Working capital management and corporate profitibality

Auteur : Santkin, Hugues
Promoteur(s) : Lambert, Marie
Faculté : HEC-Ecole de gestion de l'Université de Liège
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WORKING CAPITAL MANAGEMENT AND CORPORATE PROFITABILITY

Jury:
Promoter:
Marie LAMBERT
Readers:
Maxime LEDENT
Pierre-Armand MICHEL

Dissertation by
Hugues SANTKIN
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ABSTRACT

Despite its importance, working capital management is certainly not the most covered topic in corporate finance theory. In the nineties, researchers started to study the relationship between working capital management and corporate profitability with the aim of determining the adequate working capital strategy to maximize profits. To do so, regression models were used where profitability was set as the dependent variable and working capital management as the exogenous variable. In most researches, these models showed a negative relationship between working capital management and corporate profitability and stated that an optimal level of working capital existed in order to maximize the profitability. This research will apply the same methodology using regression models to determine the optimal level of working capital for a sample of non-financial Belgian firms. The specific impact of industries, business cycle phases and being publicly quoted will also be assessed. The results show an inverted U-shape type of linkage between working capital management and corporate profitability, comforting the existence of an optimal level of working capital and hold for most of the industries considered. Business cycle phases and ownership nature also seem to impact the aforementioned relationship.

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1. INTRODUCTION

Financial management has been extensively covered in the scientific literature. However, despite the widely accepted fact that its efficient management leads to greater corporate profitability (Shin and Soenen, 1998) and the amount of time managers are engaged with it, working capital management is far from being the most covered topic (Wang, 2002; Chang, 2018). This is even truer in Belgium where only a few researches were conducted and only one has been dealing with the relationship between corporate profitability and working capital management (Deloof, 2003).

The genesis of all the researches on working capital management is the duality it implies between liquidity and profitability. Decisions expected to maximize profitability will be detrimental for the liquidity position and inversely (Shin and Soenen, 1998). This study will focus on the profitability that could be generated from an efficient working capital management rather than analysing the risks inherent to liquidity management. To understand the influence of working capital management on corporate profitability, it is interesting to analyse the individual impacts of three of its components: the account receivables, the inventory and the account payables. To grant trade credits to customers can increase the level of sales for a company but on the other hand, it also increases the risk to encounter doubtful receivables and harms the profitability. Holding a high level of inventory can prevent seasonality, unexpected demand or supply fluctuations but it may reduce profitability because of the greater number of unsold items, depreciation or obsolescence. Increasing the number of account payables can constitute a mean of financing when the firm does not have access to advantageous bank loans but it may also hurt profitability because of missed opportunities to benefit from discounts granted for early payments. All these questions need to be answered with working capital management and this quick overview of the balance to be found between liquidity and profitability transcribes the challenges faced by the short-term assets managers.

On that matter, several authors have carried out studies across the world to determine the nature of the linkage between working capital management and corporate profitability using several different measures for working capital management as well as for corporate profitability thus providing eclectic reference papers for this study. Even though pioneering works were conducted in well-developed countries (Shin and Soenen, 1998; Wang, 2002; Deloof, 2003), these seminal studies were quickly followed by others whose attention was drawn to developing

countries (Mathuva, 2010; Tahir and Anuar, 2016; Bhatia and Srivastava, 2016; Jakpar et al., 2017).

Most of the studies found a negative relationship between working capital management and corporate performance and this, whatever the proxies used to measure both variables. Moreover, it seems that this trend is independent of the geographic location of the firms studied.

With account receivables and inventory accounting respectively for 22.84% and 9.51% of Belgian companies' total assets and account payables representing a financing mean up to 6.08% of the Belgian companies' total liabilities in 2015[1], it appears that working capital management is a key driver of corporate performance or at least a component that must be considered while determining the sources of profitability for Belgian firms.

By applying the same methodology than previous authors[2], this study attempts to determine empirically the nature of the relationship between working capital management and corporate profitability based on a large sample of Belgian non-financial firms. This study aims to contribute in multiple ways to the existing literature on this topic. First, as mentioned earlier, the literature focusing on Belgian firms is scarce and the last known publication dates to 2003. This study could serve as an update of previous works. Secondly, researches have been conducted only on aggregated samples with no differentiation between industries in Belgium. This study will alleviate this lack of differentiation by examining the influence of different major industries on the relationship between working capital management and corporate profitability. Then, another angle of differentiation will be analysed to determine if being publicly listed on the stock market has an impact on the linkage between working capital management and corporate profitability. Finally, the effect of exogenous economic factors will be assessed by analysing the effect of business cycle phases on the aforementioned linkage. All these empirical analyses are conducted with the hypothesis that the relationship between working capital management and corporate profitability takes the form of an inverted U-shape (Baños-Caballero, García-Teruel and Martínez-Solano, 2014). If this assumption proves to be true on a sample of Belgian non-financial firms, the computation of an optimal working capital level for this sample will be feasible, which is unprecedented in Belgium.

This empirical study will be structured as follows. First, a literature review will provide the readers with information about the evolution of the concept of working capital and its

[1] Data retrieved from the database of the National Bank of Belgium on the 26th July 2018.
[2] See the literature review section for further information.

measurements. This section also contains a comprehensive review of all the relevant past researches carried out on the relationship between working capital management and corporate profitability. The following section, rounding up all the elements pertaining to the empirical study, will be divided into several sub-sections. The first will describe the methodology used. This latter encompasses the way data was gathered, the choice of variables used in the models and their definition as well as all the regression models' equations. This sub-section will also explain the method used to control for multicollinearity issues. Thereafter, the following sub-section will display and analyse the summary statistics, the correlation matrices and the several outcomes of the regression models. Finally, the last section will provide concluding remarks as well as the key findings of this study.

2. LITERATURE REVIEW

2.1. Evolution of the working capital concept

For a long time, working capital was only defined from a financial analysis point of view as the difference between current assets and current liabilities giving indications on the liquidity position of the firm[3]. Sagan (1955) was the first to make a distinction between working capital measures for financial analysts and creditors and working capital measures for managers. The author stressed out that what matters for a manager is the cash management. He concluded by saying that an active management of working capital accounts was undoubtedly associated with the firm's health, making the link between corporate profitability and working capital management. Fess (1966), supported the view of Sagan (1955) and argued that managers should focus on working capital to derive the firm's operating cycle[4] instead of just considering it as a liquidity measure. On that matter, Preve and Sarria-Allende (2010), also stepped back from the liquidity point of view to focus on operating activities. To do so, they relied on the Financial Needs for Operation (FNO)[5] which is suited to depict the financing needs due to timing mismatches between cash inflows and outflows. Darun, Roudaki and Radford (2015), stated that nowadays, the research concerning working capital would be divided into two distinct branches: the working capital management effectiveness in which this work is part of and the understanding of working capital management practices. The authors believe that, in the near future, the concept of working capital will further evolve to a firm-specific metric where good practices and theoretical models will fit more and more complex organizations, deviating from its roots of liquidity assessment to become a real day-to-day management tool enabling to make the firm more competitive in an ever-changing environment.

