The relation between working capital management and stock return: Evidence from Swedish listed companies

Mei Hong[i] Philipp Kränzle[ii]

Master Thesis
Department of Finance
Stockholm School of Economics

May 16, 2016

Abstract

We provide the first empirical study of the relationship between working capital management and shareholder wealth in Sweden. In a sample of listed companies ranging from 2006 through 2014, we find that there is no easy and generalizable answer to what the relationship of working capital management and stock performance is. Yet, we provide indication that the relationship between the two variables depends on the level of working capital. On average, stock performance and working capital are negatively correlated for firms with high levels of working capital and to a weaker extent positively related for companies with low levels of working capital. However, we do not find strong evidence for the existence of an optimal level of net working capital. Furthermore, this paper is the first study to provide evidence for the importance of interest rates when assessing the relationship between working capital and stock performance. We find some indication that during periods of high interest rates, the relation between working capital and shareholder wealth is more negative than in low interest rate episodes.

Keywords: Working Capital Management, Stock Performance, Net Trade Cycle

JEL Classification: G31, G32

Acknowledgement: We would like to express our deepest gratitude to our tutor Michael Halling. He always found time to provide us with valuable insights, guidance, support and constructive feedback on our thesis.

[i] 40745@student.hhs.se
[ii] 40766@student.hhs.se

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List of abbreviations

WCM: Working Capital Management, defined as the management of working capital, i.e., account receivables, inventories and account payables.

NWC: Net Working Capital, defined as the sum of accounts receivable and inventories minus accounts payable.

NTC: Net Trade Cycle, defined as (NWC/Sales)*365.

CCC: Cash Conversion Cycle, defined as number of days of accounts receivable (365*accounts receivable/sales) plus number of days of inventories (365*inventories/purchases) minus number of days of accounts payable (365*accounts payable/purchases).

ROA: Return on Assets

VIF: Variance Inflation Factor

WCR: Working Capital Requirement

BMV: Book-to-Market Value

CAPM: Capital Asset Pricing Model

SME: Small and Medium-sized Enterprises

1. Introduction

Corporate finance literature has traditionally been focusing on long-term financial aspects such as optimal capital structure, M&A activities, dividend policy and investments, while much less attention has been paid to working capital management (WCM)[1] (García-Teruel and Martínez Solano (2007)). However, the relatively low interest in WCM seems to be unjustified considering the magnitude of working capital in many studies. For example, for Swedish public companies in our sample, net working capital (NWC) represents more than 20% of total assets on average. The ratio of NWC-to-assets is 14% in 1997 for all the non-financial firms in Belgium (Deloof (2003)). Hill et al. (2010) similarly report that for US companies, net working capital represents on average 23% of total assets during the period of 1996-2006. Despite of its importance, the following studies have shown that working capital is not managed effectively. Aktas et al. (2015) conclude that there is an optimal level of working capital and that firms which converge to this level experience benefits thereof, both in terms of operating as well as stock performance. Ek and Guerin (2011) argue that there is tremendous scope for improving one or more areas of working capital in most businesses. EY (2015) highlights in its WCM report, that the 2000 leading companies in the US and Europe in 2014 may have as much as US$1.3 trillion in excess NWC, equivalent to 7% of their combined sales, which shows big potential for WCM improvement – about US$70 million for every US$1 billion in sales on average.

Several empirical studies show that there is a statistically significant relationship between a company's profitability as well as shareholder wealth and the efficiency of WCM (e.g., Deloof (2003); Kieschnick et al. (2013)). However, most of these previous studies focus on firms in the US, Asian counties and few other European countries (e.g., Spain, UK and Belgium), while studies in Sweden are relatively rare. To the best of our knowledge, there is only one published paper so far investigating the relation between profitability and working capital management by Yazdanfar and Öhman (2014). Moreover, EY (2009) points out that "Nordic firms find it hard to turn good

[1] Throughout the paper, working capital management (WCM) is defined as the management of working capital, i.e., accounts receivable, inventories and accounts payable. Net working capital (NWC), which is also used very often in this paper, is defined as the sum of accounts receivable and inventories minus accounts payable. This is different to the typical definition of working capital as current assets minus current liabilities. However, some components of current assets (e.g. cash) and current liabilities (e.g., short-term bank borrowing) are more of financial and not operational nature (Hawawini et al. (1986)), which is why we choose our definition.

policy intention on working capital management into reality". EY (2015) reports continuous deterioration in WCM performance among Nordic firms in 2014, and concludes that the poor performance is heavily skewed towards the performance of certain industries.

In this context, the objective of this paper is to provide empirical evidence about the relation between WCM efficiency and stock performance of publicly listed companies in Sweden. This paper contributes to previous finance literature in two ways: First, for Swedish firms, the effect of NWC on stock performance has not been studied in earlier research. Second, to our knowledge, no study has introduced the control variable interest rate, which we believe plays an important role in the relationship between NWC and stock performance.

This paper is organized as follows: In section 2, a brief review of relevant previous literature related to WCM is provided. In section 3 we build the main hypotheses of this paper. In section 4, we outline the data and variables used in our research and develop several models to test our hypotheses. In section 5 the results of our research are presented and discussed. Section 6 provides a summary of our main findings. Section 7 covers limitations of our study and potential areas of future research.

2. Literature Review

Although working capital has not received the same attention as capital structure or other long-term financial decisions in academia, a number of researchers have addressed the topic. The most important studies and findings in this area are summarized in the following section.

2.1 Relation between working capital management and firm profitability

Many previous studies find a statistically significant relation between WCM (management of working capital components, i.e., accounts receivable, inventories and accounts payable) and performance in different countries and areas, which supports the importance of efficient WCM for companies.[2] Using a sample of US firms over the period 1975-1994, Shin and Soenen (1998) find a strong negative relation between the length of the firm's net-trade cycle and its profitability. For a panel of Spanish small and medium-sized enterprises (SMEs) from 1996-2002, García-Teruel

[2] The efficiency of working capital management is measured differently in different literature. However, different measurements are essentially different expressions of a similar thing, which is the working capital to sales ratio of a firm.

and Martínez Solano (2007) conclude that reducing accounts receivable, inventories or generally the Cash Conversion Cycle (CCC) increases firm profitability measured by Return on Assets (ROA). However, the negative relationship between accounts payable and performance is found not to be robust. In their research about the relation of inventory and profitability in the US manufacturing sector, Capkun et al. (2009) find that there is a significant relationship between inventory levels and performance - lower inventory to sales levels are associated with both higher gross margins and higher operating profitability. This supports the idea that improved inventory management can contribute to value creation in companies. In a sample of Belgian firms, Deloof (2003) finds a negative relationship between all three components of the Cash Conversion Cycle, i.e., accounts receivable, inventories and accounts payable, and profitability measured by gross operating income. A similar working capital to profitability relationship is also found in a sample of listed companies in Finland over the period 1990-2008. Moreover, the impact of working capital management efficiency on firm profitability is suggested to be more severe during economic downturns relative to economic booms (Enqvist et al. (2014).

2.2 Relation between working capital management and shareholder wealth

Instead of taking short-term profitability, i.e., ROA, gross profit, gross operating income, as a proxy for firm performance, some studies use stock performance, measured by excess stock return adjusted by a benchmark portfolio return, as a measure of long-term value to shareholders.

In a study of US corporations from 1990 through 2006, Kieschnick et al. (2013) find that the incremental dollar invested in net working capital is worth less than the incremental dollar held in cash for the average firm, and therefore argue that efficient working capital management is of major importance for managers. Moreover, Kieschnick et al. (2013) identify several factors that significantly affect the valuation of the incremental dollar invested in net working capital investments, such as access to external funding, sales expectations and bankruptcy risk. A similar negative relation between working capital investments and stock performance has also been found for French firms (Autukaite and Molay (2011)) and Brazilian companies (Ribeiro de Almeida and Eid Jr. (2014)), with similar methodology to the one applied in Kieschnick et al. (2013).

Researching the relationship between working capital and fixed-assets investments, Fazzari and Petersen (1993) find that working capital competes with investments in fixed-assets for a limited pool of funds. In other words, there is a negative relationship between investments in these two fields. They also find that changes in working capital often mitigate the effect of fixed-asset investment on performance. Once working capital investment is considered, lower investments in fixed-assets have stronger and significant impact on financial performance of firms in the short run.

Molina and Preve (2009) find that firms tend to increase accounts receivable when they have profitability problems while they decrease accounts receivable when having liquidity problems. The study also suggests that financially distressed firms, which cut their accounts receivable in times of distress, will experience a further drop in sales and stock returns. Furthermore, the decline in performance is much stronger if financially distressed firms cut accounts receivable compared to financially distressed firms that do not cut accounts receivable.

2.3 The existence of an optimum level of net working capital

According to the static tradeoff hypothesis in capital structure, there is an optimum level of debt for companies due to a two-way impact of debt: Tax shields of interest expenses increase the attractiveness of debt while cost of financial distress and bankruptcy increase with debt levels (Mayers (1984)). A similar logic applies in the case of working capital. The effects of working capital management on firm performance can be broken down into two main parts, i.e., the impact on liquidity (Kim, Mauer and Sherman (1998)) and profitability of the firm (e.g., Shin and Soenen (1998); Deloof (2003); García-Teruel and Martínez Solano (2007)). In other words, decisions that tend to maximize profitability are likely to reduce the chance of adequate liquidity and thus increase financial cost and cost of financial distress, while focusing too much on liquidity will tend not to maximize the potential profitability of the company (e.g., Shin and Soenen (1998)). Take increasing inventory management as an example. On the one hand, large inventory may lead to higher sales and profitability by reducing the risk of stock-out. On the other hand, working capital tied up in accounts receivable and inventories requires financing, therefore leads to higher financial expense and lower profitability (e.g., Deloof (2003).

The importance of balancing trade-offs between the dual goals of working capital management, i.e., liquidity and profitability, was first addressed by Smith (1980). Following that, researchers find evidence that firms have an optimal level of net working capital that maximizes their value (e.g., Aktas et al. (2015); Hill et al. (2010); Baños-Caballero et al. (2014)).

Using an exhaustive sample covering a 30-year period from 1982 to 2011, Aktas et al. (2015) examine the relationship between excess stock return and excess NWC (measured as the difference of NWC level of the company and median level of the industry the company belongs to). The study of Aktas et al. (2015) leads to the conclusion that there is an optimal level of working capital for companies, based on the findings that companies which converge to the industry-median level, either by increasing or decreasing their investment in working capital, experience better stock performance. Aktas et al. (2015) also find that corporate investment is the channel through which efficient WCM translates into superior firm performance. In other words, firms with efficient WCM seem to reutilize unnecessary working capital in more efficient ways, such as funding growth investment.

Similarly, Baños-Caballero et al. (2014) find an inverted U-shaped relationship between the level of working capital and performance for a sample of UK companies. That is, investment in working capital and corporate performance relate positively at low levels of working capital and negatively at higher levels. In other words, it indicates the existence of an optimum level of working capital. Moreover, the optimal level of working capital is found to be lower for financially constrained firms. One possible explanation would be that the cost of external financing is higher for financially constrained firms. In this study, performance is measured as the ratio of the sum of market value of equity and book value of debt to the book value of assets.

2.4 Determinants of working capital, industry effects and firm characteristics

In addition to its importance and relation with companies' performance, researchers are also interested in how working capital is determined (e.g., Hill et al. (2010); Hawawini et al. (1986)). Shin and Soenen (1998) argue that working capital management is an integral component of the overall corporate strategy to create shareholder value. Following that, studies presented below find that working capital is determined by many internal and external factors.

By using a sample of US firms over the period of 1991-2006, Hill et al. (2010) find that working capital requirement (WCR, defined as the sum of accounts receivable and inventories net of accounts payable) is determined by sales growth, size, sales volatility, and financing capabilities. Specifically, Hill et al. (2010) uncover that WCR is inversely related to sales growth, uncertain demand, cost of external financing, and financial distress. Moreover, by using subsamples of industries and concentrated industries, the study finds that the effect of sales growth on working capital is influenced by the degree of industry competitiveness and consequently differs across industries. For firms in concentrated industries, higher sales growth actually reduces the level of working capital. One possible explanation provided in Hill et al. (2010) is that growing companies in concentrated industries have less need to loosen credit and inventory policies to facilitate increases in sales. Meanwhile, suppliers are more likely to offer increases in credit and better terms to these firms. Furthermore, in concentrated industries, gross profit margin is positively related to working capital.

Chiou and Cheng (2006) suggest that debt ratio and operating cash flow have a significant influence on working capital but other factors such as business indicators, sales growth, and industry effects do not. This is partially consistent with Hill et al. (2010), in the sense that debt ratio and operating cash flow are highly related to financing capabilities.

Hawawini et al. (1986) argue that firm's working capital requirement is determined by the firm's technology (i.e., the nature of the products it sells and the process it employs to manufacture and deliver), the degree of efficiency of operations management and the firm's level of sales. Moreover, Hawawini et al. (1986) conclude that there is a significant industry effect on firms' investment in working capital from the analysis of a sample of 1,181 US firms from 1960 through 1979.

2.5 Working Capital Management in Sweden

To the best of our knowledge, there is only one paper so far focusing on working capital management among Swedish firms. For a sample of small and medium-sized enterprises (SMEs) over the 2008-2011 period in Sweden, Yazdanfar and Öhman (2014) find empirical evidence that WCM efficiency significantly affects profitability, where WCM efficiency is measured as Cash Conversion Cycle (CCC) while profitability is measured as ROA. No previous study focuses on the relation between stock performance and working capital management for Swedish firms.

3. Hypothesis Building

In this paper we seek to link WCM to stock performance of Swedish public firms. Following previous studies in different aspects of this topic discussed above, we develop a set of hypotheses to test in our study.

Hypothesis 1: There is a negative relation between WCM and stock return

Based on the theoretical arguments and empirical findings of previous researchers, we expect an overall negative relationship between NWC and excess return. We assume that this negative relationship between NWC and excess return is particularly strong for companies with high levels of NWC. To the contrary, for companies with low levels of NWC, the relationship between NWC and Excess Return is expected to be positive.

Hypothesis 2: There is an optimal level of NWC

From an academic as well as practitioner's perspective, it is desirable to know if there is an optimal level of NWC. Finding this level could save firms money and allow for a more efficient allocation of capital. From a theoretical perspective, we would assume that companies that exceed this optimal level of NWC would profit from a reduction in NWC. To the opposite, companies that have a NWC level that is below the optimal level would benefit from increasing their NWC level. In other words, companies can improve performance by converging towards an optimal level of NWC. However, aiming to find this theoretically optimal level of NWC is challenging, as it is unobservable. In this empirical study, we will use several approximations of optimal NWC levels to come closer to an answer of this question.

Hypothesis 3: Interest rates influence the relation between NWC level and stock return.

