LUND UNIVERSITY
School of Economics and Management

Department of Business Administration
BUSN79
Degree Project in Accounting and Finance
Spring 2020

Does Working Capital Management Work?

The relationship between working capital management and profitability in Swedish firms

Authors:

Anton Efraimsson
Alex Hesslin

Abstract

Seminar date: 2/6-2020

Course: BUSN79 - Degree Project in Accounting and Finance

Authors: Anton Efraimsson & Alex Hesslin

Advisor: Anna Glenngård

Five key words: working capital management, cash conversion cycle, profitability, pecking order theory, Stockholm Stock Exchange

Purpose: The purpose of this study is to explore if and how working capital management impacts profitability in Swedish listed non-financial firms.

Methodology: This study is quantitative in nature and therefore naturally employs a deductive and positivistic approach to fulfil its defined purpose. A strongly balanced panel data set is collected using Thomson Reuters Datastream as the main source with the primary statistical method used being an extension of OLS, namely fixed effects.

Theoretical perspectives: No established theoretical framework exists on working capital management. Instead, capital structure theory is elaborated upon and its implications for working capital management are derived and used to develop hypotheses.

Empirical foundation: The sample consists of 254 Swedish firms listed on the Stockholm Stock Exchange between 2012 - 2018 resulting in 1,778 observed firm year observations.

Results: The cash conversion cycle is found to significantly impact profitability of Swedish, listed, non-financial firms. Additionally, all components of the cash conversion cycle are also found to significantly impact profitability.

Conclusions: The findings of our study are largely in line with those of previous research as well as the theoretical background. A significant relationship is established between working capital management and profitability.

Acknowledgements

First and foremost, we would like to thank our supervisor, Anna Glenngård for her dedicated and insightful guidance throughout the research process. We would also like to thank Lund University and more specifically LUSEM for preparing us well for our professional careers.

Anton Efraimsson

Alex Hesslin

Table of contents

List of abbreviations

CCC - cash conversion cycle
AP - accounts payable
AR - accounts receivable
INV - inventory
NAP - no. of days accounts payable
NAR - no. of days accounts receivable
NAI - no. of days inventory
WCM - working capital management
NWC - net working capital
NTC - net trade cycle
ROA - return on assets
OLS - ordinary least squares
POLS - pooled ordinary least squares
FE - fixed effects

1. Introduction

1.1 Background

Working capital management is a powerful tool that can free up valuable cash for firms that are able to manage internal processes such as accounts receivables, accounts payable and inventory in an efficient manner. The reason that working capital management has attracted the attention of a wide array of researchers is that freeing up cash gives firms the option to boost capital investment without needing to take on additional debt through external funding. A number of researchers have previously investigated the relationship between working capital and corporate performance in both small, medium and large corporations, (see for example Deloof, 2003; Shin & Soenen, 1998; Smith, 1980; Samiloglu & Dermigunes, 2008; Lazaridis & Tryfonidis, 2006; Gill, Biger & Mathur, 2010; Garcia-Teruel & Martinez-Solano, 2007; Baños-Caballero, Garcia-Teruel & Martinez-Solano, 2014). Some have taken more detailed approaches by only looking at isolated components that make up working capital such as inventory management or trade credit. In one of the most prominent pieces of research on the subject, Deloof (2003) finds that working capital management has a significant impact on the profitability of Belgian firms. Researchers have replicated the study in other geographical areas and on other markets with various methodological alterations but reaching similar results. However, according to Baños-Caballero et al. (2014), two main views on working capital management have developed. The first view is that higher levels of working capital allows firms to obtain discounts for early payments and to increase their sales. The second, competing view, is that higher levels of working capital requires additional financing which places financial constraints on firms, ultimately triggering the risk of going bankrupt.

In a relatively recent report, PwC (2017) finds that the Nordic region largely lags behind European and North American firms in efficient working capital management. The report identifies a potential cash release of 24 billion USD if Nordic firms were to improve their working capital efficiency to the next quartile. The same report finds that in 2016, the net working capital (NWC) conversion cycle of Swedish firms was 69 days compared to the European average of 42 days, indicating almost 40% less efficient working capital management. These findings seemingly indicate an incentive for Nordic firms to boost their capital efficiency which begs the question why this has not yet happened. Consequently, we have chosen to investigate whether or not the same significant relationship between working capital and firm performance exists for Swedish firms as in the firms of previously researched markets.

1.2 Problem discussion

The two previously mentioned competing views on working capital management suggests both pros and cons with extending as well as accepting trade credit. It has been found that while

extending trade credit increases the level of working capital, it can also increase sales by acting as a form of discount for a firm's customers (Brennan, Maksimovic & Zechner, 1988; Petersen & Rajan, 1997). Similarly, Smith (1987) find that extending trade credit allows customers to assess the quality of a product or service before issuing payment which can benefit long term supplier-buyer relationships by reducing information asymmetry. Given the variation in previous findings as well as the different explanations found by different authors, it is somewhat unclear whether or not it is favourable for a firm to increase or decrease the different components that make up their working capital. Consequently, we will aim to provide insight as to whether or not the higher levels of working capital in the Nordics in general and Sweden in particular can be explained by a higher equilibrium of working capital to corporate performance. By empirically highlighting which factors play a significant role in deciding the relationship between working capital management and corporate performance, we hope to fill the previously identified research gap.

Garcia-Teruel & Martinez-Solano (2007) find a significant negative relationship between working capital and Spanish firm's return on assets (ROA). They discuss the possibility of their findings being attributable to the fact that Spanish firms operate under the so-called continental model, characterized by less-developed financial markets. Garcia-Teruel & Martinez-Solano (2007) argue that this means Spanish firms have reduced access to external financing and consequently rely more on short-term financing such as trade credit. However, Demirguc-Kunt & Maksimovic (2002), on the other hand, find that firms in more developed banking systems grant more trade credit to their customers. Again, contradictory findings exist and thus, it becomes seemingly more relevant to study Sweden, where firms operate under more developed banking systems. Consequently, we will investigate whether or not this could be the reason for the previously mentioned higher levels of working capital in Sweden and if the level of working capital is less significant for Swedish firms operating under more developed banking systems with relatively easy access to external financing.

Many factors that impact the level of working capital have been explored separately by researchers. Examples are; payment moral (Svensson, 1997), risk of financial distress (Baños-Caballero et al, 2014) and growth opportunities (Garcia-Teruel & Martinez-Solano, 2007; Baños-Caballero et al., 2014). Furthermore, different working capital measures have been used in different pieces of research. Baños-Caballero et al. (2014) use the net trade cycle (NTC) while Deloof (2003) use both the cash conversion cycle (CCC) as well as individual measure for the components of working capital; accounts payable (AP), inventory and accounts receivable (AR). Additionally, different measures have been applied to capture corporate performance. Shin & Soenen (1998) investigate stock returns and some proxy corporate performance with enterprise value (Baños-Caballero et al., 2014). We aim to combine previously applied approaches and measures in order to holistically explore the state of Swedish firms and to avoid the risk of our results being biased by a specific measure. To our knowledge there is no study of the relationship between working capital management and corporate performance in Swedish listed firms. Consequently, this study will fill a gap in existing research.

Finally, little classical theory exists on working capital specifically which means we will rely heavily on previous research and the methodology applied by others in order to be able to compare results. However, we will also apply fundamental financial theory on capital structure such as the agency theory and the pecking order theory and argue for their implications for working capital management.

1.3 Purpose & Research question

The purpose of this thesis is to determine the effect of working capital management on profitability in Swedish listed non-financial firms. To achieve reliability and replicability, we build on existing research and test if previously established findings hold for Swedish firms.

The problem discussion and purpose has led us to identify the following research questions:

- *Is there a significant relationship between working capital management and profitability of Swedish listed non-financial firms?*
- *Are older firms less reliant on financing through working capital management to be profitable?*
- *Are financially constrained firms more reliant on financing through working capital management to be profitable?*

1.4 Target group & Contribution

This study is primarily aimed towards academics in the form of researchers and students with knowledge of econometrics and corporate finance. Additionally, this thesis is relevant for researchers, managers and investors for a number of reasons;

First, researchers will be made aware of similarities and differences in the relationship between working capital management and profitability in Swedish listed firms. This could present opportunities for further research in similar areas. Second, a number of potential contributions for different stakeholders is possible. Managers may be able to make use of our findings in managing the working capital of firms to maximize profitability or potentially reach other organizational goals. Investors will be made aware of how working capital management impacts performance and consequently their return on investment. Last, creditors may benefit from including working capital management as a covenant or criterion in loan terms.

1.5 Thesis outline

The outline of this thesis will be as follows;

Chapter 2 - Theoretical Framework & Hypotheses
In this section, we will present and discuss the agency theory, pecking order theory and the Altman Z-score. These frameworks are the main theoretical frameworks that are fundamental to the current state of research. Additionally, we will interpret the implications the chosen frameworks have for working capital management. Based on this, we will develop the hypotheses that we aim to test in this thesis.

Chapter 3 - Literature review
In this chapter, we will present the current state of research on the relationship between working capital management and firm performance. Additionally, a summary of the explanatory variables employed in previous research will be provided along with their expected relationship with the dependent variable.

Chapter 4 - Data and methodology
In section four, we will explain and motivate the chosen methodology, how the data was collected and what selection criteria we applied. Moreover, we will explain the variables and the econometric model employed.

Chapter 5 - Results
In this section, descriptive statistics for the sample will be presented, followed by the regression results from the initial models as well as the regression results for models including interaction terms. These results will be objectively and critically depicted to enable a further analysis in the next section. Last, the assumptions of OLS will be tested and the results discussed, especially with regards to its implications for the empirical results in general.

Chapter 6 - Analysis
In this chapter the regression results will be interpreted and compared to the findings of previously conducted studies on working capital management. First, the main explanatory variable related to working capital management, profitability, will be analysed. Second, the relationship between the control variables and the dependent variable will be examined.

Chapter 7 - Conclusion & Discussion
In the last chapter, we will conclude by answering our research questions and discussing our study, the results and their practical implications. Finally, we will provide suggestions for the direction of future research on the subject of working capital management.

2. Theoretical Background & Hypotheses

In this section, we will present and discuss the agency theory, pecking order theory and the Altman Z-score. These frameworks are the main theoretical frameworks that are fundamental to the current state of research. Additionally, we will interpret the implications the chosen frameworks have for working capital management. Based on this, we will develop the hypotheses that we aim to test in this thesis.

2.1 Working capital management

It must be acknowledged that although many research papers have been written about working capital management and its relationship with profitability and corporate performance, no definitive theoretical framework exists on the subject. Consequently, to date, no widely accepted notion on how WCM affects different firm aspects has been established. However, many frameworks exist on the topic of capital structure. In an effort to develop our hypothesis, we will attempt to apply the most relevant capital structure frameworks and interpret their implications for working capital management.

2.2 Agency theory

The agency theory developed by Jensen & Meckling (1976) states that the interests of a firm's managers and its owners are inherently misaligned. Owners (shareholders) seek to maximize firm value while managers can pursue activities such as empire building to increase their power and satisfying their own interests through the exploitation of firm assets. Costs that arise as a consequence of these activities are called agency costs. The misalignment of interests typically stems from the presence of asymmetric information between the agent and the principal, effectively causing managers and shareholders to adopt various signalling and screening methods. The authors suggest introducing incentive schemes for managers that incorporate shareholding or options to overcome this inherent misalignment of interests and reduce agency costs.

Furthermore, Jensen (1986) concludes that firms with an excess of free cash flow, and misaligned interests, face increased risk of having their managers destroy firm value by deciding to invest in high risk, sometimes NPV-negative projects, in the pursuit of strengthening their own reputation as exceptional managers. Additionally, he raises the issue that option programmes may incentivize managers to maximize short term profit by pursuing risky investments in order to maximize the value of their options. To overcome the above-mentioned issues, he suggests that firms experiencing challenges in misaligned interests between principal and agent introduce debt into their capital structure. The introduction of debt places increased constraint on a firm and calls for caution in choosing which projects to invest in since failure to meet obligations of debt financing can lead to bankruptcy. When the severity of the consequences following misdirected free cashflow increases and managers interests are threatened, they tend to act more conservatively (Jensen & Meckling, 1976 & Jensen, 1986).

To further reinforce the generalizability of the agency theory, Chittenden, Hall & Hutchinson (1996) as well as Myers (2001) show that it holds regardless of firm size and that it should have the same implications for small and large firms alike. Another aspect of the agency theory to consider is the misaligned risk appetite between principals and agents (Jensen & Meckling, 1976). The authors argue that managers often have an incentive to take more risk than owners since they are not directly affected by the downside if too much risk is taken on. Again, this could potentially be remedied by introducing incentive schemes that incorporate firm-performance based compensation for managers.

Agency theory largely lays the foundation for multiple theoretical frameworks in finance. Its implications for signalling, information asymmetry and mis-aligned interests have sparked research ranging from behavioural finance to capital structure theory.

2.2.1 Agency theory - Implications for working capital management

According to Easterbrook (1984), a combination of the two forces mentioned in the previous subsection that drive the actions of managers might also lead to more conservative working capital management. In other words, managers are likely to increase levels of working capital to provide a safety net if their risky investments fail. Thus, the pursuit of risky investments and inferior, short-sighted strategies is often associated with less reliance on a short cash conversion cycle to achieve internal working capital financing. Instead, more emphasis is put on external financing with equity and loans. The reason is that debt functions as a control mechanism that limits the flexibility of managerial actions. As a result, managers are likely to prefer internal financing that increases their freedom.

Furthermore, misaligned risk appetite or aversion between managers and owners can also have implications for working capital management. While owners might prefer a certain working capital policy that maximizes profitability, managers can be willing to pursue a more aggressive policy to fulfil their own interests.

2.3 Pecking order theory

As an extension of the agency theory presented above, Myers & Majluf (1984) find that debt financing should be preferred to equity financing due to costs related to information asymmetry. Thus, their findings indicate a preferred order of financing. In essence, the authors conclude that firms prefer the financing options with the least information asymmetry attached to them since this results in lower costs of capital. For example, an outside investor with limited information and little knowledge about the true value of a firm, will expect higher returns on their investments to compensate for risk. Consequently, firms will hesitate to issue equity due to this added cost. As a result, the suggested order of financing is; (1) internal financing, (2) debt financing, and (3) equity financing.

