In a similar study Kieschnick, LaPlante, and Moussawi (2013), used the valuation model developed by Faulkender and Wan (2006), to examine the relationship between working capital management and firm value for a sample of US firms. Data from Compustat and CRSP databases on a sample of 3,786 US firms from 1990 to 2004, was used for the study. The statistical analysis generated the following results: (i) a dollar invested in net operating capital is worth less on average than a dollar held in cash; (ii) on average, an additional dollar of investment in net operating working capital at current levels of such investment reduces firm value; (iii) the evidence that a dollar invested in net operating working capital is worth less than a dollar is primarily driven by its financing; and (iv) firms with better access to public capital market, and particularly commercial paper markets, face a lower reduction in value from financing investment in working capital.

Gill (2011) also attempted to determine the factors that influence working capital requirements in Canada. The research sample consisted of 166 Canadian firms trading on the Toronto Stock Exchange over the three years period, 2008 and 2010. It was concluded that business cycle, return on assets, internalization of firm, and firm size are some of the determinants of listed firms' working capital requirements in Canada. Kieschnick *et al.* (2013) confirmed the effect of working capital management on shareholder's wealth. They provided evidence of the influence of other firm characteristics such as financing constraints on the valuation of working capital. Further

investigations revealed that the investment in accounts receivable had a greater impact on shareholder wealth compared to the investment in inventories.

Lastly, in their recent study, Cumbie and Donnellan (2017) used quantitative, correlational and archival methods to investigate whether a non-linear relationship exists between accounts receivable, accounts payable, inventory and firm value for U.S. listed firms. A sample of 140 firms for the years 2003-2012 were selected from a stratified random sample of firms listed on the Russell 2000 index. Accounts receivable days outstanding, accounts payable days outstanding, and inventory days outstanding were regressed on economic value to determine whether a curvilinear relationship existed. The correlation and regression results revealed that there is a significant curvilinear relationship between all three CCC components – inventory, accounts receivable, and accounts payable – and firm value (measured by Economic Value Added, EVA). Based on the results, Cumbie and Donnellan (2017) concluded that firm managers consider lowering accounts receivable, accounts payable, and inventory days during boom economic times while increasing accounts receivable, accounts payable, and inventory days during recessionary economic times.

3.8.2 Evidence from developing countries

As in the developed countries' literature review above, this section is organised as follows. First, Section 3.8.2.1 focuses on the relationship between CCC and profitability, while the nexus between profitability and both inventory management and accounts receivable management are reviewed in Sections 3.8.2.2 and 3.8.2.3 respectively. This is followed by Section 3.8.2.4 which discusses the association between accounts payable and profitability. Lastly, the literature on relation between WCM and firm value is reviewed in Section 3.8.2.5

3.8.2.1 Empirical studies on cash conversion cycle and profitability

As far as studies from developing countries is concerned, researchers have examined the relationship between working capital management and firm profitability in various countries in Africa, Asia and South America. As in the previous discussions, majority of the studies reported a linear (positive or negative) relationship between CCC and profitability. For example, Eljelly (2004), examined the relationship between profitability and liquidity (measured by current ratio and cash gap) on a sample of 929 listed firms in Saudi Arabia. Using correlation and regression analyses, the results revealed a significant negative relationship between the firms' profitability and liquidity level, as measured by current ratio. In another study, Raheman and Nasr (2007) employed a panel data regression analysis of cross-sectional and time series data for a sample of 94 Pakistani firms listed on Karachi Stock Exchange. Raheman et al reported a significant negative relationship between net operating profit and the average collection period, inventory turnover in days, average payment period and cash conversion cycle.

In the Nigerian context, Falope and Ajilore (2009) analysed the impact of working capital management on profitability for a sample of 50 Nigerian non-financial firms listed on the Nigerian Stock Exchange (NSE) from 1996 to 2005. The panel data regression results showed that there is a significant negative association between net operating profit and the average collection period, inventory turnover, average payment period and cash conversion cycle. Besides that, they found no substantial difference between large and small firms on the impact of WCM. Based on the results, Falope et al concluded that shareholders value can be enhanced if WCM is managed efficiently via minimizing the days of accounts receivable and inventories.

Dong and Su (2010) attempted to examine the relationship between profitability, cash conversion cycle and its components for listed firms in the Vietnam stock market during 2006 - 2008. They found a significant negative relationship between profitability, measured by gross operating profit,

and the cash conversion cycle. Based on the findings, Dong *et al.*, concluded that corporate managers can create a positive value for their shareholders by minimizing cash conversion cycle via keeping each different working capital component to an optimum level.

Charitou, Elfani and Lois (2010) empirically investigated the effect of working capital management on firm's financial performance for a sample of 43 industrial firms listed on the Cyprus Stock Exchange for the 10 years period, 1998 to 2007. Using multivariate regression analysis, the results support the hypothesis that cash conversion cycle and all its major components, namely, days in inventory, days sales outstanding and creditors payment period, have a significant negative relationship with profitability (measured by return on assets (ROA)). On the contrary, Sharma and Kumar (2011) analysed the relationship between profitability and cash conversion cycle for a sample of 263 Indian firms listed on the Bombay Stock Exchange (BSE) between 2000 and 2008. The results showed a significant positive relationship between cash conversion cycle and profitability. In other words, the longer the CCC of a firm, the lower the profitability.

In their study, Mongrut, Cubillas and Cubillas (2014) examined the factors that affect working capital management in nonfinancial firms from five Latin American countries² for the period 1996-2008. Using an unbalanced panel data regression analysis for companies listed on the five capital markets the study revealed that companies in Argentina, Brazil, Chile and Mexico, except Peru, tend to hold cash excesses, which could destroy firm value. The results further indicated that industry cash conversion cycle, company market power, future sales and country risk have an influence on the way Latin American companies manage their working capital with significant differences among countries in the region.

In the Ghanaian context, Akoto et al (2013) used secondary data covering the period, 2005 – 2009 to investigate the relationship between working capital management practices and

² Argentina, Brazil, Chile, Mexico and Peru

profitability for a sample of 13 GSE-listed manufacturing firms in Ghana. Using panel data methodology, the study reported a significant negative relationship between profitability and accounts receivable days. However, the firms' cash conversion cycle, current asset ratio, size, and current asset turnover significantly positively influence profitability. Akoto et al, therefore concluded that managers can create value for their shareholders by creating incentives to reduce their accounts receivable to 30 days. They further recommended that, enactments of local laws that protect indigenous firms and restrict the activities of importers are eminent to promote increase demand for locally manufactured goods both in the short and long runs in Ghana. In a similar study, Mensah (2014) studied the relationship between profitability (measured by the return on assets) and working capital management (proxied by CCC) and its separate components - average collection period (ACP), average payment period (APP) and inventory turnover days (ITD). The sample comprised four (4) companies listed on the Ghana Stock Exchange (GSE) out of a population of five (5) listed trading companies for the 2006 to 2010 financial years. The results showed a significant negative relationship between the cash conversion cycle, average collection period and average payment period, implying that a reduction in the periods for receiving cash, an increase in the period for paying cash a reduction in the cash conversion cycle will cause an increase in profit. The inventory turnover days as well as all other control variables showed a positive relationship with profitability. On the basis of the findings, Mensah (2014) recommended that trading companies should manage their working capital more efficiently so as to keep it in equilibrium.

In a multi-country study, Ukaegbu (2014) investigated the relationship between working capital efficiency and corporate profitability for a sample of listed manufacturing firms in four African countries - Egypt, Kenya, Nigeria and South Africa. Data for the study was obtained from the Orbis database for the period 2005–2009. Using balanced panel data regression analysis, the results revealed that there is a significant negative relationship between profitability, measured by net operating profit, and cash conversion cycles across different industrialisation typologies.

The negative association implies that, when the cash conversion cycle increases, the profitability of the firm declines. Ukaegbu (2014) concluded, based on the results, that managers can create positive value for shareholders by reducing the day's customers settle their accounts, ensuring that they sell off their inventories as quickly as possible and delaying the payments to their suppliers, as long as this does not affect their credit rating.

Tahir and Anuar (2016) also attempted to determine the relationship of working capital management and the firm's profitability in the textile sector of Pakistan. A sample of 127 textile firms listed in the Karachi stock exchange for the period 2001–2012 was used in the study. Using the dynamic panel generalized method of moments the findings revealed that average collection period in days, net working capital level, current assets to operating income, current assets to sales ratio, current liabilities to total assets has a significant negative impact on profitability (measured by return on assets), whereas the accounts payable period in days, inventory turnover in days, cash conversion cycle, net trade cycle, cash turnover ratio, current assets to total assets ratio, and current ratio has a significant positive association with profitability. Based on these findings, the authors recommended that managers should design and implement effective policies on working capital in order to enhance firms' profitability.

In a recent study, De Rozari, Sudarma, Indiasuti, and Febrian (2015) analysed the association between working capital efficiency (CCC) and working capital policy on both profitability (return on assets) and firm value (measured by Tobin's Q) during and after the global financial crisis for 104 manufacturing firms listed on Indonesia Stock Exchange (IDX) over the period 2005-2013. Using panel data hierarchical regression analysis, the study reported significant differences in the effect of the cash conversion cycle (and its components) and working capital policy on profitability during the crisis period compared to the non-crisis period. In contrast, the study found no differences in the effect of the cash conversion cycle (and its components) and working capital policy on the firm value during the crisis and non-crisis period. On the basis of these findings, De

Rozari *et al* concluded that the sampled firms seemed to manage their working capital policy more efficiently during the global economic crisis than during the non-crisis period.

Shah (2016) analysed the influence of working capital management on firms' profitability under different business cycles for 65 Pakistani non-financial firms listed on Karachi stock exchange covering the 10 years period, 2004 to 2013. The panel data regression results revealed that there is a significant negative relationship between profitability and cash conversion cycle, and each CCC component in isolation. Moreover, business cycle affects the working capital management and firms' profitability relationship. Based on the findings, Shah (2016) concluded that efficient working capital management matters and hence should be included in financial planning. Bhatia and Srivastava (2016) used fixed- and random-effects model and generalized method of moments (GMM) to analyse a sample of 179 firms listed on the S&P BSE 500 Index of Bombay Stock Exchange (BSE) for the period 2000–2014. The results revealed that there is a significant negative relationship between working capital management and firm performance, necessitating the need to efficiently manage working capital for enhanced profitability.

In another recent study carried out in Brazil, Silva and Miranda (2016) compared the indicators of working capital management before and after the adoption of International Financial Reporting Standards (IFRS) for a sample of 500 Brazilian listed firms covering the ten years period, 2004 to 2013. The WCM indicators are Net Working Capital (NWC), Working Capital Requirement (WCR), Cash Balance (CB) and Liquidity Ratio (LR). The study year was divided in two periods: the first covered the four-year period before the adoption of the international standards, from 2004 to 2007; and the second covered the four years after the adoption from 2010 till 2013. The years 2008 and 2009 were not investigated, as that was the transition period, when the international standards were adopted. The Mann-Whitney nonparametric test was used to analyse the data. The results showed that, with the exception of working capital requirement (WCR), the other working capital indicators – net working capital (NWC), cash balance (CB), and liquidity ratio (LR),

have undergone significant changes after IFRS adoption. Based on these results, the authors concluded that the adoption of international accounting standards strongly affects financial items in the working capital than operational items. Thus, by using the financial statements for decision making, external users should be aware of the changes that have affected the financial elements of current assets and liabilities, since such fluctuations can change the indicators, thus affecting the decision-making process.

Nobanee (2017) recently examined the relationship between the efficiency of working capital management and profitability of construction firms listed in the United Arab Emirates stock markets, taking into account the global financial crisis. The results showed that there is a significant negative relationship between net trade cycle for all construction firms and large construction firms. However, the coefficient for small firms was positive and insignificant, an indication that small construction firms do not manage their working capital efficiently. The results further showed that there is a significant negative relation between the net trade cycle and profitability of construction firms during crisis period. Based on these results, Nobanee (2017) concluded that UAE construction companies are more efficient in managing their working capital during crisis periods.

Lastly, in a comprehensive study, Cetenak, Vural and Sokmen (2017) examined working capital determinants at both firm-level, and industry-country level for a sample of 2453 manufacturing firms across 14 emerging markets³ over the period, 2000 – 2014. The first level is the ‘firm’ while the second is ‘industry-country’ combination. Working capital was used as the dependent variable while return on assets, Tobin’s Q, and Altman’s Z-score were used as the firm-level determinants of working capital. Herfindahl-Hirschman index (HHI) was used as industry-level determinant and four variables – exchange rate, Lerner index, inflation rate, and credit provided from financial sector – were country-level determinants. Macroeconomic data as obtained from the World Bank

³ Argentina, Brazil, Chile, Egypt, Greece, Indonesia, Israel, Malaysia, Mexico, Philippines, Poland, Romania, South Africa, and Turkey

while financial information on each firm was collected from Datastream database. Using multilevel mixed-effects linear regression model to analyse the data, the results revealed that at firm level, return on assets has a significant negative relationship with working capital, while Tobin's Q and Altman's Z-score have significant positive relationship with working capital. At industry-country level, exchange rate, Lerner index (firm's market power), Herfindahl-Hirschman index (HHI) (measure of market concentration), and rule of law have positive relation with working capital levels, while credit from private sector is significantly negatively related to working capital levels.

Contrary to the findings stated above, other researchers have reported a non-linear relationship between WCM and profitability. For example Aval, Hajiha and Rakhshani (2013) employed multivariate regression model to test the effect of working capital management on performance for a sample of 155 firms listed on Tehran Stock Exchange (TSE) over the five-year period, 2010 – 2014. The results suggested that there is an inverse U-shape relationship between net operating working capital and return on assets. However, there was no significant association between net operating working capital and return on stock. In a similar study, Adebowale, Salleh and Rohani (2015) investigated whether there is a non-linear relationship between investment in working capital and performance in the food and beverages industry for a sample of 73 listed food and beverages firms in Bursa Malaysia over the period 2009-2013. Tobin's Q was used as a proxy for performance, while cash conversion cycle (CCC), was used as a proxy for working capital management. Using panel data regression, the results provided evidence that an inverted U-shaped relationship exist between investment in working capital and performance. This indicates the presence of an optimal investment level in working capital which stabilizes costs and benefits and ensure maximization of firms' value. Based on the findings, Adebowale *et al* (2013) opined that maintaining an efficient and effective working capital should be a priority for managers because of its effect on overall firm performance and also due to the costs that could be incurred if optimal working capital level is not achieved by the firm.

3.8.2.2 Empirical studies on inventory management and profitability

In the literature, the relationship between inventory performance and financial performance has been investigated from two distinct viewpoints, namely, direct and indirect. In the indirect paradigm, researchers analysed that inventory performance affects other related indicators like IT performance which in turn affect financial performance of the firm. However, in direct effects researchers tried to investigate the direct relationship between inventory performance and financial performance. In their study, Raheman and Nasr (2007) examined the effects of inventory turnover on the net operating profit of a sample of 94 firms listed on Karachi Stock Exchange for the six year period, 1999 – 2004. The authors found a strong negative relationship between inventory conversion period (ICP) and profitability. In other words, a decrease in ICP leads to higher profitability, and vice versa. On the basis of the findings, Raheman and Nasr (2007) concluded that managers can create a positive value for shareholders by reducing the ICP to a minimum level.

Falope and Ajilore (2009) also used panel data econometrics in a pooled regression to analyse the nexus between inventory management and profitability for a sample of 50 listed Nigerian non-financial firms for the period 1996 – 2005. The results revealed that there is a significant negative relationship between net operating profit and the inventory turnover.

In the Indian context, Gaur and Bhattacharya (2011) analysed the relationship between the performance of the discrete components of inventory (RMI, WIPI, and FGI), and financial performance of Indian manufacturing firms. The results suggest that finished good inventory (FGI) has a significant negative relation with profitability, while raw materials inventory (RMI) and work-in-progress inventory (WIPI) have no impact of profitability. In another Indian study, Panigrahi (2013) investigated the relationship between inventory conversion period and firms' profitability for a sample of five top Indian cement companies over a period of ten years from 2001-2010. The study employed regression analysis to determine the impact of inventory conversion period on gross operating profit taking current ratio, size of the firm, financial debt ratio

as control variables. The results showed that there is a significant negative relationship between inventory conversion period and profitability. In Malaysia, Sahari, Tinggi and Kadr (2012) empirically evaluated the relationship between inventory management and firm performance and capital intensity on a sample of 82 construction firms for the period 2006–2010. The regression results showed a positive correlation between inventory management and firm performance.