With the hypothesis of optimal level of NWC, we explicitly assume the trade-off of liquidity (as well as financing cost) and profitability in WCM decisions. Since decreased liquidity and increased external financing cost are associated with the level of interest rates, we propose that interest rates have an effect on the relation between WCM and stock return. More specifically, we think that in high interest rate environments, the negative relation between stock performance and NWC level is stronger than in times of low interest rates.

4. Variables, Data & Methodology

4.1 Variable definitions

In this paper, the first question we investigate is the relation between WCM and stock performance for public firms in Sweden. In other words, we are interested in whether efficient WCM adds value to shareholders. If efficient WCM does add value to shareholders, how does interest rate play a role in it? To answer this question, we test several models with different measures of stock return and NWC as dependent variable and independent variable respectively. Together with a broad range of control variables, these variables are discussed in detail in section 4.

4.1.1 Dependent variables

The dependent variable for each regression is excess return. We provide two different measures of excess return in order to add credibility to our analysis and gain further insights into the relationship of return and NWC. Excess Return 1 and Excess Return 2 are used to represent the two measurements. Excess Return 1 is calculated by deducting the return of a portfolio of companies with similar book-to-market values and size from the raw return of the respective observation. For Excess Return 2, the expected return based on the CAPM is deducted from the raw return of a firm-year observation. Both specifications of excess return are explained in further detail below and reported in each regression, which we conduct later on.

Excess Return 1: Return adjusted by book-to-market values (BMV) & size

Following Faulkender and Wang (2006), Aktas et al. (2015) and Kieschnick et al. (2013), excess return is defined as stock i's return during fiscal year t less the return of stock i's benchmark portfolio during fiscal year t. The benchmark portfolios, defined below, are designed to offset the expected return components of stock i due to its size and book-to-market ratio at the beginning of the fiscal year (Faulkender and Wang (2006)). Below, the methodology to calculate excess return is presented in detail.

First, we calculate the raw return of company i in year t by using the formula in Equation (1). We take the change of market capitalization and dividend paid between year t-1 and t and then divide the sum of the two by the market capitalization at the end of year t-1.

$$(1) \qquad R_{i,t} = \frac{Market\ Capitalization_{i,t} - Market\ Capitalization_{i,t-1} + Dividend_{i,t}}{Market\ Capitalization_{i,t-1}}$$

Second, following Fama and French (1992) and Fama and French (1993), we construct six portfolios out of firms in our sample for each year, based on companies' size and book-to-market ratio of equity at the beginning of each fiscal year.[3] We take market capitalization as a proxy for size while we define book-to-market as the ratio of book value of equity over market value of equity. Book value of equity is collected directly from Amadeus while market value of equity is taken from Bloomberg. The dividing line for size is the median while the breakpoint for book value is bottom 30% (Low), middle 40% (Medium) and top 30% (High) respectively. For each year, we group every firm into one of six size and book-to-market portfolios based on the interaction between the size and book-to-market independent sorts. The reason to sort firms into three groups on book-to-market ratio and only two on size follows the evidence in Fama and French (1992) that book-to-market equity has a stronger role in average stock returns than size. Instead of using return from July of year t-1 to June of year t as in Fama and French (1993), we use the return based on year-end stock price, because monthly return is not available due to a lack of monthly dividend information in our dataset.[4] Based on the raw return of the company, we calculate the value-weighted average return, $R^{B}_{i,t}$, for each of the six portfolios for each year, and use it as the return of the benchmark portfolio.

Thereafter, we calculate a firm's Excess Return 1 for each year t by using formula in Equation (2). Specifically, we deduct the return of the benchmark portfolio which stock i belongs to at the beginning of year t from the raw return of stock i in year t.

$$(2) \qquad ER_{i,t} = R_{i,t} - R^{B}_{i,t}$$

[3] In previous studies Fama-French 25 portfolios are used (e.g., Faulkender and Wang (2006), Aktas et al. (2015) and Kieschnick, LaPlante and Moussawi (2013)). However, we choose six portfolios over 25 portfolios due to the limited number of companies in our sample.

[4] Fama-French uses the returns from the July of year t to June of year t+1 to make sure that accounting variables are known before the returns used to explain.

Excess Return 2: Return adjusted based on CAPM

As described before, we also use an alternative measurement of benchmark return by using Capital Asset Pricing Model (CAPM) developed by Sharpe (1964) and Lintner (1965). Following Bartholdy and Peare (2003), we apply CAPM in the following steps.

First, we estimate firms' betas in each year from 2006 through 2014 using the following equation:

(3) $Beta_{i,t} = Covar(R_{i,t}, R_{m,t})/Var(R_{m,t})$

where $R_{i,t}$ is daily return calculated based on daily stock price of firm i in year t; Dividend is not considered when calculating $R_{i,t}$ because we use daily data and we do not have information about the payout date of dividend. $R_{m,t}$ is market return measured by daily return of The MSCI Sweden Index[5] over the same period.

$R_{i,t}$ and $R_{m,t}$ can be calculated in several ways. In common practice, there is no consensus about data frequency for beta estimation; 5 years of monthly data, 2 years of weekly data, and 1 year of daily data are all commonly used methodologies (Bartholdy and Peare (2003)). However, some studies indicate that the return interval used has a significant impact on the beta estimate, as argued in Mukherji (2011). Reilly and Wright (1988) show that there are large differences in the betas estimated by Value Line Investment Survey and Merrill Lynch Investment Service, which calculate beta over five years, using weekly and monthly returns, respectively. Bartholdy and Peare (2003) suggest that 5 years' monthly data provides the best estimate. We use daily data of one year in our study, as the number of observations is relatively low in our sample and thus scarcity of data is our major concern.[6]

Using the betas generated through the described process, we estimate expected return using the following equation according to CAPM.

[5] The MSCI Sweden Index is designed to measure the performance of the large and mid cap segments of the Swedish market. With 30 constituents, the index covers about 85% of the equity universe in Sweden.

[6] Our data sample ranges from 2006 to 2014. The number of observations increases from 94 in 2006 to 223 in 2014, which means many firms in our sample went public after 2006 and we would lose many observations if 5-year data was used for beta estimation.

(4) $Expected(R_{i,t}) = R_{f,t} + Beta_{i,t-1} * (R_{m,t} - R_{i,t})$

where $Beta_{i,t-1}$ is the beta of company i estimated based on its daily stock price during the previous year. In other words, betas estimated based on historical data are used to predict expected returns in subsequent years. This approach has been used in many previous academic studies (e.g., Bartholdy and Peare (2003)). As described before, $R_{m,t}$ is the annual return of The MSCI Sweden Index in year t; $R_{f,t}$ is the risk-free rate in year t, measured as annualized interest rate of the one-month Swedish Treasury bill. We take one-month Treasury bill because Mukherji (2011) find that short-term Treasury bills are better proxies for the risk-free rate than longer-term Treasury securities regardless of the investment horizon.

Thereupon, we calculate the firm's Excess Return 2 for each year t by using the formula in Equation (5). Specifically, we deduct the expected return of stock i estimated by CAPM in year t from the raw return of stock i over the same period.

(5) $ER_{i,t} = R_{i,t} - Expected(R_{i,t})$

4.1.2 Independent variable of interest

As for the dependent variable, we also provide several measurements for our independent variable of interest - NWC. The different specifications are used to test different hypotheses.

To test the first hypothesis, the relationship between NWC and stock performance, we take Net Trade Cycle (NTC) as our independent variable, following Shin and Soenen (1998) and Baños-Caballero et al. (2014). This variable is computed by multiplying the NWC-to-sales ratio with 365 (days) as can be seen in Equation (6). NTC represents the number of days that it takes for a company to convert resource inputs into cash flows (Gladen (2014)). Higher NTC implies higher investments in NWC in days of sales.

(6) $NTC_{i,t} = (Inventories_{i,t} + Accounts\ Receivable_{i,t} - Accounts\ Payable_{i,t}) / (Sales_{i,t})*365$

This measurement does not make any assumptions about which level of NWC could be desirable but instead just measures the level of NWC itself. This specification will constitute Model 1 of the analysis, which will be discussed in detail later.

To test Hypothesis 2, which suggests that there is an optimum level of working capital, we introduce Excess NWC as independent variable of interest by following Aktas et al. (2015). As explained in Equation (7), this variable is calculated by deducting the industry median level of NWC-to-sales of each year from the raw NWC-to-sales level of each firm-year observation. We use this way of standardization as previous studies observe that the industry has a strong effect on NWC levels (e.g., Hill et al. (2010); Hawawini et al. (1986)).

(7) $Excess\ NWC_{i,t} = NWC_{i,t} - NWC_{i,t}^{B}$

where $NWC_{i,t}$ is firm i's ratio of its NWC at the end of year t to its sales during year t. NWC is the sum of inventories and accounts receivable net of accounts payable, a definition widely used by previous studies (e.g., (Aktas et al. 2015); (Kieschnick et al. (2013), etc.). $NWC_{i,t}^{B}$ is the median NWC-to-sales ratio of the industry, which firm i belongs to, at the end of year t. We take an eight-industry definition directly from Stockholm Stock Exchange and Aktietorget (Nasdaq Stockholm (2016), Aktietorget (2016)). This is different to Fama-French 49-industry classification used by Aktas et al. (2015). Due to the limited number of observations, we classify our observations into these eight categories instead of relying on a more granular definition.

For every given year, excess NWC measures the portion of NWC, which goes beyond the industry median level and is therefore considered as unnecessary cash tied up in working capital. A positive excess NWC indicates that the firm is over-investing in working capital compared to industry median. This implies that there is room for the firm to increase the efficiency of its WCM by adopting a relatively more aggressive working capital policy (such as by reducing inventories and payment delays granted to customers). A negative excess NWC indicates that the firm is currently adopting a relatively aggressive working capital policy, compared to its industry peers. This might imply room for improving performance through investments in working capital (e.g., Aktas et al. (2015)) as companies with relatively low NWC could lose customers through not being able to serve them in periods of high demand. Furthermore, longer days payable is one aspect of customers purchase decisions. Low accounts receivable could hint on short period of payment, which could result in a loss of customers. By using this methodology, we implicitly assume that the industry median NWC-to-sales is the optimal level of NWC-to-sales that trade-offs the benefits and costs of investment in working capital and maximizes shareholder wealth.

4.1.3 Control variables

In this study, we are interested in the relation between stock performance and working capital management. We understand that stock performance is affected by both common risk factors (Fama and French (1993)) and other firm-specific characteristics (Caloghiroua et al. (2004)). Therefore, it is important to control for those factors that may affect working capital and may be correlated with stock returns. Control variables included in our models are described as follows:

1. Size

Firm size affects both the level of working capital (Petersen and Rajan (1997)) and stock performance of the firm (e.g., Fama and French (1992)). Larger companies might be less affected by demand fluctuations as they depend on average less on single customers (Kitson and Michie (2015)). Consequently, large companies are less pressured by single customers to for example grant long periods of payment. Thus, their working capital level might be lower. However, the performance of larger companies can also be higher due to market power and economies of scale. On the other hand, Fama and French (1992) find that large companies underperform small companies in stock market. In order to avoid potential influence of a company's size on the relation of working capital and performance, we include size as a control variable. Previous studies (e.g., Kieschnick et al. (2013); Faulkender and Wang (2006)) also argue that size can be a measurement for financial constraint. Financing might be more difficult for smaller companies as they might have less access to capital markets and the information asymmetry between the firms and potential lenders is larger, making refinancing more complicated and expensive.

2. Sales growth

As argued by Kieschnick et al. (2013), investments in net operating working capital should be more valuable for firms with greater expected future sales growth, as the positive effect of NWC investment in sales growth dominates the negative effect of higher financing cost for companies with higher expected future sales growth (Deloof (2003)). However, there is no simple way to know the expected future sales growth. By using historical sales growth rate in prior years as proxy for expected sales growth, Kieschnick et al. (2013) conclude that sales growth influences the relation of net working capital and stock performance.

3. Profitability

Kieschnick et al. (2013) introduce a proxy for profitability, which is calculated as earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits. Higher profitability allows companies to implement a less strict working capital policy. This means that a company can for example afford to grant longer days payable for customers or can pay their own bills earlier, which reduces days of accounts payable (Hill et al. (2010)). Hill et al. (2010) suggest that the capacity to adopt working capital policies is determined by a firm´s operating cash flows. In our study, we will use EBITDA as our measurement. On the one hand, EBITDA measures the operating profitability of a company (Klonowski (2014)). On the other hand, EBITDA is also often used as a proxy for operating cash flow (DePamphilis (2010)).[7] Furthermore, a higher EBITDA value suggests higher contribution margins. The larger the contribution margin, the larger is the difference between accounts receivable and accounts payable. This will have a positive impact on the working capital level. We also expect EBITDA to be related to higher performance, which is why we expect a positive relationship between contribution margin and performance (Hill et al. (2010)).

4. Fixed assets

Previous studies (e.g., Fazzari and Petersen (1993)) show that there is a negative relation between investments in fixed assets and investments in working capital. Similarly, Aktas et al. (2015) report that the channel through which an improvement in NWC affects firm performance is higher investments in fixed assets. These findings suggest that there is a competition for the use of limited funds of a company. At the same time, higher investments in fixed assets could be positively related to performance of the company as well. Cooper et al. (2008) show that total assets growth has a significant effect on stock performance. As both working capital and fixed assets represent significant portions of total assets, it is reasonable to control fixed assets while focusing our study on working capital. Aktas et al. (2015) also find significant evidence that fixed asset investments are associated with increasing firm performance, for which one possible explanation could be that firms could have better economies of scale through additional capital expenditures. As the level of

[7] As EBITDA does not include changes NWC (compared to operating cash flow), using EBITDA also helps to clearly assign the portion of excess return that is due to changes in NWC and the ones due to operational profitability.

investments in fixed assets can have effects on both the dependent variable (i.e., Excess Return 1 or 2) and independent variable (i.e., Excess NWC or NTC), we control for this factor.

5. Leverage

Following Kieschnick et al. (2013), we include leverage as a control variable and define it as the ratio on book value of debt to market value of equity. Higher leverage can be expected to be associated with higher stock return, higher debt level relative to expected income, and lower probability of reorganization following default as highly leveraged firms have problems in raising additional financing for profitable investment projects (Harris and Raviv (1990)). At the same time, leverage is also an important determinant of working capital as suggested by Hill et al. (2010) as well as Chiou and Cheng (2006).

6. Firm risk

Following Aktas et al. (2015), we also include firm risk measured as firm i's daily stock volatility in each year as a control variable. An excessively aggressive WCM might increase firm risk, which in turn requires higher return of stock. Therefore, the expected negative relation between NWC and stock performance might be due to increasing firm risk following higher NWC level. By including firm risk as control variable, we are able to rule out potential biases from this factor.