However, some authors have criticized the pecking order theory for being too general (Fama & French, 1999; Fama & French, 2002; Frank & Goyal, 2009). Fama & French (1999) argue that due to the effects of leverage, debt is a more suitable source of financing for mature firms who are often financially unconstrained.

2.3.1 Pecking order theory - Implications for working capital management

Working capital management can be classified as a form of internal financing that allows firms to avoid dedicating retained earnings to cover liquidity shortages in the form of differences between current assets and liabilities. Instead, internal funds can be used to finance capital investments. Based on the fact that internal financing is found to be the least costly way for a firm to finance its investments (Myers & Majluf, 1984), and that higher levels of working capital means that more cash is tied up in the operations, it can be argued that a firm's level of working capital should be negatively related to profitability. This leads us to the formulation of our *first* hypothesis:

$$H_{0-1} : The\ cash\ conversion\ cycle\ does\ not\ impact\ firm\ profitability$$

Furthermore, the argument that more mature firms should prefer debt financing to internal financing due to leverage (Fama & French, 1999) also has implications for working capital management. When debt is the preferred source of financing, working capital management should intuitively receive less attention from managers. In other words, efforts to keep net working capital to a reasonable minimum will be reduced. This leads us to the formulation of our *second* hypothesis:

$$H_{0-2} : For\ older\ firms, the\ cash\ conversion\ cycle\ does\ not\ significantly\ impact\ firm\ profitability.$$

2.4 Altman Z-score - financial constraints

Considering the argument provided above regarding financial position, Altman (1968) employs ratio analysis in an attempt to predict corporate bankruptcy. His paper results in the formulation of the Altman Z-score, frequently used to determine if a firm runs the risk of going bankrupt within two years. The score is based on five ratios that include items from the both balance sheet and income statement (see 4.4.2 for equation). In initial use, the ratio-model successfully predicted bankruptcy in 94% of the cases (Altman, 1968). A limitation with the model mentioned by the author himself is that the investigated sample consisted solely of publicly held manufacturing firms. Moreover, the Altman Z-score has been criticized by a number of academics for not being accurate in predicting bankruptcy (Johnson, 1970 & Moyer, 1977). However, it is still widely used as a control variable in finance research.

2.4.1 Altman Z-score - Implications for working capital management

Firms with a Z-score lower than 1.80 are considered to run the risk of going bankrupt within two years while scores exceeding 3.00 should indicate that the firm is most unlikely to end up in financial distress in the close future (Altman, 1968). More financially constrained firms face the challenge of raising capital for their investments since they have limited access to external funding. Consequently, internal financing should receive more attention from managers in financially constrained firms. Lowering the cash conversion cycle is an efficient way to free up cash that can be used to meet financial obligations and to finance investments (Smith, 1980). This leads us to the formulation of our *third* hypothesis:

$$H_{0-3} : For\ financially\ constrained\ firms, the\ cash\ conversion\ cycle\ does\ significantly\ impact\ firm\ profitability.$$

2.5 Section summary

To summarize, no theoretical framework exists on the topic of working capital management. Consequently, we adopt classical theoretical frameworks on capital structure and interpret their implications for working capital management in order to develop our hypotheses. This resulted in the use of the agency theory (Jensen & Meckling, 1976) and the pecking order theory (Myers & Majluf, 1984), two of the most prominent theories in financial research.

The agency theory states that the interests of a firm's managers and owners are inherently misaligned. Managers will destroy firm value by exploiting firm assets in pursuing their own interests. In order to remedy this, debt can be introduced to the capital structure. Consequently, managers are likely to prefer internal financing that gives them more freedom. The pecking order theory implies that a longer cash conversion cycle should be negatively correlated with firm profitability due to the lower cost of capital for internal financing. Furthermore, critique raised by Fama & French (1999) indicates that mature firms should prefer debt financing over internal financing and thus, for older firms, working capital management should not impact profitability.

3. Literature Review

In this chapter, the current state of research on working capital management will be presented. Main findings from prominent pieces of research from different markets will be introduced along with a brief description of their employed samples and methodology. A detailed summary of previously employed explanatory variables can be found in subsection 3.2. A comprehensive summary table of the literature review can be found in Table 1, with an extended version found in Appendix 1.

3.1 Previous research

Deloof (2003) explores whether working capital management (WCM) has an impact on the profitability of Belgian firms. The dependent variables used in the study are gross operating income and net operating income. The working capital measures used are cash conversion cycle (CCC), No. of days accounts payable (AP), No. of days accounts receivable (AR) and No. of days inventory. In a sample of 1,009 non-financial firms between 1992 - 1996, he finds a significant negative relationship between profitability and all three components of the CCC. Deloof (2003) concludes that managers can positively impact the profitability of firms by reducing No. of days AR and No. of days inventory. He attributes the negative relation between AP and profitability to the fact that profitable firms pay their bills faster than unprofitable firms. No significant relationship is found between profitability and CCC (Deloof, 2003). This study has since received critique for not performing sufficient controls for endogeneity (Garcia-Teruel & Martínez-Solano, 2007) which makes it difficult to say if the dependent variable is influenced by the explanatory variable or vice versa.

Baños-Caballero et al. (2014) examine the relationship between WCM and corporate performance in 258 UK firms between 2001-2007. The authors employ the dependent variable (MV Equity + BV Debt)/BV Assets to measure corporate performance and use net trade cycle (NTC) and NTC^2 to measure working capital while potentially identifying a U-shaped relationship. A statistically significant positive relationship is found between NTC and corporate performance. A negative relationship is found between NTC^2 and corporate performance which indicates a U-shaped relationship and consequently suggests that there is an optimal level of working capital. Additionally, the authors examine the impact of financial constraints on WCM by using the Altman Z-score to classify firms as financially constrained or unconstrained. The findings show that the optimal level of working capital is lower for firms that are financially constrained and higher for firms who are unconstrained. However, the authors identify a need for further research on this and largely attribute it to the fact that higher levels of working capital require more external financing which is easier to access for unconstrained firms (Baños-Caballero et al., 2014).

Shin & Soenen (1998) study the relationship between WCM and shareholder wealth and in extension, corporate performance. Contrary to Deloof (2003), Shin & Soenen (1998) find a significant negative relationship between both CCC and profitability as well as between NTC and profitability. The study is conducted with a large sample of 2,949 US firms between 1975-

1994. Various measures are used to proxy corporate performance including both accounting based measures and Jensen's Alpha and Treynor Index which are both measures for risk adjusted stock returns. Similar to Deloof (2003), this study has received critique for not controlling for endogeneity in the regressions (Garcia-Teruel & Martínez-Solano, 2007) potentially rendering the findings indecisive.

Garcia-Teruel & Martínez-Solano (2007) study WCM and its relationship to profitability in a sample of 8,872 Spanish SMEs between 1996-2002. The authors argue for the increased importance of WCM in countries with less developed financial markets because of reduced access to external financing. They employ ROA as the dependent variable and proxy for profitability. CCC, No. of days AP, No. of days AR and No. of days inventory are used as working capital measures. Their main findings include significant negative relationships between No. of days AR and ROA as well as between No. of days inventory and ROA. No significant relationships are found for CCC or No. of days AP after the authors controlled for endogeneity.

Gill, Biger & Mathur (2010) explore the relationship between WCM and profitability in a sample of 88 US manufacturing firms between 2005-2007. They use gross operating profit as the dependent variable and working capital measures are; CCC, No. of days AP, No. of days AR and No. of days inventory. Contrary to other studies, they find a positive relationship between the CCC and profitability, however this relationship is not statistically significant. No argument or explanation is presented as to why an opposite relationship was found. Additionally, a negative relationship is found for No. of days AR and no significance is found for the two remaining working capital measures.

Mathuva (2010) studies 30 Kenyan firms listed on the Nairobi Stock Exchange between 1993-2008. The dependent variable used is net operating profit and working capital measures are CCC, average collection period, inventory conversion period and average payment period. Significant negative relationships are found between the dependent variable and the CCC and average collection period. Positive relationships are found for inventory conversion period and average payment period.

Lazaridis & Tryfonidis (2006) examine how profitability is influenced by working capital management in 131 firms listed on Athens Stock Exchange between 2001-2004. They use gross operating profit as the dependent variable and proxy for corporate performance. CCC, No. of days AP, No. of days AR and No. of days inventory are chosen as working capital measures. Significant negative relationships are found between gross operating profit and all working capital measures. The findings are largely in line with Deloof (2003) with the addition of CCC being statistically significant. Similar to Deloof (2003), Lazaridis & Tryfonidis (2006) attribute the negative coefficient for No. of days AP to the fact that more profitable firms pay their bills faster.

Samiloglu & Dermigunes (2008) choose ROA as dependent variable and the CCC, AR period and inventory period as working capital measures in their study of WCM and profitability. Their sample consists of 146 Turkish firms listed on the Istanbul Stock Exchange between the years 1998-2007. The main findings are significant negative relationships between AR period and profitability and between inventory period and profitability. No significant relationship is found between the CCC and profitability. Thus, their findings suggest that managers can increase firm profitability by efficiently managing and reducing AR and inventory to a reasonable minimum.

Raheman & Nasr (2007) study the relationship between WCM and profitability in 94 Pakistani listed firms on the Karachi Stock Exchange between 1999-2004. The variables used by the authors are adopted from Mathuva (2010). Net operating profit is used as the dependent variable and working capital measures are; CCC, average collection period, inventory turnover in days and average payment period. The study finds that all working capital management variables are significant and negatively impact profitability.

Sharma & Kumar (2011) adopt variables from Garcia-Teruel & Martínez-Solano (2007) and use ROA as dependent variable and proxy for corporate performance. CCC, No. of days AP, No. of days AR and No. of days inventory represent working capital measures and explanatory variables in different equations. The sample consists of 263 Indian firms listed on the Bombay Stock Exchange between 2000-2008. However, the findings differ from Garcia-Teruel & Martínez-Solano (2007) as all components of working capital are found to have significant relationships with profitability. The CCC and No. of days AR have positive coefficients while No. of days AP and No. of days inventory have negative coefficients. These findings indicate that longer CCC is correlated with higher profitability in terms of ROA which is contradictory to most other studies, however this finding is not statistically significant. Sharma & Kumar (2011) identify that their findings go against existing research but do further investigate the reason behind this. They call for more research on emerging markets in general and India in particular.

In one of the more recent studies on the subject, Yazdanfar & Öhman (2015) look at a sample of 13,797 Swedish SMEs between 2008-2011. The authors employ ROA as the dependent variable and the CCC as explanatory working capital measure. They find that longer CCC has a significant negative impact on firm profitability. Additional findings include that the control variables size, firm age and industry also significantly affect firm profitability. Similar to Garcia-Teruel & Martínez-Solano (2007), Yazdanfar & Öhman (2015) also conclude that financing is one of the greatest challenges faced by SMEs. This indicates that WCM and short-term financing with the help of internal resources are more important for these firms.

Baños-Caballero, Garcia-Teruel & Martínez-Solano (2011) study 1,008 Spanish SMEs between 2002-2007. They look for a U-shaped relationship similar to Baños-Caballero et al. (2014) by employing CCC and CCC^2 as explanatory variables and two versions of ROA as

dependent variables. They find significant relationships for both explanatory variables which suggests a U-shaped relationship and thus, an optimal level of working capital.

Author(s)	Year	Market	Main findings
Deloof	2003	Belgium	Does not find a significant relationship for the CCC. Finds significant negative relationships for all components of the cash conversion cycle.
Banos-Caballero, Garcia-Teruel & Martinez-Solano	2014	UK	Finds a significant positive relationship for the NTC and a negative relationship for the quadratic NTC which indicates a U-shaped relationship.
Shin & Soenen	1998	US	Finds a significant negative relationship between profitability and the NTC.
Garcia-Teruel & Martinez-Solano	2007	Spain SMEs	Does not find a significant relationship between the CCC and ROA. Finds significant negative relationships for both AR and inventory.
Gill, Biger & Mathur	2010	US Manufacturing	Finds a significant negative relationship between AR and profitability. Does not find significance for any other working capital measures.
Mathuva	2009	Kenya	Finds a significant negative relationship between profitability and the CCC. Also finds significance for all components of the CCC.
Lazaridis & Tryfonidis	2006	Greece	Finds significant negative relationships for the CCC as well as for all its components.
Samiloglu & Dermigunes	2008	Turkey	Does not find significance for the CCC. Finds signifiance and negative coefficients for the AR period and inventory period
Raheman & Nasr	2007	Pakistan	Finds a significant negative relationship between profitability and the CCC. Also finds significance for all components of the CCC.
Sharma & Kumar	2011	India	Does not find a significant relationship between ROA and the CCC. However, finds signifiant relationships between ROA and all components of the CCC.
Yazdanfar & Öhman	2014	Sweden SMEs	Finds a significant negative relationship between ROA and the CCC.
Banos-Caballero, Garcia-Teruel & Martinez-Solano	2011	Spain SMEs	Finds a significant positive relationship for the CCC and a negative relationship for the quadratic CCC which indicates a U-shaped relationship.

***Table 1**. Summary of literature review.*

3.2 Factors proven to impact profitability

In order to capture the effects of working capital management on firm profitability, it is important to consider other factors that potentially have an effect on profitability. In this

subsection, factors considered in previous research will be introduced. Additionally, their expected relationship with profitability will be predicted based on previous findings.

Cash Conversion Cycle (CCC)

A majority of studies conducted on the subject employ CCC as the measure for working capital management. The most common finding is a significant negative relationship between CCC and profitability (Baños-Caballero et al., 2011; Yazdanfar & Öhman, 2015; Raheman & Nasr, 2007; Lazaridis & Tryfonidis, 2006 & Mathuva, 2010). Additionally, a number of researchers have found non-significant negative relationships (Samiloglu & Dermigunes, 2008; Garcia-Teruel & Martinez-Solano, 2007 & Deloof, 2003). Last, a couple of previous studies find non-significant positive relationships for CCC (Sharma & Kumar, 2011 & Gill, Biger & Mathur, 2010).