Lwiki, Ojera, Mugenda, and Wachira (2013), also attempted to analyse the effect of inventory management practices on the financial performance of sugar manufacturing firms in Kenya. The study focused on the extent to which lean inventory system, strategic supplier partnership and technology are being applied in these firms. Primary data was collected using structured and semi-structured questionnaires. Secondary data was obtained from annual financial performance statements available in the Sugar Statistics Year Book. Correlation analysis was used to determine the nature and magnitude of the relationship among inventory management variables. The results indicated that there exists a significant positive correlation between inventory management and both return on sales and return on equity.

3.8.2.3 Accounts receivable management and profitability

This section reviews relevant literature on accounts receivable management and firm performance in a number of developing countries. In Dong and Su's (2010) study discussed earlier in which they analysed working capital management effects on firms' profitability of listed Vietnamese firms, they also analysed the relationship between accounts receivable and profitability. Dong et al reported the existence of a significant negative association between profitability and accounts receivable. On the basis of the findings, Dong *et al.* concluded that that decreasing firms' receivable days will lead to a higher profit and vice versa.

Mathuva (2010) analysed the impact of working capital management components on corporate profitability by using a sample of 30 companies listed on the Nairobi Stock Exchange (NSE) from 1993 to 2008. He used Pearson and Spearman's correlations, the Pooled Ordinary Least Square

(OLS), and the fixed effects regression models to conduct data analysis. The results show that there is high significant negative relationship between accounts receivable and profitability. Velmathi and Ganesan (2011) examined the credit management for a sample of five Indian commercial vehicle industry firms over a period of ten years using ratios, descriptive statistics and ANOVA. The study revealed that debtors' management was good in selected sample whereas the application of one-way ANOVA revealed that the mean ratios of all the selected units differed significantly. Meanwhile, Ramana, Ramakrishnaiah and Chengalrayulu (2013) studied the impact of managing receivables on the working capital and profitability of cement companies in India. Ramana *et al.* found that the sampled firms were efficient in managing their receivables and this was reflected in lower collection period. The efficient receivables management was found to have a positive impact on both working capital and profitability.

Saudi Arabia, Rehman, Khan and Khokhar (2014) also analysed the determinants of profitability of petrochemical companies in Saudi Arabia. Specifically, the study examined the relationship of net profit margin with creditors' Velocity, long-term debt to equity ratio, debtors' turnover ratio, inventory turnover ratio and total assets turnover ratio. The results suggest that creditors' velocity, long-term debt to equity ratio, inventory turnover ratio and total assets turnover ratio have a significant relationship with profitability measured using net profit margin. However, debtors' turnover ratio (receivable conversion period) did not show any significant relationship with net profit margin.

Lastly, Mbula, Memba and Njeru (2016) investigated the nexus between accounts receivables and financial performance of Kenyan firms with venture capital funding from the government. The results showed that there is a positive relation between accounts receivable and financial performance of these firms. Based on the results, Mbula *et al.* concluded that managers of these firms should improve efficiency of management of accounts receivable in order to enhance profitability.

3.8.2.4 Empirical studies on accounts payable management and profitability

Another important component of working capital that affects firm performance is accounts payable. It is widely acknowledged that the effective and efficient management of accounts payable contributes positively to the firm's profitability and value. For example, Abor (2004) studied listed non-service Ghanaian firms within the period of 1998-2002 and used cash conversion cycle and net trade cycle as a measure of profitability and arrived at the following conclusions. First, that there is a negative significant relationship between profitability and number of day's inventory and number of day's account receivable but negative non-significant relationship between profitability and number of day's accounts payable. He also found a negative relationship between profitability and the cash conversion cycle and Trade cycle. Another study from Ghana was conducted by Mbawuni, Mbawuni and Nimako (2016). They analysed the impact of working capital management on profitability of a sample of retail petroleum firms in Ghana over the six years period, 2008 – 2013. Using correlation analysis and panel data regression analysis, the results indicate that the accounts payable deferral period is the most important working capital management variable that drives the firms' profitability. The remaining working capital management components – CCC, ICP and RCP – did not have significant relationship with profitability.

In Nigeria, Falope and Ajilore (2009) used a sample of 50 Nigerian listed non-financial firms for the period 1996 – 2005. Their study utilized panel data econometrics in a pooled regression, where time series and cross sectional observations were combined and estimated. They found a significant negative relationship between net operating profit on one hand and the average collection period (ACP) and average payment period (APP) on the other hand for the sampled firms. In addition to the above study, Ikechukwu and Nwakaego (2015) analysed the relationship between accounts payable management and financial performance of listed manufacturing companies in Nigeria. Data was collected from the Annual Reports of the listed firms and analysed using correlation and regression methods. The results showed that accounts payable had positive

and significant correlation with the profitability. This means that a day's increase in payables period will result in a corresponding increase in the profitability for the sampled firms.

An often cited African study was conducted by Mathuva (2010) on Kenyan listed firms. Specifically, the study examined the influence of receivables and payables management on corporate profitability for a sample of 30 firms listed on the Nairobi stock exchange (NSE) for the periods 1993 to 2008. Using correlation and regression analyses the results showed that there exist a significant positive relationship between the accounts payable and profitability. In other words, lengthening the payable period will lead to a lower CCC and hence higher profitability. In a recent study from Kenya, Achode and Rotich (2016) analysed the effects of accounts payable on financial performance for 16 manufacturing firms listed on the Nairobi Stock Exchange (NSE) over the period, 2009 through to year 2013. Multiple regression model was used to test the relationship between the accounts payable and firm performance. The results were consistent with the CCC theory that there is a significant positive relationship between accounts payable period and profitability.

Ponsian, Chrispina, Tago, and Mkiibi (2014) also conducted a study to examine the nexus between company's working capital management and profitability using a sample of three manufacturing companies listed on the Dar es Salam Stock Exchange (DSE) for a period of ten years from 2002 to 2011 with a total of 30 observations. The key findings from the study are as follows. First, there exists a positive relationship between cash conversion cycle and profitability. Second, there is a significant negative relationship between liquidity and profitability. Third, there exists a significant negative relationship between average collection period and profitability indicating that a decrease in the number of days a firms received payment from sales has a favourable impact upon profitability. Fourth, there exists a highly significant positive relationship between average payment period and profitability.

In summary, the literature review indicates that accounts payable management impacts on the profitability of the firm but the results are mixed, with no clear-cut direction of the relationship between any of the variables of accounts payable and profitability.

3.8.5 Empirical studies on working capital management and firm value

Numerous studies have been conducted in developing countries to investigate the relationship between working capital management and firms' value. Nazir and Afza (2009) analysed the effects of working capital financing and investment policies on profitability and value for a sample of 204 Pakistani firms listed on the Karachi Stock Exchange (KSE). The results confirmed that there is a significant positive relationship between conservative working capital policy and both profitability and firm value (measured by Tobin's Q). Nazir et al concluded that aggressive working capital investment destroys a firm's profitability and value. In terms of working capital financing policy, they found an inverse relationship between restrictive working capital financing policy and firm profitability and a positive relationship between restrictive working capital financing policy and firm value. Moreover, Mohamad and Saad (2010) also examined the effect of working capital components on firm performance (represented by the Tobin's Q) for 172 Malaysian listed firms. The study found a significant inverse relationships between working capital variables and firm performance.

Abuzayed (2011) investigated working capital management and firms' performance for a sample of firms listed on the Amman Stock Exchange. The study includes a conceptual as well as empirical analysis, in which data from a sample of listed firms for the period from 2000 to 2008 was analysed to examine if efficient working capital management improves firms' accounting profitability and firms' value. Cash conversion cycles as well as its components are used as measures of working capital management skills. In this study, two performance measures are used: one accounting and one market measure, believing that wealth maximization is shareholders' main concern. To bring up more robust results, this study used more than one

estimation technique, including panel data analysis, fixed and random effects, and generalized methods of moments. Using robust estimation techniques this study found that profitability is affected positively with the cash conversion cycle. This indicates that more profitable firms are less motivated to manage their working capital. In addition, financial markets failed to penalize managers for inefficient working capital management in emerging markets.

In the case of Nigeria, Ogundipe, Idowu, and Ogundipe (2012), analysed annual reports of fifty four non-financial firms listed on the Nigerian Stock Exchange for the period 1995-2009. The findings revealed that working capital management (CCC) has a significant negative relationship with market valuation (Tobin Q). In another study, De-Almeida and Eid Jr (2014) investigated the effect of investment in working capital on firm value for a sample of 82 Brazilian firms listed on BM&FBOVESPA from 1995 – 2009. Working capital was measured by investment in current assets, while firm value was proxied by excess stock return. The results revealed that an extra investment in working capital is significantly less worth, on average, than an extra investment in cash. Also on average, increasing the level of working capital at the beginning of a fiscal year reduces company value. Lastly, using OLS regression analysis, Wasiuzzaman et al (2013) studied the relationship between working capital efficiency and firm value and the influence of financing constraints on this relationship for a sample of 192 listed Malaysian firms spanning a period of ten years (1999-2008). The study showed that improvements in working capital efficiency through reduction in working capital investment results in higher firm value. However, this relationship is influenced by the financing constraints faced by a firm. For financially constrained firms, working capital efficiency significantly increases firm value but it is found to be insignificant for unconstrained firms.

3.8.3 WCM and firm performance: evidence from South Africa

As mentioned in Chapter 1, the empirical literature on working capital management and firm performance in South Africa is very scant, especially those focusing on economic crisis periods. Thus, unlike the previous two sections (developed and developing countries) where the studies were discussed under four separate sections, the literature review in this section combines all relevant studies carried out in South Africa.

One of the relevant studies on working capital management in South Africa was carried out by Smith (1995). He explored the association between traditional and alternative working capital measures and the returns of 135 industrial firms listed on the Johannesburg Stock Exchange over the ten years period, 1984 – 1993. Secondary data was obtained from I-Net Bridge/BFA McGregor data base. Traditional liquidity ratios measuring working capital position, activity and leverage, and alternative liquidity measures, were calculated for each of the 135 sampled firms for the 10 years. The results from the chi-square and regression tests indicated that the traditional working capital leverage measures, in particular, total current liabilities divided by funds flow, and to a lesser extent, long-term loan capital divided by net working capital, displayed the greatest associations. In another study, Smith and Fletcher (2009) used correlation and regression analyses to investigate the factors that influence working capital management in the South African environment for a sample of 103 industrial firms listed on the JSE over the period 1998 – 2007. Secondary data was obtained from I-Net/BFA McGregor database. Two dependent variables – Net Liquid Balance (NLB) and working capital requirement (WCR) were used as proxies for working capital management. The independent variables include company type, debt ratio, turnover, operating cash flows and return on assets. The regression and correlation results indicated no significant industry effect on working capital management. Similarly, models built to measure the influence of four predictors on the working capital proxies did not reveal any significant influences. However, when absolute values were used, the study found that turnover displayed the greatest influence on working capital management. The findings suggest that by

not considering subgroups in the variables, we might be overlooking, and hence not measuring, the underlying relationships between these variables.

Le Roux (2008) used regression analysis to investigate the relationship of corporate profitability and working capital management for a sample of 118 JSE listed firms over the period 2003 - 2007. The results confirms the CCC theory that: 1) there is a significant negative relationship between CCC and profitability and CCC, 2) there is a significant negative relationship between CCC and inventory conversion period, 3) there is a significant negative relationship between CCC and receivables conversion period. The results, however, contradict the hypothesised positive association between CCC and payables deferral period. In light of the results, Le Roux concluded that managers or owners of firms can improve profitability by handling correctly the cash conversion cycle and keeping each individual component (accounts receivable, accounts payable and inventory) to an optimum level. Lastly, he argued that managers can create value for shareholders by reducing the cash conversion cycle and its individual components.

Erasmus (2010) also tested the relationship between WCM and profitability on a sample of 3924 (2275 listed and 1649 delisted) South African industrial firms over the 19 year period, 1989-2007. Regression and correlation techniques were used to analyse the data which resulted in a significant negative relationships between profitability (measured by ROA and Net Trade Cycle (NTC)). On the basis of the findings, Erasmus concluded that management can improve profitability by decreasing the overall investment in net working capital.

In another study, Ncube (2011) investigated the association between working capital management components and profitability taking into account the 2008/2009 recession period. The sample consisted on 254 non-financial firms listed on the Johannesburg Securities Exchange (JSE) over the seven year period, 2004 to 2010. The data was obtained from I-Net Bridge/BFA McGregor database. Using the Pooled OLS regression method, the study examined how the influence of the selected working capital management components changes as macroeconomic

conditions change. The results revealed the following. First, there exists a significant negative relationship between cash conversion cycle and profitability. Second, there exists a significant negative relationship between accounts receivables and profitability. Third, an increase in the length of a firm's cash (operating) cycle tends to increase profitability during an economic recession than during an economic boom. On the basis of the above results, the author concluded that firms adopt a more generous trade credit policy during an economic recession than during a boom in an attempt to boost sales which would ordinarily dwindle during a recession. Lastly, the study reported that there exists a highly significant negative relationship between profitability and the following ratios: day's payables outstanding, current ratio, and capital structure. According to Ncube, the negative relationship found between profitability and debt to equity ratio (used as a proxy for capital structure) indicates that South African firms' profitability tends to decrease at excessively high and increasing levels of debt.

In a similar study, Ngwenya (2012) empirically examined the nexus between WCM and profitability for a sample of 69 JSE-listed firms for the period, 1998 to 2008. The results revealed a statistically significant negative relationship among profitability (gross operating profit), the cash conversion cycle (CCC), and number of days accounts receivable (AR). Siame (2012) also analysed data from published financial statements of 120 JSE listed firms. The results suggest that there exists a negative relationship between profitability and liquidity (cash conversion cycle). The results further show that efficient liquidity management improves return to shareholders by reducing time taken from the moment that creditors/suppliers are paid until the moment cash is collected from customers/debtors.

In a recent study, Kwenda (2014) investigated working capital investment and financing practices of a sample of 305 firms listed on the Johannesburg Stock Exchange (JSE) and also examined whether these practices play a role in alleviating financial constraints within the firms. Using the Generalised Method of Moments (GMM) the results suggest that despite operating in an environment with a well-developed financial system, South African firms use trade credit as a key

short-term financing instrument. These firms pursue target trade credit and short-term financial debt levels and they quickly adjust towards their target. Furthermore, these firms have optimal working capital investment levels and they endeavour to adjust towards this optimal level. The study also found that the relationship between working capital investment and firm value is concave due to the benefits and costs associated with working capital investment. More importantly, the results showed that working capital management plays an important role in alleviating the impact of financial constraints. In light of these findings, Kwenda concluded that executives in South Africa should adopt efficient working capital management as part of their overall corporate strategy as this can improve cash flows, competitive advantage and can help them cope with financial constraints.

Meanwhile, Garg and Gumbochuma (2015) used panel data regression to analyse the nexus between working capital management and profitability for a sample of 17 JSE listed firms for a period of ten years from 2004 to 2013. The study found a strong negative relationship between working capital and profitability. Firm profitability and financial debt ratio was also negative. Larger firm size was found to produce a positive and significant effect on the profits. Lastly, the leverage-factor variable showed a positive effect on firm profits but the impact was not statistically significant. The results demonstrate that working management affects profitability and should be an integral part of a firm's financial planning.

In another study, Magwiwo (2015) examined the effect of the working capital management on profitability in the retail sector for a sample of 15 JSE listed firms over the five years period, 2009 to 2013. The working capital variable was proxied by the Cash Conversion Cycle (CCC). The Using panel data regression analysis the study found an expected and significant negative relationship between working capital (CCC) and firm profitability. This means a shorter CCC means higher cash liquidity and hence higher profits. The relationship between firm profitability and Financial Debt Ratio was also negative and statistically significant, meaning that a higher Debt to Assets ratio leads to lower profits. Higher firm sales were found to produce a positive and

significant effect on the profits. Lastly the leverage-factor variable showed a positive effect on firm profits but the impact was not statistically significant.

Louw, Hall and Brummer (2015) also investigated the effect of working capital management on the profitability of South African retail firms. Data for a sample of 18 retail firms listed on the JSE over the 9 years period, 2004-2012, was analysed using panel data regression methodology. The findings show that a strategy of reducing investment in inventory and trade receivables, while increasing trade payables, appears to improve the profitability of South African retail firms. Inventory management seems to have the strongest statistically significant impact on a firm's profitability. Hence, it was recommended that retail firms implement advanced inventory management systems in order to optimise inventory levels and enhance profitability.

Lastly, Moodley, Ward and Muller (2017) used a buy-and-hold portfolio methodology to study the nexus between accounts payable and return on capital for the top 160 firm listed on the Johannesburg Stock Exchange (JSE) over the period 1986 to 2014. Moodley *et al* found that for those companies in industries that have a significant investment in payables, there is a significant positive association between changes in payable days and shareholder return, which supports the general theory of working capital management.