[3] By representing the amount of cash or cash-equivalent at disposal to meet the short-term obligations (Preve and Sarria-Allende, 2010).
[4] Referred as the amount of time between the moment when the cash is invested in the production and sales of goods and the moment when the cash is recovered from the sales.
[5] Defined as current assets minus short-term operating liabilities.

2.2. Measurements

2.2.1. Static measures

Traditionally, two measures were used as estimators for the liquidity of the firms (Faden, 2014). These measures are considered static because they only depict the firm's stock of liquid resources, mainly related to the contingency of a liquidation, instead of incorporating liquidity coming from operational activities (Canina and Carvell, 2008). Therefore, many researchers have questioned the use of such ratios. For example, Kaiser and Young (2009) argued that managing working capital according to these ratios encourages managers to act with the worst scenario in mind, the death of the company synonymous of liquidation. Moreover, Shulman and Cox (1985) stated that such ratios do not disclose the operating cycle modifications that would impact corporate liquidity. Nonetheless, these ratios remain widely used by managers because of the easiness of computation.

2.2.1.1. The current ratio

Defined as the ratio of current assets divided by current liabilities, it indicates the managers whether short-term assets will be sufficient to pay short-term debts (Ross, Westerfield and Jaffe, 2013). As Preve and Sarria-Allende (2010) noted, there is no "right number" and the value of the ratio will depend on numerous firms and industry characteristics. This ratio taken individually is useless in the scope of a comprehensive firm financial analysis, it must be compared with equivalent peers' ratios. As a rule of thumb, the current ratio is expected to be at least equal to one so that the firm does not encounter liquidity issues. However, a too high current ratio value is not good either because the firm is then over-liquid and this situation could depict profitability issues (a substantial rise in inventories i.e.).

2.2.1.2. The quick ratio

The quick ratio is very similar to the current ratio except that inventories are subtracted from the current assets. Therefore, it alleviates the caveat mentioned before consisting of artificially raising the liquidity of a firm by increasing the level of inventory. Moreover, inventory is considered as the least liquid asset and its valuation can be difficult due to obsolescence, damaged goods etc. (Ross, Westerfield and Jaffe, 2013). Thus, excluding it from the measure could prevent misleading conclusions due to computational errors.

2.2.2. Dynamic measures

Richards and Laughlin (1980) stated that managers should focus more on the firm's ability to cover current liabilities with operating cash flows, which are sensitive to economic downturns and declining sales periods, instead of putting too much attention on the liquidity value of assets, often misjudged because of difficulties to correctly value the least liquid types of assets. To remedy this, the two authors defined the operating cycle concept. This concept consists in the incorporation of elements taken from the operating income statements in the previous measures, solely based on static balance sheet elements (Richards And Laughlin, 1980). However, the concept of operating cycle, defined as the sum of receivables turnover and inventory turnover did not appear to be a comprehensive measure of the firm's liquidity because it omitted the liabilities engagement of the firm. (Richards and Laughlin, 1980). The cash conversion cycle (CCC) alleviates this problem by implementing a third term: the payables turnover. This concept of cash conversion cycle has been thereafter widely used in the literature as a comprehensive measure of working capital management. Richards and Laughlin (1980) asserted that the benefit of such concept is to illustrate the amount of time a firm needs to finance its operational activities, given the unsynchronized characters of each of its four components, namely purchasing or production, sales, collection and payments. Hutchison, Farris II and Anders (2007) referring to the work of Peter Skomorowsky (1988), claimed that managing the cash conversion cycle properly was a key determinant of the profitability level of a firm because it could help generate greater cash flows. This view is shared by Moss and Stine (1993) who thought that a well-managed cash conversion cycle could, to a certain extent, protect the firm against unfortunate events and give it the possibility to adopt an opportunistic strategy in favourable circumstances by improving cash flows.

Even though several definitions were used in the literature (Hutchison and Farris II, 2002), the most widely used formula (Wang, 2002; Deloof, 2003; Lazaridis and Tryfonidis 2006; Enqvist, Graham and Nikkinen, 2013; García-Teruel and Martínez-Solano 2007; Hutchison, Farris II and Anders 2007; Canina and Carvell 2008; Bhatia and Srivastava, 2016; Chang, 2018) is the following:

$$\text{Cash Conversion Cycle} = \frac{\text{Account Receivables}}{\text{Sales}} \times 365 + \frac{\text{Inventory}}{\text{Cost of Goods Sold}} \times 365 - \frac{\text{Account Payables}}{\text{Cost of Goods Sold}} \times 365$$

Notwithstanding this scientific consensus, Gentry, Vaidyanathan and Lee (1990) found a caveat to the measure. They argued that the cash conversion cycle only takes into account the length of time during which capital is fixed in each step of the cycle. In their paper, they suggested an enhanced version of the cash conversion cycle, the weighted cash conversion cycle, which takes into account not only the length of time of each step of the cycle but also the amount tied in each of these steps. However, as Shin and Soenen (1998) mentioned, the difficulties to compute such measure make it very unpractical for empirical studies.

For computational convenience, Shin and Soenen (1998) introduced the net trade cycle (NTC). This measure is very close to the cash conversion cycle except that the denominator is always the amount of sales. Both measures are expected to give the same results and can be interpreted in the same way.

2.3. Working capital management and corporate performance

Even though financial researchers started studying the concept of working capital management during the late sixties, one has to wait until 1989 to see the premises of scientific work focused on the correlation between working capital management and firm performance with the paper of Ravindra Kamath titled "How useful are common liquidity measures?" (Faden, 2013).

Several papers on the same topic and covering various regions of the world were then published. This section aims to give the reader an overview of the different methodologies used and the results that came out of these empirical studies. It will also define the scope of this present research and serve as a comparison tool. As a matter of accuracy and coherency, only papers covering developed markets (European markets, Japan and the US) which may be compared to the Belgian market will be treated in this section.

At the outset, studies focused on the US market, Soenen (1993) being the first to publish his results. Then, Manuel L., Lancaster and Stevens (1996) also studied the link between firm profitability and working capital management in the US. They used the cash conversion cycle as a measure of working capital management. Firm profitability proxies were the return on assets (ROA) and the return of equity (ROE) respectively defined as $\frac{\text{Ebit}}{\text{Total Assets}}$ and $\frac{\text{Ebt}}{\text{Equity}}$ (Manuel L., Lancaster & Stevens, 1996). The authors retrieved 20 years of data (from 1974 to 1993) for 2,718 US firms from the Compustat database. These firms were divided in seven

groups, each of them representing a particular industry identified by its SIC[6] code. Their studies consisted in correlation coefficients analyses on pooled data then on subgroups characterized by firms' size expressed as the natural logarithm of sales as well as cross-sectional regressions analyses incorporating firms' size as control variable. Manuel L., Lancaster and Stevens (1996) discovered that larger companies tend to have a smaller cash conversion cycle and to be more profitable. The Pearson's correlation coefficients for both the relationships between CCC-ROA and CCC-ROE are negative and significant for each industry except the construction and the financial services industry. The results of the cross-sectional regressions analyses corroborated these results by underlining a negative and significant relationship between CCC and ROA for all industries except natural resources and construction.