7. R&D expense

In modern economies, a large part of a firm's value may reflect its intangible assets, among which R&D expense is an important item. However, this element is usually not capitalized as asset on the balance sheet (Coccia (2012)). Previous researches find that companies with high R&D to equity market value earn large excess returns (e.g., Chan et al. (2001)). Meanwhile, R&D-intensive companies may not focus as much on working capital management as other companies. In order not to assign the high performance mistakenly to their working capital policy, we include the control variable R&D expenditure.

8. Dividend

Companies who pay dividend may depend less on working capital to finance their investments (Fazzari et al. (1988)). Thus, their performance might not be affected as strongly by working capital than financially constraint companies. Meanwhile, dividend is also directly related to stock return since it is an important part of stock return.

9. Cash holding

Following Kieschnick et al. (2013), we include the level of cash holdings in our regression as previous research shows that cash holding is related to both stock performance and working capital. Faulkender and Wang (2006) suggest that the level of cash holdings is associated with the value of a company. Bates et al. (2009) find the existence of a substitution effect between cash reserves and working capital through time.

10. GDP growth

In their research on the relationship between NWC and profitability for Finnish firms, Enqvist et al. (2014) discover that the relation of NWC and firm profitability differs depending on the current state of the business cycle, with a pronounced impact in economic downturns than in booms. Considering this, we introduce GDP growth as control variable.

11. Interest rate

As argued in the literature review section, trade-off between liquidity and profitability is an important aspect of WCM decisions (e.g., Kim et al. (1998); Shin and Soenen (1998), etc.). Since interest rates are directly related to financing cost, which is in turn affected by liquidity of the firm, interest rate is expected to have an impact on working capital level. Meanwhile, common stock return is found to be correlated with interest rate change (Flannery and James (1984)). Therefore, we include interest rate as control variable. According to the segmented market theory, short-term assets (such as accounts receivable and inventories) should be matched with short-term liabilities (Fabozzi (2007)). For this reason, we take the 6-month treasure bill as a proxy for the financing costs of short-term liabilities.

4.2 Data

4.2.1 Sample construction

To conduct the research, we collect accounting data from Amadeus, a dataset that provides yearly accounting information of European companies, and both yearly and daily market data from Bloomberg. Our sample comprises of all companies listed on the two stock exchanges in Sweden, i.e., Stockholm Stock Exchange (Nasdaq Stockholm) and AktieTorget, from the years 2006 through 2014.[8] The data is refined in the following steps.

First, we eliminate firms with missing values of variables and negative values for market capitalization, book value of equity and sales. However, as dividend is one of the determinants when calculating excess return, we search for annual reports of companies with missing dividend information and add this information in the dataset. Second, following Fama and French (1992), we exclude financial and utility firms as defined by the exchange they are listed on, as capital structure and working capital are different between financials and non-financials. We also exclude utility firms by following Hill et al. (2010) and Shin and Soenen (1998). In total, this gives us 250 companies and 1392 firm-year observations for our full-set data regression.

Figure 1 reports the number of sample firms in each year. The number of firms increases over time and ranges from 94 in 2006 to 223 in 2014. This finding displays the ongoing IPO activity at the Stockholm Stock Exchange as well as the high number of business formations in Sweden (Abrahamson et al. (2011)).

Subsequently, we winsorize all variables at 1% and 99% level to mitigate the influence of extreme values or wrong reporting in the database (Aktas et al. (2015)).

[8] Amadeus records only the market capitalization of the most liquid share class. In contrast, Bloomberg´s market capitalization data includes all classes of shares. Since dividends recorded in Amadeus are for all classes of shares, taking only the most liquid class of shares would skew return calculation.

Figure 1: Number of firms over time

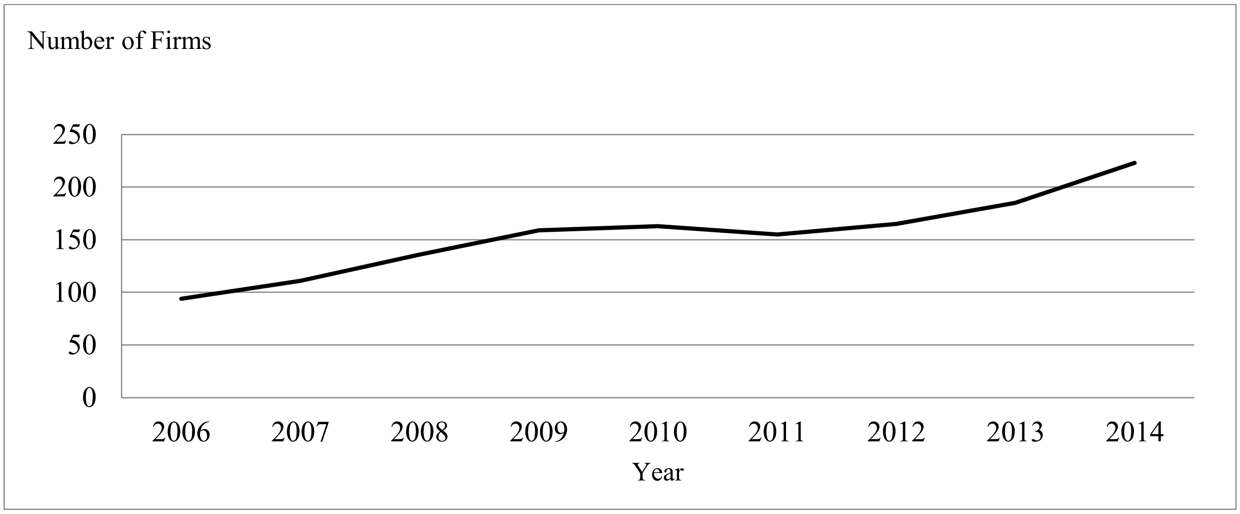


Table 1 reports some descriptive statistics for corporate performance, net working capital and the control variables for each sample year.

Table 1: Summary statistics of variables

Variables	Obs	Median	Mean	Std.	Min	Max
Excess Return 1	1392	-0.0072	0.0381	0.4814	-0.9952	3.0830
Excess Return 2[9]	1343	0.0618	0.2960	2.5132	-1.4452	79.3558
ExcessNWC	1392	0.0000	-0.0400	1.1112	-36.3534	4.7890
NTC	1392	63.9032	59.5242	154.9022	2,588.1820	709.4793
NWC-to-sales	1392	0.1751	0.1409	1.1141	-36.1415	4.9697
NWC-to-assets	1392	0.1979	0.2094	0.1500	-0.3824	0.7696
Size	1392	1.1870	1.7904	1.9966	0.0000	11.1266
ΔSales	1392	0.0518	0.0600	0.5115	-2.4719	2.4664
ΔEBITDA	1392	0.0114	0.0181	0.1929	-0.7703	1.1505
ΔFixed Assets	1392	0.0084	0.0419	0.3385	-1.1425	2.7782
Lev	1392	0.1309	0.3355	0.5992	0.0000	4.0015
Firm Risk	1392	37.8858	45.4410	24.7590	16.7373	166.4215
ΔRD	1392	0.0000	0.0005	0.0075	-0.0319	0.0360
ΔDiv	1392	0.0000	-0.0013	0.0348	-0.1942	0.1499
ΔCash	1392	0.0020	0.0118	0.1080	-0.3740	0.6500
GDP Growth	1392	2.4981	1.4465	3.0836	-5.1847	5.9889
Interest Rate	1392	2.0614	2.0774	1.3138	0.7295	4.9004

[9] The number of observation is lower for Excess Return 2 due to data unavailability.

We also check the detailed statistics of our variables and notice that the kurtosis for several variables in the full data set is very high, (e.g., a value of 844 for Excess NWC and 49 for NTC). Due to this peculiarity of our data set, we will run regressions using the full data set as well as using a trimmed data set. Specifically, for every regression we run with the full data set, we also run with a subsample which excludes the lowest and highest 5% respectively 10% of the values of Excess NWC or NTC (depending on the regression).

The summary statistics presented in Table 1 show that the median NWC-to-sales ratio is around 17.5%, a figure that is lower than the 18.9% reported by Hill et al. (2010) for US firms. Concerning the industry-median adjusted NWC-to-sales ratio (i.e., excess NWC), the mean is -4% and the median 0.00%, compared to the 1.20% and 0.00% reported by Aktas et al. (2015) for US firms. This indicates that the difference within industry is higher in Sweden than in US.

Figure 2 reports the cross-sectional average and median NWC-to-sales ratio from 2006 to 2011. The median NWC-to-sales ratio over this period is decreasing over time, from about 19% in 2006 to 16.5% in 2014. This is similar with the level and trend in the US over the same period reported by Aktas et al. (2015), which is around 16% in 2006 and 15% in 2011. This decreasing trend has been observed for the last 20 years (Hill et al. (2010); Deloof (2003); Capkun et al. (2009)).

Figure 2: Time series of NWC-to-sales ratio

This figure plots cross-sectional median of NWC-to-sales ratio for Swedish non-financial public firms by year from 2006 to 2014. NWC corresponds to inventories plus accounts receivables minus accounts payable.

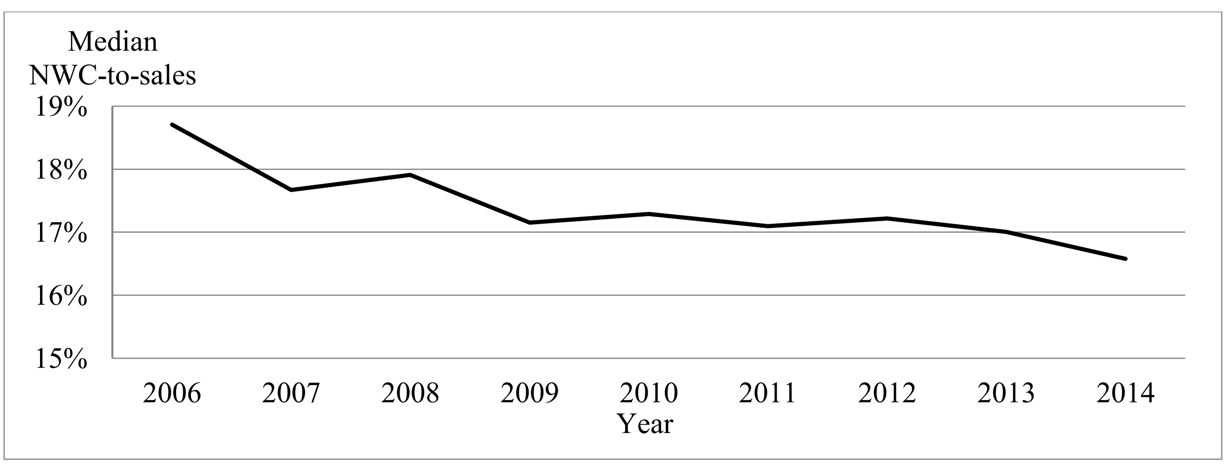
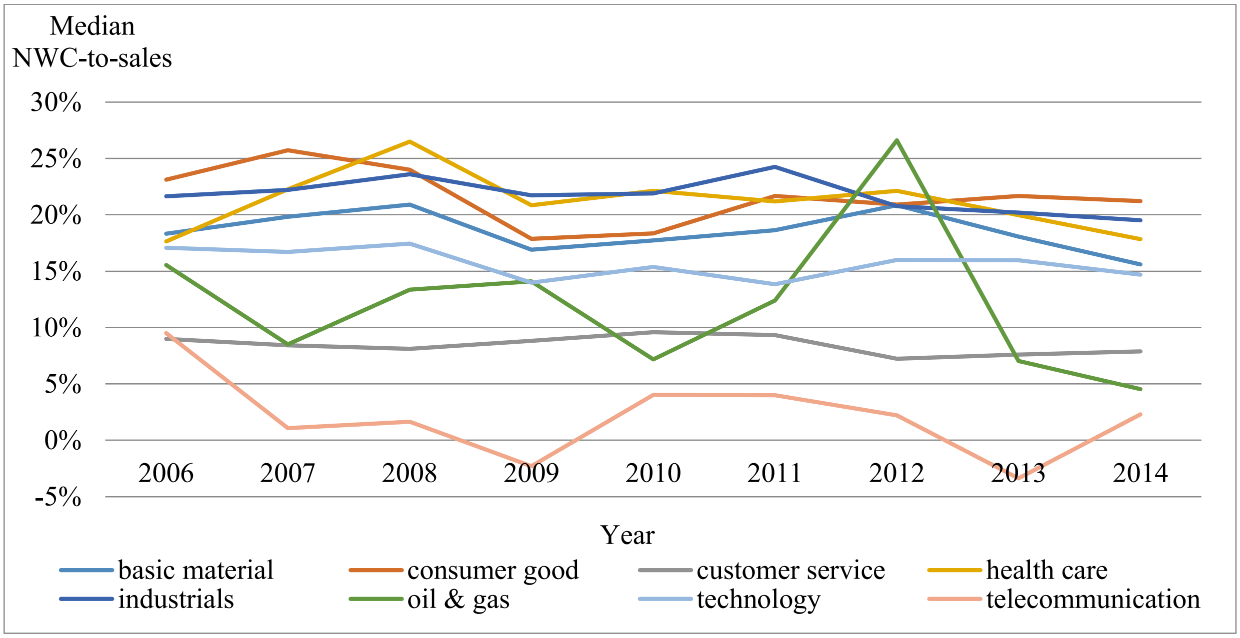


Figure 3 summarizes median NWC-to-sales ratio by industry, which shows that there is an apparent industry effect on working capital level. The level of NWC varies very much over time in oil & gas sector, which can be explained by very limited number of observations each year (less than 5) and the capital intense nature of the industry.

Figure 3: Median NWC-to-sales ratio by industry over time



4.2.2 Correlation matrix and VIF factors

We perform a multi-collinearity analysis between all independent variables, as shown in Tables 2 and 3. From the analysis of the correlations shown in Table 2, we can see that all of our independent variables are not strongly correlated with one another.

We also calculate the variance inflation factor (VIF) for each independent variable in our models, as shown in Table 3. The largest VIF value is 1.43 while the mean of VIFs is 1.16, which confirms that there is no multi-collinearity problem in our sample. Kleinbaum et al. (2007) suggest that VIF over 5 indicates multi-collinearity issue.