To conclude, it is important to state that this study has benefited immensely from the literature review in many ways. First, the identification and development of the central research problem (and the associated research questions) based explicitly on the theory of working capital management would not have been possible without careful analysis and synthesis of the extant literature. This is consistent with Adams and White's (1994) argument that, unlike undergraduate and master's dissertations, a PhD thesis should be guided by some explicit theoretical or conceptual framework' and without this, the thesis becomes a 'mindless ... theoretical wasteland'. Another benefit relates to choice of methodology, variables and research instrument which were

guided by prior studies. Third, the review has helped in the operationalization and measurement of the dependent variables (profitability and firm value), and independent variables (CCC, ICP, RCP and PDP) as well as explanatory variables (Size, firm growth, leverage, GDP, and CATA. Finally, the development of the theoretical framework which forms the basis of empirical evidence collection used to address the research questions unambiguously can be attributed to the literature review.

3.9 Chapter Summary

The main theoretical arguments and empirical evidence pertaining to the association of working capital management (CCC) and its components with profitability and also with firm value were reviewed. First, the underlying cash conversion cycle theory of WCM was used to explain the existence of the central research problem. Second, various theories proposed to link the discrete components of working capital (inventory, accounts receivable and accounts payable) were discussed. These include transaction motive theory, precautionary motive theory, speculative motive theory, financial distress theory, product quality guarantee theory, product differentiation theory, and market power theory, financing advantage theory, transaction cost theory, and price discrimination theory. Lastly, the chapter concludes with analysis of the empirical literature in three different environments – developed countries, developing countries and South Africa.

It is clear from the reviewed literature that majority of the studies in South Africa investigated the effect of WCM on firm performance in stable economic (non-crisis) periods with little focus on the crisis periods. This study therefore attempted to fill this gap by investigating the impact of working capital management on profitability and firm value in the South African context before, during and after the global financial crisis.

CHAPTER 4

METHODOLOGY

4.1 Introduction

This chapter presents the methodology employed to address the research questions formulated in chapter 1. The rest of the chapter is organised as follows. The research design is explained in Section 4.2, followed by presentation of the analytical framework in Section 4.3. The hypotheses are presented in Section 4.4, while the theoretical foundations of the empirical model is presented and discussed in Section 4.5. The general empirical model and specific models are presented in Section 4.6. In addition the section describes the measurement of the various variables employed in the study. Section 4.7 describes the population, sample, and data collection. Lastly, Section 4.8 summarises the chapter.

4.2 Research design

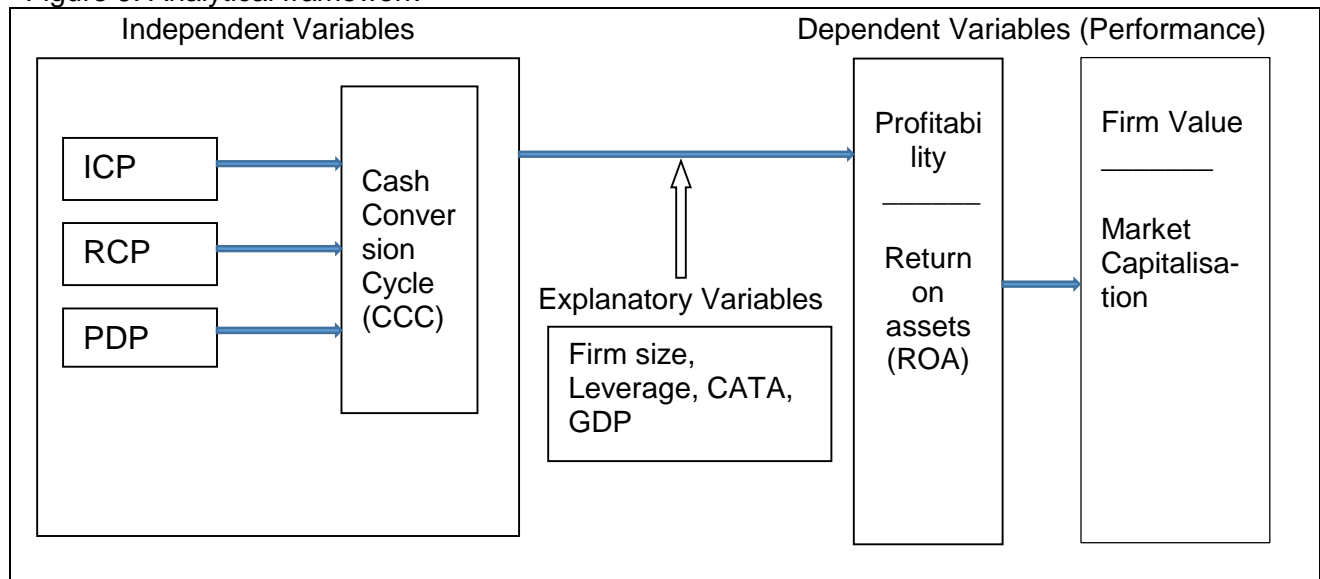
Creswell (2003) defined research design as procedures for collecting, analysing, interpreting and reporting data in research studies. He went on to state that rigorous research designs are important because they guide the methods and decisions that researchers must make during their studies and set the logic by which they make interpretations at the end of their studies. Donaldson et al. (2013) also defined research design as the researcher's overall plan or outline for obtaining answers to the research questions. According to Wester, Borders, Boul, and Horton (2013) the selection of research design depends on the nature of the research question, target population, data collection, and analysis techniques. Wester et al (2013) further stated that it is important to consider the advantages and disadvantages of all three types of research designs – experimental, quasi-experimental, or nonexperimental designs. Experimental research design requires manipulating variables or applying treatments to the participating firms (Wisdom *et al.*, 2012). A quasi experimental design focuses on comparison and evaluation of the effectiveness of

interventions (Venkatesh et al., 2013). A non-experimental research design does not require any form of intervention or manipulation as it relies on the retrieval of archival data (Kura, 2012). In line with the above discussions and previous studies (e.g. Deloof, 2003; Nobanee *et al.*, 2011; Rehn, 2012; Banos-Cabellero, 2014; Kwenda, 2014; Daisuke, 2017) this study employed non-experimental correlational research design because the research questions focused on examining the causal relationship between working capital management and firm performance.

4.3 Analytical framework

The analytical framework (Figure 9) employed to examine the relationship between WCM and firm performance as well as the factors that influence this relationship is based on the CCC theory discussed in chapter three.

Figure 9: Analytical framework



Source: Own construction

Hedrick *et al* (1993) opined that it is necessary to specify the hypothesized relationship between the dependent variable and independent variables in the analytical framework. Accordingly, the stated variables together with theoretical predictions of the direction of their influence on profitability and firm value are summarized in Table 3.

4.4 Empirical Model

This section presents the general empirical model, a description of the variables and specific models specification.

4.4.1 General empirical model

The following general empirical panel data model was employed to estimate the relationship between working capital management and its discrete components, and both profitability and firm value. The empirical model is stated as follows:

$$Y_{it} = \beta_0 + \beta_k X_{it} + v_{it} + \varepsilon_{it} \quad (1)$$

Where

Y_{it} = Profitability (ROA) or firm value (Market Cap) for firm i in year t

X_{it} = RCP, ICP, PDP, CCC, GDPGR, CATA, DEBT, and SIZE (to be estimated)

β_0, β_1, \dots = Regression co-efficients.

v_{it} = individual error component (a particular characteristic of each firm)

ε_{it} = the idiosyncratic error (unobservable factors) that vary over time and affect profitability.

i = 1,2,3,..., 75 (firms)

t = 2003, 2004..., 2012 (time)

k = 1, 2, 3,..10

4.4.2 Models specification

Three groups of models were specified to answer the research questions and also test the stated hypotheses (see Section 4.5). The first group regress firm profitability (return on assets) for firm i at time t on CCC and each component of CCC (ICP, RCP and PDP), in addition to the included control or conditioning variables as follows:

$$ROA = \beta_0 + \beta_1 CCC_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (2)$$

$$ROA = \beta_0 + \beta_1 ICP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (3)$$

$$ROA = \beta_0 + \beta_1 RCP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (4)$$

$$ROA = \beta_0 + \beta_1 PDP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (5)$$

Model specification (2) determines the impact of CCC, size, leverage, CATA, and GDP on profitability before (2003-2006), during (2007-2009) and after (2010-2012) the global financial crisis. Model specification (3) determines the impact of ICP, size, leverage, CATA, and GDP on profitability for all three periods stated above. Model specification (4) determines the impact of RCP, size, leverage, CATA, and GDP on profitability for all the three periods. Lastly, model specification (5) determines the impact of PDP, size, leverage, CATA, and GDP on profitability for all three periods.

The second group of models regress firm value (market capitalisation) for firm i at time t on CCC and each component of CCC (ICP, RCP, and PDP) in addition to the included control or conditioning variables as follows:

$$MV = \beta_0 + \beta_1 CCC_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (6)$$

$$MV = \beta_0 + \beta_1 ICP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (7)$$

$$MV = \beta_0 + \beta_1 RCP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (8)$$

$$MV = \beta_0 + \beta_1 PDP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + \varepsilon_{it} + vit \quad (9)$$

Model specification (6) determines the impact of CCC, size, leverage, CATA, and GDP on firm value before (2003-2006), during (2007-2009) and after (2010-2012) the global financial crisis. Model specification (7) determines the impact of ICP, size, leverage, CATA, and GDP on firm value before (2003-2006), during (2007-2009) and after (2010-2012) the global financial crisis. Model specification (8) determines the impact of RCP, size, leverage, CATA, and GDP on firm value before (2003-2006), during (2007-2009) and after (2010-2012) the global financial crisis. Lastly, model specification (9) determines the impact of PDP, size, leverage, CATA, and GDP on firm value before (2003-2006), during (2007-2009) and after (2010-2012) the global financial crisis.

The last group of models are similar to the first two group of models, except that CCC^2 was added to test for non-linear relationship between WCM and firm performance (Sasabuchi, 1980; Lind & Mehlum, 2007; Knauer et al., 2013; Banos-Caballero et al., 2014; Atkas et al., 2015; Cumbie et al., 2017). The models are presented as follows:

$$ROA = \beta_0 + \beta_1 CCC_{it} + \beta_2 CCC_{it}^2 + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 CATA_{it} + \beta_6 GDP_{it} + \varepsilon_{it} \quad (10)$$

$$MV = \beta_0 + \beta_1 CCC_{it} + \beta_2 CCC_{it}^2 + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 CATA_{it} + \beta_6 GDP_{it} + \varepsilon_{it} \quad (11)$$

Model specification (9) determines the impact of CCC, CCC^2 , size, leverage, CATA, and GDP on profitability for all the periods, while model specification (10) determines the impact of CCC, CCC^2 , size, leverage, CATA, and GDP on firm value for the three periods. The variables and their measurement are presented next.

4.4.3 Variables

To explore the relationship between firms' performance and WCM within listed firms in South Africa, the study used two groups of variables listed in Table 3. These are performance and control

variables. Performance is measured using two important variables, namely, profitability (proxied by return on assets) and firm value (proxied by market capitalization). It is argued here that working capital management may have similar effect on these performance variables. The effects will depend on working capital policies adopted by the firms. In addition to the performance variables a number of independent variables, classified into main variables and control variables (which serve as control or conditioning variables) that may affect performance are used. The main independent variables include the inventory conversion period (ICP), receivables conversion cycle (RCP) and the payables deferral period (PDP) and, the cash conversion cycle (CCC). The control variables include firm size, financial leverage, current assets to total assets ratio, and GDP growth rate (state of the economy). Measurement of these variables are presented in table 3.

Table 3: Variables definition, measurement and expected signs

Variable	Definition	Measurement
DEPENDENT VARIABLES		
ROA	Return on assets	EBIT /Total Assets Earnings before interest and tax (EBIT) divided by total assets (TA) at the end of the financial year. This refers to the overall effectiveness of management in generating profits with its available assets. The higher the firm's ROA, the better the performance of the firm (Gitman <i>et al</i> , 1985).
MV	Market Value (Market Capitalisation)	Market Value (MV) = Number of ordinary shares outstanding at end of year, t x closing price at end of financial year, t (Lai, 2012; Damodaran, 2013; Ghodrati <i>et al.</i> , 2014)
INDEPENDENT VARIABLES		
CCC	Cash conversion cycle	Cash conversion cycle represents the length of time from the payment for the purchase of raw materials to manufacture a product until the collection of account receivable associated with the sale of the product (Besley and Brigham, 2005). $CCC = ICP + RCP - PDP$
RCP	Receivables conversion period	Receivables conversion period (RCP) is the average length of time to convert the firm's receivables into cash, that is, to collect cash following a sale. It is used as a proxy for the receivables policy and is calculated by dividing accounts receivable by the averages credit sales per day: $RCP = [Accounts\ Receivable / Sales] \times 365.$

ICP	Inventory conversion period	The ICP is the average time required to convert materials into finished goods and then to sell those goods. It is calculated by dividing inventory by sales per day. That is: ICP = [Inventory / Sales x 365
PDP	Payables deferral period	Payables deferral period (PDP) is the average length of time between the purchase of materials and labour and the payment of cash for them. It is used as a proxy for the payment policy and is calculated as accounts payable divided by daily purchases as follows: PDP = [Accounts Payables/ purchases] x 365
CONTROL VARIABLES		
LEV	Leverage	Debt is used as a proxy for financial leverage and is calculated by dividing total debt by shareholders' equity, i.e. Leverage = Total debt/Equity
GDP	Change in GDP growth	$GDPGR = \frac{GDP_t - GDP_{t-1}}{GDP_t}$
CATA	Current assets to total assets ratio.	Current assets/Total assets, a measure of a firm's liquidity.
Size	Firm size	Firm size (SIZE) is measured by the natural logarithm of its total assets. That is, firm size (SIZE) = Log (value of total assets).

Source: Own construction based on literature review

4.5 Hypotheses

Based on the literature review discussed in chapter 3, the following hypotheses will be tested:

Hypothesis 1: There is a negative relationship between cash conversion cycle and profitability of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 2

Hypothesis 2a: There is a negative relationship between the inventory conversion period (ICP) and profitability of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 2b: There is a negative relationship between the receivables conversion period (RCP) and profitability of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 2c: There is a positive relationship between the payables deferral period (PDP) and profitability of JSE-listed firms before, during, and after global financial crisis.

Hypothesis 3

Hypothesis 3a: There is a negative relationship between cash conversion cycle and value of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 3b: There is a negative relationship between inventory conversion period (ICP) and value of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 3c: There is a negative relationship between accounts receivables conversion period (RCP) and value of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 3d: There is a positive relationship between accounts payable deferral period (PDP) and value of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 4

Hypothesis 4a: There is an inverted U-shape relationship between cash conversion cycle and profitability of JSE-listed firms before, during, and after the global financial crisis.

Hypothesis 4b: There is an inverted U-shape relationship between cash conversion cycle and value of JSE-listed firms before, during, and after the global financial crisis.

Having presented the testable hypotheses, the next section discusses the quantitative data analysis methods used to analyse the data.

4.6 Data

This section describes the data collection process, encompassing target population, sample selection and data collection.

4.6.1 Population, sample selection and data collection

This section deals with the population, sample and data collection.

4.6.1.1 Population

The target population for the study comprises all firms listed on the main board of the JSE Securities Exchange over the period, 2003 to 2012. As at 31 December 2012, a total of 335 firms were listed on the main board of which financial firms represent 27.2 per cent (91 firms). The remaining 72.8% (244) non-financial firms were then segmented according to the JSE Industry Classification Benchmark (ICB) as shown in table 1 (Chapter 2).

4.6.1.2 Sample

A sample of 75 firms listed on the main board of the JSE was selected from the target population. To arrive at the sample, the study excluded financial firms. This is due to the fact that financial firms have different accounting regulations that are relatively different from those required by nonfinancial firms (Deloof, 2003). Also, and as argued by Falope and Ajilore (2009), financial services firms' financial characteristics and investment in working capital are fundamentally different from non-financial firms. Lastly, the exclusion of the financial services firms allows for easy comparability with prior studies, which also excluded financial services firms (e.g. Deloof 2003; Lazaridis and Tryfonidis 2006; Falope and Ajilore 2009; Kieschnick, Laplante, and Moussawi, 2013). To be included in the final sample, companies must have their complete financial statements for the entire period under consideration, that is, from 1 January 2003 to 31 December 2012 inclusive. As a result of the application of the above criteria, the final sample was

narrowed down to 75 non-financial firms which represent 22.4% of firms listed on the JSE as at 31 December 2012 shown in table 2 (Chapter 2). The sample is consistent with the proposed guidance on a representative sample by Sekaran and Bougie (2009) of between 30 and 500 firms.