Shin and Soenen (1998) also studied the relationship between the efficiency of working capital management and corporate profitability on the US market. They gathered 58,985 firm-year observations on a time horizon of 20 years starting from 1975 to 1994. The data were retrieved from the Compustat database. The variable used as a proxy of working capital management was the net trade cycle (NTC) defined by the authors as:

$$\text{NTC} = (\text{Inventory} + \text{Account Receivable} - \text{Account Payable}) \times \frac{365}{\text{Sales}}$$

Firms' profitability is measured by two ratios called IA and IS and respectively computed as follows:

$$\text{IA} = \frac{\text{Operating Income+Depreciation}}{\text{Total Assets}} \qquad \text{IS} = \frac{\text{Operating Income+Depreciation}}{\text{Net Sales}}$$

These accounting ratios were completed with risk-oriented proxies such as Jensen's Alpha (ALPHA) and Treynor Index (TI). The authors also incorporated control variables, namely the current ratio, the debt ratio and the sales growth. Two types of correlation matrices were used in the study: the Pearson's correlation matrix and the Spearman's correlation matrix. Both types of correlation coefficients NTC-IA, NTC-ALPHA and NTC-TI were negative and significant (at a 10% level in the case of NTC-TI for Pearson's coefficient). The result for the Spearman's correlation coefficient NTC-IS was positive and significant whereas the Pearson's correlation coefficient between the same variables was negative but not significant. The regression analyses (pooled and cross-sectional) also showed a significant negative relationship between NTC and the various dependent variables. These results indicated that a lower net trade cycle leads to higher profitability and risk-adjusted returns. Shin and Soenen (1998) also found

[6] Standard Industrial Classification

that this is the reduction in assets that leads to value creation rather than the increase in account payables since a negative relationship between debt and market value was found.

Wang (2002) focused on the Japanese and Taiwanese markets. He gathered data from 1555 Japanese and 379 Taiwanese firms over a period of 11 years from January 1985 to December 1996. Following the methodology of Manuel L., Lancaster and Stevens (1996), the author used ROA and ROE as proxies for corporate profitability. Nonetheless, Wang (2002) introduced Tobin's Q[7] ratio as a measure of corporate value. First, the choice of ROA and ROE was motivated to underline different possible relationships with working capital management according to financial structure. Then, Tobin's Q ratio was aimed to assess whether an aggressive working capital management policy would raise the corporate value. Working capital management is once again represented by the cash conversion cycle. Concerning the Japanese panel, the Pearson's correlation coefficients showed negative and significant CCC-ROA and CCC-ROE relationships on the pooled sample. When industries were taken separately, CCC-ROA correlation coefficients were significantly negative for five industries (Foods, Construction, Manufacturing, Services and Others) and significantly positive only for the Petrochemicals industry. The CCC-ROE correlation coefficients showed the same results except for Petrochemicals industry where the positive correlation coefficient was no longer significant. The Taiwanese panel showed even less contrasted results. The pooled correlation coefficients CCC-ROA and CCC-ROE were negative and significant. Studied separately, six industries showed a significantly negative CCC-ROA correlation coefficient (Foods, Textiles, Constructions, Petrochemicals, Manufacturing and Electronics) and none a significantly positive correlation coefficient. The CCC-ROE correlation coefficients were significantly negative for five industries (Foods, Textiles, Petrochemicals, Manufacturing and Electronics) while Transportations showed a positive and significant correlation coefficient. Wang (2002) also performed cross-sectional regression analyses, incorporating the natural logarithm of sales as control variable and splitting the data according to their Tobin's Q ratio value (greater than 1 and lower or equal to 1). For both Japanese and Taiwanese panels, the results of the regressions showed a significant and negative relationship between CCC and ROA when considering the total sample and the sample of Tobin's Q ratios greater than 1. For the panel where Tobin's Q ratios are lower or equal to 1, the result of the regression also showed a negative relationship but only significant at a 10% level. Wang (2002) concluded by

[7] $Q = \frac{\text{Market Value of Equity+Book Value of debt}}{\text{Book Value of Assets}}$

highlighting the sensitivity of the CCC-ROA and CCC-ROE relationships to industry factors. The author also pointed out that firms with a Tobin's Q ratio higher than 1 (synonymous of growth potential according to the author) made a better management of their working capital showing lower cash conversion cycles and that an aggressive working capital management policy led to greater corporate value for both Japanese and Taiwanese firms independently of their structural differences.

Deloof (2003) was the first to study the relationship between working capital management and corporate profitability in a European market, precisely the Belgian market. The sample retrieved from the Belgian National Bank database contained 1,009 firms for a 5-year period from 1992 to 1996. The gross operating income (GOI) was used to represent the firms' profitability instead of market-based proxies due to the limited number of Belgian quoted firms. The cash conversion cycle (CCC) was used as a measure of the working capital management. Deloof (2003) also added several control variables: the firm's size, the growth rate of sales, the financial debt ratio, the ratio of fixed financial assets over total assets and the variability of net operating income. The Pearson's correlation coefficient CCC-GOI was negative, a result aligned with previous studies. The author also underlined the negative Pearson's correlation coefficient between GOI- Number of days of account receivables, GOI-Number of days of inventories and more surprisingly GOI-Number of days of account payables. This latter was explained by the fact that Belgian firms are granted discounts when payments are quickly made (Deloof, 2003). However, the author did not reject the hypothesis that profitability impacted the number of days of payables and not the opposite. This interrogation about the direction of the relationship led to the use of regression analyses. In the model, Deloof (2003) added 4-year dummies and 37 industry dummies in order to segment the data panel. The author performed 2 types of regressions: Fixed-effects regressions and ordinary least squares regressions with industry and year dummies. Fixed-effects regressions showed a negative and significant relationship between the GOI and all the components of the CCC taken individually (number of days of account receivables, number of days of inventories and number of days of account payables) which was in accordance with the Pearson's correlation coefficients. However, the fixed-effects regressions did not provide a significant estimate for the CCC. The OLS regressions with year and industry dummies showed negative and significant relationships between the GOI and the CCC but also between the GOI and all the components of the CCC taken separately, once again in accordance with the previous results of the Pearson's correlation coefficients.

Lazaridis and Tryfonidis (2007) focused on the firms quoted on the Athens Stock Exchange and not all Greek firms as a matter of financial statement reliability. The authors used a relatively small panel of just 131 firms for a period from 2001 to 2004 divided into eight industries, thus constituting a database of 524 observations. Analogous to Deloof (2003), Lazaridis and Tryfonidis (2007) used the cash conversion cycle to measure the working capital management efficiency. The authors also used the control variables introduced by Deloof (2003): the firm's size, the financial debt ratio and the ratio of fixed financial assets over total assets. Once again, the gross operating income measured the firms' profitability. The analysis of the Pearson's correlation matrix revealed that the CCC was negatively and significantly correlated with the GOI. Moreover, the GOI was negatively and significantly correlated with both inventories and account receivables which supported the findings of the previous authors. However, Lazaridis and Tryfonidis (2007) found a positive and significant correlation coefficient between the GOI and account payables, as opposed to Deloof (2003) but more in line with the scientific literature covering that topic. The regression analyses gave the same results as the Pearson's correlation matrix except for the relationship between the GOI and the inventory, still negative but no longer significant.