Table 2: Correlations of all the variables

	Excess Return 1	Excess Return 2	Excess NWC	NTC	Size	ΔSales	ΔEBITDA	ΔFA	Lev	Firm Risk	ΔR&D	ΔDiv	ΔCash	GDP Growth	Interest Rate
Excess Return 1	1														
Excess Return 2	0.4688	1													
Excess NWC	-0.0101	0.0161	1												
NTC	-0.0364	0.0233	0.8022	1											
Size	0.1497	0.2251	0.025	0.0101	1										
ΔSales	0.1652	0.0155	-0.0055	-0.0182	-0.2688	1									
ΔEBITDA	0.2262	0.2546	-0.0033	-0.0318	0.0233	0.2221	1								
ΔFA	0.2619	0.3244	-0.003	0.0034	-0.1165	0.4106	0.1363	1							
Lev	-0.0567	-0.0361	0.0087	0.0106	0.3436	-0.0705	-0.0994	-0.0129	1						
Firm Risk	0.2177	0.1754	-0.057	-0.1185	0.1106	-0.0408	0.091	0.0046	0.0557	1					
ΔR&D	0.0168	0.0019	0.0071	0.0193	-0.068	0.0719	-0.0298	0.0446	-0.0044	-0.0395	1				
ΔDiv	-0.0965	-0.0593	0.0001	0.0068	-0.262	0.1621	0.0716	0.0152	-0.0733	-0.0742	0.0466	1			
ΔCash	0.1726	0.0067	0.0082	0.0155	0.0388	0.1272	0.1625	0.0048	-0.0449	0.0687	-0.0047	-0.0478	1		
GDP Growth	-0.0037	-0.0865	0.003	0.0009	-0.238	0.1765	0.1668	0.0217	-0.0821	-0.1152	0.0632	0.2176	-0.0018	1	
Interest Rate	-0.0143	-0.0879	-0.0033	0.0365	-0.1513	0.0908	-0.0484	0.0829	0.1517	-0.0111	0.0524	0.1017	-0.054	-0.0095	1

Table 3: Variance Inflation Factors (VIFs) of all the independent variables

Variables	VIF	1/VIF
Size	1.43	0.7005
Δ Sales	1.40	0.7138
Leverage	1.23	0.8145
Δ Fixed Assets	1.21	0.8251
Δ EBITDA	1.15	0.8672
GDP Growth	1.15	0.8687
Δ Dividends	1.13	0.8880
Interest Rate	1.09	0.9141
Δ Cash	1.06	0.9405
Firm risk	1.04	0.9593
Δ RD	1.01	0.9856
Excess NWC	1.00	0.9954
Mean	1.16	

4.3 Methodology and model specification

4.3.1 General methodology

For our baseline model to test Hypothesis 1, we follow the methodology developed by Faulkender and Wang (2006), which is also used later by Kieschnick et al. (2013). Meanwhile, we also use the idea of Excess NWC from Aktas et al. (2015) and quadric term from Baños-Caballero et al. (2014), to extend our baseline model for a better understanding of the relation between WCM and stock performance. All the models will be explained in detail in the following section of model specification.

To conduct a regression analysis, we mainly adopt the methodology used in Hill et al. (2010). Given the 9-year panel data set we construct, we first test pooled OLS with the Lagrange multiplier introduced by Breusch and Pagan (1980) to see if a pooled OLS or a panel data methodology, i.e., random effects model and fixed effects model, is more appropriate for our data. As Hill et al. (2010) point out, the variation in our dependent variable (i.e., Excess Return 1 or 2) across firms may be a result of firm-specific unobservable factors, which, if also correlated with the independent variable, can cause pooled OLS regression results to suffer from heterogeneity bias as pooled OLS simply ignores firm-specific characteristics and treat all the firms in the same way instead. Although we have controlled for 9 firm-specific factors that we expect to be correlated to both dependent and independent variables, there may also be some other unobservable firm-specific characteristics that should be controlled. In the end, the use of pooled OLS methodology is rejected by the Lagrange multiplier test, which suggests a problem with heterogeneity.

Once we decide on the panel data methodology, we run a Hausman test to choose between a random effects model and a fixed effects model. These two models have different assumptions on the correlation of unobservable firm-specific factors and independent variables. Hausman (1978) test determines whether the unobservable heterogeneity is correlated with the independent variables, with the null hypothesis being that it is not. If unobservable heterogeneity is not correlated with the independent variables, then random effects model and fixed effects model are equal, as there is no bias from ignoring unobservable heterogeneity - in fact, it becomes part of the residual (Angrist and Pischke (2008)). Otherwise, fixed effects model is preferred. The Hausman test gives us a p-value of 0.0000 (<0.05), which suggests that fixed effects model is preferred for our data.[10] Therefore, fixed effects model is used throughout all of our regressions, with η_i being used to represent firm-specific characteristics for firm i. Moreover, we run all the fixed effect regressions with robust option in Stata, which gives us t-statistics calculated using White's correction for heteroskedasticity.

In a fixed effects regression, for each company, the company mean across time is deducted from specific observations of that company in order to eliminate the unobservable firm-individual effects (Angrist and Pischke (2008)). As confirmed by the above conducted tests, this methodology improves the quality of our model as the bias from firm-fixed effects is taken into account. [11]

As mentioned in the data description section, there might be a problem of extreme value in our data set. Although we winsorize all variables at 1% and 99% level, we are not sure if the effects of outliers are successfully mitigated. Therefore, we run all the regressions on 3 sets of data, the full data set after winsorizing at 1% and 99% level, and two more aggressively trimmed data sets, in which our dependent variable (e.g., Excess Return 1 or 2) and independent variable (e.g., NTC or Excess NWC) are trimmed at 5% and 95% level, 10% and 90% level, respectively.

Further more, we are also interested in the different effects of NWC on stock performance at different levels of NWC, considering the nonlinear relation between Excess NWC and firm value found by Aktas et al. (2015) in the US and the nonlinear relation between NTC and firm performance reported by Baños-Caballero et al. (2014) for a U.K. sample. Therefore, for all the regressions with NTC, we run them with full sample data as well as subsamples of observations with negative and positive NTC.

One potential problem with the research design might be the presence of endogeneity. In the presented regression models, we assume and expect that NWC has an effect on excess return. However, there is a risk of reverse causality, i.e. that excess return also has an effect on NWC. In our research study, it might be that lower return causes higher NWC as a firm might try to increase

[10] This holds for all the regression models in our study.
[11] Another potential fixed-effect stems from year fixed effects. Thus, we also test our regressions using year-fixed effects. However, the coefficients are very similar compared to the regression without year-fixed effects and most of the year coefficients are insignificant. Hence, we decide to keep our model as simple as possible and proceed without introducing year-fixed effects.

sales. On the other hand, companies with low returns could decide to reduce NWC in order to reduce financing costs.

One way to tackle the problem of endogeneity in the research of NWC and excess return is by using lagged explanatory variables (e.g. Atkas et al. (2015).[12] Through lagging the variables by one period, the model should take into account that the variables might be determined simultaneously and that reverse causality might exist. In the Models 2-4, we introduce the lagged variable for NTC. However, this method has its own shortcomings and potential biases, as Duncan et al. (2004) and Bellemare et al. (2015) argue. Thus, we decide not to use it throughout the paper, but only for Models 2-4.

4.3.2 Presentation & Discussion of regression models

Model 1- with NTC as independent variable

To study the relation between NWC and stock performance of firms (Hypothesis 1), we develop the following regression model (Model 1) as our baseline model:

Model 1: $$ER_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 Size_{i,t} + \beta_3 \Delta Sales_{i,t} + \beta_4 \Delta EBITDA_{i,t} + \beta_5 \Delta FA_{i,t} + \beta_6 Lev_{i,t} + \beta_7 Risk_{i,t} + \beta_8 \Delta R\&D_{i,t} + \beta_9 \Delta Div_{i,t} + \beta_{10} \Delta C_{i,t} + \beta_{11} GDP_t + \beta_{12} IR_t + \eta_i + e_{i,t}$$

where $ER_{i,t}$ is our dependent variable measuring the excess return of stock i in period t. On the right side, we have NTC as our independent variable and all the control variables discussed in the previous section. For all the firm-specific control variables (except leverage), we take the changes over the previous period and standardize them by one-year lagged market value of equity, to avoid having the largest firms dominate the results (Faulkender and Wang (2006)).

Hypothesis 1 suggests a negative relation between NWC level and stock return, so we expect the coefficient of NTC (i.e., β_1) to be negative.

The idea behind this methodology is that the unexpected excess return on the left hand side is caused by changes in the variables on the right hand side during the same period. Ideally, we should use unexpected changes in our independent variable and control variables. Since our dependent

[12] Another prominently used methodology to tackle the problem of reverse causality is by using IV estimators (e.g. (Angrist and Pischke (2008)).

variable is excess return, any expected changes in variables should be reflected in firm value. In other words, excess return should be caused only by unexpected changes. Unfortunately, it is not easy to obtain unexpected changes. Moreover, Faulkender and Wang (2006) find that using actual changes provide similar estimates to various unexpected change estimates and so it is reasonable for us to use actual changes as well (Further details on variable definition can be found in Appendix).

To control for time-invariant firm characteristics, all regressions include firm fixed effects η_i, which allows mitigating missing (unobservable) variable issues (Aktas et al. (2015)). It is also important to note that industry effects are indirectly controlled for through the use of industry-median adjusted NWC by following Aktas et al. (2015).

Model 2, 3 & 4 – with Change in NTC as independent variable

Instead of only relying on the level of NWC (measured by NTC), we conduct another set of regressions by introducing a change term of NTC (Model 2), which is explained in Equation (8).

(8) $NTC\ Change_{i,t} = NTC_{i,t} - NTC_{i,t-1}$

Following, we subsequently introduce one-year lagged NTC in addition to change in NTC (see Model 3) and an interaction term between the change in NTC and the one-year lagged NTC in the regressions in addition to the two before mentioned variables (see Model 4).

Model 2: $ER_{i,t} = \beta_0 + \beta_1 \Delta NTC_{i,t} + \beta_2 Control\ variables_{i,t} + \eta_i + e_{i,t}$

Model 3: $ER_{i,t} = \beta_0 + \beta_1 \Delta NTC_{i,t} + \beta_2 NTC_{i,t-1} + \beta_3 Control\ variables_{i,t} + \eta_i + e_{i,t}$

Model 4: $ER_{i,t} = \beta_0 + \beta_1 \Delta NTC_{i,t} + \beta_2 NTC_{i,t-1} + \beta_3 \Delta NTC_{i,t} * NTC_{i,t-1} + \beta_4 Control\ variables_{i,t} + \eta_i + e_{i,t}$

Hypothesis 1 suggests a negative relation between NWC level and stock return, therefore we also expect the coefficient of $\Delta NTC_{i,t}$ (i.e., β_1 in Models 2-4) to be negative. Furthermore, we expect the coefficient of the interaction term (i.e., β_3 in Models 4) to be negative, as Hypothesis 1 also indicates that this negative effect of NWC is stronger for companies with higher levels of NWC.

Model 5 & 6 – with Excess NWC as independent variable

To examine Hypothesis 2, we follow Aktas et al. (2015) and develop Model 5, by introducing excess NWC as independent variable instead of NTC.

Model 5: $$ER_{i,t} = \beta_0 + \beta_1 ExcessNWC_{i,t} + \beta_2 Control\ variables_{i,t} + \eta_i + e_{i,t}$$

where $ExcessNWC_{i,t}$ is defined as the difference between firm i's NWC level and industry-median level. Here we explicitly assume that the industry median is the optimum level. Positive $ExcessNWC_{i,t}$ indicates that the firm has a higher level of NWC than the optimum level.

Considering that positive and negative excess NWC may have different effects on performance, we also develop Model 6 by introducing a dummy D.

Model 6: $$ER_{i,t} = \beta_0 + \beta_1 ExcessNWC_{i,t} * D + \beta_2 ExcessNWC_{i,t} * (1 - D) + \beta_3 Control\ variables_{i,t} + \eta_i + e_{i,t}$$

where D is the dummy variable taking value 1 if the corresponding excess NWC is positive and 0 otherwise. By this definition, β_1 will give us the effect of positive excess NWC while β_2 represents the effect of negative excess NWC.

The existence of an optimum level of NWC means that excess NWC and stock performance are positively related when excess NWC is negative but negatively related when excess NWC is positive. In other words, we expect β_1 to be negative and β_2 to be positive.

Model 7 – with NTC and NTC² as independent variables

As a robustness test for Hypothesis 2, we also modify the baseline model by following Baños-Caballero et al. (2014). Instead of having only NTC_t in the regression, we now introduce the term NTC_t as a linear term and as a quadratic term as can be seen in Model (7):

Model 7: $$ER_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC_{i,t}^2 + \beta_3 Control\ variables_{i,t} + \eta_i + e_{i,t}$$

We expect that there is an optimum level of net working capital, which means that net working capital and stock performance relate positively at low levels of net working capital and negatively at higher levels. With this model, the hypothesis would be that β_1 is positive and β_2 is negative, because it would indicate a positive combined effect of NTC and NTC^2 at low level of NTC and a negative overall effect at high level when the effect of NTC^2 dominates. As we include a square term, we only use observations with positive NTC for this specification.

Model 8 & 9 – with interaction between interest rate and independent variables

To test Hypothesis 3 (i.e., the effect of interest rate on the relation between NWC and stock return), we develop Model 8 & 9 based on Model 1 & 5 by adding the interaction of NTC (Excess NWC) and interest rate as independent variables.

Model 8: $$ER_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC_{i,t} * IR_t + \beta_3 Control\ variables_{i,t} + \eta_i + e_{i,t}$$

Model 9: $$ER_{i,t} = \beta_0 + \beta_1 ExcessNWC_{i,t} + \beta_2 ExcessNWC_{i,t} * IR_t + \beta_3 Control\ variables_{i,t} + \eta_i + e_{i,t}$$

For these two models, we assume negative coefficients for the two interaction terms. Higher interest rates result in higher financing cost, which is detrimental for a firm´s net income. Since NWC needs to be financed, the cost of high NWC is higher in high interest rate environment and we assume that it will negatively affect a company’s return.

5. Results

In the following section, we present regressions based on Models 1-9 to test the hypotheses formulated above. Results are presented in Tables 4-13. First, we examine the relationship between excess return and NTC (excess NWC). Then we test the existence of an optimal level of NWC. In the end we explore the effect of interest rate on the relation of excess return and excess NWC.

Result tables are presented with the same structure, with the tables (except Table 13) being divided into two sides: for regressions on the left side, excess return is calculated by deducting the value-weighted return of benchmark portfolio (formed based on book-to-market value and size) from companies the raw return for each year-firm (Excess Return 1). On the right hand side, excess return is calculated by deducting the return predicted by CAPM (Excess Return 2).

Considering the potential effects of outliers, for some regressions (i.e., Models 1, 5, 6 & 7), three regressions are conducted. The first one uses the full data set, the second one drops observations with the 5% lowest and highest values for the independent variable of interest (e.g., Excess NWC or NTC) and the third one drops 10% lowest and highest.[13]

5.1 The relation between excess return and NTC

Hypothesis 1 postulates an overall negative effect of NWC on excess return. To test Hypothesis 1, we regress Excess Return on the Net Trade Cycle (NTC), and we receive inconsistent results (see Table 4). When using the full data set, the coefficient is positive, but not significant. The more data we drop, the more negative the coefficient becomes. This suggests that higher NTC is detrimental for companies with NTC closer to the median. Contrary, companies with negative and/or very positive NTC do not seem to be negatively affected by higher NTC.