4.6.1.3 Data collection

Data for this study was collected through electronic retrieval of financial statements of 75 firms from both the I-Net Bridge/BFA McGregor data base at the University of Pretoria library and the Johannesburg Stock Exchange (JSE) respectively, covering the ten years period, 2003-2012. The I-Net Bridge/BFA McGregor database contains standardised financial information on firms' statement of financial position and statement of comprehensive income. According to Johnston (2014), this approach to data collection is consistent with the method that investors and financial analysts use to evaluate the performance of listed firms. Moreover, there are advantages of retrieving secondary data from electronic databases. First, secondary data are inexpensive as researchers could bypass instrument creation and data collection stages by drawing data from existing sources. Second, Parker (2012) asserted that secondary data saves time and resources by complementing primary data. Third, secondary data sources are reliable because researchers can collect data in a less obtrusive manner. Fourth, secondary data minimises biases that primary data collection approaches may bring to the study (Johnston, 2014). Lastly, Butler et al. (2012) argued that the use of secondary data without involving human subjects minimises threats to ethical principles.

Another step in the data collection involved (a) importing the data into Microsoft Excel, (b) calculating the measures for all variables from 2003 to 2012, and (c) importing the values to Stata Perpetual Version 14 as panel data for analysis. According to Tasic and Feruh (2012), the collection of a panel data lends itself to trend analysis because a panel data offers a relatively easy way to monitor changes over time and across firms.

4.7 Methods of data analysis

This study employed a quantitative research method to address the research questions and test the stated hypotheses. A quantitative method provides a rigorous methodological process that emphasises objectivity and prediction (Allwood, 2012). In addition, a quantitative method allows for deductive testing, empirical measurement, and statistical analysis of the hypothesised relationship between working capital management and firm performance (Donaldson et al., 2013). Lastly, Allwood (2012) opined that a quantitative research method is best when the researcher needs to compare data in a systematic way and generalize the findings to a larger population. Bryman and Bell (2011) suggested three quantitative methods of data analyses that can be applied to examine variables and relationships between them. These are univariate analysis, bivariate analysis and multivariate analysis. Each of the above methods is discussed next.

4.7.1 Univariate (Descriptive) analysis

Univariate analysis is aimed primarily at describing the data in a convenient, usable, and understandable manner. This involves the use of techniques such as measures of central tendency (mean, median, and mode), measures of dispersion (variance and standard deviation), frequency tables, cross-tabulations and charts to describe the data as it is. Univariate analysis will be carried out for the dependent variables (profitability and firm value), independent variables, as well as the control variables.

4.7.2 Bivariate analysis

According to Bryman and Bell (2011) bivariate analysis is concerned with the analysis of two variables in order to uncover whether or not these variables are related. Essentially, exploring relationships between two or more variables means searching for evidence that the variation in one variable coincides with variation in another variable. A variety of statistical techniques is available for analysing the relationship between two variables. These include, cross-tabulation

and Chi-Square, Pearson's Product Moment correlation coefficient, rank correlation coefficient, Phi and Cramer's V.

The Pearson's product-moment correlation coefficient was used in this study to test the relationship among CCC, ICP, RCP, PDP, firm value and profitability and the various control variables. The test helps to determine the strength of the relationship between two variables. Pearson's product-moment correlation coefficient was the result of work by the French physicist Auguste Bravais and the British mathematician Karl Pearson. It defines an absolute measure that can assume values between $r = (-1)$ and $r = (+1)$. The coefficient takes the value of $(+1)$ when two variables have a perfect linear and positive relationship (i.e. all observed values lie along a rising linear slope). It takes the value of (-1) when two metric variables have a perfect linear and negative relationship (i.e. all observed values lie along a falling linear slope). The closer it is to 0, the more the value pairs diverge from a perfect linear relationship. Specifically, the study employs the correlation matrix technique to determine whether the inclusion of the various independent and control variables in the models will create any problems of multicollinearity among the models. Essentially, this matrix explores whether or not the relationship between variables is positive or negative, in addition to determining the degree of association between the variables. The results of this analysis are presented in chapter five.

Despite their use in analysing data, there are certain limitations with bivariate analysis. For example, it only takes in to account the relationship between two variables. In order to understand how a third variable affects the others, multivariate techniques are needed. Additionally, bivariate analysis usually does not factor in how a variable could influence the other, and therefore cannot give an accurate explanation for the relationship between the two variables.

4.7.3 Multivariate analysis

Multivariate analysis is essentially a statistical process employed to establish a cause and effect relationship between a set of independent variable (s) and a dependent variable. Two important

statistical techniques are Ordinary Least Squares (OLS) regression analysis and multiple regression analysis.

4.7.3.1 Ordinary Least Square regression (OLS) analysis

Simple Ordinary Least Square (OLS) regression analysis is a statistical technique that uses sample data to estimate the true population relationship between two variables, a dependent variable and one explanatory variable. The study will employ the OLS regression technique to conduct a regression analysis of the nexus between profitability and WCM as well as between firm value and WCM.

4.7.3.2 Multiple regression analysis

Multiple regression analysis (MRA) is a statistical tool for understanding the cause and effect relationship between two or more variables. The goal of MRA is to enable the researcher to assess the relationship between a dependent (predicted) variable and several independent (predictor) variables. The end result of MRA is the development of a regression equation (line of best fit) between the dependent variable and several independent variables. Multiple regression analysis can be used for pure cross-sectional and pure time series data sets or a combination of cross-sectional and time series dataset (i.e. panel data).

For the purpose of the present study, panel data econometric regression analysis was used to estimate the effect of a unit change in each respective independent (explanatory) variable upon profitability and firm value, while other independent variables are held constant. This is a form of multiple regression analysis that allows for the pooling of observations on a cross-section over several time periods. Several previous studies have used the panel data multiple regression analysis in studying the impact of working capital management on profitability (see for example Abuzayed, 2012; Kwenda & Holden, 2013; Enqvist et al., 2014; Hoberg et al, 2015; Soykan & Ulucak, 2016; Cumbie et al, 2017; Daisuke, 2017). Four main reasons have been cited for using

panel data multiple regression analysis. Firstly, it can determine whether the independent variables explain a significant variation in the dependent variable. Secondly, it can determine how much of the variation in the dependent variable can be explained by the independent variables. Thirdly, it can control for other independent variables when evaluating the contributions of a specific variable or set of variables. Lastly, it can predict the values of the dependent variable. The next section presents the theoretical foundation of the panel data regression model used to analyse the data.

4.8 Panel data regression analysis

Panel data, also called longitudinal data or cross-sectional time-series data, is a dataset in which the behaviour of entities are observed across time (Kennedy, 2008). These entities could be individuals, households, firms, governments, or countries. Specifically, panel data set contains n entities or subjects, each of which includes T observations measured at 1 through t time period. Thus, the total number of observations in the panel data is nT (Kennedy, 2008). Panel data may have individual (group) effect, time effect, or both. As such panel data regression models examine group (individual-specific) effects, time effects, or both in order to deal with *heterogeneity* or *individual effect* that may or may not be observed. The random effect models and fixed effect model are discussed next.

4.8.1 Fixed Effects model

The Fixed Effects (FE) model assumes that the slope coefficients are constant for all firms, but the intercept varies across firms. As argued by Greene (2002), the formulation of the FE model assumes that differences across units can be captured in differences in the constant term. According to Baltagi (2005), the FE model is an appropriate specification if the focus is on a specific set of (N) firms or regions. One advantage of FE is that there is no need to assume that the effects are independent because it allows the unobserved individual effects to be correlated

with the included variables. The disadvantages of FE are that FE estimator cannot estimate the effect of any time invariant variable like location. Therefore, any time invariant variable is wiped out by the deviations from means transformation. In addition, the FE model suffers from a large loss of degree of freedom because of estimating $(N-1)$ extra parameters. Also, too many dummies may increase the problem of multicollinearity among the regressors.

4.8.2 Random Effects model

The Random Effects (RE) model (estimator) is more efficient than the FE model if it can be assumed that firm effects are randomly distributed across firms. Therefore, the generalised least squares (GLS) estimator of Balestra and Nerlove (1966) can be used. RE model is an appropriate specification if (N) cross-sectional units are randomly drawn from a large population. The one advantage as argued by Owusu-Gyapong (1986) and Greene (2002) is that GLS estimator is a weighted average of the within-group and between-group estimators, which enables the researcher to extract information from those two variations. However, the disadvantage of RE model is that the researcher has to make specific assumptions about the pattern of correlation between the effects and the included explanatory variables (Hsiao 2007).

4.8.3 Diagnostic tests

After fitting a regression model it is important to determine whether all the necessary model assumptions are valid before performing inference. If there are any violations, subsequent inferential procedures may be invalid resulting in faulty conclusions. Therefore, it is crucial to perform appropriate model diagnostics. In constructing regression models we assumed that the response of Y_i to the explanatory variables (X_i 's) were linear in the parameters and that the errors were independent and identically distributed (i.i.d) normal random variables with mean 0 and constant variance. Model diagnostic procedures involve both graphical methods (e.g. histograms, boxplots, scatter plot matrix, and sequence plots) and formal statistical tests (e.g. Hausman test,

Pesaran CD test, and Variance Inflation Factor (VIF) test, etc). These procedures allow the researcher to explore whether the assumptions of the regression model are valid and also decide whether the subsequent inference results can be trusted. Some of the problems of panel data include heteroskedasticity and multicollinearity. The diagnostic tests that will be employed in this study are presented below.

4.8.3.1 Multicollinearity Diagnostics

Multicollinearity is a statistical phenomenon in which there exists a perfect or exact relationship between the predictor variables. When there is a perfect or exact relationship between the predictor variables, it will be difficult to come up with reliable estimates of their individual coefficients. Field (2005) argues that the presence of multicollinearity represents a threat to multiple regressions. For instance, a good independent variable may be found to be statistically insignificant and be rejected from the model (Type II error) because of a collinearity problem. If the independent variables are highly correlated then it would be difficult to know which variable is more important, as the regression model could include either one. This threat can be mitigated by checking for any significant multicollinearity between the independent variables before running the regression analysis (Haniffa, 1999).

Multicollinearity can be checked using two methods. The first is based on screening the correlation matrix. The second way of checking for multicollinearity is by calculating the Variance Inflation Factor (VIF), which indicates whether a high correlation exists between independent variables. Specifically, variance inflation factors measure the extent to which an independent variable is explained by all other independent variables in the model. There is a VIF for each term in the model. The VIF for the j th term is $(VIF)_j = 1 / (1 - R^2_j)$ where R^2_j is the unadjusted R^2 for the regression of X_j on all the other X s. The variance inflation factors (VIF) for each predictor X_{it} will be calculated and tested for multicollinearity. For all variables, if the VIF remains below 10 (critical value) while running the regression models, the absence of a multicollinearity problem is

confirmed. Moreover, tolerance, which is the reciprocal ($1/VIF$), should be above 0.2 (critical value) (Field, 2005).

4.8.3.2 Heteroscedasticity

One of the main assumptions for the ordinary least squares regression is the homogeneity of the variance of the residuals. If the variance of the residuals is non-constant, then the residual variance is heteroskedastic making the regression estimates, namely coefficients and standard errors, to be biased if the models are not re-specified or variables not transformed. Essentially, heteroskedasticity means that the variance of the error term is not constant overtime. That is,

$$e_i^2 \neq \sigma_i^2 \text{ for all } i$$

This study uses the Breusch-Pagan test in the regression model specifications to verify whether or not heteroskedasticity is present in the models. The null hypothesis is that the variance of the residuals is homoscedastic. Thus, if the p -value is very small (less than 0.05), the null hypothesis will be rejected and the alternative hypothesis accepted that the variance is not homogenous.

4.8.3.3 Hausman's test

The decision to use fixed effects (FE) or random effects (RE) would require the researcher to run a Hausman test where the null hypothesis is that the preferred model is random effects versus the alternative, the fixed effects (Green, 2002). The test basically tests whether the unique errors (u_i) are correlated with the regressors. The null hypothesis is they are not. To achieve this, it is necessary to run a fixed effects model and save the estimates, then run a random effects model and save the estimates, then perform the Hausman test. If we get a statistically significant p -value (i.e. $p < 0.05$) we shall reject the null hypothesis that RE model is appropriate, and accept the alternative hypothesis that FE model is the appropriate model. Alternatively, if we get a statistically insignificant p -value (i.e. $p > 0.05$) we accept the null hypothesis that RE model is the appropriate model and reject the alternative hypothesis that FE model is the appropriate model.

4.9 Chapter Summary

The chapter discussed the methods used to conduct the empirical study. It provided a detailed discussion of the research design, hypotheses, as well as the theoretical and empirical models. The chapter also described the study population, the sample selection procedures, data collection and analysis. The next chapter presents the data analysis and discussion of results.

CHAPTER 5

DATA ANALYSIS AND DISCUSSION OF RESULTS

5.1 Introduction

This chapter presents and discusses the results of the data analysis using Stata Perpetual Statistical Software version 14. The rest of the chapter is organised as follows. Section 5.2 presented the descriptive statistics of the dependent, independent and control variables, while Section 5.3 focused on correlational analysis for all the variables. This was followed by panel data regression analysis in Section 5.4. The chapter concluded with a summary of the findings.

5.2 Univariate analysis (Descriptive Statistics)

The first step in the analysis of the data is to investigate each variable separately (univariate analysis) by looking at the range of values, measures of central tendency, as well as the standard deviation of the values. In fact, the primary purpose of univariate analysis is to describe each variable on its own based on descriptive statistics. The descriptive statistics (mean, standard deviation, minimum and maximum values) for firm performance (profitability and market capitalisation), working capital variables, and the control variables before, during and after the global financial crisis are provided in Appendix B. For ease of discussion, only the mean values for the dependent and independent variables are reported in table 4.

Table 4: Descriptive statistics for dependent and independent variables before, during and after the global financial crisis

Variable	Pre-crisis period (2003-2006), (n=300)	During crisis (2007-2009), (n=225)	Post-crisis period (2010 - 2012), (n=225)
	Mean	Mean	Mean
ROA	0.2700	0.2015	.2588
CCC	28.3883	12.4978	16.1556
ICP	65.3436	29.4954	46.3756
RCP	48.3362	46.3145	62.0270
PDP	84.2230	63.3017	92.2814
MKTCAP	18.9356	16.2717	24.4236
SIZE	14.5843	14.6049	14.1284
LEV	0.5716	0.4496	.5452
Chgdp	3.51	3.5382	3.4818
CATA	0.5872	0.5328	.6484

Source: Own calculations. Data obtained from I-Net BFA McGregor database, StatSA (www.statsa.co.za), and JSE (www.jse.co.za)

5.2.1 Dependent variables

The descriptive statistics presented in the Table 4 are discussed in this section.

5.2.1.1 Return on assets (ROA) (Profitability)

From the table, it can be seen that average profitability (ROA) for the sample decreased from 27% (before the financial crisis) to 20.2% during the crisis period and rose to 25.9% after the financial crisis. The findings suggest that the financial crisis impacted negatively on the profitability of the sampled JSE-listed firms.

5.2.1.2 Market capitalisation (firm value)

Like profitability, the descriptive statistics shows that the average market capitalisation decreased from R18.9 billion before the crisis to R16.3 billion during the crisis period, and thereafter increased to a high of R24.4 billion after the crisis. Again, the results suggest that the global financial crisis had a negative effect on the value of the sampled firms used in this study.

5.2.2 Independent variables

The descriptive statistics of the main independent variables, ICP, RCP PDP and CCC, are discussed in this section.

5.2.2.1 Inventory conversion period (ICP)

The results in Table 4 shows that inventory conversion period (ICP) before the crisis is 65 days. This indicates that, prior to the crisis, it takes the average firm within the sample about two months and 5 days to turnover inventory. This improved to 29.5 days (about 30 days or exactly one month) during the financial crisis, an indication of efficient inventory management. These findings are consistent with some prior studies which suggest that during crisis periods, firms tend to manage working capital more efficiently to counter the negative effects of financial contractions (Love et al., 2007; KPMG, 2009; Kesmli et al., 2011).

5.2.2.2 Accounts receivable conversion period (RCP)

It can be seen from Table 4 that, before the crisis, it took the average firm 48.3 days (about one month and 18 days) to collect accounts receivables. This dropped (i.e. improved) to 46.3 days (about one month 16 days) during the crisis period and jumped to 62 (about two months and two days) after the financial crisis. These findings also suggest that firms become more efficient in managing their accounts receivables by tightening credit terms to their customers during periods of economic contractions and relaxes them during non-crisis periods (Nia *et al.*, 2016; Love et al., 2007).