García-Teruel and Martínez-Solano (2007) added their contribution firstly by focusing on Spanish SMEs that are expected to have less access to alternative sources of financing and secondly by realizing tests that are statistically robust to endogeneity problems[8]. The authors collected the data of 8,872 SMEs belonging to eight different sectors for the 2002-2006 period. The ROA was used as a profitability proxy while working capital management, like the peers, was approximated by the cash conversion cycle. The control variables introduced in the model are very similar to those used by Deloof (2003): the firm's size, the sales growth and the leverage[9]. Due to the nature of the companies under study, the authors did not judge useful to incorporate the ratio of fixed financial assets over total assets as a control variable. The Pearson's correlation matrix revealed the same results as those found by Deloof (2003): the CCC, the account receivables, the inventories and the account payables are negatively and significantly (at a 99% level) correlated with the ROA. The results of the regressions performed successively with the CCC, the account receivables, the inventories and the account payables

[8] Endogeneity issues occur when a variable is correlated with the error term of the regression, in mathematical terms if $E[x|u] \neq 0$.

[9] Expressed as the ratio $(\frac{\text{Total Debt}}{\text{Liabilities}})$.

reinforced the previous results by displaying negative and significant relationships between the variables under scrutiny and the ROA.

Despite a numerous amount of scientific papers discussing the impact of working capital management on corporate profitability over a defined time horizon, none of them had yet focused on the business cycles and how these latter would influence the relationship between working capital management and corporate profitability. Enqvist, Graham and Nikkinen (2013) contributed to the literature on this very specific topic. They used a sample of 1,136 firm-year observations from the Nasdaq OMX Helsinki Stock Exchange covering a period from 1990 to 2008. They categorized each year in one of the three following states: Low, Medium and High. To do so, the authors used two methodologies that gave similar results. The first consisted in computing the annual GDP growth rates over the time horizon and then segment them in five-year periods. The five-year period experiencing the lowest growth in GDP was considered as Low and the five-year period experiencing the highest growth in GDP was considered as High. The second method consisted in computing the natural logarithm of each year GDP then regress them and add or deduct a constant so that 25% of observations were above the trend and 25% below it, constituting respectively the HIGH and LOW segments. Afterwards, Enqvist, Graham and Nikkinen (2013) studied the impact of the interaction between the CCC and both GOI and ROA depending on the economic states. Unfortunately, most of their results were not statistically significant.

Baños-Caballero, García-Teruel and Martínez-Solano (2014) had a slightly different approach. Indeed, they made the initial hypothesis, already mentioned by several previous researchers, that it existed an optimal number of days of cash conversion cycle that would maximize the firms' profitability and therefore adapted the regression model to express that specific hypothesis (See Appendix 2). They also investigated the impact of financial constraints on this optimal level by introducing dummy variables indicating whether a firm was financially constrained or not according to several measures such as the cost of external financing, the dividend pay-out ratio, the interest coverage etc. The authors restrained their research on a sample of 258 UK firms during a period of 5 years. Baños-Caballero, García-Teruel and Martínez-Solano (2014) measured the firms' probability with the Tobin's Q ratio previously used by Wang (2002). The net trade cycle was used as a proxy of working capital management following the methodology of Shin and Soenen (1998). The firms' size and leverage but also

the growth prospects[10] and the ROA were used as control variables. Surprisingly, the correlation analysis revealed a positive coefficient between NTC and Q which is in opposition with previous results. The results of the regression, as far as they are concerned, displayed more logical relationships. In fact, even though the NTC seemed to reveal a positive and significant relationship with Q, the same variable elevated to the square showed a negative and significant relationship with the corporate profitability, characteristic of an inverted U-shape function.

These results are in accordance with the authors' hypothesis of an optimal level of NTC. Simply by computing the first derivative related to the NTC of the right-hand side of the equation and setting Q to zero, Baños-Caballero, García-Teruel and Martínez-Solano (2014) found an optimal NTC length of 66.95 days[11]. Ultimately, the authors also revealed that more financially constrained firms also experienced the same inverted U-shape function but their optimal length of NTC was shorter (without displaying any number). Baños-Caballero, García-Teruel and Martínez-Solano (2014) explained this shorter NTC length by affirming that more financially constrained firms, less eager to search for and/or to get external capital, simply invested less in working capital.

Aktas, Croci and Petmezas (2015) alongside the traditional analysis of the impact of working capital management on the firms' profitability and stock performance, wanted to understand the causes of this impact. Using a large sample of 15,541 US firms for the period 1982-2011, the authors performed several regression analyses, first to assess the impact of working capital management on corporate profitability and stock return, then to link these impacts with firm risks related to more aggressive working capital management policies and investment decisions. The particularity of the regression equation is the extensive number of control variables (See Appendix 2). The authors used the net working capital-to-sales ratio as the independent variable of interest, an unusual choice in the literature. The goal was to extract the unnecessary cash tied up in working capital by subtracting to this ratio the median value of the ratio for the corresponding industry (Aktas, Croci and Petmezas, 2015). The authors drew up several conclusions. In addition to the documentation of the existence of an optimal working capital level already suggested by several researchers, Aktas, Croci and Petmezas (2015) also found that the increase in firm performance was driven by the reallocation of fund previously tied up in working capital to more efficient investments. Consequently, a good working capital management is of greater importance when the company disposes of valuable investment

[10] Expressed as $\frac{\text{Intangible Assets}}{\text{Total Assets}}$

[11] The full methodology is described in appendix 2

opportunities. Finally, the authors highlighted the fact that the negative relationship between stock performance and working capital management was a consequence of the increase of the firm's risk due to a more aggressive working capital policy.

Ultimately, Chang (2018) published the last known paper examining the relationship between working capital management and corporate performance. This paper contributed to the literature thanks to its comprehensive geographical coverage. Indeed, the study analysed the relationship in 46 countries via a panel of 31,612 companies from 1994 to 2011. Chang (2018) adopted the industry-adjusted CCC as the working capital management proxy[12] while the industry-adjusted ROA and the industry-adjusted Tobin's Q ratios represented the corporate performance. Several control variables were used in the model (See Appendix 2). The results of the summary statistics showed that Belgian companies managed their CCC a lot better than other countries on average (Belgian pooled CCC of 42.16 days against a mean CCC of 82.14). The study also revealed that the negative relationship between CCC and corporate performance was global. In fact, 71% of the countries experienced a negative CCC-ROA relationship. However, the results for the CCC-Tobin's Q ratio were more nuanced with only 43% of significantly negative relationships. Unfortunately, no significance was found in the case of Belgium and consequently, the paper of Deloof (2003) remains the only basis of comparison for the present study.