One possible explanation for the unexpected insignificant result could be that companies with negative NTC profit from higher NWC investment whereas companies with positive NTC are negatively affected by NWC investment. In order to test this hypothesis and understand this relationship better, we subsequently split up the sample into those companies with positive NTC and those with negative NTC.

Table 5 presents the regression results for the subsample of observations with positive NTC. The positive subsample displays the expected negative relationship between NTC and Excess Return for each regression. However, it is only statistically significant when using Excess Return 1. When dropping outliers, the significance remains relatively stable and only increases slightly for both return measurements. This indicates that the negative relation between NTC and Excess Return is less prevalent for companies with very high NTCs.

Concerning the control variables, the coefficient estimates also depend on the excess return measurement used in the regression. However, the results are very consistent when 5% and 10% outliers are dropped, which suggests robustness.[14] When Excess Return 1 is used, the coefficients

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[13] We also conducted our analysis using a non-winsorized sample for these models, which give us very similar results compared to the winsorized sample. Therefore, these results are not reported in this paper.

[14] As showed in Tables 4-13, the coefficient estimates of control variables are also very consistent in different regression models, except those two regressions on a small subsample of observations with negative NTCs. Therefore, results regarding to control variables are only presented in the first regression.

of firm size, sales growth, EBITDA, fixed assets, leverage, firm risk and GDP growth are always significant at conventional levels, except that EBITDA becomes insignificant when 10% outliers dropped. The signs of the coefficients are consistent with previous literature that stock performance increases with sales growth, fixed assets growth (Cooper et al. (2008)), firm risk (Aktas et al. (2015)) and GDP growth (Wade and May (2013))[15]. The negative relation between leverage and stock performance is counterintuitive and also inconsistent with previous NWC related research (e.g., Atkas et al. (2015), Faulkender and Wang (2006)). However, Baker and Martin (2011) report a negative relationship between leverage and stock performance which can for example be attributed to lower profitability and differences in cost of financial distress (Baker and Martin (2011)). The coefficient estimates of R&D expense and cash holding are statistically insignificant, which is different from previous studies (Chan et al. (2001), Aktas et al. (2015), Faulkender and Wang (2006)). When Excess Return 2 is used as dependent variable, the coefficient estimates for control variables are mostly less significant.

Table 6 reports the regression results for the subsample of observations with negative NTC. The results show that the coefficient for NTC is positive in each specification. The result is only significant in one case (using Excess Return 1 and the full data set), but in this instance the significance is very high with a p-value of 0.00. Similar to the results in Table 4, we can see that dropping the outliers leads to lower levels of significance for the coefficient. One aspect that causes lower significance is the lower number of observations when dropping data. Another possible explanation could be that the positive effect of NTC on Excess Return for companies with less negative NTC value is more ambiguous. As in previous regressions, the significance level also depends on the measurement of excess return.

[15] Conventional view holds that stock performance is not positively linked to GDP growth, supported by Dimson et al. (2005). However, Wade and May (2013) find that the relationship between stock performance and GDP growth has shifted in the years following the global financial crisis of 2007-2008 such that there appears to be a stronger positive relation between GDP growth and stock performance.

Table 4:

The relation between excess return and NTC (Model 1) - Full sample

This table shows the regression output for testing Hypothesis 1. The dependent variable excess return is regressed on Net Trade Cycle (NTC) and several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Full data set	Drop 5% outliers	Drop 10% outliers	Variables	Full data set	Drop 5% outliers	Drop 10% outliers
NTC	2.22e-06 (0.03)	-.0005849 (-0.76)	-.0014891* (-1.75)	NTC	.0000358 (0.35)	.008544 (1.08)	-.0013474 (-0.77)
Size	.1034124*** (6.26)	.092555*** (5.51)	.0870454*** (5.17)	Size	.6554291*** (3.63)	.4758833*** (3.90)	.4349227*** (3.20)
Δ Sales	.1467737** (2.34)	.1266993** (2.05)	.1709014*** (3.06)	Δ Sales	-.5058724 (-0.47)	-.6203727 (-0.58)	.6165386*** (3.25)
Δ EBITDA	.2927882** (2.44)	.2502578** (2.14)	.2200204* (1.97)	Δ EBITDA	3.31012 (1.52)	2.993826 (1.51)	.8167602** (2.43)
Δ FA	.2511554*** (3.22)	.2588619*** (3.19)	.2678136*** (2.98)	Δ FA	1.985314* (1.82)	1.688503* (1.92)	.7406663** (2.55)
Lev	-.0833497*** (-3.19)	-.0810084*** (-3.23)	-.0774116*** (-3.00)	Lev	-.5807665*** (-3.39)	-.6829884*** (-2.86)	-.4127039*** (-5.90)
Risk	.0038918** (2.26)	.0042081** (2.35)	.0046625** (2.60)	Risk	.01109 (1.60)	.0161306 (1.58)	.0059576 (1.24)
Δ R&D	.7288053 (0.52)	1.171525 (0.74)	.9522707 (0.51)	Δ R&D	8.201744 (1.16)	11.41718 (1.38)	2.541638 (0.71)
Δ Div	-.7057565 (-1.23)	-.7056723 (-1.22)	-.8995903 (-1.55)	Δ Div	2.965166 (0.80)	2.168971 (0.74)	-.9517497 (-0.86)
Δ Cash	.2376898 (1.01)	.2127736 (0.81)	.1916337 (0.68)	Δ Cash	-.8472055 (-0.68)	.5531897 (0.84)	.8178626 (1.43)
GDP	.0128033*** (2.66)	.0104661** (2.30)	.0101957** (2.21)	GDP	.0035085 (0.20)	-.0125676 (-0.74)	.0038531 (0.40)
IR	.0181306** (2.22)	.0159397* (1.95)	.0157571* (1.89)	IR	-.0273966 (-0.91)	-.0824569 (-1.58)	-.0348989 (-0.89)
Constant	-.3809554*** (-5.02)	-.3387821*** (-3.72)	-.3008482*** (-3.36)	Constant	-1.195171** (-2.23)	-1.458838* (-1.79)	-.6261507** (-2.59)
Overall R^2	0.1579	0.1603	0.1528	Overall R^2	0.2029	0.2130	0.2784
# of observations	1392	1327	1244	# of observations	1477	1410	1308

Table 5:

The relation between excess return and NTC (Model 1) – Subsample of observations with positive NTC

This table shows the regression output for testing Hypothesis 1. This table reports results for the data set, which only includes companies with positive values of Net Trade Cycle (NTC). The dependent variable excess return is regressed on NTC and several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Full data set	Drop 5% outliers	Drop 10% outliers	Variables	Full data set	Drop 5% outliers	Drop 10% outliers
NTC	-.0006781* (-1.97)	-.0017208** (-2.05)	-.0023409** (-2.55)	NTC	-.0027437 (-1.04)	-.0019051 (-0.97)	-.0023076 (-1.19)
Size	.0962363*** (5.54)	.0834624*** (5.03)	.0825655*** (4.82)	Size	.7034745*** (3.51)	.4288208*** (3.78)	.4539541*** (3.11)
Δ Sales	.1577865*** (2.65)	.1419667** (2.51)	.1614403*** (2.84)	Δ Sales	-.4158858 (-0.43)	-.3544326 (-0.42)	.6303147*** (3.03)
Δ EBITDA	.234385** (2.05)	.1782213* (1.74)	.1551123 (1.52)	Δ EBITDA	3.586489 (1.52)	2.884008 (1.56)	.7588279** (2.07)
Δ FA	.3220754*** (3.87)	.3375811*** (4.05)	.3170981*** (3.54)	Δ FA	2.820764* (1.75)	2.493007* (1.82)	.9031938*** (2.75)
Lev	-.0946955*** (-3.36)	-.0986233*** (-3.19)	-.0782539*** (-2.69)	Lev	-.8750383*** (-2.83)	-1.185173** (-2.09)	-.5088492*** (-6.75)
Risk	.004641*** (2.68)	.0041716** (2.36)	.0042782** (2.36)	Risk	.0083402* (1.72)	.0110816* (1.89)	.0060229 (1.26)
Δ R&D	.4193324 (0.27)	.3742985 (0.23)	.9379838 (0.47)	Δ R&D	5.571628 (0.98)	7.298428 (1.33)	1.796448 (0.49)
Δ Div	-.6022057 (-1.06)	-.6836104 (-1.18)	-.7818716 (-1.35)	Δ Div	3.505722 (0.94)	1.259933 (0.60)	-.5177002 (-0.40)
Δ Cash	.4044795* (1.74)	.419769* (1.71)	.415394 (1.57)	Δ Cash	-1.292467 (-0.73)	.2758791 (0.33)	.8612313 (1.32)
GDP	.0103831** (2.20)	.0086609* (1.85)	.0095477** (2.01)	GDP	.0045222 (0.24)	-.0218585 (-0.92)	.0062682 (0.62)
IR	.013774* (1.66)	.0130254 (1.58)	.0133664 (1.57)	IR	.0008614 (0.02)	-.06099 (-1.50)	-.0269412 (-0.65)
Constant	-.3399535*** (-4.35)	-.2265761** (-2.53)	-.2093864** (-2.24)	Constant	-.9919772*** (-2.93)	-.459831 (-1.50)	-.6226889** (-2.34)
Overall R^2	0.1955	0.1837	0.1689	Overall R^2	0.2309	0.2601	0.3035
# of observations	1280	1238	1173	# of observations	1301	1256	1189

Table 6:

The relation between excess return and NTC (Model 1)
– Subsample of observations with negative NTC

This table shows the regression output for testing Hypothesis 1. This table reports results for the data set, which only includes companies with negative values of Net Trade Cycle (NTC). The dependent variable excess return is regressed on NTC and several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Full data set	Drop 5% outliers	Drop 10% outliers	Variables	Full data set	Drop 5% outliers	Drop 10% outliers
NTC	.0005997*** (4.58)	.0050511 (0.88)	.02478 (1.02)	NTC	.0002501 (1.07)	.0027898 (0.43)	.0130187 (0.57)
Size	.2011103** (2.55)	.2299821*** (3.14)	.2426774** (2.48)	Size	.6166724*** (7.02)	.6473517*** (6.60)	.6399984*** (5.85)
Δ Sales	-.1412433 (-0.80)	-.1295767 (-0.65)	-.2561719 (-1.03)	Δ Sales	-.274669 (-0.95)	-.2249153 (-0.79)	-.1641354 (-0.45)
Δ EBITDA	.5763058 (1.12)	.2209903 (0.50)	.2160696 (0.59)	Δ EBITDA	1.238089** (2.54)	.9506748** (2.05)	.727835 (1.49)
Δ FA	-.0078738 (-0.03)	.0160344 (0.06)	-.2812026 (-0.93)	Δ FA	.5441949*** (2.72)	.4992597** (2.23)	.3323356 (1.33)
Lev	.009344 (0.31)	.0005832 (0.01)	.0180211 (0.32)	Lev	-.0336188 (-0.27)	-.1060024 (-0.87)	-.0111505 (-0.07)
Risk	-.0026515 (-0.54)	-.0011324 (-0.15)	.0022732 (0.22)	Risk	-.0061761 (-0.94)	-.0064014 (-0.67)	.0022438 (0.17)
Δ R&D	-3.604744 (-1.28)	-1.927637 (-0.80)	16.56892* (2.03)	Δ R&D	-.1057068 (-0.03)	-1.838237 (-0.29)	47.50619** (2.44)
Δ Div	-4.141039 (-1.05)	-4.249271 (-1.06)	-3.914262 (-1.00)	Δ Div	-4.128829* (-1.97)	-3.718174* (-1.78)	-3.776025* (-1.90)
Δ Cash	-.8038464* (-1.71)	-1.056123** (-2.65)	-.883686** (-2.32)	Δ Cash	-.9215208 (-0.95)	.3248174 (0.37)	.7167575 (0.67)
GDP	.0225779 (0.98)	.006555 (0.38)	.0300816 (1.39)	GDP	-.003254 (-0.13)	-.0216368 (-1.13)	-.0046395 (-0.17)
IR	.088882* (1.91)	.1230865** (2.23)	.1286958* (1.76)	IR	.0739967 (1.60)	.087077 (1.62)	.0364346 (0.57)
Constant	-.1048488 (-0.35)	-.423531 (-1.28)	-.5623237 (-1.28)	Constant	-.3038431 (-0.99)	-.3511003 (-1.10)	-.6850684 (-1.39)
Overall R^2	0.0068	0.0880	0.1907	Overall R^2	0.1314	0.1678	0.2227
# of observations	111	88	70	# of observations	175	153	118

As an alternative methodology to test Hypothesis 1, we run regressions using change in NTC as independent variable (based on Model 2). This variable is calculated by Equation (8) (i.e., $Change\ in\ NTC_t = NTC_t$- NTC_{t-1}). With this specification, we focus on the effect of changes in NTC instead of viewing the levels of NTC. Three regressions are reported next to each other in Table 7: The first regression only includes the change variable (Model 2), the second adds the lagged term of NTC (Model 3), and the third one introduces an interaction term between the two variables (i.e., an interaction of one-year lagged NTC and change in NTC) (Model 4). All of these regressions are conducted using the full data set. We can see that the change term does not seem to have a strong effect on excess return. Only for one of the six specifications, the term is significant. Once added, lagged NTC takes a strongly negative and significant coefficient. This indicates that levels of NTC have a negative effect on excess return. However, once we add the interaction term, lagged NTC becomes insignificant. Instead, the interaction term has a negative coefficient and is highly significant for the regression with Excess Return 1. This indicates that a positive level of NTC makes adding further NWC less attractive while companies with negative NTCs benefit from additional investment in NWC.

In order to unveil further insights, we split the sample into those observations with positive NTC and negative NTC. The former sample does not confirm the hypothesis that adding further NWC is disadvantageous for companies with positive NTCs. The regressions are largely insignificant and have inconsistent mathematical signs as can be seen in Table 8. In Model 4, which includes all three independent variables, the coefficient for the interaction term turns negative and is highly significant for the first return measurement. However, for the second return measurement, the coefficient is positive (although not significant). The negative coefficient makes sense from a theoretical perspective, as the higher lagged NTC is, the less beneficial adding further NWC should be. Still, taking all six regressions into account, the overall evidence for this proposition is low.

The results of the regression with the subsample of observations with negative NTC are displayed in Table 9. It shows that the effect of a change in NTC on excess return is positive and highly significant in Model 2. However, once the lagged NTC is introduced in Model 3, the significance of the coefficient decreases and the lagged NTC seems to have a positive effect (negative NTC * negative coefficient) on excess return. When the interaction term between Change in NTC and lagged NTC is introduced in Model 4, the coefficient of the interaction term is negative as expected. It is very significant for the second return measurement and close to significance at 10% level with a t-value (p-value) of -1.51 (0.138). This suggests that among companies with negative NTC, those with a more negative value of lagged NTC will profit more from an increase in NWC.