Most studies that employ CCC as working capital measure also break it down into its components, No. of days Accounts Receivable, No. of days Inventory and No. of days Accounts Payable. These factors will be introduced below. Based on previous findings, a negative relationship is expected between CCC and profitability.

No. of days accounts receivable

A majority of previous studies find a significant negative relationship between No. of days AR and profitability (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Gill, Biger & Mathur, 2010; Mathuva, 2010; Lazaridis & Tryfonidis, 2006; Samiloglu & Dermigunes, 2008 & Raheman & Nasr, 2007). This is consistent with the finding that CCC is negatively related to profitability since No. of days AR increases the CCC and therefore contributes to a higher level of working capital. Sharma & Kumar (2011) found a significant positive relationship for No. of days Accounts Receivable. They attribute this finding to the fact that more generous payment terms allow customers to inspect quality before paying which can result in higher future sales.

Based on previous findings, a negative relationship is expected between No. of days Accounts Receivable and profitability.

No. of days inventory

The most prevalent finding in previous research is a significant negative relationship between No. of days Inventory and profitability (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Lazaridis & Tryfonidis, 2006; Samiloglu & Dermigunes, 2008; Raheman & Nasr, 2007 & Sharma & Kumar, 2011). Similar to No. of days AR, this variable increases the CCC and the level of working capital. Consequently, the negative relationship found by previous studies is consistent with a negative relationship between CCC and profitability.

Based on previous findings, a negative relationship is expected between No. of days Inventory and profitability.

No. of days accounts payable

Most previous studies find a significant negative relationship between No. of days AP and profitability (Deloof, 2003; Mathuva, 2010; Lazaridis & Tryfonidis, 2006; Raheman & Nasr, 2007 & Sharma & Kumar, 2011). This finding is contradictory to the finding that CCC is negatively correlated with profitability since No. of days AP reduces the total CCC and therefore the working capital level. A possible explanation is that more profitable firms pay their bills faster (Deloof, 2003). No author found a positive relationship for No. of days AP.

Based on previous findings, a negative relationship is expected between No. of days Accounts Payable and profitability.

Firm size

Many previous studies employ firm size as an explanatory variable since it is likely to affect profitability. The most prominent finding is that size is positively correlated with profitability (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Raheman & Nasr, 2007; Yazdanfar & Öhman, 2015; Mathuva, 2010 & Lazaridis & Tryfonidis, 2006).

Based on previous findings, a positive relationship is expected between size profitability.

Leverage

Debt ratio as a proxy for leverage is commonly used as a control variable in previous research on working capital management. A majority of studies find a negative relationship between leverage and profitability (Garcia-Teruel & Martinez-Solano, 2007; Shin & Soenen, 1998; Gill, Biger & Mathur, 2010 & Lazaridis & Tryfonidis, 2006).

Based on previous findings, a negative relationship is expected between leverage and profitability.

Growth opportunity

Growth opportunity has often been proven to impact profitability and is therefore included in most previous studies as an explanatory variable. The most common finding is a positive relationship with profitability (Garcia-Teruel & Martinez-Solano, 2007; Shin & Soenen, 1998; Yazdanfar & Öhman, 2015 & Baños-Caballero et al, 2011).

Based on previous findings, a positive relationship is expected between growth opportunity and profitability.

Firm age

Firm age is frequently employed as a control variable in previously conducted studies (Garcia-Teruel and Martinez-Solano, 2007; Baños-Caballero et al., 2010; Mathuva, 2010 & Yazdanfar & Öhman, 2015). The most common finding is that firm age positively impacts profitability (Garcia-Teruel and Martinez-Solano, 2007; Baños-Caballero et al., 2010 & Mathuva, 2010). However, Yazdanfar & Öhman (2015) find a negative relationship.

Based on previous findings, a positive relationship is expected between firm age and profitability.

Revenue growth

Revenue growth is often employed as an explanatory variable in previously conducted studies (Deloof, 2003; Shin & Soenen, 1998; Sharma & Kumar, 2011 & Garcia-Teruel & Martinez-Solano, 2007). The most prominent finding is a positive relationship between revenue growth and profitability.

Based on previous findings, a positive relationship is expected between revenue growth and profitability.

Altman Z-score

Baños-Caballero et al. (2014) employ the Altman Z-score as a dummy variable to divide their sample between firms who are financially constrained and unconstrained. They find that firms who are more likely to be financially constrained have a lower level of optimal working capital.

Based on previous findings, it is expected that more financially constrained firms have lower cash conversion cycles. Baños-Caballero et al. (2014) does not include the Z-score as a traditional control variable in their regressions. Thus, its relationship with profitability cannot be predicted based on previous findings.

Industry

The industry classification of firms has previously shown to be a significant determinant of firm profitability and is commonly included as a control variable.

Factor	Expected relationship	Sources
Cash Conversion Cycle (CCC)	Negative	Banos-Caballero et al., 2011; Yazdanfar & Öhman, 2014; Raheman & Nasr, 2007; Lazaridis & Tryfonidis, 2006 & Mathuva, 2010
No. of days Accounts Receivable	Negative	Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Gill, Biger & Mathur, 2010; Mathuva, 2010; Lazaridis & Tryfonidis, 2006; Samiloglu & Dermigunes, 2008 & Raheman & Nasr, 2007
No. of days Inventory	Negative	Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Lazaridis & Tryfonidis, 2006; Samiloglu & Dermigunes, 2008; Raheman & Nasr, 2007 & Sharma & Kumar, 2011
No. of days Accounts Payable	Negative	Deloof, 2003; Mathuva, 2010; Lazaridis & Tryfonidis, 2006; Raheman & Nasr, 2007 & Sharma & Kumar, 2011
Size	Positive	Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Raheman & Nasr, 2007; Yazdanfar & Öhman, 2014; Mathuva, 2010 & Lazaridis & Tryfonidis, 2006
Leverage	Negative	Garcia-Teruel & Martinez-Solano, 2007; Shin & Soenen, 1998; Gill, Biger & Mathur, 2010 & Lazaridis & Tryfonidis, 2006
Growth opportunity	Positive	Garcia-Teruel & Martinez-Solano, 2007; Shin & Soenen, 1998; Yazdanfar & Öhman, 2014 & Banos-Caballero et al, 2011
Firm age	Positive	Garcia-Teruel and Martinez-Solano, 2007; Baños-Caballero et al., 2010 & Mathuva, 2010
Revenue growth	Positive	Deloof, 2003; Shin & Soenen, 1998; Sharma & Kumar, 2011 & Garcia-Teruel & Martinez-Solano, 2007
Altman Z-score	N/A	-
Industry	N/A	-

***Table 2**. Summary of considered factors and their expected relationships to gross profit.*

3.3 Section summary

To summarize, the considered studies employ different measures for profitability, working capital management and control variables. The studied markets characteristics range from developed to developing and emerging. Additionally, even when similar measures are employed, the findings differ between markets and periods. However, a majority of the studies find negative relationships between the CCC and profitability as well as negative relationships between the two components that increase working capital (accounts receivable and inventory) and profitability. While the findings of some studies contradict each other, consensus for expected findings exists for a majority of the explanatory variables.

To clarify, a negative relationship between the CCC and corporate performance indicates that managers can increase firm profitability by managing the components of the CCC to reduce it to a reasonable minimum which is pointed out by several authors (Deloof, 2003; Shin & Soenen, 1988; Garcia-Teruel & Martinez-Solano, 2007). Finally, while often not reported, a majority of the studies include control variables for size, leverage, growth and industry.

4. Data & Methodology

In this section, details behind the execution of this study will be conveyed to strengthen the validity of our results. First, the foundational properties of the study will be presented. Second, the research design will be elaborated, including a presentation of assumptions and data gathered based on the literature review and the hypotheses developed above. Additionally, the data collection and sampling process will be set forth. Third, a brief discussion of the econometric methods applied will be prepared. Last, the operationalization of the data into the included variables will be elaborated followed by a concluding section on the reliability, replicability and validity of the study and points of critique against it.

4.1 Research properties

According to Bryman and Bell (2011), there are two distinctive clusters of business research strategy, namely quantitative and qualitative research. The main distinction is made in the connection between theory and research as well as the epistemological and ontological considerations of these two strategies. Although they do state that there is considerably more to the distinction than these three areas, they provide a general classification of the respective approaches.

Due to the statistical nature of this study, mainly pertaining to its financial focus, a deductive approach is found to be most suited for the intent of fulfilling the purpose of this study and attempting to answer the formulated research question: *Is there a significant relationship between working capital management and profitability of Swedish listed non-financial firms?* The basic idea is to put the defined hypotheses under empirical scrutiny in an attempt to find support for or against current theories and empirical findings in working capital and profitability. The deductive approach is dependent on the current research domain within corporate finance, more specifically, previous research and established theories, to deduce a hypothesis (or hypotheses), which are then translated into one or several econometric models for the purpose of determining the existence of a causal relationship. Based on the findings from various regression analyses, we will either be able to reject or fail to reject the developed hypotheses, from which conclusions can be drawn to either confirm or propose revisions to the theoretical considerations mentioned previously (Bryman & Bell, 2011). Adhering to this approach of business research means that the problem discussion, purpose and research question formulated in previous subsections are all influenced by the current research domain, which also significantly shapes the overall methodological approach, assumptions made and the type of data gathered to fulfil the purpose of our study.

Since the objective of this study is to test the current theories through a positivistic approach of empirical models and analyses of objective measures it will mainly follow the quantitative strategies suggested by Bryman and Bell (2011).

4.2 Research design

In the following subsection, the employed research design will be presented with respect to assumptions, data collection and treatment, as well as the validity of these steps.

4.2.1 Assumptions and data collection

The deductive, objective and positivistic nature of this study implies a great reliance on theoretical considerations and the current research domain (Bryman & Bell, 2011). As a result, a thorough literature review of previous research is conducted to establish the outset and foundation of this study. Empirical evidence is examined and compared between the included studies and against established corporate finance theories to identify the key contributors within the area to assist the formulation of our expectations and hypotheses for our own study. The included literature originates from a wide variety of regions and periods to provide nuance and perspective. We acknowledge that the difference in regions and periods studied could provide conflicting results from other studies, and in fact our own and as countermeasure try and maintain a critical standpoint throughout the review and formulate our expectations and hypothesis based on the key contributors operating with similar data samples to ours whilst also keeping in mind the particular characteristics of the Swedish market post the global financial crisis.

The process of collecting data was managed and structured in a way that ensures reliability and validity by keeping it clean and continuously making checks during necessary formatting and sorting procedures. We also made sure to save the data at different stages of the process to enable eventual revisions and error checks. The data consists of secondary data mainly gathered from Thomson Reuters Datastream; a database that compiles financial data published by the companies. Datastream was chosen as the main source of data due to its wide range, high quality, and detailed data as well as its accessibility.

The sample consists of longitudinal data to capture both the cross-sectional and the time series dimensions whilst also following the same companies throughout the defined period. By including the time dimension to a cross-sectional sample using the same individuals means that we cannot assume that the observations are independently distributed across time, i.e. there is a risk of time-constant attributes in variables, both observed and unobserved in the sample, that could influence our results and render any conclusions indecisive. This requires certain modifications to be made to the traditional econometric analysis, as will be described and specified in the following subsections.

In this study we will be dealing with a strongly balanced data set as most variables have the same number of observations. The main cause of some imbalances pertains to certain variables being constructed as fractions or natural logarithms of different financials where the denominator or number in some cases being equal to zero, i.e. there is a mathematical error in computing those variables. The total number of missing values will be presented in conjunction with the descriptive statistics.

4.2.2 Treatment and sampling

While the contemporary research domain and the wide range of regions that have been investigated with the purpose of finding a causal relationship between working capital management and firm profitability, we found a lack of studies performed on the Swedish market post the global financial crisis in 2008-2009. Sweden is an interesting case due to its acknowledged developed financial markets which also went through the crisis relatively unscathed. Additionally, due to the foundational restrictions of this study, mainly in terms of time and scope, the data collected is heavily reliant on data available. Consequently, the study will exclusively focus on listed firms, and more specifically, firms listed on the Swedish market. Thus, the data gathered covers Nasdaq Stockholm, including large-, medium-, and small-cap as well as the First North Growth Market (GM) during the period 2012-2018 from Thomson Reuters Datastream. The period chosen resides from the fact that Yazdanfar & Öhman (2015) already researched the period 2008-2011 and we concluded that starting in 2012 should provide a sufficient buffer for the short, yet present, recovery period post crisis. This resulted in an initial sample of 667 firms, which represents all listed firms on the above exchanges as per April 2020. As a criterion of inclusion in the sample, we required that the data was available for the full period to ensure a balanced panel data set, which resulted in the exclusion of 386 firms. In the cases where only minor parts of the requested data were missing, complementary actions were conducted where we gathered the data from Thomson Reuters Eikon and/or the relevant annual report. In doing so, checks were also made to ensure the reliability and correctness of the data gathered as well as ensuring that the data was equally defined. The results from these checks were satisfactory. Furthermore, due to the structural discrepancy of financial and investment firms in terms of working capital as well as profitability, they were excluded from the sample, resulting in another 27 firms to be excluded and the final sample to be examined therefore consists of 254 firms, or 1,778 firm-year observations.

Initial sample	667
Full data not available	386
Financial and investment firms	27
Final sample	**254**

***Table 3**. Summary of sample selection.*

4.2.3 Verification

Thomson Reuters Datastream was used as the main source of data for this study as it provides high quality and in-depth data from various sources while providing clear definitions. Using the same source for every financial measure ensures objectivity and consistency across the sample. When conducting complementary procedures for collecting missing data points, we therefore made sure to use Thomson Reuters Eikon and ensured that the definition was equal to that of Datastream. Both sources operate under the same well-known brand of Thomson Reuters which in itself provides additional verification. Lastly, some data was complemented through direct collection from the firms' published annual reports. The process of collection

was performed to balance accuracy with time efficiency due to the foundational constraints of this study. The data was gathered through the Datastream add-in in Microsoft Excel, ensuring an efficient and safe process of data gathering. The complementary data was added manually and during this process, adjacent data points were double-checked against the complementary source. After the gathering process and the procedures of exclusion mentioned above, the data was formatted and structured into a longitudinal data set fitted for the statistical software package Stata.