[12] CCC minus the median value of the considered industry CCC.

3. EMPIRICAL STUDY

3.1. Methodology

3.1.1. Data gathering

The data required for this study were retrieved from the Bel-first database. Bel-first is a service of the company Bureau van Dijk, provider of private companies' data, financial metrics, peer group analyses and M&A information. The choice of using Bel-first came as an evidence since very few Belgian companies are publicly quoted and consequently a limited amount of information is available to the public. Bel-first was the only database that gave access to Belgian private companies' data and thus, was a key tool in order to carry out this study.

First, only companies displaying at least nine years of complete accounts were selected. This criterion was paramount to ensure the continuity of the data and make possible time analyses, which will be further discussed. Second, the list of companies has been narrowed to keep exclusively Belgian companies. Finally, the selection was refined by retaining only the big and very big companies. This was made necessary for purpose of computing some key variables based on financial information only displayed in comprehensive balance sheet accounts. This methodology provided a list of 9260 firms for each year starting from 2008 to 2016.

Once the data retrieved, firm-year observations for which some values where missing have been excluded from the sample. Moreover, replicating the statistical procedure followed by Shin and Soenen (1998), Deloof (2003), Chang (2018) and other researchers, the first and the last percentile of days of account receivables, days of account payables, days of inventory, gross operating income (GOI) and return on assets (ROA)[13] were removed from the sample to avoid a too great influence of outliers on the study results[14]. The final sample contained 48,050 firm-year observations.

[13] These variables and their utility will be further discussed in the section "Variable under scrutiny".
[14] Note that this methodology has been applied to each year constituting the aggregate sample.

3.1.2. Industries

Working capital management policies massively depend on the industry wherein the company is active. The discrepancies between industries should be explained by internal factors, exclusive to a specific industry. Preve and Sarria-Allende (2010) enumerated several possible industry-related factors that impact working capital. The first is the seasonality inherent to certain industries (mostly manufacturing or farming). Even though each company within an industry is not expected have the same strategy to cope with this seasonality (due to the trade-off between profitability and liquidity), trends should occur nevertheless. The competition within the industry is also mentioned as a key factor since firms active in competitive environments are expected to use aggressive strategies in terms of account receivables. Another obvious thought that comes to mind is the nature of the inventory. One can think about the food industry where goods are perishable or technological industries where obsolescence triggers for low level of inventory. Contrarywise, the construction sector is expected to keep a greater level of inventory given the unperishable nature of the raw materials stocked.

Most of the aforementioned researchers have taken into account the specific effects of industry. For example, Shin and Soenen (1998) tested their model for 8 different industries. For some of them, the relationship between working capital management and corporate profitability were not significant (Oil & gas, Agriculture and Communication). Wang (2002) highlighted significant differences in terms of working capital management across industries. On his Japanese panel, the food industry had a mean CCC of 43 days while the construction industry exhibited a CCC length of 102 days on average. Discrepancies were even bigger in Taiwan where the transportation sector mean CCC were 41 days in comparison with the 650 days CCC of the construction sector. The correlation coefficient also varied from an industry to another, with the Japanese construction industry displaying a coefficient of -0.22291 (P-value < 0.01) while petrochemicals revealed a coefficient of 0.10543 (P-value < 0.01).

Heterogeneity within industries is also expected to be different. Aktas, Croci and Petzemas (2015) analysed the standard deviation of the net working capital-to-sales ratio and found disparate results. The construction sector revealed a standard deviation of 48.46% while the healthcare sector experienced a much lower standard deviation of 6.4%. Even though the authors found a general decrease in net working capital across numerous industries and also a

decrease in standard deviations, it is still informative to compare these values in order to underline the key discrepancies remaining.

The industry classification used in this study is the North American Industry Classification System (NAICS 2017). This classification has been chosen because it constitutes a more concise classification method and allows to form industry groups more easily[15]. On a two digits level, this method includes 24 different industry clusters (See Appendix 3). Following Shin and Soenen (1998), Deloof (2003), Lazardis and Tryfonidis (2006), Enqvist, Graham and Nikkinen (2013), Baños-Caballero, García-Teruel and Martínez-Solano (2014), Aktas, Croci and Petmezas (2015) and Chang (2018), some industries were excluded from the analysis. These industries are Utilities, Finance and Insurance, Real-Estate, Rental and Leasing, Professional, Scientific and Technical Services, Company Management, Other Services and Public Administration (NAICS 22, 52, 53, 54, 55, 81 and 92 respectively). This filtering procedure was motivated by the nature of the activities of such industry. For example, financial institutions do not have "classical" balance sheets and consequently, the computation of traditional working capital management measures is very complicated. The utility industry for its part, is prone to be highly leveraged, state-owned and in monopoly situations.

Given the nature of this study, the emphasis was put on industries for which working capital is a paramount factor of the business such as the construction, manufacturing, wholesale trade and retail trade industries (NAICS 23, 31-32-33, 42 and 44-45 respectively). Nonetheless, other industries have also been taken into account in order to get the bigger picture and perform an analysis on a sample that reflects as much as possible the Belgian economic landscape.

The purpose of this segmentation is to highlight the differences of working capital management policies across industry and to identify, to the possible extent, industry-specific optimal working capital levels.

3.1.3. Time window and business cycle phases

The sample used in this study is made of observations from 2009 to 2016[16] constituting a time horizon of eight years[17]. The decision of studying the largest time window possible has

[15] For the reader's understanding, who is not necessarily familiar with this specific classification, each industry code will be accompanied by its label.
[16] The observations of 2008 were only used to compute specific variables for 2009.
[17] This time horizon has been somewhat imposed by the Bel-first database, containing only data for the ten previous years. Furthermore, only parts of 2017 data were available at the retrieving time making them unusable.

been motivated by the aim of analysing the impact of business cycles[18] on firms' profitability and how these business cycles might influence working capital management policies in Belgium. The period from 2009 to 2016 is particularly appropriate for this purpose since it encompasses both global financial crisis of 2009 and the Euro crisis that followed.

Alongside a "year-by-year" analysis, the different years composing the sample have been categorized in three different segments following the work of Enqvist, Graham and Nikkinen (2013). The authors argued that analysing each year separately does not correctly represent the different stages of a business cycle that is expected to run over several years. To alleviate this concern, Enqvist, Graham and Nikkinen (2013) proposed two different methodologies in order to identify the three main steps of a business cycle: the downturn period, the stable period and the upturn period.

First, the Belgian GDP have been retrieved from the National Bank of Belgium database. The GDP is expressed in chained 2015 euros to avoid currency differences over time. Second, the annual percentages of change between year t and year t-1 have been computed for the period 2009 to 2016. Then, the 25^{th} and 75^{th} percentiles of these GDP growth rates were computed. These percentiles constituted the thresholds enabling the classification of each GDP growth rate. The classification has been made as following: each value of GDP growth rate lower than the 25^{th} percentile has been classified as "Low", corresponding to an economic downturn. The same way, each GDP growth rate greater than the 75^{th} percentile has been classified as "High", corresponding to an economic upturn. The GDP growth rates left have been classified as "Stable". This methodology ensures an even distribution of observations across the three different categories[19].