To summarize, regressions using all companies, do not provide the expected results. NWC does not seem to be negatively associated with excess return in general. However, when splitting up the sample into those companies with positive and negative NTC, we receive some support for the idea that NWC tends to have a positive effect on companies with negative NTC and a negative effect on companies with positive NTC. However, the significance of these results depends on the measurement of excess return.

Table 7:

The relation between excess return and change in NTC (Model 2, 3 & 4) - Full sample

This table shows the regression output for testing Hypothesis 1. The dependent variable excess return is regressed changes in NTC (Model 1), changes in NTC and lagged NTC (Model 2), changes in NTC, lagged NTC and an interaction term between changes in NTC & lagged NTC (Model 4) as well as several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Change in NTC (Model 2)	Change & Level (Model 3)	Change, Level & Interaction (Model 4)	Variables	Change in NTC (Model 2)	Change & Level (Model 3)	Change, Level & Interaction (Model 4)
Δ NTC	.0000359 (0.79)	1.57e-07 (0.01)	-.0000138 (-0.70)	Δ NTC	.0000959 (1.01)	.0000472* (1.79)	.0000338 (1.26)
NTC_{t-1}		-.0003616*** (-4.95)	.0001117 (0.51)	NTC_{t-1}		-.0004954** (-2.31)	-.000044 (-0.11)
Δ NTC* NTC_{t-1}			-1.34e-07*** (-2.82)	Δ NTC* NTC_{t-1}			-1.27e-07 (-1.02)
Size	.1013695*** (6.22)	.0993436*** (6.07)	.1014386*** (6.17)	Size	.6716519*** (3.75)	.6686986*** (3.71)	.6708535*** (3.74)
Δ Sales	.1469968** (2.35)	.148304** (2.35)	.1472365** (2.34)	Δ Sales	-.6109699 (-0.53)	-.6092648 (-0.53)	-.6098889 (-0.53)
Δ EBITDA	.3037029** (2.56)	.2884732** (2.40)	.2871065** (2.42)	Δ EBITDA	3.482819 (1.52)	3.462698 (1.51)	3.461028 (1.51)
Δ FA	.2482169*** (3.18)	.2446028*** (3.12)	.2455132*** (3.12)	Δ FA	2.393893* (1.84)	2.388843* (1.83)	2.389493* (1.83)
Lev	-.0831843*** (-3.22)	-.0850796*** (-3.33)	-.0842173*** (-3.26)	Lev	-.5814342*** (-3.66)	-.5848349*** (-3.68)	-.5835596*** (-3.67)
Risk	.0040034** (2.37)	.0043382** (2.58)	.0039372** (2.33)	Risk	.009742 (1.52)	.0102259 (1.62)	.0098166 (1.49)
Δ R&D	.8058919 (0.58)	1.018312 (0.71)	.6652542 (0.49)	Δ R&D	8.19451 (1.14)	8.494074 (1.19)	8.151051 (1.11)
Δ Div	-.7113916 (-1.24)	-.696296 (-1.22)	-.6923048 (-1.21)	Δ Div	3.8766 (0.92)	3.889433 (0.93)	3.902596 (0.93)
Δ Cash	.2246764 (0.94)	.2707128 (1.10)	.2680017 (1.11)	Δ Cash	-.8022344 (-0.69)	-.7374165 (-0.63)	-.740146 (-0.63)
GDP	.0116465** (2.54)	.0110387** (2.42)	.0109594** (2.40)	GDP	.0050706 (0.26)	.0042222 (0.22)	.0041247 (0.21)
IR	.0167666** (2.03)	.0161536** (1.99)	.0182915** (2.24)	IR	-.0379675 (-1.25)	-.0387546 (-1.27)	-.0367431 (-1.19)
Constant	-.3765252*** (-4.97)	-.365824*** (-4.83)	-.4058936*** (-5.32)	Constant	-1.204243** (-2.35)	-1.188394** (-2.30)	-1.226253** (-2.48)
Overall R^2	0.1613	0.1393	0.0224	Overall R^2	0.2199	0.2164	0.1861
# of observations	1381	1381	1381	# of observations	1332	1332	1332

Table 8:

The relation between excess return and change in NTC (Model 2, 3 & 4) - Subsample of observations with positive one-year lagged NTC

This table shows the regression output for testing Hypothesis 1. This table reports results for the data set, which only includes companies with positive values of lagged Net Trade Cycle (NTC). The dependent variable excess return is regressed changes in NTC (Model 1), changes in NTC and lagged NTC (Model 2), changes in NTC, lagged NTC and an interaction term between changes in NTC & lagged NTC (Model 4) as well as several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Change in NTC (Model 2)	Change & Level (Model 3)	Change, Level & Interaction (Model 4)	Variables	Change in NTC (Model 2)	Change & Level (Model 3)	Change, Level & Interaction (Model 4)
Δ NTC	-7.64e-06 (-0.41)	-9.02e-06 (-0.48)	1.13e-06 (0.09)	Δ NTC	.00002 (1.04)	.0000253 (0.84)	.0000143 (0.43)
NTC_{t-1}		.0001007 (0.53)	-.000115 (-0.50)	NTC_{t-1}		-.0003737 (-0.35)	-.0001375 (-0.12)
Δ NTC* NTC_{t-1}			-2.77e-07*** (-3.15)	Δ NTC* NTC_{t-1}			2.99e-07 (1.10)
Size	.0938113*** (5.31)	.0940445*** (5.33)	.0939671*** (5.31)	Size	.7368357*** (3.43)	.4312136*** (4.08)	.7359935*** (3.45)
Δ Sales	.1327964** (2.04)	.1321198** (2.02)	.1320921** (2.02)	Δ Sales	-.5803364 (-0.51)	.0278152 (0.11)	-.578048 (-0.51)
Δ EBITDA	.2742222** (2.14)	.2748839** (2.15)	.2723591** (2.12)	Δ EBITDA	3.738167 (1.47)	1.02831** (2.39)	3.738562 (1.47)
Δ FA	.280069*** (3.52)	.2811058*** (3.52)	.2800788*** (3.51)	Δ FA	2.305968* (1.89)	-.2803892 (-0.60)	2.303411* (1.90)
Lev	-.0911324*** (-3.06)	-.0911886*** (-3.06)	-.0900704*** (-3.03)	Lev	-.5256777*** (-5.18)	-.0962005* (-1.87)	-.5268161*** (-5.19)
Risk	.0050786*** (2.92)	.0050216*** (2.88)	.004948*** (2.84)	Risk	.0133198* (1.75)	-.0075858 (-1.36)	.0136278* (1.68)
Δ R&D	1.38659 (0.82)	1.347479 (0.81)	1.360358 (0.81)	Δ R&D	10.06842 (1.20)	-3.795072 (-0.79)	10.20884 (1.17)
Δ Div	-.7204952 (-1.12)	-.7210586 (-1.12)	-.7159602 (-1.12)	Δ Div	5.262443 (1.04)	2.175054* (1.90)	5.253996 (1.04)
Δ Cash	.3589178 (1.50)	.3586278 (1.50)	.3792111 (1.57)	Δ Cash	-1.149643 (-0.80)	.1675909 (0.42)	-1.171399 (-0.81)
GDP	.0119663** (2.48)	.012003** (2.49)	.0118198** (2.44)	GDP	.0141027 (0.71)	-.0196944 (-0.81)	.0141797 (0.71)
IR	.0116254 (1.38)	.0117973 (1.40)	.0121616 (1.45)	IR	-.0297705 (-0.92)	.0759021 (1.22)	-.0307346 (-0.95)
Constant	-.4064474*** (-5.11)	-.4131413*** (-5.17)	-.3940673*** (-4.83)	Constant	-1.528673** (-2.28)	-.4930087 (-1.63)	-1.525335** (-2.44)
Overall R^2	0.1955	0.1954	0.1945	Overall R^2	0.2249	0.0570	0.2246
# of observations	1280	1280	1280	# of observations	1237	94	1237

Table 9:

The relation between excess return and change in NTC (Model 2, 3 & 4)
- Subsample of observations with negative one-year lagged NTC

This table shows the regression output for testing Hypothesis 1. This table reports results for the data set, which only includes companies with negative values of lagged Net Trade Cycle (NTC). The dependent variable excess return is regressed changes in NTC (Model 1), changes in NTC and lagged NTC (Model 2), changes in NTC, lagged NTC and an interaction term between changes in NTC & lagged NTC (Model 4) as well as several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Change in NTC (Model 2)	Change & Level (Model 3)	Change, Level & Interaction (Model 4)	Variables	Change in NTC (Model 2)	Change & Level (Model 3)	Change, Level & Interaction (Model 4)
Δ NTC	.0007569*** (8.74)	.0000987 (0.33)	7.45e-06 (0.03)	Δ NTC	.0012982*** (14.18)	.0010795* (1.70)	.0008785 (1.35)
NTC_{t-1}		-.0005556** (-2.57)	.0000585 (0.16)	NTC_{t-1}		-.0001845 (-0.38)	.0011581** (2.11)
Δ NTC* NTC_{t-1}			-1.42e-07 (-1.51)	Δ NTC* NTC_{t-1}			-3.12e-07*** (-3.45)
Size	.1128131** (2.46)	.1192731** (2.69)	.121225*** (2.78)	Size	.429692*** (4.05)	.4312136*** (4.08)	.4375165*** (4.22)
Δ Sales	.0932443 (0.96)	.0830454 (0.81)	.08039 (0.78)	Δ Sales	.0322223 (0.12)	.0278152 (0.11)	.0112817 (0.04)
Δ EBITDA	.3316787 (1.50)	.3610644 (1.57)	.3949416 (1.62)	Δ EBITDA	1.017847** (2.43)	1.02831** (2.39)	1.105697** (2.44)
Δ FA	-.2873724 (-1.16)	-.2902307 (-1.22)	-.3060476 (-1.30)	Δ FA	-.2791622 (-0.60)	-.2803892 (-0.60)	-.3117266 (-0.69)
Lev	-.0388262 (-0.99)	-.0369688 (-0.83)	-.0357418 (-0.78)	Lev	-.0963598* (-1.87)	-.0962005* (-1.87)	-.0923137* (-1.86)
Risk	-.0046898** (-2.32)	-.0051653** (-2.15)	-.0070123*** (-3.23)	Risk	-.0074382 (-1.33)	-.0075858 (-1.36)	-.0116286** (-2.44)
Δ R&D	-1.103158 (-0.44)	-.9636486 (-0.38)	-3.396776 (-1.21)	Δ R&D	-3.843202 (-0.78)	-3.795072 (-0.79)	-9.147476*** (-2.85)
Δ Div	1.167912 (1.67)	1.085686* (1.74)	1.126208* (1.83)	Δ Div	2.196213* (1.90)	2.175054* (1.90)	2.256083* (2.00)
Δ Cash	-.8973879*** (-3.59)	-.9518722*** (-4.40)	-1.016343*** (-5.28)	Δ Cash	.1883674 (0.47)	.1675909 (0.42)	.0239696 (0.06)
GDP	-.005393 (-0.48)	-.0060693 (-0.55)	-.0084261 (-0.83)	GDP	-.0194244 (-0.82)	-.0196944 (-0.81)	-.0250547 (-1.11)
IR	.0445229 (1.62)	.0668925** (2.23)	.074562** (2.33)	IR	.0683242 (1.06)	.0759021 (1.22)	.0934556 (1.39)
Constant	-.1042759 (-0.83)	-.1552766 (-1.12)	-.2071796 (-1.50)	Constant	-.4771858 (-1.59)	-.4930087 (-1.63)	-.6439458** (-2.55)
Overall R	0.0148	0.0275	0.0006	Overall R	0.0540	0.0570	0.0011
# of observations	99	99	99	# of observations	94	94	94

5.2 The existence of optimal level of NWC

To test Hypothesis 2, we first examine the relation of Excess Return and Excess NWC. As can be seen in Table 10, the coefficient for Excess NWC is negative in each specification as expected, which means that stock return is negatively correlated with excess NWC. However, it is significant only when using Excess Return 1 and without dropping extreme Excess NWC values. In the other five cases, Excess NWC has no statistically significant impact on excess return. This result indicates that higher excess NWC is associated with lower excess returns, although the relation is not robust. One reason for this is the limited observations in our sample. Another explanation could be that the negative and positive excess NWC have different effects on excess return.

As described above, one possible reason that the results are not significant could be that positive and negative excess NWC have different effects on excess return. To solve this problem, a dummy D is introduced in regression of Model 6, which allows us to differentiate the effects of positive and negative excess NWC. Below, Table 11 shows that the coefficient for companies with above industry median NWC-to-sales ratios is negative in each regression. However, the results are more significant when using Excess Return 1. For companies with negative excess NWC, the results are mixed. Using the full data set, the coefficient is as expected positive. Still, the more data is dropped, the lower the coefficient turns. This finding indicates that the positive relation between negative excess NWC and stock performance is, as expected, particularly strong for companies with very low excess NWC. Once the companies with the lowest 10% of Excess NWC are dropped, this positive relation disappears and the negative implications of NWC prevail.

Alternatively, as a robustness test, we run regression based on Model 7, which includes NTC and the square term of it. Results are reported in Table 12. However, it doesn´t give the expected results. In five out of six specifications, the coefficient for NTC remains negative, always being insignificant. The square term is positive in four out of six specifications and significant only in one regression. This result is different from what we expected. It indicates that higher NWC is initially detrimental for stock performance. For companies with very high levels of NWC, more NWC results in higher return, because the effect of NTC^2 increase exponentially with the level of NTC, which seems rather counterintuitive. However, the economic significance is of this coefficient is rather low.

In summary, the results from Model 5 & 6 do not provide strong evidence that the industry median level is the optimum level of NWC. Model 7, which does not assume the industry median to be the optimum level, also does not provide an optimum level of NWC. This is not consistent with findings from previous researches (Aktas et al. (2015); Baños-Caballero et al. (2014)). Although Fig. 3 reports differences across industries, industry median might not be a good proxy for the optimum level of NWC. Also, Model 7 also seems to be suboptimal, as it does not take industry effects into account although Figure 3 shows large differences across industries. Potentially, industry has an effect on the optimum level of NWC without the industry median being the optimum level. Due to the limited number of observations, we are not able to test this hypothesis.