During the entire process, a professional awareness and scepticism was adopted to ensure that the data gathered was as accurate as possible to warrant reliable results for the generalizability and contribution of any conclusions, analyses and discussion produced. As part of this, the data was continuously examined and saved in a unified document. After completing the literature review of prominent research papers encapsulating the contemporary domain of working capital management and conducting a simple univariate data analysis it was determined that the data gathered was in line with previous research and provided reliable data for the fundamental variables of this study. In developing the hypotheses for empirical investigation, the theoretical outset has been thoroughly explained to synthesise its implications for the research question and the purpose of the study. This proved essential since most of the fundamental theories in corporate finance have a clear focus on firm capital structure, producing analogic interpretations for working capital management. Subsequently, we remain confident to perform the study by putting the data through regressions and various econometric tests to then be subjected to analysis before any conclusions can be drawn and discussions elaborated.

4.3 Operationalization of included variables

While all financial and accounting data were collected from Thomson Reuters Datastream, Eikon and annual reports, ratios were calculated in Excel before importing the data set to Stata. The natural logarithms and dummy variables generated were done directly through commands in Stata.

4.3.1 Dependent variable

Gross operating profit (GOP)
The definition of the dependent variable for the regression models is adopted from Deloof (2003) who defines profitability as gross operating profit divided by total assets.

Profitability = Gross Operating Profit / Total Assets = (Sales - COGS) / Total Assets

4.3.2 Explanatory variables

Cash Conversion Cycle (CCC)
The CCC is the most commonly used measure for working capital and the primary explanatory variable in regression model 1 and 2. The variable measures how many days it takes for a firm

to convert its current assets and liabilities to an in- or out flow of cash (Deloof, 2003; Shin & Soenen, 1998 & Garcia-Teruel & Martinez-Solano, 2007).

$$CCC = (No.\ of\ days\ AR) + (No.\ of\ days\ Inventory) - (No.\ of\ days\ AP)$$

No. of days Accounts Receivable (NAR)
A majority of previously conducted studies on working capital management break down the working capital measure of choice into its components (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Gill, Biger & Mathur, 2010 & Lazaridis & Tryfonidis, 2006). NAR is one of those components and is defined by Deloof (2003) as the average number of days it takes for a firm to collect payments from its customers, normalized with sales.

$$No.\ of\ days\ Accounts\ Receivable = (Accounts\ Receivable * 365) / Sales$$

No. of days Inventory (NAI)
NAI is the second component of working capital management and is defined by Deloof (2003) as the average number of days it takes for a firm to convert its inventory to cash, normalized with cost of goods sold.

$$No.\ of\ days\ Inventory = (Inventory * 365) / COGS$$

No. of days Accounts Payable (NAP)
NAP is the final component of working capital management defined by Deloof (2003) as the average number of days it takes for a firm to pay its suppliers, normalized with cost of goods sold.

$$No.\ of\ days\ Accounts\ Payable = (Accounts\ Payable * 365) / COGS$$

Firm size
In line with Deloof (2003), the natural logarithm of sales is used as a proxy for firm size in this study.

$$Size = Sales * (log10)$$

Leverage
The financial debt ratio is used to proxy leverage (Deloof, 2003).

$$Leverage = Financial\ debt / Total\ assets$$

Growth opportunity
Growth opportunity is an indicator of growth potential and investment opportunities. It is defined by Baños-Caballero et al. (2014) as the ratio of intangible assets to total assets.

$$Growth\ opportunity = Intangible\ assets / Total\ assets$$

Firm age
Yazdanfar and Öhman (2015) define firm age as the natural logarithm of the number of years since incorporation.

$$Firm\ age = (Current\ year - Year\ of\ incorporation) * (log10)$$

Revenue growth
Revenue growth is used to highlight growth in revenue between two years (Deloof, 2003) as is simply computed as the difference in sales between the current and the previous period divided by the previous period sales.

$$Revenue\ growth = (Sales1 - Sales0) / Sales0$$

Q - Corporate performance
Baños-Caballero et al. (2014) employ this measure as their dependent variable to proxy corporate performance. Since the measure incorporates market value of equity, it considers risks and market expectations. Furthermore, it is not distorted by tax regulation or accounting practice (Baños-Caballero, 2014). In this study, the measure is employed as an explanatory variable to control for the effect of market performance on firm profitability.

$$Q = (Market\ value\ of\ equity + Book\ value\ of\ debt) / Book\ value\ of\ assets$$

Altman Z-score
In line with Baños-Caballero et al. (2014), the Altman Z-score, developed by Altman (1986), is used to determine whether a firm is considered financially constrained or not. This classification is used following a re-estimation of the Z-score made by Begley, Mings & Watts (1996).

$$Z\text{-}score = 1{,}2 * A + 1{,}4 * B + 3{,}3 * C + 0{,}6 * D + 1{,}0 * E$$

Where A represents working capital / total assets, B is retained earnings / total assets, C is EBIT / total assets, D is market value of equity / total liabilities, and lastly E is sales / total assets.

Industry
This study uses the standard industry classification (SIC) system used by the Securities and Exchange Commission (SEC) to determine and classify the sample by industry. There are 10 general industry divisions presented by the Occupational Safety & Health Administration of the U.S. Department of Labor (n.d.) specified by the two first digits of the companies' SIC codes, and therefore 10 dummy variables are generated for the data set, taking the value of 1 if the firm belongs in that particular industry group, and 0 otherwise. No firm can belong to two different groups at the same time.

Explanatory Variable	Definition	Data source
Cash Conversion Cycle (CCC)	$NAR + NAI - NAP$	Thomson Reuters DataStream
No. of days Accounts Receivable (NAR)	$\frac{Accounts\ receivable * 365}{Sales}$	Thomson Reuters DataStream
No. of days Inventory (NAI)	$\frac{Inventory * 365}{COGS}$	Thomson Reuters DataStream
No. of days Accounts Payable (NAP)	$\frac{Accounts\ payable * 365}{COGS}$	Thomson Reuters DataStream
Size	$Sales\ (log10)$	Thomson Reuters DataStream
Leverage	$\frac{Financial\ debt}{Total\ assets}$	Thomson Reuters DataStream
Growth opportunity	$\frac{Intangible\ assets}{Total\ assets}$	Thomson Reuters DataStream
Firm age	$Current\ year - Year\ of\ incorporation$	Thomson Reuters DataStream
Revenue growth	$\frac{(Sales_1 - Sales_0)}{Sales_0}$	Thomson Reuters DataStream
Q - Corporate performance	$\frac{MV\ Equity + BV\ Debt}{Total\ assets}$	Thomson Reuters DataStream
Altman Z-score	$1{,}2A + 1{,}4B + 3{,}3C + 0{,}6D + 1{,}0E$	Thomson Reuters DataStream
Industry	SIC-code classification	Thomson Reuters DataStream

***Table 4**. Summary of variable definitions and source.*

4.4 Statistical model description

In the coming subsections, the statistical model employed will be discussed and elaborated with respect to its assumptions and robustness followed by detailed specifications and definitions of the models estimated.

4.4.1 Assumptions

The regression models adopted for econometric analysis will be reliant on the ordinary least squares (OLS) method and its assumptions for the multiple linear regression model (MLR). The assumptions are crucial when determining if the models used are the Best Linear Unbiased Estimators (BLUE) for the relationship examined (Wooldridge, 2016). More specifically, Wooldridge (2016) presents four main assumptions for the multiple linear regression (MLR) under which the OLS estimators can be considered unbiased for the population parameters, namely:

MLR.1 - Linear in Parameters
MLR.2 - Random Sampling
MLR.3 - Sample Variation in the Explanatory Variable
MLR.4 - Zero Conditional Mean

The first assumption simply defines the multiple linear regression, which for the population can be written as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + u$$

Where β_j are the population parameters and u is the unobserved error. This model is very flexible as the underlying variables of interest, both the dependent and the independent, can be expressed as the product of any arbitrary function, such as the natural logarithm and squares. The second assumption states that we have a random sample of size n from the population:

$$(x_{i1}, x_{i2}, \ldots, x_{ik}, y_i) : i = 1, \ldots, n$$

This implies that the data gathered and studied is representative of the population as the objective is to estimate a population relationship (Wooldridge, 2016). The third assumption concerns collinearity and states that no explanatory variables can be constant or experience perfect linear relationships with other explanatory variables. This does not specify the relationship between the explanatory variables and the error term. The only thing that is concerned under MLR.3 is the relationship between the explanatory variables. If an explanatory variable experiences a perfect linear relationship with another explanatory variable, we have perfect collinearity, and any estimations produced by OLS will be deemed void. However, Wooldridge (2016) is clear to state that while perfect collinearity is not allowed, imperfect collinearity is, as otherwise the multiple regression analysis would be useless for econometric analyses. For this study, we will use a simple correlation matrix to investigate the presence of collinearity. While some correlations are expected and allowed, we will remain cautious and exclude one of the variables where the correlation coefficient exceeds the arbitrary value of +/- 0.70, given that it is not part of the correct model for the population.

Finally, the fourth assumption concerns the relationship between the explanatory variables included in the model and the unobserved factors left in the error term. While this assumption is more likely to hold under multiple regression analyses simply because more variables are included in the model, issues may still arise due to omitted or mis specified variables. For example, this could occur by not including a quadratic term of a certain variable, or when we use the level of variable when the log of the variable is used in the true model, or vice versa. If we were to use the wrong function for the variables included, the estimators will be biased (Wooldridge, 2016). Additionally, the omittance of a variable that is correlated with any of the explanatory variables can also cause the assumption to fail. However, certain factors are likely to exist that we cannot include, either due to data limitations or ignorance, which if they should be controlled for and are correlated with any of the independent variables, can also cause the assumption of exogeneity to fail. Important to remember is that correlation between the explanatory variables is allowed under MLR.3, as long as it is not perfect. The main challenge of MLR.4 is to estimate a model that is neither over- nor underspecified compared to the true model. While over specifying, i.e. including irrelevant variables, does not affect the unbiasedness of the relevant variables included, it may cause undesirable effects on the variances of the OLS estimators. Underspecifying, on the other hand, is a more serious problem

as excluded variables that are relevant for the population, generally causes the OLS estimators to be biased. When dealing with panel data, the unobserved factors are split into two components, a_i and u_{it}, as specified by the following simple fixed effects model:

$$y_{it} = \beta_0 + \beta_1 x_1 + a_i + u_{it}$$

Where i denotes the individual examined in the cross-sectional dimension and t indicates the time period. The error term is split into a_i, also called the unobserved heterogeneity, which varies by individual but not by time, and u_{it}, containing the unobservables that vary across time, also called the idiosyncratic errors specific to each unit but varying over time and affecting the outcome in y_{it} (Wooldridge, 2016).

One way of reducing the potential for omitted variable bias is by adopting the fixed effects (FE) model, which is a method that eliminates the fixed effect a_i by subtracting the time-averaged equation from other time periods from the estimating equation. Variables such as industry or country of origin that are innate to the individuals are therefore algebraically removed as they are constant over time. Additionally, the FE model allows arbitrary correlation between the regressors and the fixed effect captured in a_i, but it still requires a strict exogeneity assumption with respect to the idiosyncratic error captured in u_{it}. As a result of the exclusion of within i time averages, there can be no serial correlation within a_i, but there is still a risk that it may be present within u_{it}. To deal with this, we use cluster robust inference, which clusters the standard errors by the units under study. However, if there is reason to believe that a_i, is uncorrelated with the regressors, it could be useful to adopt the random effects (RE) estimation. Unlike FE, RE leaves a_i in the error term and then accounts for the serial correlation over time via a generalized least squares (GLS) procedure. In other words, it allows for the inclusion of time-constant explanatory variables whereas FE would effectively and automatically remove them. Therefore, the adoption of RE highly depends on the importance of using time-constant, or close to time-constant, variables as regressors. Since our model does not include any time-constant variables, the FE estimator seems more suitable in accounting for heterogeneity. The suitability of the models will be evaluated through a Hausman test comparing the estimators on variables that change across individuals and time. Under these four assumptions, the OLS estimators can be considered unbiased. This does not mean that we can state that each estimate obtained from the OLS model is unbiased as it is a fixed number from a particular sample, which is rarely equal to the population parameter. Rather, the unbiasedness is related to the procedure where the OLS estimators are applied across all possible random samples of the population studied (Wooldridge, 2016).

After obtaining the central tendencies of the estimated coefficients, we will investigate the variance of the OLS estimators by adding a homoscedasticity assumption (MLR.5) to the model. This basically means that the variance in the error term u is constant over any values for the explanatory variables. Although this assumption can never be guaranteed, it will be tested for and if violated, accounted for in an effective manner. These five assumptions make up what is known as the Gauss Markov assumptions and in order to fulfil the criteria of BLUE,

all five assumptions mentioned must hold. Lastly, whilst not affecting the unbiasedness of OLS or the conclusion of being BLUE under the Gauss Markov assumptions presented above, we will add a normality assumption (MLR.6). Normality is concerned with the distribution of the error, which directly influences the normality of the OLS estimators. The assumption requires the sampling distribution to be normal in order to ensure the accuracy of the *t* and *F* statistics for the regressions and tests performed. However, Wooldridge (2016) claims that when working with large enough sample sizes with hundreds of observations, this assumption is much less likely to be violated. Therefore, considering we are working with a fairly large panel data set, we can conclude that the OLS estimators are approximately normally distributed. The distribution of the variables will still be examined and, where appropriate, certain variables may be subject to arbitrary functions such as the natural logarithm or a quadratic term while in some cases, winsorizing will be performed to ensure a fair representation of the population parameters. This will be executed while considering previous research and the convention permeating the formulation of the models used for estimating the relationship between working capital management and firm profitability, to facilitate that our model is as close to the true model as possible.