Enqvist, Graham and Nikkinen (2013) used a second methodology to check the robustness of the previous results obtained. This time, the analysis was based on the Belgian annual GDP. The natural logarithm of each value of GDP has been computed. Then, using a linear regression, a trend as well as an intercept have been computed. This linear function has been used to detrend the time series of GDP. Finally, the same classification was made through

[18] A business cycle is defined by the OECD as: "Sequences of alternating phases of expansion and contraction in economic activity".
[19] The distribution is considered as balanced because the "Stable" category encompasses the "Expansion" and the "Recession" periods, respectively following an economic downturn and an economic upturn period. This justifies the 25-50-25 percent distribution.

the 25th and 75th percentiles computation. The results of both methodologies are displayed in Appendix 4.

The results given by the second methodology confirmed those obtained via the analysis of GDP growth rates. The final classification used in this study is depicted in Table 1:

LOW	STABLE	HIGH
2009	2012	2010
2013	2014	2011
	2015	
	2016	

Table 1: Years Classification

3.1.4. Dependent variables

Two different variables have been chosen to measure the firms' profitability: the gross operating income (GOI) and the return on assets (ROA). Numerous researchers have used stock market-based measures of profitability (Shin and Soenen, 1998; Baños-Caballero, García-Teruel and Martínez-Solano, 2014; Aktas, Croci and Petmezas, 2015; Bhatia and Srivastava, 2016; Chang, 2018). However, as underlined by Deloof (2003), only a small number[20] of Belgian companies are publicly traded on the Belgian Stock Exchange. Consequently, such stock market-based measures of corporate profitability are arduously applicable in the case of this Belgian companies-focused study. Therefore, only accounting measures have been used as dependent variables.

3.1.4.1. Gross operating income

As supported by Lazaridis and Tryfonidis (2006), the GOI constitutes a genuine "operational performance-oriented" measure of firms' profitability. This is particularly suited to the purpose of this study since working capital management is exclusively linked to day-to-day operations and a good strategy related to it is mainly expected to impact the operational part of firms' profitability. Deloof (2003) added that using the GOI as dependent variable instead of the ROA is preferable in order to measure the real capacity of a firm to be profitable when leaving the effect of financial assets aside.

[20] Belfirst database contains information of only 224 listed Belgian companies.

The GOI is computed as below:

$$\mathrm{GOI}_{i,t} = \frac{\mathrm{Sales}_{i,t} - \mathrm{COGS}_{i,t} + \mathrm{D\&A}_{i,t}}{\mathrm{Total\ Assets}_{i,t} - \mathrm{Financial\ Assets}_{i,t}}$$

The GOI represents the cash generated solely by the firm's operational activities[21] divided by the total assets minus the financial assets. The denominator is used to control for any financial activities influence (Lazaridis and Tryfonidis, 2006).

3.1.4.2. Return on assets

Notwithstanding the arguments of Deloof (2003) against the use of the ROA as dependent variable in the model, several authors decided to make use of it (Wang, 2002; García-Teruel and Martínez-Solano, 2007; Enqvist, Graham and Nikkinen, 2013; Aktas, Croci and Petmezas, 2015; Chang, 2018).

The ROA is mainly used because of its representation of the firm's profitability in a broad sense (Enqvist, Graham and Nikkinen, 2013). In this sense, it would be interesting to compare the influence of working capital management policies on both operational profitability and overall profitability.

The ROA is computed as follows:

$$\mathrm{ROA}_{i,t} = \frac{\mathrm{EBIT}_{i,t}}{\mathrm{Total\ Assets}_{i,t}}$$

This ratio, measuring the firm's profit per euro of asset, is neutral concerning the capital structure of the firm since it does not take into account the influence of interest income/cost and taxes (Ross, Westerfield and Jaffe, 2013). Therefore, this formula has been chosen instead of the most commonly known[22].

3.1.5. Variables under scrutiny

The concept of cash conversion cycle was introduced by Richard and Laughlin (1980). The idea of the authors was to shift from a static measure of liquidity (the current ratio) exclusively based on balance sheet figures to a more dynamic model, incorporating elements of the income statement. The goal was to underline the fact that it would be illusory to think

[21] $\mathrm{D\&A}_{i,t}$ is added to the numerator because this variable does not represent a genuine cash outflow.

[22] Expressed as $\frac{\text{Net Income}}{\text{Total Assets}}$

that the three pillars of the operating activities, namely the production of goods, the distribution and the collection of payments are immediate and synchronized concepts. According to the authors, the cash conversion cycle represents the "*net time interval between actual cash expenditures on a firm's purchase of productive resources and the ultimate recovery of cash receipts from product sales, establishes the period of time required to convert a dollar of cash disbursements back into a dollar of cash inflow from a firm's regular course of operations*" (Richards and Laughlin, 1980).

Shin and Soenen (1998) also mentioned in their paper the concept of weighted cash conversion cycle (WCCC) introduced by Gentry, Vaidyanathan and Lee (1980). The weight attributed to each component of the cash conversion cycle is scaled by the importance of the investment thighed to it. However, this WCCC is more complicated to compute due to the deeper level of analysis of the operating cycle and therefore, this measure is not used in empirical researches.

Wang (2002) used the cash conversion cycle as a measure of working capital management enumerating the advantages exposed by Richards and Laughlin (1980) as justification. Deloof (2003), Lazaridis and Tryfonidis (2006), Garcia-Teruel and Martinez-Solano (2007), Ebben and Johnson (2011), Bhatia and Srivastava (2016) and Chang (2018) also used the cash conversion cycle to model the working capital management. All the authors defined the formula of the CCC as follows:

$$\text{CCC} = \text{Days Account Receivables} + \text{Days Inventory} - \text{Days Account Payables}$$

Where

$$\text{Days Account Receivables} = \frac{\text{Account Receivables}}{\text{SALES}} \times 365$$

$$\text{Days Inventory} = \frac{\text{Inventory}}{\text{COGS}} \times 365$$

$$\text{Days Account Payables} = \frac{\text{Account Payables}}{\text{COGS}} \times 365$$

Enqvist, Graham and Nikkinen (2013) justified the use of the cash conversion cycle as a measure of working capital management underlining the scientific consensus on the concept and its wide use among scientific papers.

However, the cost of goods sold (COGS) nor the way it is computed are available in Bel-first database. Consequently, this variable has to be approximated with this formula:

$$\text{COGS} = \text{Purchases of materials \& consumables} - \text{Changes in inventory}$$

This lack of information conducting to the approximation formula coupled with extreme values of days inventory and days payables leading to highly negative and unrealistic values of CCC triggered the necessity to find another, more robust, measure of working capital management efficiency: the net trade cycle (NTC).