Table 10:

The relation between excess return and excess NWC (Model 5)

This table shows the regression output for testing Hypothesis 2. The dependent variable excess return is regressed on excess NWC and several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Full data set	Drop 5% outliers	Drop 10% outliers	Variables	Full data set	Drop 5% outliers	Drop 10% outliers
Excess NWC	-.1979263* (-1.91)	-.3395662 (-1.18)	-.5503887 (-1.25)	Excess NWC	-.093006 (-0.53)	-.2480081 (-0.53)	-.1996854 (-0.29)
Size	.1015236*** (6.17)	.0796814*** (4.28)	.0837537*** (4.14)	Size	.6714856*** (3.74)	.2866866*** (10.08)	.3211673*** (9.53)
Δ Sales	.1420794** (2.25)	.158161*** (2.73)	.1842191*** (2.94)	Δ Sales	-.6106541 (-0.53)	.4427721*** (3.53)	.4775061*** (3.40)
Δ EBITDA	.2872702** (2.40)	.2076848* (1.80)	.2820016** (2.20)	Δ EBITDA	3.46156 (1.53)	.5291522*** (2.66)	.6332893*** (2.79)
Δ FA	.2518837*** (3.23)	.2364682** (2.49)	.2662578** (2.54)	Δ FA	2.39339* (1.84)	.5290025*** (3.57)	.6840652*** (4.14)
Lev	-.0834355*** (-3.21)	-.0867503*** (-3.31)	-.0944424*** (-3.00)	Lev	-.5872282*** (-3.64)	-.4545878*** (-8.81)	-.5057475*** (-8.75)
Risk	.0041069** (2.40)	.0047183*** (2.63)	.0035565** (2.05)	Risk	.0100122 (1.53)	.0103665*** (2.74)	.0069252** (2.07)
Δ R&D	.5787116 (0.41)	.7254549 (0.41)	.8717437 (0.44)	Δ R&D	7.971677 (1.11)	3.606855 (1.14)	1.782215 (0.46)
Δ Div	-.7112564 (-1.24)	-.8922213 (-1.50)	-1.218089* (-1.92)	Δ Div	3.900897 (0.93)	-1.4907 (-1.31)	-1.830992 (-1.52)
Δ Cash	.2472271 (1.05)	.2379382 (0.85)	.1476806 (0.47)	Δ Cash	-.7719737 (-0.67)	1.272265*** (3.06)	1.268605*** (2.89)
GDP	.0129585*** (2.67)	.009564** (2.01)	.0066129 (1.33)	GDP	.0057473 (0.30)	-.0030232 (-0.34)	-.0007588 (-0.08)
IR	.0172117** (2.11)	.0113928 (1.33)	.0139326 (1.59)	IR	-.0376865 (-1.24)	-.0784084*** (-4.67)	-.0660773*** (-3.80)
Constant	-.3865998*** (-5.06)	-.3651604*** (-4.43)	-.3251381*** (-3.89)	Constant	-1.216663** (-2.35)	-.5404423*** (-3.54)	-.4781634*** (-3.24)
Overall R	0.1604	0.1420	0.1421	Overall R	0.2195	0.3148	0.3093
# of observations	1392	1254	1114	# of observations	1343	1213	1077

Table 11:

The relation between excess return and excess NWC (Model 6) - NWC Dummies

This table shows the regression output for testing Hypothesis 2. The dependent variable excess return is regressed on excess NWC and several control variables. The excess return is multiplied by a dummy which indicates if the observation has positive or negative excess NWC. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Full data set	Drop 5% outliers	Drop 10% outliers	Variables	Full data set	Drop 5% outliers	Drop 10% outliers
Excess NWC*D	-.1439471** (-2.14)	-.6805598* (-1.73)	-.9876171 (-1.63)	Excess NWC*D	-.0558744 (-0.27)	-.5231312 (-0.75)	-.1941387 (-0.24)
Excess NWC*(1-D)	.0140994 (1.05)	.0425369 (0.08)	-.0401519 (-0.04)	Excess NWC*(1-D)	.0160091** (2.10)	.0638756 (0.07)	-.2062422 (-0.15)
Size	.1025415*** (6.20)	.0791121*** (4.27)	.0832845*** (4.14)	Size	.6721177*** (3.76)	.2863064*** (10.07)	.3211717*** (9.56)
Δ Sales	.1424027** (2.26)	.1568818*** (2.71)	.1823957*** (2.91)	Δ Sales	-.6101791 (-0.53)	.4415615*** (3.51)	.4775315*** (3.39)
Δ EBITDA	.2872621** (2.40)	.2058012* (1.78)	.2825617** (2.21)	Δ EBITDA	3.461299 (1.53)	.5274394*** (2.65)	.6332878*** (2.79)
Δ FA	.2532483*** (3.24)	.2397688** (2.51)	.2672218** (2.54)	Δ FA	2.394187* (1.84)	.5319421*** (3.57)	.6840461*** (4.12)
Lev	- .0823346*** (-3.16)	-.085443*** (-3.31)	-.0918605*** (-2.94)	Lev	- .5864526*** (-3.64)	-.4536475*** (-8.82)	-.5057763*** (-8.69)
Risk	.0038936** (2.27)	.0046875*** (2.64)	.0034932** (2.04)	Risk	.0098819 (1.51)	.0103434*** (2.75)	.006926** (2.08)
Δ R&D	.6232902 (0.45)	.6513672 (0.37)	.7631375 (0.39)	Δ R&D	7.992216 (1.12)	3.549867 (1.11)	1.783567 (0.46)
Δ Div	-.7056226 (-1.23)	-.8991421 (-1.51)	-1.232822* (-1.94)	Δ Div	3.904553 (0.93)	-1.493497 (-1.31)	-1.830873 (-1.52)
Δ Cash	.2469192 (1.05)	.2335034 (0.83)	.1434804 (0.45)	Δ Cash	-.7739188 (-0.68)	1.268591*** (3.04)	1.268657*** (2.88)
GDP	.0129312*** (2.69)	.0093139** (1.98)	.006321 (1.29)	GDP	.005733 (0.30)	-.0031974 (-0.37)	-.0007554 (-0.08)
IR	.0178162** (2.19)	.0111345 (1.31)	.0138642 (1.58)	IR	-.0375014 (-1.22)	-.0785982*** (-4.68)	-.0660762*** (-3.80)
Constant	- .3682198*** (-4.81)	-.3376953*** (-4.33)	-.2957569*** (-3.67)	Constant	-1.206746** (-2.36)	-.5184013*** (-3.57)	-.4785337*** (-3.32)
Overall R	0.1568	0.1411	0.1408	Overall R	0.2195	0.3150	0.3093
# of observations	1392	1254	1114	# of observations	1343	1213	1077

Table 12:

The relation between excess return and NTC and NTC² (Model 7) – Subsample of observations with positive NTC

This table shows the regression output for testing Hypothesis 2. The dependent variable excess return is regressed on Net Trade Cycle (NTC) and the squared term of NTC as well as several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Excess Return 1 - BMV & size adjusted				Excess Return 2 - CAPM adjusted			
Variables	Full data set	Drop 5% outliers	Drop 10% outliers	Variables	Full data set	Drop 5% outliers	Drop 10% outliers
NTC	-.0005891 (-1.41)	-.0028272 (-1.35)	.0002235 (0.08)	NTC	-.0044217 (-1.20)	-.0129887* (-1.74)	-.0053478 (-0.51)
NTC^2	-6.60e-08 (-0.45)	6.62e-06 (0.52)	-.0000192 (-0.95)	NTC^2	1.17e-06 (1.43)	.0000673* (1.68)	.0000229 (0.32)
Size	.0964273*** (5.54)	.0831348*** (5.04)	.0829646*** (4.81)	Size	.6998206*** (3.54)	.4258454*** (3.81)	.4534048*** (3.14)
Δ Sales	.1579387*** (2.66)	.1422616** (2.52)	.1599458*** (2.83)	Δ Sales	-.4192192 (-0.43)	-.3513892 (-0.42)	.6318222*** (3.00)
Δ EBITDA	.2352261** (2.06)	.1792091* (1.75)	.1526519 (1.50)	Δ EBITDA	3.571829 (1.53)	2.897683 (1.57)	.7617987** (2.05)
Δ FA	.3216882*** (3.86)	.3365131*** (4.03)	.3192538*** (3.54)	Δ FA	2.828939* (1.75)	2.479601* (1.82)	.9008016*** (2.80)
Lev	- .0944138*** (-3.34)	-.0983877*** (-3.17)	-.0770726*** (-2.66)	Lev	-.8786766*** (-2.81)	-1.184231** (-2.09)	-.5104936*** (-6.59)
Risk	.0046115*** (2.64)	.0041871** (2.38)	.0042352** (2.36)	Risk	.0088408* (1.79)	.0111854* (1.91)	.0060603 (1.28)
Δ R&D	.4398126 (0.28)	.3855943 (0.23)	.84429 (0.43)	Δ R&D	5.18442 (0.93)	7.410199 (1.35)	1.906127 (0.53)
Δ Div	-.5992104 (-1.05)	-.688833 (-1.19)	-.7728829 (-1.34)	Δ Div	3.448922 (0.93)	1.204018 (0.58)	-.5280423 (-0.41)
Δ Cash	.4078357* (1.75)	.4263744* (1.72)	.4167405 (1.58)	Δ Cash	-1.346214 (-0.75)	.3294184 (0.40)	.8602454 (1.31)
GDP	.0103499** (2.19)	.0087657* (1.88)	.0095311** (2.01)	GDP	.0051246 (0.28)	-.0206117 (-0.88)	.0062556 (0.62)
IR	.0137036 (1.65)	.0129864 (1.58)	.0138601 (1.64)	IR	.0013704 (0.03)	-.0609396 (-1.50)	-.0274323 (-0.68)
Constant	- .3450489*** (-4.44)	-.1907685* (-1.67)	-.27594** (-2.16)	Constant	-.8907253*** (-2.86)	-.1066238 (-0.27)	-.543449** (-2.00)
Overall R	0.1973	0.1847	0.1648	Overall R	0.2264	0.2604	0.3051
# of observations	1280	1238	1173	# of observations	1301	1256	1189

5.3 The effect of interest rate on the relation between NWC and excess return

To test Hypothesis 3, we run the regression based on Model 8 & 9, which introduce the interaction term between NTC (Excess NWC) and interest rate into Model 1 & 5. Table 13 shows the results of the regressions when introducing this interaction term.

The coefficient of the interaction term is - as expected - negative, which is consistent with Hypothesis 3 that a higher interest rate makes higher NWC level less desirable from an excess return perspective. However, again the significance of the results depends on the measurement of excess return. When Excess Return 2 is used, the result is significant at 10% (5%) level in Model 8 (9). When using the first return measurement, the result is not as pronounced.

In Model 9, the results show that under the Excess Return 1 specification, stock performance is negatively associated with both lagged NWC and the interaction term, although the relation with the interaction term is rather weak. To the contrary, when using Excess Return 2, excess NWC has a positive coefficient and a more negative relation appears between the interaction term and excess return.

Summarizing, these results provide some support for Hypothesis 3 and indicate that interest rate affects the relationship between NWC and stock performance - higher interest rates are associated with a stronger negative relation between those two variables.

Table 13:

Regression including interaction term between NWC and interest rate (Model 8 & 9)

This table shows the regression output for testing Hypothesis 2. In regressions on the left side, the dependent variable excess return is regressed on Net Trade Cycle (NTC) and an interaction term of NTC and interest rate as well as several control variables. In the regressions on the right side, the dependent variable excess return is regressed on Excess NWC and an interaction term of Excess NWC and interest rate as well as several control variables. Further information about the dependent and independent variables can be found in Section 4. Observations range from 2006 – 2014 and include Swedish companies listed on the Stockholm Stock Exchange (Nasdaq Stockholm) or Aktietorget.
The values in parentheses (below the coefficients) show the White heteroscedastic-consistent standard errors of that variable (White (1980)). The stars indicate statistical significance, whereby * indicates significance at 10% level, ** significance at 5% level, and *** significance at 1% level.

Independent variable - NTC			Excess Return 2 - CAPM adjusted		
Variable	Excess Return 1 - BMV & size adjusted	Excess Return 2 - CAPM adjusted	Variable	Excess Return 1 - BMV & size adjusted	Excess Return 2 - CAPM adjusted
NTC	.0001326 (1.32)	.0009834* (1.74)	Excess NWC	-.1737096 (-1.15)	.5036875 (1.34)
NTC * Interest Rate	-.0000802 (-1.57)	-.0005031* (-1.95)	NWC * Interest Rate	-.0114207 (-0.28)	-.2926714** (-1.98)
Size	.1032042*** (6.25)	.6711008*** (3.75)	Size	.1015314*** (6.17)	.6713074*** (3.74)
Δ Sales	.1466687** (2.34)	-.6071949 (-0.53)	Δ Sales	.1420009** (2.25)	-.6119963 (-0.54)
Δ EBITDA	.2948089** (2.46)	3.480586 (1.53)	Δ EBITDA	.2878521** (2.41)	3.478309 (1.53)
Δ FA	.2496283*** (3.19)	2.382533* (1.84)	Δ FA	.2514967*** (3.22)	2.382687* (1.85)
Lev	-.0833389*** (-3.19)	-.5868436*** (-3.67)	Lev	-.0833234*** (-3.20)	-.5834638*** (-3.67)
Risk	.0039633** (2.30)	.0101871 (1.54)	Risk	.0041157** (2.40)	.0101443 (1.54)
Δ R&D	.5795771 (0.41)	7.095974 (1.03)	Δ R&D	.5338059 (0.38)	6.771066 (1.00)
Δ Div	-.7101967 (-1.24)	3.874295 (0.92)	Δ Div	-.7121153 (-1.24)	3.87312 (0.92)
Δ Cash	.2346941 (1.00)	-.8001874 (-0.69)	Δ Cash	.2466758 (1.04)	-.7833856 (-0.68)
GDP	.0127244*** (2.63)	.0048803 (0.25)	GDP	.0129651*** (2.67)	.0058162 (0.30)
IR	.0237082*** (2.65)	-.0033939 (-0.10)	IR	.0171942** (2.12)	-.0387587 (-1.28)
Constant	-.3922483*** (-5.10)	-1.285363** (-2.37)	Constant	-.3869251*** (-5.06)	-1.220214** (-2.34)
Overall R	0.1576	0.2203	Overall R	0.1602	0.2197
# of observations	1392	1343	# of observations	1392	1343

6. Conclusion

Several researchers reported a negative relationship between NWC and shareholder wealth in a number of countries including the US, European as well as Asian economies. In this paper, we use a variety of methods to test if this relationship can be confirmed for Swedish listed companies. Our first finding is that for Sweden, we cannot confirm a general negative relationship between NWC and performance. However, we find some indication that for companies with positive values of NWC, NWC seems to be negatively correlated with stock performance. Although not as significant, we find some hints that NWC is positively associated with stock performance for companies with negative levels of NWC.

In this study, we also seek to examine the existence of an optimal level of NWC. To test this hypothesis, we use two methodologies. The first assumes that industry median is the optimal level of NWC. The second does not make assumptions on the optimum level but introduce NTC^2 as variable. However, both methodologies provide mixed results and thus do not support the existence of an optimal level of NWC.

Furthermore, this study is the first to introduce an interaction term between NWC and interest rate. The results suggest that interest rates affect the relationship between NWC and excess return. In times of high interest rates, the expected negative relation of NWC and stock performance is stronger than for periods of low interest rates. Considering strong fluctuations in the interest rate during the last decades and the current (and historically unparalleled) situation of prolonged periods of low interest rates, this finding is relevant for Swedish companies.