For investigative purposes, various regression models for panel data are conducted to decide the best fit whilst also ensuring that the assumptions hold and that the final model used is both consistent and efficient. The three main types of regression models used for panel data are pooled OLS (POLS), first differencing (FD), and fixed effects (FE). According to Wooldridge (2016), for POLS to be unbiased and consistent, we need to assume that the idiosyncratic error u_i, is uncorrelated with any of the explanatory variables. However, since we suspect that there may be heterogeneity bias caused from omitted time-constant variables, the FD or FE estimators are more suitable. This can also be tested from an F-test following the FE regression output in Stata where the null hypothesis states that the observed and unobserved fixed effects are equal to zero. Furthermore, if POLS and FE provide different results in their estimations of the model it indicates a potential correlation between the explanatory variables and the fixed effects in a_i. If FD and FE also differ, there may be reason to assume that the strict exogeneity assumption is violated since both methods allow arbitrary correlations between the regressors and the fixed effects. In the case of strict exogeneity failing, FE has an advantage over FD under reasonable assumption and with larger time periods where FE tends to be less biased. Lastly, there is another method called the random effects (RE) estimation, which leaves the fixed effects in the error term and is useful when we believe that it is uncorrelated with the explanatory variables. This will also be tested through a Hausman test with the null hypothesis that RE is more efficient and consistent than the FE, i.e. we want sufficient evidence to reject the RE model in favour of FE. The test and its results are elaborated upon in subsection 5.3.1.

4.4.2 Model specifications

In light of the presented theories, the contemporary research domain and the statistical description above, we have developed an econometric model in an attempt to estimate the economic relationship between the level of working capital management and profitability. The

basic econometric model for our first hypothesis stated in section 2.3.1 can be formulated as follows:

$$\begin{aligned} Gross\ Profit_{it} &= \beta_0 + \beta_1 CCC_{it} + \beta_2 Firm\ size_{it} + \beta_3 Leverage_{it} \\ &+ \beta_4 Growth\ opportunity_{it} + \beta_5 Firm\ age_{it} + \beta_6 Revenue\ growth_{it} \\ &+ \beta_7 Q_{it} + \beta_8 Zscore_{it} + \beta_9 Year_t + a_i + u_{it} \end{aligned}$$

Due to the use of a fixed effect estimation, the industry dummies are captured by a_i as they do not vary over time. Furthermore, we employ a variation of the model where the cash conversion cycle is broken down into its three components, no. of days accounts payable, no. of days inventories, and no. of days accounts receivable, will also be estimated and can be formulated as:

$$\begin{aligned} Gross\ Profit_{it} &= \beta_0 + \beta_1 NAR_{it} + \beta_2 NAI_{it} + \beta_3 NAP_{it} + \beta_4 Firm\ size_{it} + \beta_5 Leverage_{it} \\ &+ \beta_6 Growth\ opportunity_{it} + \beta_7 Firm\ age_{it} + \beta_8 Revenue\ growth_{it} \\ &+ \beta_9 Q_{it} + \beta_{10} Zscore_{it} + \beta_{11} Year_t + a_i + u_{it} \end{aligned}$$

Where NAR represents No. of days accounts receivable, NAI is No. of days inventory, and NAP is No. of days accounts payable. Since the model is designed to estimate the economic relationship between two variables, the *t*-test is two-sided, which is standard in most statistical software programs, including Stata.

Additionally, to test the second and third hypotheses, defined in section 2.3.1 and 2.3.2 respectively, interaction terms will be added to the model in an attempt to measure their unique effects on the cash conversion cycle. Since the second hypothesis is concerned with firm age, the interaction term will be a dummy variable determining if the firm is considered older or not. As a proxy for this, we will use the median firm age of the collected sample, with the dummy being equal to 1 if it is older than the median and 0 otherwise. Due to the characteristics of our sample, this will enable us to draw conclusions about Swedish non-financial listed firms with regards to the age distribution within the sample. Where an interaction term for firm age is added to the previous model defined in (1). Due to the characteristics of the variable for firm age used in (1), the correlation coefficient between firm age and the interaction term will be too high and, according to Wooldridge (2016) and the Gauss Markov assumptions, may violate MLR.3, which could cause biases in the estimations. Consequently, the variable for firm age will be omitted from this particular model.

The third hypothesis concerns firms operating under financial constraints and similar to Baños-Caballero et al. (2014), we will use the Altman Z-score as the indicator for whether the firm is considered to be constrained or not. The interaction term will be a dummy variable where 1 indicates if the firm has a Z-score exceeding the median of the sample, and 0 otherwise, in line with Baños-Caballero et al. (2014) and Begley et al. (1996). Where an interaction term

proxying for whether the firm is considered to be financially constrained or not, is added to the original model specified in (1). In this case, the correlation coefficient was not considered problematic between the variable controlling for the firms' Z-score and the interaction term. Therefore, the original model in (1) will be unaltered beyond the inclusion of the interaction term for financial constraints.

Generally, the coefficient of the interaction term tells us the difference in the effect of the main explanatory variable, allowing conclusions to be drawn about whether mature firms or those deemed financially constrained experience a significantly different effect from the cash conversion cycle on firm profitability. In doing so, the marginal effect of one explanatory variable can be analysed as dependent on another explanatory variable. In this case, the interaction term is a dummy variable, which implies that the interpretation of the coefficients is rather straightforward as it will tell us the difference between the main explanatory variable dependent on its classification with respect to the dummy variable, e.g. being considered mature or financially constraint.

4.5 Critique/Limitations

In the subsequent sections, general criticism against the design and conduction of the study as well as potential weaknesses of the study will be discussed for a nuanced view on the impact of the presented results and its implications for practice and research.

4.5.1 Critique of research design

Due to the scope and reach of the study performed, the data gathered was on a yearly basis and thus, the gap between each data point is quite long from an economic viewpoint. Additionally, since the data is based on the annual reports for each company and therefore illustrates their financial status at the end of each fiscal year, the risk of management override with respect to financial reporting is significantly higher than during other periods of the year as firm's tend to polish their numbers before they go public to avoid scrutiny. Therefore, working with more frequent data points, e.g. monthly or even quarterly data, might have increased the accuracy and unbiasedness in the data regarding working capital management and firm profitability whilst avoiding the potential management of numbers prevalent close to fiscal year end reporting.

4.5.2 Critique of variables

Control variables are included when they are believed to have an effect on the dependent variable that could possibly neglect the effect of the main explanatory variable. In this study, the chosen control variables are solely based on variables employed in previous studies on the topic. However, it is difficult to capture the full extent of factors that could potentially mitigate the explanatory power of working capital management on profitability in the case of this study. Consequently, a risk of bias in the choice of control variables is present. The conclusions also risk being somewhat skewed since it is possible that other factors than the chosen control

variables have an impact on firm profitability. Furthermore, a majority of the included control variables are based on accounting data and other financial information. While outside the scope of this study, the presence of difficult to measure, intangible factors such as corporate culture and other organization-specific characteristics could affect firm profitability.

Last, as previously mentioned we use interaction terms to isolate the effect of older firms and more financially constrained firms and how their working capital management impacts profitability compared to younger and less financially constrained firms. While the use of interaction terms is an effective way to introduce classifications to the sample, the challenge of where to split it remains. Both firm age and financial constraint are dummy variables that take on the value 1 or 0 depending on which classification the firm belongs to. For both variables the split is made at the median value in the sample. This introduces the problem of whether or not a firm that is above median age is objectively old or old relative to the rest of the sample. Similarly, firms over median Z-score are classified as financially constrained relative the rest of the sample. To overcome this, the descriptive statistics were examined to ensure that realistic median values exist.

4.5.3 Critique of previous research

This study relies heavily on methods and variables used in previous studies. Consequently, it is important to acknowledge potential limitations of said studies. While many studies exist on the topic of working capital management and its effect on profitability, they are fundamentally different in a number of ways. First, all previous studies are conducted on different geographical markets. Second, previous studies look at different types of firms including smaller firms, SMEs and publicly held firms. Third, a wide variety of both dependent and explanatory variables are employed in previous studies. All these factors contribute to the ambivalence and potential varying reliance of previous findings. As a result, the expected relationship between the chosen explanatory variables and the dependent variable employed in this study may deviate from the actual relationship. The above-mentioned factors could potentially distort the expected relationships between the explanatory and dependent variables since they are derived based on findings in previous research.

5. Empirical Results

In this section, descriptive statistics for the sample will be presented, followed by the regression results from the initial models defined in (1) and (2) as well as the regression results for models including interaction terms defined in (3) and (4). These results will be objectively and critically depicted to enable a further analysis in the next section. Last, the assumptions of OLS will be tested and the results discussed, especially with regards to its implications for the empirical results in general.

5.1 Descriptive statistics

In order to create a comprehensive, informative and fair presentation of the distribution and common characteristics of the sample included in this study, summary statistics are presented in Table 4. Through a simple univariate analysis, we are able to develop expectations and describe the basics of the data before any regression analysis is performed. As discussed previously in section 4.2.1, the composition of the variables included have led to a number of data points missing, which becomes clear when examining the number of observations. The highest number, which is also the maximum of the firms and years included, is 1,778 observations with the lowest being 1,685 observations. Despite this, the sample can still be said to be strongly balanced and the estimations should therefore be, ceteris paribus, unbiased and consistent (Wooldridge, 2016).

Variable	Observations	Mean	SD	Min	Median	Max
Gross Profit	1,778	0.29	0.36	-0.81	0.24	2.22
Cash Conversion Cycle	1,685	61.17	64.82	-133.38	61.26	244.49
No. of days receivable	1,733	51.46	27.15	4.57	53.66	95.38
No. of days inventory	1,685	64.18	55.42	0.00	62.23	171.60
No. of days payable	1,685	53.80	31.81	13.45	47.20	135.34
Firm size	1,778	10,401	32,786	0	674	390,834
Leverage	1,778	0.18	0.19	0.00	0.14	1.62
Growth Opportunity	1,778	0.29	0.24	0.00	0.27	0.99
Firm age	1,778	36	32	2	24	195
Revenue Growth	1,729	0.17	0.68	-1.00	0.07	8.28
Q	1,778	1.89	1.80	0.25	1.29	13.52
Z-score	1,778	4.06	3.20	-0.65	3.20	11.81

***Table 4**. Descriptive statistics.*

The average gross profit for the sample is 0.29, which means that on average, Swedish publicly traded non-financial firms have a gross profit of 29%. The mean is slightly higher than the median at 0.24, suggesting a minimal right skewness of the sample. This is also clear when looking at the minimum and maximum values, being at -0.81 and 2.22 respectively, i.e. the upper limit is significantly higher than the lower. Considering the characteristics of the variable, this could suggest that many firms included in the sample have quite low asset bases compared to their gross profits. The standard deviation sits at 0.36, which is higher than the average and the median, and indicates that almost the entire sample is located between -0.43

and 1.01. Meanwhile, the average cash conversion cycle is at 61.17 days, with the median value being 61.26, indicating that the distribution is fairly normalized. This is also evident from the fact that the minimum and maximum values are at -133.38 days and 244.49 days respectively. The distribution of the individual components of the cash conversion cycle, i.e. number of days accounts receivable, inventories, as well as payable, are also fairly normalized. However, when it comes to total sales, the discrepancy is noticeably greater with an average of 10,401 kSEK and median of only 674 kSEK. This indicates that the sample is strongly skewed to the right as most observations are below the estimated sample average. Additionally, the lowest value and highest values are 0 kSEK and 390,834 kSEK respectively, which illustrates the skewed distribution of the variable. However, it is not unexpected as a number of pharmaceutical companies, who conventionally have low to zero amounts of revenue before the product is finally launched. Simultaneously, the sample includes the likes of Volvo, Ericsson, H&M, and Skanska, with significantly higher revenues than most other firms considered, especially in Sweden.

Furthermore, the average revenue growth is 0.17, with a median of 0.7, also indicating a right skewness, mainly caused by some extraordinary upside values as the highest value of the sample is 8.28 and the lowest being -1.00, which makes sense, since it measures the percentage change between two years, and therefore mechanically cannot go below -1.00. The estimated average leverage ratio of the sample is merely 0.18, which coupled with a median at 0.14, indicates rather low levels of debt financing. Despite this, the average growth opportunity ratio is at 0.29, with a median of 0.27, which indicates a preference towards other sources of financing, i.e. working capital, retained earnings or equity, as the firms are seemingly able to make positive net present value investments whilst maintaining low levels of debt. Additionally, the average Q value is at 1.89, with a slightly lower median of 1.29, also shows that the average firm in the sample is valued at almost double the actual book value, which in turn could explain the ability to continuously make positive investments without having to rely on debt financing. The average Altman Z-score is measured at 4.06 with a median of 3.20, which shows that the majority of firms included in the sample are not considered financially constrained. Lastly, the average firm age of the observed sample is 36 years, with a median of 24 years and the lower and upper limit being 2 years and 195 years respectively. In other words, most firms included are younger than the average while some firms have been incorporated since the early 1800s, which skews the mean somewhat.

5.2 Robustness tests

In the following subsections the various actions and procedures carried out to ensure the validity, unbiasedness and consistency of the estimators are described with relevant results being presented and discussed.

5.2.1 Model specification

With an F-statistic of 29.82 and a resulting *p*-value of 0.0000, the null of all observed and unobserved fixed effects being equal to zero is strongly rejected. As a result, we can confidently assume that the FD and FE estimators are more suitable than the POLS. This is in line with our expectations based on Wooldridge (2016) as the POLS is more prevalent when dealing with pooled cross-sectional data where the sample includes different individuals over time, whereas we are dealing with the same individuals across all time periods. The fact that the same individuals are examined during the full period indicates that there is bound to be correlation between the explanatory variables and the fixed effects, which is also suggested by the differing results in the estimations produced by POLS compared to FD and FE, presented in Appendix 2. Moreover, the FD and FE yielded rather similar results with respect to the main explanatory variables, while some minor differences examined observing the control variables, as is to be expected when dealing with panel data exceeding two time-periods. Under the assumption of homoscedasticity and no autocorrelation in the error term, FE is deemed more efficient. Additionally, a Hausman test was performed to compare the accuracy and suitability of the FE and RE estimators on the explanatory variables that change across *i* and *t*. The test was performed with the unanimous and undisputed conclusion that the FE estimator is the appropriate model for estimating the population parameters with a chi-square of 64.29 and a *p*-value significant to the fourth decimal, i.e. the null hypothesis that the individual-level effects are adequately modelled by the RE model is strongly rejected. The regression estimations and test results are presented in Panel A and B, respectively, in Appendix 3.