As defined by Shin and Soenen (1998), the NTC represents the working capital financing in terms of days of sales. It is thus a length of time. Since the NTC is closely linked with sales, it is also used to appraise future financing needs depending on the sales growth expectations. Obviously, the first purpose of the NTC remains being a reliable estimate of the firm's working capital management efficiency since it is constituted by the main components of the working capital: the account receivables, the inventory and the account payables. Another interesting property of the NTC, likewise the CCC, is that it connects working capital management and corporate value. Indeed, the shorter the NTC, the greater the present value of cash flows generated by the current assets and ultimately the higher the company value for shareholders. At the same time, a shorter NTC indicates less financing dedicated to working capital and consequently a better operational efficiency. Finally, less external financing needs potentially leads to better financial performances as well.

Baños-Caballero, García-Teruel and Martínez-Solano (2014) added that, alongside its easy interpretation, the NTC allays just as good as the CCC the caveats of traditional static working capital ratios such as the current and quick ratios.

As it can be seen, the NTC constitutes a simple but comprehensive measure of working capital management efficiency while linking all the aspects of the firm's operational activities.

The NTC formula is very close to the CCC one. Indeed, the NTC is computed as below:

$$\text{NTC} = \frac{\text{Account Receivables}}{\text{Sales}} \times 365 + \frac{\text{Inventory}}{\text{Sales}} \times 365 - \frac{\text{Account Payables}}{\text{Sales}} \times 365$$

All the three components are divided by the amount of sales, therefore the NTC represents the number of days of sales the firm has to finance. According to Shin and Soenen (1998), the fact that the denominator is common for all the numerators makes the addition more coherent than with the CCC.

3.1.6. Control variables

3.1.6.1. Size

The firm's size certainly the most obvious control variable to be implemented in the model since sales are the first generator of operating performance. Furthermore, this control variable has been highly significant in most of the studies conducted (Shin and Soenen, 1998; Baños-Caballero, García-Teruel and Martínez-Solano, 2014; Deloof, 2003; Bhatia and Srivastava, 2016; Aktas, Croci and Petmezas, 2015; García-Teruel and Martínez-Solano, 2007).

The firm's size impacts mainly two components of the working capital: the receivables and the payables. Petersen and Rajan (2007), based on empirical studies using a panel of US firms, found that the amount of trade receivables tends to increase with firm size. This can be explained by the theory of Meltzer (1960) who affirmed that firms with easier access to financial credits behave as moneylender for less favoured firms. Now, Baños-Caballero, García-Teruel and Martínez-Solano (2014) claimed that size is a decisive factor of the firm's access to financial credit. However, in his study focused on the trade credit as a substitution of bank credit in Italy, de Blasio (2004) expressed serious doubts on the realization of Meltzer theory (1960) in real conditions. Rajan and Petersen (2007) also discovered that larger firms use less trade payables as a financing tool. This can be explained by the high cost of trade credit and the greater access to financial credit for such firms (Preve and Sarria-Allende, 2010).

Following the most widely accepted papers on that subject, the firm's size is defined as follows:

$$\text{SIZE} = \text{Ln}(\text{Sales})$$

This definition is motivated by the fact that the aim is to control for firm's size in terms of operational activity scale and the profit inherent to it.

3.1.6.2. Sales growth

The sales growth rate is expected to have an impact on firms' performance. Given the empirical results of many studies, it seems that sales growth has a statistically significant but yet moderate positive impact on the firms' profitability in mature markets (Shin and Soenen, 1998; Baños-Caballero, García-Teruel and Martínez-Solano,2014; Deloof, 2003; Aktas, Croci and Petmezas, 2015; García-Teruel, Martínez-Solano, 2007). These results are in accordance with the findings of Ramezani, Soenen and Jung (2002), who stated that profitability maximization is reached by companies experiencing moderate growth rates which is typically the case for firms competing in mature markets.

However, the authors also found that companies experiencing high growth rates fail to maximize their profitability. This observation can be supported by the empirical study carried out by Bhatia and Srivastava (2016) on Indian quoted firms (+7.107% GDP growth rate compared to +1.446% in Belgium[23]) which found a negative and statistically significant relationship between the firm's profitability and sales growth rate.

Nonetheless, other factors such as agency problem can lead to a negative relationship between growth and profitability. Indeed, Ross, Westerfield and Jaffe (2013) suggested that the managers will to empowerment and wealth could lead to too much focus on corporate size and/or sales growth forgetting the main goal of the enterprise: the value creation for the shareholders.

The sales growth variable is defined as follows:

$$\text{Sales Growth} = \frac{\text{Sales}_t - \text{Sales}_{t-1}}{\text{Sales}_{t-1}}$$

3.1.6.3. Leverage

Controlling for firms' leverage is important because this latter can raise profitability due to economies of scale but also increase the firms' credit risk leading to solvency issues. Suppliers are also assumed to look closely at the leverage of their clients to assess their trustworthiness. This could lead to greater payment conditions or in opposition, difficulties to

[23] World Bank data retrieved on May 23rd, 2018.

find suppliers. Consequently, leverage is assumed to affect profitability of firms because of both internal and external factors.

The leverage variable is defined as below:

$$\text{Leverage} = \frac{\text{Total Debt}}{\text{Total Assets}}$$

3.1.6.4. Ratio of fixed financial assets over total assets

Fixed financial assets are considered as the firm's participation in other firms and are expected to contribute to the activities of the firm that holds the participation. These participations can represent a great part of the total assets and influence the performance of the firm. (Deloof, 2003; Lazaridis and Tryfonidis, 2006).

The ratio is computed as follows:

$$\frac{\text{FFA}}{\text{TA}} = \frac{\text{Fixed Financial Assets}}{\text{Total Assets}}$$

3.1.6.5. Variability of the net operating income

The variability of net operating income aims to control for the business risk inherent to the firm.

The variability of the net operating income is computed as below:

$$\text{Variability NOI} = \sigma\left(\frac{\text{Net Operating Income}}{\text{Total Assets} - \text{Financial Assets}}\right)$$

3.1.6.6. Research & development

Johansson and Lööf (2008) found that Swedish firms that have constant R&D investments perform better than their peers who do not invest regularly in R&D in terms of productivity and profitability. Parcharidis and Varsakelis (2007) stated that, in the case of Greek quoted firms from 1995 to 2000, the R&D led to positive effects on profitability after a two-year period. Bates, Khales and Stulz (2009) argued that the R&D can be considered as a proxy for the firm's growth opportunities and therefore might have an impact on the firm's future performance. Baños-Caballero, García-Teruel and Martínez-Solano (2014) also saw R&D as

the growth opportunities for the firm. Moreover, the lack of information available concerning the R&D expenses of Belgian firms in Bel-first database led to consider the R&D variable as defined by Baños-Caballero, García-Teruel and Martínez-Solano (2014):

$$\text{R\&D} = \frac{\text{Intangible Assets}}{\text{Total Assets}}$$

Since intangible assets are mostly composed of patents, copyrights and trademarks which come from the firm's R&D activities, they can be used as an estimate of the magnitude of the firm's R&D program.