5.2.2.3 Accounts Payable deferral period (PDP)

Table 4 shows that average firm's PDP decreased from 84.2 days (about 2 months and 24 days) during the pre-crisis period to 63.3 days (about 2 months and 13 days) during the crisis period; and then increased to 92.3 days (a little above three months) after the crisis. The plausible

reason for these findings is that the sampled firms had not been given favourable credit terms by their suppliers, hence the shorter payment period during the crisis period, compared to favourable credit terms during the non-crisis periods.

5.2.2.4 Cash conversion cycle (CCC)

It can be seen from the table that the average firm's CCC was 28.4 days before the crisis and dropped to 12.5 days during the crisis period and later increased to 16.2 days after the crisis.

The shorter average CCC shows that JSE listed firms manage their working capital efficiently during crisis periods by converting inventory into goods for sale as possible and also collecting monies owed by customers quickly but pay their suppliers as late as possible. In practical terms, this means that it took on average about two weeks' time for the sampled JSE-listed firms to convert a rand of cash disbursements back into a rand of cash inflow from their regular course of operations during the crisis period.

5.3 Bivariate (Correlational) analysis

Section 5.2 presented the dependent and independent variables and their traits individually. This section evaluates the degree of linear relationship among all variables using Pearson product-moment correlation coefficient. Tables 5 to 7 present the Pearson product-moment correlation coefficient matrix for all the variables that were used in the regression model before, during and after the global financial crisis.

Table 5: Correlation matrix of profitability (ROA), firm value, WCM components and control variables (pre- crisis period)

	ROA	MKTCAP	CCC	ICP	RCP	PDP	SIZE	LEV	GDP	CATA
ROA	1.0000									
MKTCA P	0.0148	1.0000								
CCC	-0.0867	0.2318**	1.0000							
ICP	-0.1118	0.3157**	0.6043**	1.0000						
RCP	-0.0379	0.1567**	0.3383**	0.1966**	1.0000					
PDP	0.0018	0.0599	-0.5621**	0.1564**	0.3055**	1.0000				
SIZE	-0.0499	0.0859	0.1809**	0.1308**	0.0798	-0.0626	1.0000			
LEV	-0.0574	-0.2950**	-0.1500	-0.2376**	0.0516	0.0476	0.1045	1.0000		
GDP	0.0894	-0.1135	-0.0231	-0.0332	0.0678	0.0343	-0.0629	0.1543	1.0000	
CATA	-0.0308	0.0163	-0.0011	0.3007**	0.1405**	0.3084**	0.0641	-0.0789	0.0395	1.0000

*, ** and *** denote significant at 10%, 5% and 1% respectively.

Source: Own calculations using a balanced panel data over the period 2003-2012. Data obtained from I-Net/BFA McGregor database and JSE

It can be inferred from Table 5 that the correlations between ROA and all working capital management variables (CCC, ICP, RCP, and PDP) are negative and positive respectively, but insignificant. Also, the correlation between MKTCAP (firm value) and CCC, ICP and RCP are all positive and significant in the periods before the global financial crisis.

Table 6: Correlation matrix of profitability (ROA), firm value, WCM components and control variables (Crisis period)

	ROA	MKTCAP	CCC	ICP	RCP	PDP	SIZE	LEV	GDP	CATA
ROA	1.0000									
MKTCA P	0.0235	1.0000								
CCC	-0.0573	-0.3421**	1.0000							
ICP	0.0156	0.0270	0.0980	1.0000						
RCP	-0.2052**	-0.0803	0.2858**	0.1160	1.0000					
PDP	-0.0311	0.2705**	-0.6700**	0.5480**	0.2575**	1.0000				
SIZE	-0.1051	0.4763**	-0.1214	0.0929	0.2100**	0.2483**	1.0000			
LEV	-0.1746	-0.5374**	-0.3176**	-0.0072	0.4614**	0.4604**	-0.0146	1.0000		
GDP	0.0090	-0.0832	-0.0120	0.0098	-0.0020	0.0151	-0.0982	0.1365	1.0000	
CATA	-0.1240	-0.2191**	0.1131	0.2281**	-0.0336	0.0216	-0.2422**	0.3802**	-0.0089	1.0000

*, ** and *** denote significant at 10%, 5% and 1% respectively.

Source: Own calculations using a balanced panel data over the period 2003-2012. Data obtained from I-Net/BFA McGregor database and JSE

Table 6 shows that there is a significant negative relationship between profitability and accounts receivable conversion period as predicted, while the relationship between profitability and CCC is negative but insignificant during the global financial crisis. Further, as expected there is a significant negative relationship between MKTCAP and CCC, and also a significant positive relationship between MKTCAP and PDP, during the financial crisis.

Table 7: Correlation matrix of profitability (ROA), firm value, WCM components and control variables (post- crisis period)

	ROA	MKTCAP	CCC	ICP	RCP	PDP	SIZE	LEV	GDP	CATA
ROA	1.0000									
MKTCAP	-0.0172	1.0000								
CCC	-0.0827	0.0967	1.0000							
ICP	-0.0289	-0.1294	0.3471**	1.0000						
RCP	0.0020	-0.1778**	0.0051	-0.1350**	1.0000					
PDP	0.0559	-0.2505**	-0.6666**	0.3739**	0.2713**	1.0000				
SIZE	-0.0279	0.6052**	0.3345**	0.1440**	-0.1070	-0.2427**	1.0000			
LEV	-0.3887**	0.2112	0.2242	0.1158	0.3187**	0.0395	0.3471**	1.0000		
GDP	0.0196	0.0077	-0.0490	-0.0331	0.0574	0.0420	-0.1391**	0.1547	1.0000	
CATA	0.1948**	-0.3932**	-0.1804**	-0.0258	0.2579**	0.2450**	-0.3276**	0.0720	0.0148	1.0000

*, ** and *** denote significant at 10%, 5% and 1% respectively.

Source: Own calculations using a balanced panel data over the period 2003-2012. Data obtained from I-Net/BFA McGregor database

It can be inferred from Table 7 that the relationship between profitability and both CCC and ICP are negative but insignificant. However, the relationship between MKTCAP and RCP is negative and significant as hypothesised. Surprisingly, the relationship between MKTCAP and PDP is negative and significant, contradicting the hypothesis that there is a significant positive relationship between firm value (MKTCAP) and PDP.

5.4 Panel data regression analysis

To further establish the relationship between WCM and firm's profitability as well as market value, panel data regression estimation procedures of Fixed Effect (FE) and Random Effect (RE) were

used. Hausman test was performed to confirm whether FE or RE was the appropriate estimation procedure (See Section 5.4.2).

5.4.1 Diagnostic tests

Diagnostic tests are robust statistical tests carried out to verify if the data used have met the assumptions underlying the ordinary least squares regression and where possible to remove problems associated with panel time series data. Two main problems of panel time series data are heteroskedasticity and multicollinearity. The diagnostic tests carried out in this study to mitigate these problems are detailed below.

5.4.1.1 Test for multicollinearity

From the correlation matrix results presented in Tables 5 to 7, it can be observed that the correlations are relatively low, ranging from -0.56 to +0.60 (before the crisis), -0.67 to +0.55 (during the crisis), and -0.67 to +0.60 (after the crisis), respectively. The results indicate that there is no multicollinearity problem. However, screening correlations only among *pairs* of predictors is limiting. Because it is possible that the pairwise correlations are small, and yet a linear dependence exists among three or even more variables. In order to obtain more robust results, the study applied a 2-step variance inflation factor (VIF) analysis method to measure the level of potential multicollinearity among the independent variables in the regression models. The VIF command computes a VIF for each variable and for the overall regression. In step 1, VIF was computed for all dependent, independent and control variables. The results generated very high VIFs for inflation, prime interest rates and real exchange rates. This indicates that they are redundant and therefore dropped from the model.

Step 2 computed the VIFs for the remaining variables. The results of the variance inflator factor (VIF) analysis for the linear regression models are presented in appendix C. The general rule of thumb is that VIFs exceeding 10 and tolerance values less than 0.1 are signs of serious

multicollinearity requiring correction (Field, 2005; Hair et al, 2006; Kennedy, 2008; Butler et al, 2012). The VIF analyses reported in appendix C shows that the explanatory variables of the regression models do not satisfy the criteria stated above because the VIFs are less than 10 in all instances and also the tolerance values are all greater than 0.1. The largest VIF is 2.47 for CATA and the smallest tolerance is 0.4052 (which occurred during the crisis period) confirming that multicollinearity is not present among the independent variables.

5.4.1.2 Tests for heteroskedasticity

The Breusch-Pagan test was used to address the problem of heteroskedasticity in the regression models. This test involves the use of the STATA *hettest* command. This performs the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity. If the test statistic is significant (i.e. $p < 0.05$), then there is unspecified heteroskedasticity, which can be corrected by estimating with the robust option to the *regress* command. For this test the null hypothesis is that all observations have the same error variance (i.e. errors are homoskedastic), versus the alternative that the error variances are a multiplicative function of one or more variables. Appendix E-G present the Breusch-Pagan/Cook-Weisberg test results for heteroskedasticity for model specification (1) to (4), before, during and after the global financial crisis. In each of the tests the p-values are less than 5% thus rejecting the null hypothesis on homoskedasticity, and indicating the presence of heteroskedasticity in the models, which if not corrected will lead to biased standard errors.

Heteroskedasticity was corrected by using the STATA “robust” command when performing all regressions, resulting in generation of “robust standard errors”. Montgomery, Peck and Vining (2001) state that the “robust standard errors” address the problem of errors that are not independent and identically distributed and that the use of “robust standard errors” does not change the coefficient estimates provided by the ordinary least squares, but change the standard errors and significance tests.

5.4.2 Panel Data Regression Analysis: linear relationship between WCM and profitability.

Panel data regression analysis was conducted in order to answer research question 1 set out in Chapter 1 and also test the hypotheses using the methodology and the econometric procedures described in chapter 4. The analysis was performed using panel data regressions, (random and fixed effects) procedure. The Hausman's test was then performed to determine whether to use fixed effects (FE) or random effects (RE) as the appropriate multiple regression model. The results of Hausman's test are presented in tables 8-10. The Hausman's test compares the parameters of the fixed and random effects model and concludes on the correlation between errors and regressors:

H_0 : Random Effects model preferred;

H_1 : Fixed Effects model preferred;

The test is based on two estimates, one coefficient from the fixed effects model (b) and one from the random effects specification (B). The fixed effects coefficient (b) under the H_0 hypothesis is consistent and inefficient and inconsistent under H_1 while random effect estimator (B) under H_0 is consistent and efficient and inconsistent under H_1 . As mentioned in section 4.5.3.3, the decision rule is that, if the analysis provides a statistically significant p-value (i.e. $p < 0.05$), then the researcher will reject the null hypothesis that RE model is appropriate, and accept the alternative hypothesis that FE model is appropriate. In other words, if there is a statistically insignificant p-value (i.e. $p > 0.05$) the researcher will accept the null hypothesis that RE model is appropriate and reject the alternative hypothesis that FE model is the appropriate.

From tables 8 and 10, the Hausman's tests show that $p > 0.05$ (i.e. the results are insignificant), therefore H_0 is accepted that random effect (RE) model is the best model to represent the data. However, the result in Table 9 show that $p < 0.05$ (i.e. the result is significant), therefore, H_1 is accepted that the fixed effect model is the best model to represent the data during the financial crisis.

Table 8: Hausman Specification test results (Pre-crisis period)

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
CCC	-.0014613	-.0012031	-.0002583	.002138
SIZE	-.0044077	-.001401	-.0030067	.0089005
LEV	-.5639358	-.4537901	-.1101457	.6635356
GDP	.0942445	.0725522	.0216924	.0212567
CATA	2.114617	-.1464509	2.261067	1.074494

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(5) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 6.79$$

$$\text{Prob}>\text{chi2} = 0.2365$$

Table 9: Hausman Specification test results (Crisis period)

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
CCC	-.0017088	-.0010982	-.0006106	.0000404
SIZE	-.1132763	.0004876	-.1137639	.0383582
LEV	.19451	-.1572441	.3517541	.1564922
GDP	-.0325192	-.0249709	-.0075483	0.000000
CATA	1.49023	.2462645	1.243966	.352605

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(5) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 32.25$$

$$\text{Prob}>\text{chi2} = 0.0000$$

Table 10: Hausman Specification test results (After - Crisis)

	Coefficients		(b-B)	sqrt(diag(V_b-V_B))
	(b)	(B)		
	fe	re	Difference	S.E.
CCC	.0019713	-.000695	.0026663	.0017616
SIZE	.0926621	.0756717	.0169904	.0348379
LEV	-.7234431	-1.022382	.2989391	.3451721
GDP	.0162862	.0448606	-.0285744	.0056463
CATA	-.0840858	.9706744	-1.05476	.5327747

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(5) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 6.05$$

$$\text{Prob}>\text{chi2} = 0.3018$$

Accordingly, the main panel data results for the periods before and after the financial crisis, as well as during the crisis, were obtained by the random effects (RE) and fixed effect (FE) methodologies respectively using STATA Perpetual Software Version (14). The estimates using the two methodologies were obtained for equation (1) to (4) stated in Chapter 4, which are re-stated below:

$$ROA = \beta_0 + \beta_1 CCC_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (2)$$

$$ROA = \beta_0 + \beta_1 ICP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (3)$$

$$ROA = \beta_0 + \beta_1 RCP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (4)$$

$$ROA = \beta_0 + \beta_1 PDP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (5)$$

Equation (1) is estimated according to hypothesis (1) in order to analyse the impact of WCM on profitability. Equations (2) to (4) are estimated to test, respectively, hypotheses (2) to (4). These estimates were carried out to analyse the impact of working capital accounts on profitability.

5.4.3 Panel data regression results

The RE panel data regression results are reported in Table 11 - 13.

Table 11: Panel data regression results (ROA as dependent variable) (before the crisis)

	1 ROA	2 ROA	3 ROA	4 ROA
CCC	-0.00120 (0.325)			
SIZE	-0.00140 (0.927)	-0.00242 (0.876)	-0.00284 (0.852)	-0.00488 (0.755)
LEV	-0.454 (0.288)	-0.642 (0.150)	-0.366 (0.389)	-0.441 (0.314)
GDP	0.0726 (0.160)	0.0812 (0.124)	0.0726 (0.160)	0.0794 (0.137)
CATA	-0.146 (0.729)	0.124 (0.786)	-0.114 (0.799)	-0.126 (0.776)
ICP		-0.00323 (0.081)		
RCP			-0.00194 (0.464)	
PDP				-0.000732 (0.646)
_cons	0.469 (0.260)	0.629 (0.145)	0.479 (0.252)	0.501 (0.246)
N	153	148	153	148

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

The regression models 1 to 3 show that there is a negative but insignificant relationship between profitability (ROA) and CCC as well as ICP and RCP in the four years prior to the global financial crisis. These findings are consistent with Enqvist et al.'s (2013) assertion that the relationship between working capital management and profitability is less significant under improved economic conditions. However, the results are inconsistent with the findings of Haron and Nomran (2016) who reported a significant negative relationship between profitability and working capital management, proxied by CCC, before the global financial crisis. Lastly, regression model 4

indicates a negative (rather than positive) relationship between ROA and PDP. This also contradicts the prediction that there is a significant positive relationship between ROA and PDP.

Table 12: Panel data regression results (ROA as dependent variable) (during crisis period)

	(1) ROA	(2) ROA	(3) ROA	(4) ROA
CCC	-0.000843 (0.442)			
SIZE	0.00328 (0.899)	-0.000507 (0.984)	0.0128 (0.617)	0.000148 (0.995)
LEV	0.133 (0.641)	0.165 (0.557)	0.152 (0.576)	0.149 (0.601)
GDP	-0.0282** (0.019)	-0.0269** (0.024)	-0.0253** (0.029)	-0.0277** (0.022)
ICP		0.000611** (0.520)		
RCP			-0.00419* (0.068)	
PDP				0.000420 (0.614)
_cons	0.238 (0.383)	0.238 (0.386)	0.219 (0.407)	0.237 (0.391)
R-sq	0.118	0.115	0.166	0.112
F	1.636	1.585	2.443	1.540
N	67	67	67	67

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

Table 12 presents the results of the four regression models during the global financial crisis. Again like the period before the crisis, regression model 1 indicates that there is a negative but insignificant relationship between profitability and the cash conversion cycle. This means that, the global financial crisis appears not to exert any measurable influence on profitability-WCM relationships. However, regression model 2 shows a significant positive relationship between profitability and inventory conversion period which is inconsistent with the hypothesis that there is a significant negative relationship between these two variables. Further, as expected regression model 3 shows that there is a significant negative relationship between ROA and RCP. This finding is in line with Enqvist et al.'s (2013) study which found a significant negative relationship

between accounts receivable and profitability during poor economic conditions. This result suggest that during economic downturns, less profitable firms extend their accounts receivable periods, while more profitable firms tighten their credit extension to customers. Also the results from regression model 4 show that there is a positive but insignificant relationship between accounts payable deferral period and profitability. The absence of significant results for both CCC and accounts payable in relation to profitability suggests that both variables do not vary according to macroeconomic conditions. Lastly, the results in table 12 revealed that GDP is significantly negatively related to profitability in all four regression models. This result is consistent with previous studies (e.g. Banos-Caballero et al., 2013; Supatanakornkij, 2014; Temtime, 2016; Daisuke, 2017) which indicated that, generally, the nexus between profitability and GDP can be either negative or positive. Table 13 presents the results after the GFC.