5.2.2 Multicollinearity

Through the use of the sophisticated statistics software Stata, the presence of multicollinearity was never a risk as the program automatically adjusts for it by dropping the variable causing it. This is mainly prominent when running the regression with yearly and industry dummies as one of the years or industries will always be omitted and the coefficients will thus be interpreted in relation to the omitted variable acting as the base year or industry. Moreover, for investigative purposes, a correlation matrix, portrayed in Appendix 4, shows that no variables experience alarmingly high coefficients. The only coefficient exceeding the arbitrarily adopted threshold of 0.70 is between the number of days inventories and the cash conversion cycle, but since the former is a component of the latter, and therefore never included simultaneously in a single regression, no violation of MLR.3 is found. Considering the computational properties of Stata and the additional correlation analysis, the assumption of no perfect collinearity can be said to hold.

5.2.3 Endogeneity

Evident by the results presented above regarding the suitability of each model, the FE was deemed most reliable and the best alternative for coping with the potential bias caused by endogeneity. Additionally, the model was tested including and excluding certain variables to determine which specification yielded the best fit in terms of estimating the true model. As suggested by Baños-Caballero et al. (2014), the relationship between working capital and

profitability is not linear, but rather quadratic, suggesting that there is an optimal level of working capital and the cash conversion cycle for profitability. This was tested by including a quadratic term for the cash conversion cycle to the main model. The quadratic term was deemed insignificant and thus excluded from the main model as we found no support for a quadratic relationship between a firm's profitability and cash conversion cycle.

5.2.4 Heteroskedasticity and serial correlation

Running the fixed effects estimation of the model initially yields a F-test statistic of 29.82, which is statistically significant to the fourth decimal. This means that we reject the null of homoscedasticity, implying a violation of the assumption for the fixed effects model being the best estimator. However, this issue is addressed through the implementation of cluster robust inference, performed by clustering the standard errors by the units under study, i.e. the firms. Additionally, the inclusion of cluster robust inference to the fixed effects model also controls for any serial correlation, or autocorrelation, as this is induced through the within estimator, and thus allowed for.

5.2.5 Normality

Both total sales and firm age demonstrate skewed distributions, where some extreme values within the sample visibly distorts the mean from the median. In an attempt to normalize the variable in accordance with the normality assumptions of OLS discussed previously, the natural logarithm of total sales and firm age will be used as a proxy for firm size and maturity respectively. This is in line with the work of Deloof (2003) and Garcia-Teruel and Martinez-Solano, (2007). Furthermore, we have also used the method of winsorizing certain variables where the values presented have been unreasonable and considered extreme outliers. Winsorizing is a typical method used in the case where some extreme values can create problems for the data set and the regression analyses performed. Therefore, winsorizing has carefully been executed on variables where unreasonable values have been revealed through close inspection of the data, particularly through simple univariate analyses by displaying the different percentiles and analysing the obtained values. Some variables attain extreme values mainly due to the mechanical characteristics of the variables in combination with the characteristics of some firms' financial reporting and performance. Whilst these are not considered defects, they cause issues in terms of the variance of the sample and therefore do not contribute to a fair representation of the observations.

5.3 Regression Results

As illustrated in Table 5, the Fixed Effect model defined in (1) yields significant results for all components of the cash conversion cycle, both combined and standalone. The model with the highest value in terms of goodness of fit, i.e. R-squared, at 0.263 is seen in the second column of Table 5 and includes all components of the cash conversion cycle as standalone estimators while the estimation using CCC yields an R-squared of 0.190.

Model	A	B	C	D	E
Estimator	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
Variables	Gross Profit	Gross Profit	Gross Profit	Gross Profit	Gross Profit
Cash Conversion Cycle	-0.000496**				
	(0.000242)				
No. of days receivable		-0.001850***	-0.001557***		
		(0.000381)	(0.000327)		
No. of days inventory		0.000706*		0.001101**	
		(0.000397)		(0.000481)	
No. of days payable		0.001814***			0.001847***
		(0.000494)			(0.000537)
Firm size (log of sales)	0.067663***	0.073015***	0.064128***	0.070534***	0.074747***
	(0.017409)	(0.017073)	(0.016193)	(0.017161)	(0.018501)
Leverage	-0.065018	-0.071151	-0.096640	-0.083374	-0.074838
	(0.058511)	(0.056331)	(0.062834)	(0.057138)	(0.060003)
Growth Opportunity	-0.128610*	-0.131727*	-0.197192**	-0.128252*	-0.137160*
	(0.069398)	(0.068330)	(0.094287)	(0.072602)	(0.071384)
Firm age (log)	0.265933***	0.256253***	0.302024***	0.267724***	0.260719***
	(0.071919)	(0.068434)	(0.081456)	(0.072334)	(0.069130)
Revenue Growth	0.022054**	0.017379*	0.020282**	0.018809*	0.016074
	(0.010482)	(0.010373)	(0.009250)	(0.010009)	(0.010847)
Q	-0.009462	-0.009420	-0.004158	-0.007411	-0.010654
	(0.008623)	(0.008412)	(0.007892)	(0.007971)	(0.008978)
Altman Z-score	0.019826***	0.019322***	0.013581**	0.018006***	0.020027***
	(0.005935)	(0.005552)	(0.005671)	(0.005514)	(0.005856)
Constant	-1.067212***	-1.150906***	-1.040528***	-1.192702***	-1.229323***
	(0.293698)	(0.290534)	(0.312356)	(0.299914)	(0.295944)
Observations	1,647	1,647	1,721	1,647	1,647
R-squared	0.190047	0.262628	0.177168	0.206364	0.227826
Year effects	Yes	Yes	Yes	Yes	Yes
Number of unit_id	244	244	252	244	244
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

***Table 5**. Regression results using Fixed Effects.*

The results presented in the table above illustrate statistical significance for the effect of the cash conversion cycle, even when broken down into its components, and the gross profit of Swedish publicly traded non-financial firms. The cash conversion cycle in itself is significant at the 5%-level and estimates that an increase of one day is related to an average decrease of 0.050% in gross profit. No. of days accounts receivable and No. of days accounts payable are strongly significant at the 1%-level where a one-day increase in No. of days accounts receivable would on average lead to a 0.185% decrease in gross profit while a one-days increase in No. of days accounts payable is estimated to have an average increase of 0.181% in gross profit. No. of days inventories being weakly significant at the 10%-level with a coefficient suggesting that a one-day increase would lead to an average increase of 0.071% in gross profit. Moreover,

the results from the model including an interaction term for firm age specified in section 4.4.2 to test our second hypothesis is presented in Table 6 below. The estimations suggest a statistically significant relationship for both No. of days inventories and No. of days accounts payable to gross profit when dependent on firm age, at the 5% and 10% level, respectively. A one-day increase in the No. of days inventories and No. of days accounts payable would, according to our model, lead to an average decrease in gross profit of 0.103% and 0.129% respectively, for firms older than 24 years. However, when it comes to financial constraints, we did not find a causal relationship between the cash conversion cycle and gross profit, as evident from the results presented in Table 7 below. These results and their implications will be analysed and discussed, in the light of the previously presented theoretical background and literature review, in section 6.

Model	A	B	C	D
Estimator	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
Variables	Gross Profit	Gross Profit	Gross Profit	Gross Profit
Cash Conversion Cycle	-0.000485			
	(0.000314)			
Cash Conversion Cycle * Firm age	-0.000066			
	(0.000270)			
No. of days receivable		-0.001894***		
		(0.000429)		
No. of days receivable * Firm age		0.000824		
		(0.000582)		
No. of days inventory			0.001519**	
			(0.000625)	
No. of days inventory * Firm age			-0.001026**	
			(0.000496)	
No. of days payable				0.002344***
				(0.000730)
No. of days payable * Firm age				-0.001286*
				(0.000722)
Firm size (log of sales)	0.066297***	0.062936***	0.068268***	0.073460***
	(0.017509)	(0.016171)	(0.016857)	(0.019096)
Leverage	-0.054939	-0.081862	-0.080666	-0.068826
	(0.058419)	(0.063464)	(0.055546)	(0.059576)
Growth Opportunity	-0.128274*	-0.204102**	-0.120977*	-0.149560**
	(0.068899)	(0.095714)	(0.071648)	(0.071090)
Revenue Growth	0.022065**	0.019981**	0.018520*	0.016544
	(0.010380)	(0.009206)	(0.009834)	(0.010871)
Q	-0.008452	-0.003187	-0.006118	-0.010487
	(0.008712)	(0.007927)	(0.008021)	(0.009342)
Altman Z-score	0.019889***	0.013706**	0.018048***	0.019785***
	(0.005974)	(0.005763)	(0.005452)	(0.005960)
Constant	-0.102180	0.060469	-0.239697*	-0.308363**
	(0.134077)	(0.117571)	(0.130465)	(0.143014)
Observations	1,647	1,721	1,647	1,647
R-squared	0.178089	0.163303	0.203535	0.222994
Year effects	Yes	Yes	Yes	Yes
Number of unit_id	244	252	244	244
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 6. *Regression results using fixed effects including interaction term for firm age.*

Model	A	B	C	D
Estimator	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
VARIABLES	Gross Profit	Gross Profit	Gross Profit	Gross Profit
Cash Conversion Cycle	-0.000623**			
	(0.000304)			
Cash Conversion Cycle * Financially constrained	0.000231			
	(0.000259)			
No. of days receivable		-0.001697***		
		(0.000465)		
No. of days receivable * Financially constrained		0.000242		
		(0.000453)		
No. of days inventory			0.001091*	
			(0.000585)	
No. of days inventory * Financially constrained			0.000054	
			(0.000378)	
No. of days payable				0.002147***
				(0.000727)
No. of days payable * Financially constrained				-0.000531
				(0.000619)
Firm size (log of sales)	0.066324***	0.063543***	0.069914***	0.073743***
	(0.017328)	(0.016153)	(0.017084)	(0.018409)
Leverage	-0.054671	-0.088298	-0.072471	-0.064598
	(0.059529)	(0.063773)	(0.058070)	(0.060770)
Growth Opportunity	-0.122071*	-0.194952**	-0.124017*	-0.131789*
	(0.069866)	(0.095024)	(0.072426)	(0.072009)
Firm age (log)	0.263469***	0.301382***	0.266917***	0.254453***
	(0.071195)	(0.081068)	(0.071441)	(0.068282)
Revenue Growth	0.022170**	0.020265**	0.018580*	0.016230
	(0.010401)	(0.009206)	(0.009867)	(0.011048)
Q	-0.008815	-0.003720	-0.006933	-0.010505
	(0.008445)	(0.007801)	(0.007917)	(0.008860)
Altman Z-score	0.015677***	0.009794*	0.013866***	0.015589***
	(0.005609)	(0.005426)	(0.005294)	(0.005542)
Constant	-1.008180***	-0.995237***	-1.150689***	-1.179961***
	(0.287491)	(0.306066)	(0.293892)	(0.287316)
Observations	1,647	1,721	1,647	1,647
R-squared	0.195197	0.180565	0.211626	0.234379
Year effects	Yes	Yes	Yes	Yes
Number of unit_id	244	252	244	244
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 7. Regression results including interaction term for financial constraints.

6. Analysis

In this chapter the regression results will be interpreted and compared to the findings of previously conducted studies on working capital management. First, the main explanatory variable related to working capital management, profitability, will be analysed. Second, the relationship between the control variables and the dependent variable will be examined. A comparison of expected and actual relationships can be found in Table 8.

6.1 General analysis

As can be seen in Table 5, the two main regression models yield an R-squared of 19.0% and 26.3% respectively. Although this is a rather low value, according to Wooldridge (2016) not uncommon, who also suggests that a low R-squared does not render the regression useless as the determination of whether the model is good estimate of the ceteris paribus relationship between the cash conversion cycle and gross profit. While the low R-squared might suggest that the variables included do not explain much of the variance in firm profitability, the estimates may still be considered reliable estimates of the ceteris paribus effect of each explanatory variable on the dependent variable. However, the low R-squared could reflect the fact that firm profitability as measured by gross profit divided by total assets, is more difficult to predict for the sample at hand (Wooldridge, 2016).

Explanatory Variable	Expected relationship	Result
Cash Conversion Cycle (CCC)	Negative	Negative
No. of days Accounts Receivable	Negative	Positive
No. of days Inventory	Negative	Positive
No. of days Accounts Payable	Negative	Negative
Size	Positive	Positive
Leverage	Negative	Negative
Growth opportunity	Positive	Positive
Firm age	Positive	Positive
Revenue growth	Positive	Positive
Corporate performance (Q)	-	Negative
Altman Z-score	-	Positive
Industry	N/A	N/A

***Table 8**. Expected relationship compared to estimated result.*

6.2 Working capital management

The results from regression model A show that a statistically significant relationship was found between the cash conversion cycle and profitability. Additionally, the coefficient is found to be negative which indicates that lowering the cash conversion cycle increases profitability. This finding confirms findings in the majority of previously conducted research where a negative relationship is the most prominent result (Deloof, 2003; Yazdanfar & Öhman, 2014; Raheman & Nasr, 2007; Lazaridis & Tryfonidis, 2006 & Mathuva, 2010). Furthermore, it

confirms the pecking order theory's believed implications for working capital management and consequently also our first hypothesis as the cash conversion cycle was expected to be negatively related to profitability because of lower costs of capital for internal financing (Jensen & Meckling, 1976).