7. Limitations and Future Research

However, we understand that there are several limitations in our study.

First, the number of firm-year observations in our sample is relatively low compared to studies conducted in US and UK. On average, we have only 150 firms for each year.

Second, due to limited observations, we have to take the vague industry classification from Nasdaq Stockholm, which also limits our ability to obtain a more accurate measure of Excess NWC to mitigate industry effects.

Third, we are using year-end data to calculate working capital levels. However, for firms with seasonal cycles, especially for those with big sales happening during Christmas season, this methodology gives inaccurate measurement of WCM efficiency and thus leads to potential wrong conclusions.

Fourth, there are different ways for the construction of portfolios and calculation of returns. Fama and French (1992) use the returns from the July of year t to June of year t+1 to make sure that accounting variables are known before the returns used to explain them. We are not able to follow them due to unavailability of data, which might result in an inferior measurement of excess stock return, which is the dependent variable of our regression.

Using a large number of different methodologies, we can also resume that the results vary strongly depending on the methodology used. In this context, it would be interesting for further research, to conduct similar analysis for the US (a country for which several studies on NWC exist) and examine whether previous research deliberately chose methodologies based on the significance of the results or if previous research findings can be confirmed when applying multiple methodologies to the same data.

Contrary to previous studies, we do not conclude that the relationship between NWC and excess return is significantly negative in our sample of Swedish listed companies. Instead, the previous level of NWC influences the relation of NWC level and excess return in the following period. In order to enhance the understanding of the relation, it would be interesting to conduct industry specific analysis. Aktas et al. (2015) observe that there are significant differences in NWC across industries. There might be a relationship between the maturity of an industry and the relationship between NWC and excess return. For companies in growing industries, it is important to convince customers about the advantageousness of the companies' approach, so that their technique becomes the industry standard. Thus, the focus often lies on gaining large market shares (Kutcher et al. (2014)). Moreover, companies in growth industries can typically generate high returns, thus potentially lowering the pressure to optimize their NWC policy (Hooke (2010)). With further maturity of an industry, industry standards establish and changes in the competitive landscape are mainly due to acquisitions and price changes. Since both methods are found to be rather unattractive for firm profitability, return might be lower in mature industries (Horne and Wachowicz (2008), Hooke (2010)). Due to the limited number of observations, this analysis was not possible for the dataset at hand. Results from such an analysis could help companies in getting closer to their individually ideal levels of NWC.

NWC is constituted by the three factors accounts receivable, inventories and accounts payable. These components could also be broken down on a more granular level. Capkun et al. (2009) find that each single component of inventories (raw materials, unfinished goods and finished goods) alone has a negative relationship with profitability. It would be interesting to study the dynamics of this relationship further. For example, it might be that the desirability of inventories is more complex to answer and depends on characteristics specific to each industry or even company such as fluctuations in sales, the flexibility of its supply chain or the cost of changing the quantity of orders.

References

Abrahamson, M., Ridder, A.D. & Råsbrant, J. (2011) Information Asymmetries among European Investors: Evidence from Swedish IPOs. In Oxelheim, L., ed. *13th Annual SNEE (Swedish Network for European Economic Research) Conference. Session F1: European Corporate Finance*. Mölle, Sweden, 2011.

Aktas, N., Croci, E. & Petmezas, D. (2015) Is Working Capital Management Value-Enhancing? Evidence from Firm Performance and Investments. *Journal of Corporate Finance*, 30, pp.98-113.

Angrist, J.D. & Pischke, J.-S. (2008) *Mostly Harmless Econometrics: An Empiricistís Companion*. Princeton University Press.

Autukaite, R. & Molay, E. (2011) Cash Holdings, Working Capital and Firm Value: Evidence from France. *2011 International Conference of the French Finance*.

Baños-Caballero, S., García-Teruel , P. & Martínez-Solano, P. (2014) Working capital management, corporate performance and financial constraints. *Journal of Business Research*, 67, pp.332-38.

Baker, H.K. & Martin, G.S. (2011) *CapitalStructure and Corporate Financing Decisions: Theory, Evidence, and Practice*. John Wiley & Sons.

Bartholdy, J. & Peare, P. (2003) Unbiased Estimation of Expected Return Using CAPM. *International Review of Financial Analysis*, 12, pp.69-81.

Bates, W.T., Kahle, K.M. & Stulz, R.M. (2009) Why Do U.S. Firms Hold So Much More Cash Than They Used To? *The Journal of Finance*, 64, pp.1985-2022.

Bellemare, M.F., Masaki, T. & Pepinsky, T.B. (2015) Lagged Explanatory Variables and the Estimation of Causal Effects. Available at SSRN: http://ssrn.com/abstract=2568724 or http://dx.doi.org/10.2139/ssrn.2568724.

Breusch, T.S. & Pagan, A.R. (1980) The Lagrange Multiplier Test and Its Application to Model Speicification in Econometrics. XLVII, pp.239-53.

Caloghiroua, Y., Protogeroua, A., Spanosb, Y. & Papagiannakisa, L. (2004) Industry-Versus Firm-specific Effects on Performance: Contrasting SMEs and Large-sized Firms. *European Management Journal*, 22(2).

Capkun, V., Hameri, A.-P. & Weiss, L.A. (2009) On the relationship between inventory and financial performance in manufacturing companies. *International Journal of Operations & Production Management*, 29(8), pp.789-806.

Chan, L.K.C., Lakonishok, & Sou,. (2001) The Stock Market Valuation of Research and Development Expenditures. *The Journal of Finance*, 56(6), p.2431–2456.

Chiou, J.-R. & Cheng, L. (2006) The Determinants of Working Capital Management. *The Journal of Ameirican Academy of Business*, 10, pp.149-55.

Coccia, M. (2012) Political Economy of R&D to Support The Modern Competitiveness of Nations and Determinants of Economic Optimization and Inertia. *Technovation*, 32(6), p.370–379.

Cooper, M.J., Gulen, H. & Schill, M.J. (2008) Asset Growth and The Cross-section of Stock Returns. *The Journal of Finance*, 63, p.1609–1651.

Deloof, M. (2003) Does Working Capital Management Affect Profitability of Belgian Firms? *Journal of Business Finance & Accounting*, 30(3), pp.573-87.

DePamphilis, D.M. (2010) *Mergers, Acquisitions, and Other Restructuring Activities: An Integrated Approach to Process, Tools, Cases, and Solutions*. 5th ed. Academic Press.

Dimson, E., Marsh, P. & Staunton, M. (2005) *Global Investment Returns Yearbook 2005*. ABN-AMRO/London Business School.

Duncan, G.J., Magnuson, K.A. & Ludwig, J. (2004) The Endogeneity Problem in Developmental Studies. *Research in Human Development*, 1(1&2), pp.59-80.

Ek, R. & Guerin, S. (2011) Is there a right level of working capital?. *Journal of Corporate Treasury Management*, 4, pp.137-49.

Enqvist, J., Graham, M. & Nikkinen, J. (2014) *The impact of working capital management on firm profitability in different business cycles: Evidence from Finland*. Research in International Business and Finance.

EY. (2009) *All Tied Up: Working Capital Management Report 2009* [Online]. Available from: www.ey.com.

EY. (2015) *All Tied Up: Working Capital Management Report 2015* [Online]. Available from: www.ey.com.

Fabozzi, F.J. (2007) *Fixed Income Analysis*. 2nd ed. Hoboken, New Jersey: John Wiley & Sons.

Fama, E.F. & French, K.R. (1992) The Cross-Section of Expected Stock Return. *The Jounal of Finance*, XLVII, pp.427-65.

Fama, E.F. & French, K.R. (1993) Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33, pp.3-56.

Faulkender, M. & Wang, R. (2006) Corporate Financial Policy and the Value of Cash. *Journal of Finance*, 61(4), pp.1957-90.

Fazzari, S.M., Hubbard, R.G. & Petersen, B.C. (1988) Financing Constraints and Corporate Investment. *Brookings Papers on Economic Activity*, 19(1), pp.141-206.

Fazzari, S.M. & Petersen, B.C. (1993) Working Capital and Fixed Investments: New Evidence on Financing Constraints. *The RAND Journal of Economics*, 24(3), pp.328-42.

Flannery, M.J. & James, C.M. (1984) The Effect of Interest Rate Changes on the Common Stock Returns of Financial Institutions. *The Journal of Finance*, 39(4), pp.1141-53.

García-Teruel, P.J. & Martínez Solano, P. (2007) Effects of Working Capital Management on SME Profitability. *International Journal of Managerial Finance*, 3(2), pp.164-77.

Harris, M. & Raviv, A. (1990) Capital Structure and The Informational Role of Debt. *The Journal of Finance*, 45(2), pp.321-49.

Hawawini, G., Viallet, C. & Vora, A. (1986) Industry Influence on Corporate Working Capital Decisions. *Sloan Management Review*, 27,4.

Hill, M.D., Kelly, G.W. & Highfield, M.J. (2010) Net Operating Working Capital Behavior: A First Look. *Financial Management*, 39(2), pp.783-805.

Hooke, J.C. (2010) *Security Analysis and Business Valuation on Wall Street: A Comprehensive Guide to Today's Valuation Methods*. 2nd ed.

Horne, J.C.V. & Wachowicz, J.M. (2008) *Fundamentals of Financial Management*. 13th ed. Essex, England: Prentice Hall.

Kieschnick, R., LaPlante, M. & Moussawi, R. (2013) Working Capital Management and Shareholder Wealth. *Review of Finance*, 17(5), pp.1827-52.

Kim, C.S., Mauer, D.C. & Sherman, A.E. (1998) The Determinants of Corporate Liquidity: Theory and Evidence. *Financial Quantitative Anal.*, 33(3), pp.335-59.

Kitson, M. & Michie, J. (2015) *The Political Economy of Competitiveness: Corporate Performance and Public Policy*. Abingdon: Routledge.

Kleinbaum, D.G., Kupper, L.L. & Nizam, A. (2007) *Applied Regression Analysis and other Multivariate Methods*. 4th ed. Belmont, CA: Duxbury Press.

Klonowski, D. (2014) *Strategic Entrepreneurial Finance: From Value Creation to Realization*. Routledge.

Kutcher, E., Nottebohm, O. & Sprague, K. (2014) *Grow Fast or Die Slow* [Online]. Available from: http://www.mckinsey.com/industries/high-tech/our-insights/grow-fast-or-die-slow [Accessed 12 May 2016].

Lintner, J. (1965) The length of the period does not matter as long as all the parameters are measured over the same period. *Review of Economics and Statistics*, 47, pp.13-37.

Mayers, S.C. (1984) The Capital Structure Puzzle. *The Journal of Finance*, 39 (3), p.574–592.

Molina, C.M. & Preve, L.A. (2009) Trade Receivables Policy of Distressed Firms and Its Effect on the Costs of Financial Distress. *Financial Management*, 38(3), pp.663-86.

Mukherji ,. (2011) The Capital Asset Pricing Model's Risk-Free Rate. *The International Journal of Business and Finance Research*, 5, pp.75-83.

Petersen, M.A. & Rajan, R.G. (1997) Trade Credit: Theories and Evidence. *Review of Financial Studies*, 10(3), pp.661-91.

Reilly, F. & Wright, D. (1988) A Comparison of Published Betas. *The Journal of Portfolio Management*, 14(3), pp.64-69.

Ribeiro de Almeida, J. & Eid Jr., W. (2014) Access to finance, working capital management and company value: Evidence from Brazilian companies listed on BM & FBOVESPA. *Journal of Business Research*, 67, pp.924-34.

Sharpe, W.F. (1964) Capital Assets Prices: A Theory of Market Equibrium Under Conditions of Risk. *Journal of Finance*, 19, pp.425-42.

Shin, H.-H. & Soenen, L. (1998) Efficiency of Working Capital Management and Corporate Profitability. *Financial Practice & Education*, 8, pp.37-45.

Smith, K. (1980) Profitability Versus Liquidity Tradeoffs in Working Capital Management. In Smith, K. *Readings on The Management of Working Capital*. St. Paul, MN: West Publishing Company. pp.549-62.

Wade, K. & May, A. (2013) *GDP Growth and Equity Market Returns* [Online]. Schroder Investment Management North America Inc Available at: http://www.schroders.com/staticfiles/Schroders/Sites/Americas/US%20Institutional%202011/pdfs/Equity-Returns-and-GDP.pdf.

Yazdanfar, D. & Öhman, P. (2014) The impact of cash conversion cycle on firm profitability An empirical study based on Swedish data. *International Journal of Managerial Finance* , 10, pp.442-452.

Appendix: Definition of Variables

Excess Return 1: Raw return of the firm minus value-weighted return of the benchmark portfolio formed based on BMV and size.

Excess Return 2: Raw return of the firm minus the expected return estimated based on CAPM

$NTC_{i,t}$: Net Trade Cycle, defined as

$$(Inventory_{i,t} + Account\ Receivable_{i,t} - Account\ Payable_{i,t})/\ (Sales_{i,t})*365.$$

$Excess\ NWC_{i,t}$: firm's NWC-to-sales ratio minus industry-median NWC-to-sales ratio

$Size_{i,t}$: last year´s value for sales standardized by last year's market capitalization.

$$\frac{Sales_{t-1}}{MC_{t-1}}$$

$\Delta Sales_{i,t}$: one-year growth in sales standardized by last year's market capitalization.

$$\frac{Sales_t - Sales_{t-1}}{MC_{t-1}}$$

$\Delta EBITDA_{i,t}$: one-year growth in EBITDA standardized by last year market capitalization.

$$\frac{EBITDA_t - EBITDA_{t-1}}{MC_{t-1}}$$

$\Delta FA_{i,t}$: one-year growth in fixed assets standardized by last year's market capitalization.

$$\frac{FA_t - FA_{t-1}}{MC_{t-1}}$$

$Lev_{i,t}$: leverage, defined as book value of debt over market capitalization in the end of year (t).

$$\frac{BV\ of\ Debt_t}{MC_t}$$

$\Delta C_{i,t}$: one-year growth in cash reserves standardized by last year's market capitalization.

$$\frac{C_t - C_{t-1}}{MC_{t-1}}$$

$\Delta R\&D_{i,t}$: one-year growth in R&D expenditure standardized by last year's market capitalization

$$\frac{R\&D_t - R\&D_{t-1}}{MC_{t-1}}$$

$\Delta Div_{i,t}$: one-year growth in dividends standardized by last year's market capitalization.

$$\frac{Div_t - Div_{t-1}}{MC_{t-1}}$$

$\Delta Risk_{i,t}$: calculated as the average daily stock volatility during year (t).

IR_t: averaged annual rate of 6-month Treasury Bill in Sweden during year (t).

GDP_t: GDP growth rate in Sweden during year (t).