Table 13: Panel data regression results (ROA as dependent variable) (after crisis)

	(1) ROA	(2) ROA	(3) ROA	(4) ROA
CCC	-0.000695 (0.776)			
SIZE	0.0757** (0.031)	0.0922*** (0.009)	0.0515 (0.172)	0.0675* (0.067)
LEV	-1.022*** (0.004)	-1.163*** (0.000)	-1.066*** (0.007)	-0.943** (0.014)
GDP	0.0449 (0.206)	0.0615* (0.099)	0.0268 (0.422)	0.0329 (0.337)
CATA	0.971** (0.012)	1.216*** (0.001)	0.770* (0.066)	0.758* (0.071)
ICP		-0.00296 (0.308)		
RCP			0.00783* (0.079)	
PDP				0.00137 (0.535)
_cons	-0.781 (0.128)	-1.001** (0.051)	-0.757 (0.132)	-0.684 (0.180)
N	62	62	62	62

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

The previous sections presented and discussed the regression results before and during the global financial crisis. This section presents and discusses the regression results after the global financial crisis. Regression models 1 and 2 in Table 13 show that there is a negative but insignificant relationship between profitability and both CCC and inventory conversion cycle, after the global financial crisis. Similarly, there is a positive but insignificant relationship between accounts payable deferral period and profitability, while in regression model 3, the relationship between accounts receivable period is positive and insignificant. The results show, however, that there is a significant positive relationship between profitability and both firm size and CATA for regression models 1, 2 and 4 respectively, while the relationship between profitability and leverage for all 4 models is significantly negative.

Finally, the results indicate that there is a significant negative relationship between financial leverage and profitability in all four regression models. This result is consistent with the pecking order theory, which states that only when a firm does not have enough internal financing would it go for the next safest source of financing which is debt financing. Increase in debt means debt repayments have to be made resulting in less capital available to carry out daily operations and for future investment purposes, forcing firms to manage their working capital more efficiently, hence, reducing investment in working capital. Also, since the cost of debt financing is higher compared to the return gained from investing in liquidity, a highly levered firm will invest less of its capital in its working capital cycle (Banos-Caballero et al. 2014). The result is consistent with prior studies such Raheman and Nasr (2007), Afza and Nazir (2009), Erasmus (2010), Mathuva (2010), and Wasiuzzaman (2013).

5.5 Panel data regression analysis: inverted (U-shape) relationship between WCM and Profitability

To test *Hypothesis 4a*, the study investigated for a possible concave relation between ROA and CCC by regressing ROA against CCC and its squared (CCC^2) term in addition to the control variables as shown in equation 10 (Chapter 4):

$$ROA = \beta_0 + \beta_1 CCC_{it} + \beta_2 CCC_{it}^2 + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 CATA_{it} + \beta_6 GDP_{it} + u_i + \varepsilon_{it} \quad (9)$$

The main reason for this analysis is to establish whether there is an optimal level of CCC that maximizes profitability for the sampled South African firms. It is anticipated that CCC and profitability have a positive association at low levels of working capital investment and negatively at higher levels. Thus, the hypothesis is that β_2 should be negative and significant, an indication that firms have an optimal working capital level that balances costs and benefits of holding working capital and maximises their performance (Banõs-Caballero et al., 2014; Soykan et al., 2016; Cumbie et al., 2017). Dependent, independent and control variables are specified as before. The difference is the inclusion of the square value of the CCC. Following hypothesis 4a, the coefficient β_2 (related to CCC^2) should be significant and negative while the coefficient β_1 (related to CCC) must be positive and significant. According to Banõs-Caballero et al. this optimal level of CCC = $-\beta_1/2\beta_2$, the breakpoint that makes the derivative of profitability with respect to CCC equal to 0. The relationship between CCC and profitability is an inverted U-shape if (β_2) is negative. Thus, β_2 should be significant and negative to validate hypothesis 4a.

5.5.1 Panel data regression results

The regression results are presented in Table 14. It can be inferred from the regression results that the relation between ROA and CCC is negative but insignificant for all the three periods, suggesting that a lower working capital investment level does not exert a significant positive impact on profitability. Also, the relation between the ROA and the CCC^2 is negative but insignificant before and during the crisis periods which again does not support the hypothesis of a concave relationship between profitability and WCM. However, there is a significant negative relation between CCC^2 and ROA after the crisis. Further, the regression coefficient (β_2) for CCC^2 is negative and significant while the relation between CCC and ROA is negative, contradicting the

hypothesis of an inverted U-shape relationship between ROA and CCC. This essentially leads to the rejection of hypothesis 4a.

Table 14: Panel data regression results testing for an invested U-shape relationship between ROA and CCC (before, during and after the financial crisis)

	(1) (before crisis)	(2) (crisis)	(3) (after crisis)
	ROA	ROA	ROA
CCC	-0.00123 (0.314)	-0.00111 (0.400)	-0.000866 (0.711)
CCCSqd	-0.00000321 (0.620)	-0.000000189 (0.984)	-0.0000549* (0.090)
SIZE	-0.00175 (0.910)	-0.00102 (0.951)	0.0911** (0.005)
LEV	-0.447 (0.297)	-0.153 (0.466)	-1.131*** (0.000)
GDP	0.0726 (0.161)	-0.0251** (0.028)	0.0708* (0.059)
CATA	-0.0903 (0.837)	0.278 (0.304)	1.255*** (0.000)
_cons	0.471 (0.259)	0.351** (0.045)	-1.062** (0.035)
N	153	67	62

P-values in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.6 Working capital management (CCC) and firm value (MV)

As with the nexus between WCM and profitability, this section uses panel data regression procedures to examine linear relationship between WCM and firm value. In addition, this study investigated the possibility of a non-linear relation between WCM and firm value.

5.6.1 Panel data regression analysis – linear relationship: WCM and firm value

As with the relationship between WCM and profitability (ROA), the analysis was performed using the random effect (RE) panel data regression methodology. The following equations were estimated:

$$MV = \beta_0 + \beta_1 CCC_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (6)$$

$$MV = \beta_0 + \beta_1 ICP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (7)$$

$$MV = \beta_0 + \beta_1 RCP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (8)$$

$$MV = \beta_0 + \beta_1 PDP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CATA_{it} + \beta_5 GDP_{it} + u_i + \varepsilon_{it} \quad (9)$$

5.6.1.1 Panel data regression results

The results obtained for regression equations (6) to (9), using the RE method for all the three different periods are reported in Tables 15 to 17.

Table 15: Panel data regression results (MKTCAP as dependent variable) (Pre-crisis period)

	(1) MKTCAP	(2) MKTCAP	(3) MKTCAP	(4) MKTCAP
CCC	0.101 (0.191)			
SIZE	0.575 (0.475)	0.467 (0.577)	0.603 (0.437)	0.585 (0.475)
LEV	-86.01*** (0.003)	-76.83*** (0.009)	-91.37*** (0.001)	-97.82*** (0.001)
GDP	-5.604** (0.048)	-5.237* (0.083)	-5.856** (0.031)	-5.090* (0.080)
CATA	-37.06 (0.223)	-45.86 (0.112)	-66.38* (0.049)	-36.77 (0.257)
ICP		0.265** (0.021)		
RCP			0.536*** (0.004)	
PDP				0.118 (0.221)
_cons	99.86*** (0.000)	84.76*** (0.004)	92.60*** (0.001)	100.1*** (0.001)
N	137	132	137	132

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

Regression models 1 and 4 in Table 15 show that there is a positive insignificant relationship between MKTCAP and CCC and also between MKTCAP and PDP, thus rejecting hypotheses 3(a) and 3(b), respectively. Surprisingly, regression models 2 and 3 provide evidence of a significant positive relationship between MKTCAP and both ICP and RCP. These results also essentially rejects hypotheses 3(c) and 3(d) respectively. The next table presents the regression

results of the relationship between WCM and its separate components and firm value during the crisis period.

Table 16: Panel data regression results (MKTCAP as dependent variable) (crisis period)

	(1) MKTCAP	(2) MKTCAP	(3) MKTCAP	(4) MKTCAP
CCC	0.00255 (0.978)			
SIZE	2.827*** (0.011)	2.922*** (0.002)	2.604* (0.025)	2.885*** (0.008)
LEV	-22.96 (0.119)	-26.26** (0.054)	-24.51* (0.095)	-22.75 (0.119)
GDP	1.154 (0.166)	1.194 (0.151)	1.163 (0.150)	1.178 (0.152)
CATA	-10.12 (0.594)	-5.066 (0.776)	-9.467 (0.605)	-10.43 (0.565)
ICP		-0.120 (0.336)		
RCP			0.0895 (0.556)	
PDP				-0.0126 (0.859)
_cons	-11.67 (0.338)	-11.31 (0.316)	-11.37 (0.350)	-11.85 (0.323)
N	52	52	52	52

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

Regression models 1 to 4 in Table 16 show that the relationship between MKTCAP and all four WCM variables are insignificant, which contradicts hypotheses 3(a) to 3(d). Moreover, the results indicated a significant positive relationship between firm size and MKTCAP for all the four regression models. The plausible reason for these results is that during the financial crisis larger firms tend to perform better in managing their working capital than their smaller counterparts.

Table 17: Panel data regression results (MKTCAP as dependent variable) (Post-crisis)

	(1) MKTCAP	(2) MKTCAP	(3) MKTCAP	(4) MKTCAP
CCC	-0.118 (0.438)			
SIZE	8.126*** (0.001)	8.415*** (0.001)	8.225*** (0.002)	7.716*** (0.002)
LEV	-102.7*** (0.000)	-90.52*** (0.000)	-99.62*** (0.000)	-100.4*** (0.000)
GDP	2.384 (0.233)	1.962 (0.364)	2.349 (0.248)	2.095 (0.307)
CATA	-4.876 (0.874)	-21.89 (0.452)	-14.50 (0.640)	-12.05 (0.695)
ICP		-0.0539 (0.829)		
RCP			-0.0825 (0.779)	
PDP				0.0488 (0.737)
_cons	-28.99 (0.365)	-28.76 (0.374)	-23.62 (0.458)	-26.64 (0.401)
N	56	56	56	56

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

Regression models 1 to 4 in table 17 show that there is an insignificant negative relationship between firm value and CCC, ICP and RCP while providing evidence of a positive and insignificant relation between firm value and PDP. The two set of findings are inconsistent with the theory that there is a significant negative relation between firm value and all three variables – CCC, ICP and RCP, as well as a significant positive relation between firm value and PDP. Further, the results show that a significantly high negative relationship exists between firm value (MKTCAP) and financial leverage (LEV) for all the four models. Lastly, the empirical results show that a significantly high relationship exists between firm value and firm size.

5.6.2 Panel data regression analysis: inverted U-shape relationship, WCM and firm value

To test *Hypothesis 4b*, the study investigated for a possible inverted U-shape relation between MKTCAP (firm value) and CCC by regressing MKTCAP against CCC and its squared (CCC^2) term in addition to the control variables as shown in equation 11:

$$MV = \beta_0 + \beta_1 CCC_{it} + \beta_2 CCC_{it}^2 + \beta_3 SIZE_{it} + \beta_4 LEV_{it} + \beta_5 CATA_{it} + \beta_6 GDP_{it} + u_i + \varepsilon_{it} \quad (11)$$

As with the relationship between ROA and CCC, the main reason for this analysis is to establish whether there is an optimal level of CCC that maximizes firm value for the sampled JSE-listed firms. It is anticipated that CCC and MKTCAP (firm value) have a positive association at low levels of working capital investment and negatively at higher levels. Thus, the hypothesis is that β_2 should be negative, an indication that firms have an optimal working capital level that balances costs and benefits of holding working capital and maximises firm value (Banõs-Caballero et al., 2014; Soykan et al., 2016). Dependent, independent and control variables are specified as before. The difference is the inclusion of the square value of the CCC. Following hypothesis 4b, the coefficient β_2 (related to CCC^2) should be significant and negative, while the coefficient β_1 (related to CCC), should be positive. This is thus equivalent to the existence of an optimal level of CCC that maximizes firm value. According to Banõs-Caballero et al., this optimal level is $CCC = -\beta_1/2\beta_2$, the breakpoint that makes the derivative of market capitalisation with respect to CCC equal to 0. The relationship between CCC and firm value is an inverted U-shape if β_2 is negative. Thus, β_2 should be significant and negative to validate hypothesis 4b.

5.6.2.1 Panel data regression results

The results obtained for regression equation (11) using the RE method are reported in Table 18. The results show that the relation between firm value (MKTCAP) and CCC is positive and insignificant before and during the crisis periods. On the other hand, the relation between firm value (MKTCAP) and the CCC variable is positive and significant after the crisis. Also, the relationship between MKTCAP and the CCC^2 is positive (rather than negative) and highly significant, leading to the rejection of *Hypothesis 4b* that there is an optimum CCC level that maximizes firm value after the crisis. However, the relation between CCC^2 is negative and significant before the crisis. Combining this result with the positive association between CCC and

MKTCAP before the crisis, supports the hypothesis that there is an inverted U-shape relation between MKTCAP and CCC.

Table 18: Regression results testing for inverted U-shape relationship between firm value (MKTCAP) and CCC before, during and after the financial crisis

	Pre-Crisis MKTCAP	Crisis MKTCAP	Post-Crisis MKTCAP
CCC	0.0804 (0.123)	0.0683 (0.659)	0.616*** (0.000)
CCCSQD	-0.000628* (0.036)	0.0000871 (0.939)	0.00257*** (0.000)
SIZE	5.852*** (0.000)	5.870* (0.065)	0.527 (0.536)
LEV	-5.724 (0.520)	-30.79 (0.406)	-56.49* (0.035)
GDP	3.954* (0.070)	-2.582 (0.429)	9.660 (0.505)
CATA	-27.05*** (0.007)	-44.26 (0.236)	-75.99*** (0.008)
_cons	-70.12*** (0.000)	-12.08 (0.799)	30.61 (0.536)
N	93	63	89

P-values in parentheses; *, ** and *** denote significant at 10%, 5% and 1% respectively

The optimum CCC that generates this maximum value for firm value can be calculated as follows

$$CCC = -\beta_1/2\beta_2 = -0.0804/ (-2 \times 0.000628) = 64.02 \text{ days.}$$
This means that the sampled firms on average optimize their firm value when the cash conversion cycle is about 2 months and 4 days.

5.7 Chapter Summary

This chapter employed correlational and panel data regression methods to analyse the data to determine and examine the relationship between WCM and the performance of JSE-listed firms, before, during and after the global financial crisis. The key findings are as follows. First, the average Profitability (ROA) for the sample firms decreased from 27% (before the financial crisis) to 20.2% during the crisis period and increased to 25.9% after the financial crisis. Second, the average market capitalisation (firm value) decreased from R18.9 billion before the crisis to R16.3 billion during the crisis period, and thereafter increased to a high of R24.4 billion after the crisis.

Third, the average firm's CCC was 28.4 days before the crisis and decreased to 12.5 days during the crisis period and later increased to 16.2 days after the crisis. Fourth, accounts receivable conversion period shows a significant negative relationship between profitability during the financial crisis. However, the relationship between profitability and CCC was negative but insignificant. Similarly, the relationship between profitability and accounts payable period is positive (as hypothesised) but insignificant. Fifth, none of the three firm-specific variables is significantly related to profitability during the crisis period. Sixth, the only external variable used in this study (GDP), is significantly positively related with profitability. This suggests that profitability and state of the economy are inextricably linked. In other words, firms perform better when the economy is booming and otherwise during recession times. This is consistent with economic theory. Seven, and perhaps the most important contribution is that the study found an inverted U-shape relationship between cash conversion cycle and firm value before the crisis, but did not find any such relationship between CCC and profitability.

The next chapter summarises the study by outlining its key findings, highlights the major conclusions drawn from the results, and provides recommendations to South African corporate managers. Also the conclusion offers suggestions for possible future working capital management research areas.

CHAPTER 6

DISCUSSION AND CONCLUSION

6.1 Introduction

This chapter discusses results of the study in the context of prior empirical studies that explored the relationship between working capital management and firm performance (profitability and value). Section 6.2 highlights linkages between findings of this study and relevant prior studies. The section also provides suggestions on what could be the underlying differences between findings of this study and prior studies. Section 6.3 concludes the chapter and is followed by section 6.4 which suggests further work to be done in congruence with this study.