No. of days accounts receivable was found to have a significant negative relationship to profitability in models B through E in Table 5, which confirms the expected relationship based on previous findings (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Gill et al., 2010; Mathuva, 2010; Lazaridis & Tryfonidis, 2006; Samiloglu & Dermigunes, 2008 & Raheman & Nasr, 2007). The consensus in previous research is that lower conversion time of accounts receivable gives increased access to cash that can be utilized. Moreover, the finding confirms the believed working capital implications of the pecking order theory since higher accounts receivables increases the aggregate cash conversion cycle. An opposing view is offered by Sharma & Kumar (2011) who found a positive relationship for No. of days accounts receivable. Their finding is attributed to the fact that extending more generous credit terms might boost profitability since the customer is given the opportunity to properly examine the quality of the purchased product or service. This is believed to generate good will and establish good business relationships.

The results from models B through E in Table 5 indicate that No. of days inventory significantly impacts profitability of the firms in our sample. The coefficient is positive. A majority of previous studies found a significant negative relationship between this variable and profitability (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Lazaridis & Tryfonidis, 2006; Samiloglu & Dermigunes, 2008; Raheman & Nasr, 2007 & Sharma & Kumar, 2011). Consequently, our results contradict findings in previous research. Previous studies that find a positive coefficient for No. of days inventory often attribute that to the fact that increased inventory levels allow a firm to avoid delayed deliveries or running out of stock which might cause badwill and reduce sales in the long run. This can be believed to also be the case in this study and the previously mentioned accessibility of external funding could be a contributing factor. Furthermore, previous studies acknowledge that unlike AP and AR, not all firms hold inventory. For example, service firms such as consultancy firms generally hold little or no inventory.

In regression models B through E in Table 5, No. of days accounts payable is found to significantly impact profitability in our sample. Furthermore, the coefficient is found to be positive which is in line with the pecking order theory and its believed implications for working capital management. Since accounts payable is the only component of the cash conversion cycle that decreases the total amount of days, intuitively, most previous studies expected to find a positive relationship between accounts payable and profitability. However, previous findings vary and are somewhat ambiguous. A majority of researchers found a significant negative relationship between No. of days accounts payable and profitability (Deloof, 2003; Mathuva, 2010; Lazaridis & Tryfonidis, 2006; Raheman & Nasr, 2007 & Sharma & Kumar, 2011). This finding has been attributed to the fact that more profitable firms pay their bills

faster (Deloof, 2003). Consequently, our finding is intuitively correct and in line with theory but contradictory to previous research. Increased accounts payable means that a firm is effectively borrowing cash from suppliers at what is often zero interest rate. The borrowed cash can be used for internal financing and to meet financial obligations. Both perks are believed to boost profitability as long as bad will related to late payments is avoided.

6.3 Interaction terms

6.3.1 Firm age

The results presented in Table 6, indicate that there is a statistically significant difference for the older half of our sample compared to the younger half for both No. of days inventories and No. of days accounts payable, at the 5%-level and 10%-level respectively. Both measures are estimated to have a negative relationship, implying that the profitability in mature firms is less sensitive to changes in the cash conversion for both inventories and accounts payable. The coefficients illustrate that on average, the impact of a one-day increase in no. of days inventory and no. of days accounts payable is 0.103% and 0.129% lower, respectively, for mature firms. This is in line with the theoretical predictions of Fama and French (1999), stating that mature firms, typically experiencing fewer financial constraints, prefer other sources of financing and have fewer incentives to carefully manage their working capital.

6.3.2 Z-score

The regression results in Table 7 show no statistically significant difference in the relationship between the CCC and firm profitability with respect to firms considered financially constrained. The coefficients, although not significant, suggest that the impact of no. of days accounts receivable and no. of days inventories is greater for financially constrained firms, while the effect of no. of days accounts payable is estimated to be lower. This implies that firms operating under financial constraints experience a greater impact from a longer cash conversion in their assets, i.e. receiving payment. Simultaneously, extended credit periods are predicted to, on average, have a lower impact on profitability. In other words, the impact of not receiving payments is greater than the impact of increasing the trade credit period.

6.4 Control variables

Out of the employed control variables, size, growth opportunity, corporate performance (Q), financial constraint (Z-score), firm age and revenue growth were all found to significantly impact firm profitability in our sample. The leverage ratio is also found to significantly impact profitability in models C and D. All control variables except for growth opportunity were found to have the expected relationship with the dependent variable. In previous research, the above-mentioned control variables are often found to significantly affect profitability, which is why

they are included in this study. Capturing effects of other factors than the main explanatory variables is paramount to isolate the studied effect.

Corporate performance (Q) is a variable that has not been employed as a control variable in the reviewed previous research. The Z-score was previously employed by Baños-Caballero et al. (2014) in a paper that specifically examined working capital management in relation to financial constraint. It has not however, been found in other papers as a control variable. Both Q and Z-score were found to significantly impact profitability in the sample studied in this thesis which calls for more attention to these factors. The regression results show that Q is negatively related to profitability. This is somewhat un-intuitive since profitability would seem to positively impact equity valuation. However, our results indicate that this is not the case which must mean that other factors such as market risk or investment opportunities are better deciders of corporate performance. Furthermore, the results show that Z-score has a positive coefficient. Since a higher Z-score means that a firm is less financially constrained, a positive relationship between profitability and the Z-score is logical.

7. Conclusion & Discussion

In this section we will answer the research questions by concluding our findings. Furthermore, we will discuss the conducted study and the results. Last, we will elaborate on the practical implications of our results and provide suggestions for the direction of future research.

7.1 Conclusion

The results of regression model 1 indicate that the length of the cash conversion cycle has a significant impact on the profitability of Swedish listed firms between the years of 2012-2018. As previously mentioned, this finding is in line both with the pecking order theory's believed implications for working capital management as well as consensus in previous research on the topic. Thus, we can reject the first null hypothesis.

$$H_{0-1} : The\ cash\ conversion\ cycle\ does\ not\ impact\ firm\ profitability$$

Additionally, we find statistical significance for all three components of the cash conversion cycle, No. of days accounts receivable, No. of days inventory and No. of days accounts payable. No. of days accounts receivable is found to negatively impact profitability which means that higher levels of inventory decreases profitability and vice versa. This is in line with most previous findings (Deloof, 2003; Martinez-Solano, 2007 & Shin & Soenen, 1998) as well as the pecking order theory since higher accounts receivable increases the cash conversion cycle which was believed to be negatively related to profitability. No. of days inventory is found to positively impact profitability which means that higher level of inventory increases profitability. While this contradicts previous findings (Deloof, 2003 & Shin & Soenen, 1998), some believe that higher inventory allows for more timely deliveries and that badwill generated by running out of stock can be avoided. Moreover, No. of days accounts payable is found to have a positive impact on profitability. This finding is also in line with both consensus in previous studies (Deloof, 2003; Martinez-Solano, 2007 & Shin & Soenen, 1998) and the pecking order theory (Myers & Majluf, 1984) which further reinforces the rejection of the first hypothesis. Higher levels of accounts payable means that a firm is borrowing cash from suppliers at what is often no, or a very low, interest rate. This cash can be used to meet short term financial obligations and to finance investments which ultimately increases profitability.

Regression model 2 tests if the cash conversion cycle significantly impacts profitability in older firms. This is done with the help of interaction terms as described in the methodology section. The results from the interaction variable test indicate that whilst both no. of days inventory and no. of days accounts payable illustrate a statistically significant difference between mature and younger firms, this is not the case for the cash conversion cycle or the no. of days accounts payable, meaning that we cannot, with full confidence, reject the second null hypothesis:

$$H_{0-2} : For\ older\ firms, the\ cash\ conversion\ cycle\ does\ not\ significantly\ impact\ firm\ profitability.$$

Regression model 3 tests if the cash conversion cycle significantly impacts profitability in financially constrained firms. Similar to the test for firm age, this is done with the help of interaction terms. The interaction variable estimation did not result in any statistically significant difference in the impact of the CCC on firm profitability, and therefore we fail to reject the third null hypothesis:

$$H_{0-3}: For\ financially\ constrained\ firms, the\ cash\ conversion\ cycle\ does\ significantly\ impact\ firm\ profitability.$$

To summarize, this study finds that managers of Swedish, publicly held, non-financial firms can increase profitability by shortening the cash conversion cycle to a reasonable minimum. Additionally, it is found that all three components of the cash conversion cycle significantly impact profitability - No. of days accounts receivable, No. of days inventory No. of days accounts payable. Furthermore, results from the first interaction variable test suggest that older firms are less concerned with the cash conversion cycle and its impact on firm profitability, at least with respect to no. of days inventory and no. of days accounts payable. Last, the second interaction variable test does not provide any statistically significant support for any differences in the impact of the cash conversion cycle on firm profitability.

7.2 Discussion

The conclusions above and the findings of this study challenges why Swedish firms were found to have significantly higher net working capital conversion cycles than the European average (PwC, 2017). Since our results establish that rapid transformation of current assets and liabilities to cash significantly impacts profitability, managers seemingly have an incentive to pursue more efficient working capital management. A possible explanation for the longer cycles in Sweden could be that while working capital management impacts profitability, other factors might be higher on managers agendas due to the fact that the access to external funding is generally good in Sweden where financial markets are well developed. As a result, other organizational goals such as growth or gaining market shares may be prioritized over lean working capital management. Additionally, it is costly and time consuming to reconfigure the working capital management policy of a large firm as experts generally have to be brought in. This is likely to deter managers from seeking to improve working capital when access to external capital is sufficient. Finally, as mentioned in the introduction of this thesis, in Sweden, doing business is largely based on trust (Svensson, 1997). Consequently, tightening credit terms extended to customers could potentially damage relations more than the working capital advantages benefit the firm in the long run. The same argument can be made for inventory and accounts payable. Keeping sufficient inventory can prohibit delayed deliveries and prevent outages which can generate bad will. Deliberately withholding supplier payments might have the same effect.

While previous studies and theoretical frameworks do predict a negative relationship between the cash conversion cycle and profitability, we were sceptical to its applicability in a Swedish

setting. We believed that the relative ease of access to external funding and highly developed financial markets would downplay the significance of internal funding to a greater extent. Given the fact that our results indicate the opposite, we believe that we have filled an important gap in existing research and that our study contributes with evidence to practitioners. This will be elaborated upon further in the following subsection.

As mentioned in the problem discussion of this thesis, previous research almost exclusively employs samples with data from before 2010. Consequently, little research exists where data from after the latest financial crisis is included. Thus, it is difficult to determine the effect of potential time-specific factors. It is not unlikely that working capital management has gained increased attention from managers after the financial crisis since many banks heavily revised loan covenants and credit conditions due to both regulation and more conservative risk management. This is one factor that makes it difficult to compare our findings to other studies. Another factor is the large variety of both dependent and explanatory variables employed in previous research. In order to make a fair comparison between different studies results, it is preferable that similar methodologies and samples were used. This criterion was difficult to fulfil. Finally, it can be argued that the explanatory power of this study is low due to the relatively low R^2. However, since most models in previous studies also reach relatively low explanatory power, it can be deduced that profitability is best predicted by exogenous factors that are difficult to measure and include in regression analyses.

7.3 Practical implications

The results of this study are largely in line with those of previous studies (Deloof, 2003; Martinez-Solano, 2007 & Shin & Soenen, 1998) conducted on the topic as well as existing literature and its implications for working capital management. Consequently, our study reinforces the previously established implications for practitioners who face working capital management decisions. Mainly, our results have implications for managers, investors and debtors.

Our results indicate that managers of Swedish publicly held firms can increase firm profitability by managing working capital and their cash conversion cycles. The significant negative relationship found between the cash conversion cycle and profitability indicates that managers can increase firm profitability by reducing the cash conversion cycle to a reasonable minimum.

Furthermore, since working capital management impacts profitability and profitability is often linked with stock performance, investors should consider working capital management as a criterion for investments.

Debtors could benefit from considering the working capital management policy or cash conversion cycle of a potential client before extending credit. An efficient cash conversion cycle allows for internal financing that can help a firm meet short- and long-term financial

obligations. Consequently, a debtor should be more confident extending credit to a firm with a shorter cash conversion cycle.

7.4 Working capital management - in the light of the Coronavirus

A factor that might discourage overly aggressive working capital management has been made evident after the last months and the crisis triggered by the Corona pandemic and Covid-19. As the margin of error grows smaller for firms to remain competitive and financial slack is widely being cut away to achieve leaner organizations, the risk of financial distress is likely to increase. Seemingly endless growth in economies around the world risk incurring a false sense of security in managers who continue to optimize operations down to the last dollar and second. What has been made evident over the last months is that when a severe financial shock hits, some slack is required to stay in business.

7.5 Future research

While conducting this study and in dealing with problems and questions arising along the way, ideas for potential future research topics have come up. Additionally, the knowledge and experience we have gathered while conducting this study and reviewing previous study has granted us insight and helped us identify gaps in the current state of research.

We believe it would be interesting to include data from multiple countries in the same study. This has not been done before, but it would allow for a more comparative analysis of how the relationship between working capital management and profitability change between different countries. While the data collection process would be tedious, it would possibly also further highlight what factors cause the many differences that are evident in previous research.

Another interesting topic for future research would be the relationship between financial constraint and working capital management. This could be done by employing the cash conversion cycle as a dependent variable to show if more financially constrained firms rely more heavily on internal financing through working capital management in the form of shortening their cash conversion cycles. This could potentially confirm the notion that financial constraint and difficulty to access external funding in the form of debt and equity prioritize working capital management. Furthermore, we believe it would be interesting to further explore how different dependent variables affect the outcome of studies on working capital management. Previously both profitability and corporate performance have been employed as dependent variables. We chose to use corporate performance as an explanatory variable in order to capture capital market related effects. We believe it is worth exploring the results produced by employing it as the dependent variable for the same reason.

A third potential topic of future research could be to examine the relationship between working capital management and corporate credit ratings and decisions to extend credits. As mentioned

in the practical implications of this study, debtors could potentially benefit from some of our findings. However, it would be interesting to further examine if working capital management is already considered in the credit rating and credit granting process.