6.2 Discussion

The study investigated the relationship between working capital management (and its separate components) and performance of a sample of 75 non-financial firms listed on the Johannesburg Securities Exchange (JSE) over the ten years period, 2003 to 2012. The period was divided into three sub-periods: before the global financial crisis (2003-2006), during the global financial crisis (2007-2009) and after the global financial crisis (2010-2012). The central thesis for this study derives from Richards and Laughlin's (1980) cash conversion cycle theory which posits that, *ceteris paribus*, efficient working capital management (i.e. a short cash conversion cycle) will increase a firm's profitability and concomitantly its value, while inefficient working capital management (i.e. a long cash conversion cycle) will lead to lower profitability and lower firm value. As with other previous studies, the findings of this study are mixed. First, in line with prior studies (García-Teruel and Martínez-Solano, 2007; Ramachandran and Janakiraman, 2009; Erasmus, 2010; and Silva, 2011) the empirical results of this study show a significant negative relationship between accounts receivable conversion period and profitability during the financial crisis only.

This negative relationship indicates that, during economic crisis, corporate managers can create value for shareholders by optimizing the accounts receivable which in turn will enhance CCC and consequently profitability and firm value.

Second, the study reported mixed results for the relationship between profitability and CCC (and its separate components) before, during and after the crisis. In the case of the period before the crisis, the results showed a negative (but insignificant) relationship between profitability and CCC, ICP and RCP, while the relation between profitability and PDP is negative (instead of positive). The above findings suggest that firms are less efficient in managing their working capital under stable economic conditions. Third, the results confirmed that there is a significant negative relation between profitability and receivable conversion period suggesting that corporate managers can enhance profitability via efficient management of accounts receivable. On the contrary, the study found a positive and significant relationship between profitability and inventory conversion period. This result is consistent with prior studies (e.g. Singhal, 2005; Roumiantsev et al, 2007; Koumanakos, 2008; Sekerolgu et al, 2014).

Fourth, it can be observed that during the crisis period, the relationships between profitability and both CCC and ICP, and also between profitability and PDP are negative and positive respectively; however, the relationships are insignificant. On the contrary, the findings revealed a significant positive relation between profitability and accounts receivable conversion period. An important aspect of this study is the testing of the hypothesis that there is an inverted U-shaped relationship between profitability and working capital management before, during and after the global financial crisis. The empirical results are, however, inconsistent with the hypothesis.

Fifth, the study examined the nexus between WCM (and its separate components) and firm value (measured by market capitalisation) before, during and after the global financial crisis. The CCC theory predicts a negative relationship between firm value and WCM, ICP and RCP respectively, and a positive relationship with PDP. The empirical results, however, are inconsistent with the CCC theory before the crisis because the results show that there exist a significant positive

relationship between firm value and both ICP and RCP, while providing an insignificant positive relationship between CCC and firm value. Nevertheless, the results are consistent with the theory that there is a positive relationship between firm value and payables deferral period, but the relation is insignificant. Sixth, it has been observed that during the crisis period, there is a positive and insignificant relation between firm value and both CCC and RCP, while the relationship between firm value and both ICP and PDP are negative and insignificant. Seven, the results showed a negative but insignificant relation between firm value and CCC as well as ICP and RCP. Furthermore, the relationship between MKTCAP and PDP is negative but insignificant. Finally, an important aspect of this study is the investigation of an inverted U-shape relationship between working capital management (WCM) and firm value. The results pertaining to the nexus between WCM and profitability is consistent with the hypothesis that there is an optimal CCC level that maximises firm value. This optimal level is approximately 64 days, which means that firm value is at the maximum level at this point and will start to diminish after two months and four days. The findings of this study suggest firm managers adjust accounts receivable, accounts payable, and inventory levels in search for an optimal level of working capital.

Regarding practical applications, firm managers should manage each individual working-capital component separately to increase firm value, since a neutralizing effect may exist with the cash conversion cycle. It is also recommended that firm managers keep accounts receivable, accounts payable, and inventory days as low as practical to increase firm value, but firm value will increase by increasing accounts receivable, accounts payable, and inventory days outstanding when economic business conditions worsen. To keep accounts receivable days low, firms should implement restrictive customer credit policies when economic conditions are good to collect monies faster, while relaxing credit policies for customer when economic times are difficult for customers. It is recommended that firms take early pay discounts when business and economic conditions allow, which would lower account payable days, while attempting to match inbound

sales with outbound payments when business and economic conditions worsen. The same recommendation should be followed for inventory days outstanding

6.3 Policy implications

The results of the study provide useful insights into the relationship between working capital management and profitability as well as the relationship between working capital management and firm value before, during and after the global financial crisis, for shareholders, corporate managers, creditors, academic researchers, and policy makers. There are many policy implications of the results reported in this study. First, the results suggest that the impact of working capital management on performance is moderated by internal and external factors. The internal factors are firm size, financial leverage, and current assets to total assets ratio, while external factor is GDP. Since these factors influence the relationship between WCM and firm performance, corporate managers should focus on adjusting their working capital management strategies to the demands of these factors in order to improve firms' performance as any significant misalignment could negatively affect their performance. More importantly, the findings suggest that during economic downturns, corporate managers can enhance firm profitability by managing accounts receivable efficiently. In other words, profitable firms can shorten the receivable conversion period, while less profitable firms can lengthen their accounts receivable period. The findings also revealed that the sampled firms seemed not to manage working capital efficiently during stable economic periods.

Lastly, the main contribution of this study is to investigate whether there is an inverted U-shape relationship between working capital management and both profitability and firm value before, during and after the global financial crisis. This relationship which the literature has not considered previously in the South African context, reveals that there is an inverted U-shaped relation between working capital and firm value after the global financial crisis. This result is consistent with the findings of Banos- Caballero et al (2014). This implies that there exists an optimal level

of investment in working capital that balances costs and benefits and maximizes a firm's performance. This further supports the idea that at lower levels of working capital, corporate managers would prefer to increase the investment in working capital in order to increase the firm's sales and the discounts for early payments received from its suppliers. On the downside, there is a level of working capital at which a higher investment begins to be negative in terms of firm value creation due to the additional interest expenses and, hence, the higher probability of bankruptcy and credit risk of firms. Thus, firm managers should aim at keeping as close to the optimal working capital level as possible and try to avoid any deviations from it that may destroy firm value.

6.4 Recommendations for future research

Consideration for future quantitative research into working capital management and firm performance (profitability and firm value) should consider whether different non-linear relationships exist between firm value and working capital components during different economic cycles. In addition, future quantitative research should examine whether there is an inverted U-shape relation between the separate components of working capital (i.e. inventory, accounts receivable, and accounts payable) and both profitability and firm value. Finally, another possible avenue for qualitative research will be surveying firm managers to understand which working capital component is more important in driving profitability and firm value.

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Appendix A: ICB/SA Sectors

SA Sectors	ICB Classification	Super Sector	Sector	Sub Sector	
Resources	0001 Oil & Gas	0500 Oil & Gas	0530 Oil & Gas Producers	0533 Exploration & Production	Companies engaged in the exploration for and drilling, production, refining and supply of products.
				0537 Integrated Oil & Gas	Integrated oil and gas companies engaged in the exploration for and drilling, production, distribution and retail sales of oil and gas products.
			0570 Oil Equipment, Services & Distribution	0573 Oil Equipment & Services	Suppliers of equipment and services to oil fields and offshore platforms, such as drilling, seismic-information services and platform construction.
				0577 Pipelines	Operators of pipelines carrying oil, gas or other forms of fuel. Excludes pipeline operators whose majority of their revenues from direct sales to end users, which are classified under Gas & Pipelines.
			0580 Alternative Energy	0583 Renewable Energy Equipment	Companies that develop or manufacture renewable energy equipment utilizing sources such as wind, tidal, geothermal, hydro and waves.
				0587 Alternative Fuels	Companies that produce alternative fuels such as ethanol, methanol, hydrogen and bio-fuels, mainly used to power vehicles, and companies that are involved in the production of vehicles and/or the development of alternative fuelling infrastructure.
	1000 Basic Materials	1300 Chemicals	1350 Chemicals	1353 Commodity Chemicals	Producers and distributors of simple chemical products that are primarily used to formulate complex chemicals or products, including plastics and rubber in their raw form, fiberglass and fibers.
				1357 Specialty Chemicals	Producers and distributors of finished chemicals for industries or end users, including dyes, polymers, coatings, special plastics and other chemicals for specialized applications. Includes colorings, flavors and fragrances, fertilizers, pesticides, chemicals used to make drugs, pigments and glass in its unfinished form. Excludes producers of paint and glass products for construction, which are classified under Building Materials & Fixtures.
		1700 Basic Resources	1730 Forestry & Paper	1733 Forestry	Owners and operators of timber tracts, forest tree nurseries and sawmills. Excludes producers of wood products such as wooden beams, which are classified under Building Materials & Fixtures.
				1737 Paper	Producers, converters, merchants and distributors of all grades of paper. Excludes manufacturers of paper forms, which are classified under Business Support Services, and manufacturers of paper cups and napkins, which are classified under Nondurable Household Products.
			1750 Industrial Metals & Mining	1753 Aluminum	Companies that mine or process bauxite or manufacture and distribute aluminum bars, rods and products for use by other industries. Excludes manufacturers of finished aluminum products for siding, which are categorized according to the type of end product.
				1755 Nonferrous Metals	Producers and traders of metals and primary metal products other than iron, aluminum and steel. Excludes companies that make finished products, which are categorized according to the type of product.
				1757 Iron & Steel	Manufacturers and stockholders of primary iron and steel products such as pipes, wires, rods, bars, encompassing all processes from smelting in blast furnaces to rolling mills and foundries. Excludes companies that primarily mine iron ores.

			1770 Mining	1771 Coal	Companies engaged in the exploration for or mining of coal.
				1773 Diamonds & Gemstones	Companies engaged in the exploration for and production of diamonds and other gemstones.
				1775 General Mining	Companies engaged in the exploration, extraction or refining of minerals not defined elsewhere in the Mining sector.
				1777 Gold Mining	Prospectors for and extractors or refiners of gold-bearing ores.
				1779 Platinum & Precious Metals	Companies engaged in the exploration for and production of platinum, silver and other precious metals not defined elsewhere.
Industrials	2000 Industrials	2300 Construction & Materials	2350 Construction & Materials	2353 Building Materials & Fixtures	Producers of materials used in the construction and refurbishment of buildings and structures including cement and other aggregates, wooden beams and frames, paint, glass, roofing and flooring materials other than carpets. Includes producers of bathroom and kitchen fixtures, plumbing supplies, air-conditioning and heating equipment. Excludes producers of raw lumber, which are classified under Forestry.
				2357 Heavy Construction	Companies engaged in the construction of commercial buildings, infrastructure such as roads, bridges, residential apartment buildings, and providers of services to construction companies including architects, masons, plumbers and electrical contractors.
		2700 Industrial Goods & Services	2710 Aerospace & Defense	2713 Aerospace	Manufacturers, assemblers and distributors of aircraft and aircraft parts primarily used in commercial and private air transport. Excludes manufacturers of communications satellites, which are classified under Telecommunications Equipment.
				2717 Defense	Producers of components and equipment for the defense industry, including military aircraft, ships, equipment and weapons.
			2720 General Industrials	2723 Containers & Packaging	Makers and distributors of cardboard, bags, boxes, cans, drums, bottles and jars and glass containers and packaging.
				2727 Diversified Industrials	Industrial companies engaged in three or more classes of business within the Industrial sector, where the classes differ substantially from each other.
			2730 Electronic & Electrical Equipment	2733 Electrical Components & Equipment	Makers and distributors of electrical parts for finished products, such as printed circuit boards, televisions and other consumer electronics. Includes makers of cables, wires, ceramics, transformers, electric adapters and security cameras.
				2737 Electronic Equipment	Manufacturers and distributors of electronic products used in different industries. Includes makers of lasers, smart cards, bar scanners, fingerprinting equipment and other electronic factory equipment.
			2750 Industrial Engineering	2753 Commercial Vehicles & Trucks	Manufacturers and distributors of commercial vehicles and heavy agricultural and construction machinery, including rail cars, tractors, bulldozers, cranes, buses and industrial lawn mowers. Excludes non-military shipbuilders, such as builders of cruise ships and ferries.
				2757 Industrial Machinery	Designers, manufacturers, distributors and installers of industrial machinery and factory equipment such as machine tools, lathes, presses and assembly line equipment. Includes makers of pollution control equipment, castings, pressings, welded shapes, structural steelwork, compressors, pumps, elevators and escalators.

		2770 Industrial Transportation	2771 Delivery Services	Operators of mail and package delivery services for commercial and consumer use. Includes logistic services primarily involving air transportation.
			2773 Marine Transportation	Providers of on-water transportation for commercial markets, such as container shipping, which are classified under Transportation Services, and shipbuilders, which are classified under Commercial Vehicles & Trucks.
			2775 Railroads	Providers of industrial railway transportation and railway lines. Excludes passenger railroads which are classified under Travel & Tourism, and manufacturers of rail cars, which are classified under Commercial Vehicles & Trucks.
			2777 Transportation Services	Companies providing services to the Industrial Transportation sector, including companies that operate airports, train depots, roads, bridges, tunnels, ports, and providers of logistic services to shippers of goods. Includes companies that provide aircraft and vehicle maintenance services.
			2779 Trucking	Companies that provide commercial trucking services. Excludes road and tunnel operators which are classified under Transportation Services, and vehicle rental and taxi companies, which are classified under Travel & Tourism.
		2790 Support Services	2791 Business Support Services	Providers of nonfinancial services to a wide range of industrial enterprises and government agencies, including providers of printing services, management consultants, office cleaning services, and companies that install, service and monitor alarm and security systems.
			2793 Business Training & Employment Agencies	Providers of business or management training courses and employment services.
			2795 Financial Administration	Providers of computerized transaction processing, data communication and information services, including payroll, bill payment and employee benefit services.
			2797 Industrial Suppliers	Distributors and wholesalers of diversified products and equipment primarily used in the manufacturing and industrial sectors. Includes builders merchants.
			2799 Waste & Disposal Services	Providers of pollution control and environmental services for the management, recovery and disposal of solid and hazardous waste materials, such as landfills and recycling centers. Excludes manufacturers of industrial air and water filtration equipment, which are classified under Industrial Machinery & Equipment.
3000 Consumer Goods	3300 Automobiles & Parts	3350 Automobiles & Parts	3353 Automobiles	Makers of motorcycles and passenger vehicles, including cars, sport utility vehicles (SUVs) and trucks. Excludes makers of heavy trucks, which are classified under Commercial Vehicles & Trucks, and makers of recreational vehicles (RVs and ATVs), which are classified under Recreational Vehicles & Equipment.
			3355 Auto Parts	Manufacturers and distributors of new and replacement parts for motorcycles and automobiles, including engines, carburetors and batteries. Excludes producers of tires, which are classified under Commercial Vehicles & Trucks.
			3357 Tires	Manufacturers, distributors and retreaders of automobile, truck and motorcycle tires.
	3500 Food & Beverage	3530 Beverages	3533 Brewers	Manufacturers and shippers of cider or malt products such as beer, ale and stout.
			3535 Distillers & Vintners	Producers, distillers, vintners, blenders and shippers of wine and spirits such as whisky, brandy or liqueurs.
			3537 Soft Drinks	Manufacturers, bottlers and distributors of non-alcoholic beverages, such as soda, fruit juice and bottled water.