Last, and as was mentioned in the previous sub-section, the Corona pandemic and Covid-19 has largely disrupted the global economy. Numerous firms will and have already defaulted as a result. When the dust settles, we believe it would be very interesting to see if firms that did not manage their working capital too aggressively and thus had more financial slack going into 2020 performed better compared to others. While it has been shown that working capital management can positively impact profitability, little evidence exists on how short- or long term the effect is.

References

Altman, E. (1968). Financial Ratios, Discriminant Analysis and Prediction of Corporate Bankruptcy, *The Journal of Finance,* vol. 23, no. 4, pp. 589-609

Baños-Caballero, S., Garcia-Teruel, P. & Martinez-Solano, P. (2010). Working capital management in SMEs, *Accounting and Finance*, vol. 50, no. 3, pp. 511-527

Baños-Caballero, S., Garcia-Teruel, P. & Martinez-Solano, P. (2011). How does working capital management affect the profitability of Spanish SMEs, *Small Business Economics*, vol. 39, no. 2, pp. 517-529

Baños-Caballero, S., Garcia-Teruel, P. & Martinez-Solano, P. (2014). Working capital management, corporate performance and financial constraints, *Journal of Business Research*, vol. 39, no. 2, pp. 517-529

Begley, J., Mings, J., & Watts, S. (1996). Bankruptcy classification errors in the 1980s: An empirical analysis of Altman's and Ohlson's models. *Review of Accounting Studies*, vol. 1, pp. 267–284

Brennan, M., Maksimovic, V. & Zechner, J. (1988). Vendor financing, *The Journal of Finance*, vol. 43, pp. 1127-1141

Bryman, A. & Bell, E. (2011). Business Research Methods, 3rd edn, Oxford, England: Oxford University Press

Chittenden, F., Hall, G. & Hutchinson, P. (1996). Small Firm Growth, Access to Capital Markets and Financial Structure: Review of Issues and An Empirical Investigation, *Small Business Economics*, vol. 8, no. 1, pp. 59-67

Deloof, M. (2003). Does working capital management affect profitability of Belgian firms?, *Journal of Business Finance & Accounting*, vol. 30, no. 3/4, pp. 573-588.

Demirguc-Kunt, A. & Maksimovic, V. (2002). Firms as Financial Intermediaries: Evidence from Trade Credit Data, World Bank Working Paper.

Fama, E. F. & French, K. R. (1999). The Corporate Cost of Capital and the Return on Corporate Investment, *The Journal of Finance*, vol. 54, no. 6, pp. 1939-1967

Fama, E. F. & French, K. R. (2002). Testing Trade-off and Pecking Order Predictions about Dividends and Debt, *Review of Financial Studies*, vol. 15, no. 1, pp. 1-33

Frank, M.Z. & Goyal, V.K. (2003). Testing the Pecking Order Theory of Capital Structure, *Journal of Financial Economics*, vol. 67, no. 2, pp. 217-248

Garcia-Teruel, J. & Martinez-Solano, P. (2007). Effects of working capital management on SME profitability, *International Journal of Managerial Finance*, vol. 3, no. 2, pp. 164-177

Gill, A., Biger, N. & Mathur, N. (2010). The relationship between working capital management and profitability: evidence from the United States, *Business and Economics Journal*, vol. 10, no. 1, pp. 1-9

Jensen, M.C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers, *The American Economic Review*, vol. 76, no. 2, pp. 323-329

Jensen, M.C. & Meckling, W.H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, *Journal of Financial Economics*, vol. 3, pp. 305-360

Johnson, C.G. (1970). Ratio Analysis and the Prediction of Firm Failure, *The Journal of Finance*, vol. 25, no. 5, pp. 1166-1168

Lazaridis, I. & Tryfonidis, D. (2006). Relationship between working capital management and profitability of listed companies in the Athens stock exchange, *Journal of Financial Management and Analysis*, vol. 19, no. 1, pp. 26-35

Mathuva, D. (2010). The influence of working capital management components on corporate profitability: a survey on Kenyan listed firms, *Research Journal of Business Management*, vol. 4, no. 1, pp. 1-11

Moyer, R.C. (1977). Forecasting Financial Failure, *Financial Management*, vol. 6, no. 1, pp. 11-17

Myers, S.C. (2001). Capital Structure, *Journal of Economic Perspectives*, vol. 15, no. 2, pp. 81-102

Myers, S.C. & Majluf, N.S. (1984). Corporate Financing and Investment Decisions when Firms have Information that Investors do not have, *Journal of Financial Economics*, vol. 13, no. 1, pp. 187-221

Petersen, M., & Rajan, R. (1997). Trade credit: Theories and evidence. *Review of Financial Studies*, vol. 10, pp. 661–691

PwC. (2017). Pressure in the system - Working Capital Study Region in focus: The Nordics, Available online: https://www.pwc.se/sv/pdf-reports/corporate-finance/working-capital-study-the-nordics.pdf [Accessed 1 April 2020]

Raheman, A. & Nasr, M. (2007). Working Capital Management and Profitability - Case of Pakistani Firms, *International Review of Business Research Papers,* vol. 3, no. 1, pp. 279-300

Samiloglu, F. & Dermigunes, K. (2008). The Effect of Working Capital Management on Firm Profitability: Evidence from Turkey, *The International Journal of Applied Economics and Finance*, vol. 1, pp. 44-50

Sharma, A.K. & Kumar, S. (2011). Effect of working capital management on firm profitability: empirical evidence from India, *Global Business Review*, vol. 12, no. 1, pp. 159-173

Shin, H.H. & Soenen, L. (1998). Efficiency of working capital management and corporate profitability, *Financial Practice & Education*, vol. 8, no. 2, pp. 39-45

Smith, K. (1980). Profitability Versus Liquidity Tradeoffs in Working Capital Management, Readings on the Management of Working Capital. Ed. K. V. Smith, St. Paul, West Publishing Company, pp. 549-562

Smith, K. (1987). Trade Credit and Informational Asymmetry, *The Journal of Finance*, vol. 42, pp. 863-872

Svensson, K. (1997). Trade Credits in Europe Today: Credit Cultures, Payment Morality and Legal Systems, Unpublished Manuscript (Lund University).

U.S. Department of Labor. (n.d.). SIC Division Structure, Available online: https://www.osha.gov/pls/imis/sic_manual.html [Accessed 24 May 2020].

Wooldridge, J. (2016). Introductory Economics: A modern approach, 2nd edn, Nelson Education.

Yazdanfar, D. & Öhman, P. (2015). Debt Financing and Firm Performance: an Empirical study based on Swedish Data, *The Journal of Risk Finance*, vol. 16, no. 1, pp. 102-118

Appendix 1 – Summary of literature review.

Author(s)	Year	Period	Market	Sample (No. of firms)	Corporate performance/profitability measure (Dependent variable)	Working capital measure	Findings
Deloof	2003	1992-1996	Belgium	1,009	Gross operating income Net operating income	1. Cash Conversion Cycle 2. No. of days AP 3. No. of days AR 4. No. of days inventory	1. Non-significant 2. Negative 3. Negative 4. Negative
Banos-Caballero, Garcia-Teruel & Martinez-Solano	2014	2001-2007	UK	258	(MV Equity + BV Debt)/BV Assets	1. Net Trade Cycle 2. Net Trade Cycle^2	1. Positive 2. Negative
Shin & Soenen	1998	1975-1994	US	2,949	(Operating Income + Depreciation)/Total Assets (Operating Income + Depreciation)/Net Sales Jensen's Alpha (risk adjusted stock returns) Treynor Index (risk adjusted stock returns)	1. Net Trade Cycle	1. Negative
Garcia-Teruel & Martinez-Solano	2007	1996-2002	Spain SMEs	8,872	ROA	1. Cash Conversion Cycle 2. No. of days AP 3. No. of days AR 4. No. of days inventory	1. Non-significant 2. Non-significant 3. Negative 4. Negative
Gill, Biger & Mathur	2010	2005-2007	US Manufacturing	88	Gross Operating Profit	1. Cash Conversion Cycle 2. No. of days AP 3. No. of days AR 4. No. of days inventory	1. Non-significant 2. Non-significant 3. Negative 4. Non-significant
Mathuva	2009	1993-2008	Kenya	30	Net Operating Profit	1. Cash Conversion Cycle 2. Average Payment Period 3. Average Collection Period 4. Inventory Conversion Period	1. Negative 2. Positive 3. Negative 4. Positive
Lazaridis & Tryfonidis	2006	2001-2004	Greece	131	Gross Operating Profit	1. Cash Conversion Cycle 2. No. of days AP 3. No. of days AR 4. No. of days inventory	1. Negative 2. Negative 3. Negative 4. Negative
Samiloglu & Dermigunes	2008	1998-2007	Turkey	146	ROA	1. Cash Conversion Cycle 2. AR period 3. Inventory period	1. Non-significant 2. Negative 3. Negative
Raheman & Nasr	2007	1999-2004	Pakistan	94	Net Operating Profit	1. Cash Conversion Cycle 2. Average Payment Period 3. Average Collection Period 4. Inventory Turnover in days	1. Negative 2. Negative 3. Negative 4. Negative
Sharma & Kumar	2011	2000-2008	India	263	ROA	1. Cash Conversion Cycle 2. No. of days AP 3. No. of days AR 4. No. of days inventory	1. Non-significant 2. Negative 3. Positive 4. Negative
Yazdanfar & Öhman	2014	2008-2011	Sweden SMEs	13,797	ROA	1. Cash Conversion Cycle	1. Negative
Banos-Caballero, Garcia-Teruel & Martinez-Solano	2011	2002-2007	Spain SMEs	1,008	(Sales - COGS)/Total assets (Sales - COGS - Deprecaition)/Total assets	1. Cash Conversion Cycle 2. Cash Covnersion Cycle^2	1. Positive 2. Negative

Appendix 2 – Regression estimations using pooled OLS, first differencing, and fixed effects.

Model	A	B	C
Estimator	Pooled OLS	First Difference	Fixed Effects
Variables	Gross Profit	Gross Profit	Gross Profit
No. of days receivable	-0.000240	-0.001195***	-0.001850***
	(0.000551)	(0.000325)	(0.000381)
No. of days inventory	0.000428	0.000488	0.000706*
	(0.000339)	(0.000328)	(0.000397)
No. of days payable	0.001613**	0.001298***	0.001814***
	(0.000747)	(0.000396)	(0.000494)
Firmsize	0.041852***	0.083229***	0.073015***
	(0.007696)	(0.018133)	(0.017073)
Leverage ratio	-0.245541***	-0.172692***	-0.071151
	(0.080565)	(0.056181)	(0.056331)
Growth Opportunity	-0.082723	-0.160700**	-0.131727*
	(0.065568)	(0.065678)	(0.068330)
Altman Z-score	0.023036***	0.016500***	0.019322***
	(0.008748)	(0.003996)	(0.005552)
Firm age (log)	-0.058958**	0.376216***	0.256253***
	(0.025492)	(0.100089)	(0.068434)
Revenue Growth	-0.009034	0.013330*	0.017379*
	(0.014834)	(0.007766)	(0.010373)
Q	-0.011393	-0.011339**	-0.009420
	(0.016277)	(0.005695)	(0.008412)
Constant	0.061770	0.002796	-1.150906***
	(0.083497)	(0.011210)	(0.290534)
Observations	1,647	1,401	1,647
R-squared	0.164894	0.220432	0.262628
Year effects	Yes	Yes	Yes
Number of unit_id			244
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Appendix 3 – Fixed effects and random effects estimation including Hausman test

Panel A: Models	A	B
Estimator	Fixed Effects	Random Effects
Variables	Gross Profit	Gross Profit
Cash Conversion Cycle	-0.000551***	-0.000468***
	(0.000143)	(0.000132)
Firmsize	0.061677***	0.045453***
	(0.007048)	(0.005206)
Leverage ratio	-0.072264*	-0.071645**
	(0.036852)	(0.035895)
Revenue Growth	0.023330***	0.025091***
	(0.006056)	(0.006026)
Growth Opportunity	-0.128275***	-0.114800***
	(0.043060)	(0.038957)
Q	-0.008179***	-0.008728***
	(0.001778)	(0.001768)
Altman Z-score	0.019138***	0.020737***
	(0.002486)	(0.002390)
Firm age (log)	0.262871***	0.013891
	(0.046528)	(0.022718)
Constant	-1.009657***	-0.058300
	(0.169415)	(0.077782)
Observations	1,647	1,647
R-squared	0.199214	
Number of unit_id	244	244
Panel B: Hausman test		
Chi-square statistic		64.29
p- value		0.0000
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Appendix 4 – Correlation matrix

Variables	Gross profit	Cash conversion cycle	No. of days accounts receivable	No. of days inventories	No. of days accounts payable	Total revenue (log)	Revenue growth	Leverage	Growth opportunity	Q	Altman Z-score	Firm age (log)
Gross profit	1											
Cash conversion cycle	0.0738	1										
No. of days accounts receivable	0.0118	0.4633	1									
No. of days inventories	0.1246	0.7966	0.1232	1								
No. of days accounts payable	0.0814	-0.2049	0.1401	0.2693	1							
Total revenue (log)	0.2085	0.2052	0.0184	0.1155	-0.1913	1						
Revenue growth	-0.0029	-0.0058	0.0347	0.0302	0.0938	-0.0599	1					
Leverage	-0.1834	-0.0187	-0.1011	0.0484	0.0364	0.1792	-0.0335	1				
Growth opportunity	-0.0986	-0.1172	0.073	-0.1463	0.0391	-0.0496	0.0572	0.0552	1			
Q	0.0606	0.0464	0.0633	0.06	0.0664	-0.2404	0.094	-0.2185	-0.049	1		
Altman Z-score	0.2073	0.0821	0.0341	0.0156	-0.1074	-0.1482	0.0663	-0.535	-0.1175	0.5984	1	
Firm age (log)	0.0445	0.2602	0.1225	0.1989	-0.0663	0.5577	-0.0635	0.0729	-0.0712	-0.1473	-0.0822	1