		3570 Food Producers	3573 Farming, Fishing & Plantations	Companies that grow crops or raise livestock, operate fisheries or own nontobacco plants, manufacturers of livestock feeds and seeds and other agricultural products but excludes manufacturers of fertilizers or pesticides, which are classified under Specialty Chemicals.
			3577 Food Products	Food producers, including meatpacking, snacks, fruits, vegetables, dairy products and frozen foods. Includes producers of pet food and manufacturers of dietary supplements, vitamins and minerals. Excludes producers of fruit juices, tea, coffee, bottled water and other non-alcoholic beverages which are classified under Soft Drinks.
	3700 Personal & Household Goods	3720 Household Goods & Home Construction	3722 Durable Household Products	Manufacturers and distributors of domestic appliances, lighting, hand tools and power tools, cutlery, tableware, garden equipment, luggage, towels and linens.
			3724 Nondurable Household Products	Producers and distributors of pens, paper goods, batteries, light bulbs, tissues, toilet paper and other products such as soaps and polishes.
			3726 Furnishings	Manufacturers and distributors of furniture, including chairs, tables, desks, carpeting, wall coverings and other furniture.
			3728 Home Construction	Constructors of residential homes, including manufacturers of mobile and prefabricated homes for use in one place.
		3740 Leisure Goods	3743 Consumer Electronics	Manufacturers and distributors of consumer electronics, such as TVs, VCRs, DVD players, stereo equipment, cable boxes, calculators and camcorders.
			3745 Recreational Products	Manufacturers and distributors of recreational equipment. Includes musical instruments, sporting equipment and supplies, RVs, ATVs and marine recreational vehicles such as yachts, dirigibles and speedboats.
			3747 Toys	Manufacturers and distributors of toys and video/computer games, including such toys as action figures, playing cards, board games, stuffed animals and dolls.
		3760 Personal Goods	3763 Clothing & Accessories	Manufacturers and distributors of all types of clothing, jewelry, watches or textiles. Includes manufacturers of sunglasses, eyeglass frames, leather clothing and goods, and processors of hides and skins.
			3765 Footwear	Manufacturers and distributors of shoes, boots, sandals, sneakers and other types of footwear.
			3767 Personal Products	Makers and distributors of cosmetics, toiletries and personal-care and hygiene products, deodorants, soaps, toothpaste, perfumes, diapers, shampoos, razors and feminine-hygiene products. Includes makers of contraceptives other than oral contraceptives, which are classified under Pharmaceuticals.
		3780 Tobacco	3785 Tobacco	Manufacturers and distributors of cigarettes, cigars and other tobacco products. Includes manufacturers of plantations.
4000 Health Care	4500 Health Care	4530 Health Care Equipment & Services	4533 Health Care Providers	Owners and operators of health maintenance organizations, hospitals, clinics, dentists, opticians, homes, rehabilitation and retirement centers. Excludes veterinary services, which are classified under Specialized Consumer Services.
			4535 Medical Equipment	Manufacturers and distributors of medical devices such as MRI scanners, prosthetics, pacemakers, X-ray machines and other non-disposable medical devices.
			4537 Medical Supplies	Manufacturers and distributors of medical supplies used by health care providers and the general public. Includes makers of contact lenses, eyeglass lenses, bandages and other disposable medical supplies.

		4570 Pharmaceuticals & Biotechnology	4573 Biotechnology	Companies engaged in research into and development of biological substances for the production, discovery and diagnostic development, and which derive the majority of their revenue from the sale or licensing of these drugs and diagnostic tools.
			4577 Pharmaceuticals	Manufacturers of prescription or over-the-counter drugs, such as aspirin, cold remedies and vitamins. Includes vaccine producers but excludes vitamin producers, which are classified under Chemicals and Allied Products.
5000 Consumer Services	5300 Retail	5330 Food & Drug Retailers	5333 Drug Retailers	Operators of pharmacies, including wholesalers and distributors catering to these businesses.
			5337 Food Retailers & Wholesalers	Supermarkets, food-oriented convenience stores and other food retailers and distributors of dietary supplements and vitamins.
		5370 General Retailers	5371 Apparel Retailers	Retailers and wholesalers specializing mainly in clothing, shoes, jewelry, sunglasses and accessories.
			5373 Broadline Retailers	Retail outlets and wholesalers offering a wide variety of products including both hard goods and services.
			5375 Home Improvement Retailers	Retailers and wholesalers concentrating on the sale of home improvement products, including furniture, equipment, carpets, wallpaper, paint, home furniture, blinds and curtains, and building materials.
			5377 Specialized Consumer Services	Providers of consumer services such as auction houses, day-care centers, dry cleaners, consumer rental companies, veterinary clinics, hair salons and providers of funeral, lawn-care, consumer-storage, heating and cooling installation and plumbing services.
			5379 Specialty Retailers	Retailers and wholesalers concentrating on a single class of goods, such as electronics, books, automotive parts or closeouts. Includes automobile dealerships, video rental stores, dollar stores, free shops and automotive fuel stations not owned by oil companies.
	5500 Media	5550 Media	5553 Broadcasting & Entertainment	Producers, operators and broadcasters of radio, television, music and filmed entertainment services, including movie theatres, which are classified under Recreational Services.
			5555 Media Agencies	Companies providing advertising, public relations and marketing services. Includes billboard companies and telemarketers.
			5557 Publishing	Publishers of information via printed or electronic media.
	5700 Travel & Leisure	5750 Travel & Leisure	5751 Airlines	Companies providing primarily passenger air transport. Excludes airports, which are classified under Transportation Services.
			5752 Gambling	Providers of gambling and casino facilities. Includes online casinos, racetracks and the maintenance of pachinko machines and casino and lottery equipment.
			5753 Hotels	Operators and managers of hotels, motels, lodges, resorts, spas and campgrounds.
			5755 Recreational Services	Providers of leisure facilities and services, including fitness centers, cruise lines, movie theatres and sports teams.
			5757 Restaurants & Bars	Operators of restaurants, fast-food facilities, coffee shops and bars. Includes integrated business units, companies and catering companies.

				5759 Travel & Tourism	Companies providing travel and tourism related services, including travel agents, online travel reservation services, automobile rental firms and companies that primarily provide passenger transportation, such as buses, taxis, passenger rail and ferry companies.
	6000 Telecommunications	6500 Telecommunications	6530 Fixed Line Telecommunications	6535 Fixed Line Telecommunications	Providers of fixed-line telephone services, including regional and long-distance. Includes companies that primarily provide telephone services through the internet. Excludes companies whose primary business is Internet access, which are classified under Internet.
			6570 Mobile Telecommunications	6575 Mobile Telecommunications	Providers of mobile telephone services, including cellular, satellite and paging services. Includes tower companies that own, operate and lease mobile site towers to multiple wireless service providers.
	7000 Utilities	7500 Utilities	7530 Electricity	7535 Conventional Electricity	Companies generating and distributing electricity through the burning of fossil fuels such as coal, petroleum and natural gas, and through nuclear energy.
				7537 Alternative Electricity	Companies generating and distributing electricity from a renewable source. Includes companies that produce solar, water, wind and geothermal electricity.
			7570 Gas, Water & Multi- utilities	7573 Gas Distribution	Distributors of gas to end users. Excludes providers of natural gas as a commodity, which are classified under the Oil & Gas industry.
				7575 Multi- utilities	Utility companies with significant presence in more than one utility.
				7577 Water	Companies providing water to end users, including water treatment plants.
Financials	8000 Financials	8300 Banks	8350 Banks	8355 Banks	Banks providing a broad range of financial services, including retail banking, loans and mortgage transactions.
		8500 Insurance	8530 Nonlife Insurance	8532 Full Line Insurance	Insurance companies with life, health, property & casualty and reinsurance interests, no one of which predominates.
				8534 Insurance Brokers	Insurance brokers and agencies.
				8536 Property & Casualty Insurance	Companies engaged principally in accident, fire, automotive, marine, malpractice and other nonlife insurance.
				8538 Reinsurance	Companies engaged principally in reinsurance.
			8570 Life Insurance	8575 Life Insurance	Companies engaged principally in life and health insurance.
		8600 Real Estate	8630 Real Estate Investment & Services	8633 Real Estate Holding & Development	Companies that invest directly or indirectly in real estate through development, investment and management. Excludes real estate investment trusts and similar entities, which are classified as Real Estate Investment Trusts.
				8637 Real Estate Services	Companies that provide services to real estate companies but do not own the properties. Includes agencies, brokers, leasing companies, management companies and advisory services. Excludes real estate investment trusts and similar entities, which are classified as Real Estate Investment Trusts.
			8670 Real Estate Investment Trusts	8671 Industrial & Office REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in office, industrial and flex properties.
			8672 Retail REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in retail properties. Includes malls, shopping centers, strip centers and factory outlets.	

			8673 Residential REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in residential home properties. Includes apartment buildings and residential communities.	
			8674 Diversified REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in a variety of property types without a concentration on any single type.	
			8675 Specialty REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in storage properties, properties in the health care industry such as hospitals, assisted living facilities, health care laboratories, and other specialized properties such as auto dealership facilities, hotels, properties and net lease properties.	
			8676 Mortgage REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in mortgages or mortgage backed securities.	
			8677 Hotel & Lodging REITs	Real estate investment trusts or corporations (REITs) or listed property trusts (LPTs) that invest in hotels or lodging properties.	
	8700 Financial Services	8770 Financial Services	8771 Asset Managers	Companies that provide custodial, trustee and other related fiduciary services. Includes management companies.	
			8773 Consumer Finance	Credit card companies and providers of personal finance services such as personal loans and cashing companies.	
			8775 Specialty Finance	Companies engaged in financial activities not specified elsewhere. Includes companies not under Equity Investment Instruments or Nonequity Investment Instruments engaged primarily in stakes in a diversified range of companies.	
			8777 Investment Services	Companies providing a range of specialized financial services, including securities brokerage, online brokers and security or commodity exchanges.	
			8779 Mortgage Finance	Companies that provide mortgages, mortgage insurance and other related services.	
		8980 Equity Investment Instruments	8985 Equity Investment Instruments	Corporate closed-ended investment entities identified under distinguishing legislation, such as investment trusts and venture capital trusts.	
		8990 Nonequity Investment Instruments	8995 Nonequity Investment Instruments	Cash shells, Special Purpose Acquisition Company (SPACs), Noncorporate, open-ended investment instruments such as open-ended investment companies and funds, unit trusts, ETFs and split capital trusts.	
Industrials	9000 Technology	9500 Technology	9530 Software & Computer Services	9533 Computer Services	Companies that provide consulting services to other businesses relating to information technology. Includes providers of computer-system design, systems integration, network and systems management, data management and storage, repair services and technical support.
				9535 Internet	Companies providing Internet-related services, such as Internet access providers and search engines and providers of Web site design, Web hosting, domain-name registration and e-mail services.
				9537 Software	Publishers and distributors of computer software for home or corporate use. Excludes computer hardware producers, which are classified under Toys.

			9570 Technology Hardware & Equipment	9572 Computer Hardware	Manufacturers and distributors of computers, servers, mainframes, workstations and other hardware and subsystems, such as mass-storage drives, mice, keyboards and printers.
				9574 Electronic Office Equipment	Manufacturers and distributors of electronic office equipment, including photocopiers and
				9576 Semiconductors	Producers and distributors of semiconductors and other integrated chips, including other to the semiconductor industry, such as semiconductor capital equipment and motherboard makers of printed circuit boards, which are classified under Electrical Components & Equ
				9578 Telecommunications Equipment	Makers and distributors of high-technology communication products, including satellites, telephones, fibers optics, switching devices, local and wide-area networks, teleconferenc and connectivity devices for computers, including hubs and routers.

Source: FTSE (2017) (<http://www.icbenchmark.com/>)

Appendix B: Descriptive Statistics for Dependent and Independent Variables.

1. Before the Global Financial Crisis (2003 – 2006)

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	299	.2699666	.8667661	-.95	14.7
ccc	299	28.38826	78.77149	-393	297
icp	294	65.34356	50.92802	0	307.26
rcp	299	48.33616	36.37906	0	172.3403
pdp	294	84.22297	63.74083	0	500.48
mktcap	276	18.93561	56.36192	0	491.66
sizeta	299	14.58425	4.746237	0	89.88
levg	153	.5715686	.2352242	0	.99
chgdp	300	3.51	1.993526	-1.5	5.6
cata	299	.5871572	.2365431	0	.98

2. During the Global Financial Crisis (2007 – 2009)

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	225	.2015111	.1944347	-.2	1.67
ccc	225	12.49778	52.00327	-205	150
icp	225	29.49538	35.51366	0	198.65
rcp	225	46.31447	26.43596	0	117.6025
pdp	225	63.30165	61.09426	0	502.1724
mktcap	195	16.27167	29.05931	.02	225.11
sizeta	225	14.60493	2.643461	0	17.93
levg	67	.4495522	.3105929	0	.94
chgdp	225	3.538222	1.986912	-1.5	5.6
cata	225	.5328444	.2553043	0	.99

3. After the Global Financial Crisis (2010 – 2012)

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	225	.2588	.4581902	-.56	3.8
ccc	225	16.15556	59.34923	-247	141
icp	225	46.3756	47.8022	0	193.4446
rcp	225	62.02698	24.1207	0	242.54
pdp	225	92.2814	63.95439	0	312.35
mktcap	192	24.42356	60.54695	0	334.51
sizeta	225	14.12836	2.60878	0	19.01
levg	62	.5451613	.3229259	0	.99
chgdp	225	3.481778	2.001936	-1.5	5.6
cata	225	.6483556	.2528294	0	1

Appendix C: Variance Inflator analysis for linear regression models (1) to (4) (ROA as dependent variable) - before crisis (2003 – 2006)

Variables	Model 1		Model 2		Model 3		Model 4	
	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)
CATA	1.08	0.908691	1.19	0.837586	1.20	0.835206	1.09	0.917127
CCC	1.10	0.908691	-	-	-	-	-	-
ICP	-	-	1.25	0.797612	-	-	-	-
RCP	-	-	-	-	1.18	0.845902	-	-
PDP	-	-	-	-	-	-	1.06	0.939112
SIZETA	1.05	0.950924	1.04	0.959826	1.04	0.964257	1.04	0.964569
CHGDP	1.03	0.969042	1.04	0.963464	1.03	0.968943	1.04	0.963667
LEV	1.07	0.934674	1.11	0.900816	1.05	0.947934	1.05	0.952583
Mean VIF	1.07		1.13		1.10		1.06	

Variance Inflator Factor (VIF) analysis for linear regression models (1) to (4) (ROA as dependent variable) – during crisis (2007 – 2009)

Variables	Model 1		Model 2		Model 3		Model 4	
	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)
CATA	1.66	0.600934	2.47	0.405239	1.20	0.832911	1.22	0.817065
CCC	1.67	0.599006	-	-	-	-	-	-
ICP	-	-	2.09	0.478351	-	-	-	-
RCP	-	-	-	-	1.62	0.616922	-	-
PDP	-	-	-	-	-	-	1.40	0.713364
SIZETA	1.02	0.981715	1.03	0.972182	1.29	0.778060	1.05	0.954662
CHGDP	1.11	0.902688	1.05	0.950450	1.07	0.938916	1.11	0.898033
LEV	1.61	0.619531	1.40	0.711808	1.59	0.627305	1.40	0.716045
Mean VIF	1.41		1.61		1.35		1.24	

Variance Inflator Factor (VIF) analysis for linear regression models (1) to (4) (ROA as dependent variable) – after crisis (2010 – 2012)

Variables	Model 1		Model 2		Model 3		Model 4	
	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)
CATA	1.14	0.875205	1.14	0.877675	1.17	0.852863	1.24	0.806066
CCC	1.22	0.819998	-	-	-	-	-	-
ICP	-	-	1.39	0.721957	-	-	-	-
RCP	-	-	-	-	1.16	0.859929	-	-
PDP	-	-	-	-	-	-	1.13	0.882259
SIZETA	1.41	0.711405	1.72	0.581980	1.30	0.769668	1.37	0.731019
CHGDP	1.11	0.901999	1.16	0.860541	1.09	0.916439	1.10	0.906680
LEV	1.25	0.801121	1.26	0.796329	1.31	0.762322	1.25	0.802786
Mean VIF	1.22	-	1.33	-	1.21	-	1.22	-

Appendix D: Breusch-Pagan/ Cook-Weisberg tests for heteroskedasticity (before crisis)

Model	Hypothesis	Chi2 (1)	Prob > chi 2
Model 1	Ho: Constant variance Variables: fitted values of ROA	287.73	0.0000
Model 2	Ho: Constant variance Variables: fitted values of ROA	378.84	0.0000
Model 3	Ho: Constant variance Variables: fitted values of ROA	336.07	0.0000
Model 4	Ho: Constant variance Variables: fitted values of ROA	301.55	0.0000

Appendix E: Breusch-Pagan/ Cook-Weisberg tests for heteroskedasticity (during crisis)

Model	Hypothesis	Chi2 (1)	Prob > chi 2
Model 1	Ho: Constant variance Variables: fitted values of ROA	55.59	0.0000
Model 2	Ho: Constant variance Variables: fitted values of ROA	54.89	0.0000
Model 3	Ho: Constant variance Variables: fitted values of ROA	56.76	0.0000
Model 4	Ho: Constant variance Variables: fitted values of ROA	55.56	0.0000

Appendix F: Breusch-Pagan/ Cook-Weisberg tests for heteroskedasticity (after crisis)

Model	Hypothesis	Chi2 (1)	Prob > chi 2
Model 1	Ho: Constant variance Variables: fitted values of ROA	26.47	0.0000
Model 2	Ho: Constant variance Variables: fitted values of ROA	26.00	0.0000
Model 3	Ho: Constant variance Variables: fitted values of ROA	23.83	0.0000
Model 4	Ho: Constant variance Variables: fitted values of ROA	27.53	0.0000