3.1.7. Dummy variables

Dummy variables are binary variables that only take value 1 or 0 depending on whether the observation belongs to a specific category. This kind of variable is used to implement some qualitative differentiations among the observations. They are used when one expects to observe significant results variations depending on which category the observation belongs to.

In this study, dummy variables are paramount. Indeed, more than just analysing the impact of working capital management on Belgian firms' profitability, the objective is to observe the potential differences between industries, time and business cycle phases. In fact, industry and time (expressed in years) are perfectly represented by dummy variables since they constitute well-defined categories (an observation can only belong to one industry and to a specific year). Consequently, the aim of this analysis would not be possible without an extensive use of these specific binary variables. Thereupon, it is not a surprise to observe that all previous researchers have made use of these. This section will explain each type of dummy variables used in the regression models.

3.1.7.1. Time dummy variables

As discussed earlier, the analysis of time influence on how the working capital management of a firm impacts its profitability will be made in two steps: first by conducting a conventional year-by-year analysis and second by making an analysis based on business cycle phases. Consequently, two types of time dummy variables had to be created.

For the first model, each year will be translated into a dummy variable as follows:

Year	Dummy Variable Name
2009	YDummy2009
2010	YDummy2010
2011	YDummy2011
2012	YDummy2012
2013	YDummy2013
2014	YDummy2014
2015	YDummy2015
2016	YDummy2016

Table 2: Years Dummy Variables Nomenclature

For the second model, the nomenclature will be as below:

Business Cycle Analysis		
Low	Stable	High

Table 3: Business Cycle Phases Dummy Variables

3.1.7.2. Industry dummy variables

The industry dummy variables are constructed likewise the year dummy variables, each specific industry is represented by its correspondent dummy variable.

These are the industry dummy variables used in the regression models:

NAICS Code	Industry	Dummy Variable
11	Agriculture, Forestry, Fishing and Hunting	Industry_11
21	Mining, Carrying, Oil & Gas Extraction	Industry_21
23	Construction	Industry_23
31-32-33	Manufacturing	Industry_3
42	Wholesale Trade	Industry_42
44-45	Retail Trade	Industry_4445
48-49	Transportation and Warehousing	Industry_4849
51	Information	Industry_51
56	Administrative, Support, Waste Management and Remediation Services	Industry_56
61	Educational Services	Industry_61
62	Health Care and Social Assistance	Industry_62
71	Arts, Entertainment and Recreation	Industry_71
72	Accommodation and Food Services	Industry_72

Table 4: NAICS Dummy Variables Nomenclature

3.1.7.3. "Listed" dummy variable

Even though estimating the impact of working capital management on market-based profitability measures is very arduous due to the very limited number of Belgian listed companies, it is still feasible to analyse whether being publicly traded has a repercussion on the relationship between working capital management and corporate profitability.

Hence, the dummy variable "Listed" is incorporated in the model, taking the value 1 if the company is publicly listed and 0 if it is privately owned.

3.1.7.4. Dummy variable trap

While the use of dummy variables is very useful when considering the effects of qualitative variables in a regression model, they must be used cautiously. In fact, the use of such binary variables can lead to multicollinearity issues in the model. Multicollinearity occurs when one or several regressors of the model are perfect linear combinations of others. This induces a division per 0 in the ordinary least squares (OLS) regression method and thus, it makes impossible the computation of the different estimators of the model. (Stock, Watson, 2012).

A solution to avoid multicollinearity with a number N of dummy variable is to consider only N-1 regressors in the model. Consequently, a "year" dummy regressor as well as an "industry" dummy regressor must be omitted in the equation. The choice of the omitted variable does not change the outcome of the analysis since the dummy variable estimators represent the impact of the dummy variable compared to the "base case" which is, by construction, the estimator of the omitted dummy variable.

3.1.8. Regression formulas

Several regression models will be tested in this study to analyse different aspects of the relationship between working capital management and corporate profitability. This section will present all these models and their specific purpose.

3.1.8.1. General models

First, attention will be drawn to the general case, where the NTC-GOI and NTC-ROA relationships will be assessed without industry nor business cycle phases considerations.

Concurrently, the relationships between all the components of the NTC taken separately

(days of receivables, days of payables and days of inventory) and the profitability measures will also be analysed.

To this end, the following models will be used:

I. NTC

$$GOI_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

$$ROA_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

II. Days of Receivables

$$GOI_{i,t} = \beta_0 + \beta_1 DaysReceivables_{i,t} + \beta_2 DaysReceivables^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

$$ROA_{i,t} = \beta_0 + \beta_1 DaysReceivables_{i,t} + \beta_2 DaysReceivables^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

III. Days of Payables

$$GOI_{i,t} = \beta_0 + \beta_1 DaysPayables_{i,t} + \beta_2 \text{Days Payables}^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

$$ROA_{i,t} = \beta_0 + \beta_1 DaysPayables_{i,t} + \beta_2 DaysPayables^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

IV. Days of Inventory

$$GOI_{i,t} = \beta_0 + \beta_1 DaysInventory_{i,t} + \beta_2 DaysInventory^2_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + \text{Year Dummy Variables}$$

$$ROA_{i,t} = \beta_0 + \beta_1 DaysInventory_{i,t} + \beta_2 DaysInventory^2{}_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables$$

3.1.8.2. Industry-specific models

Then, the analysis will be further developed to capture the differences between industries. This will be made by making the industry dummy variables interact with the variable under scrutiny (either the NTC, DaysReceivables, DaysPayables or DaysInventory).

Thus, the previous model will be modified as follows:

I. NTC

$$GOI_{i,t} = \beta_0 + \beta_{1,j}(NTC_{i,t} * Industry_j) + \beta_{2,j}(NTC^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

$$ROA_{i,t} = \beta_0 + \beta_{1,j}(NTC_{i,t} * Industry_j) + \beta_{2,j}(NTC^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

II. Days of Receivables

$$GOI_{i,t} = \beta_0 + \beta_{1,j}(DaysReceivables_{i,t} * Industry_j) + \beta_{2,j}(DaysReceivables^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

$$ROA_{i,t} = \beta_0 + \beta_{1,j}(DaysReceivables_{i,t} * Industry_j) + \beta_{2,j}(DaysReceivables^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

III. Days of Payables

$$GOI_{i,t} = \beta_0 + \beta_{1,j}(DaysPayables_{i,t} * Industry_j) + \beta_{2,j}(Days\ Payables^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

$$ROA_{i,t} = \beta_0 + \beta_{1,j}(DaysPayables_{i,t} * Industry_j) + \beta_{2,j}(DaysPayables^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

IV. Days of Inventory

$$GOI_{i,t} = \beta_0 + \beta_{1,j}(DaysInventory_{i,t} * Industry_j) + \beta_{2,j}(DaysInventory^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

$$ROA_{i,t} = \beta_0 + \beta_{1,j}(DaysInventory_{i,t} * Industry_j) + \beta_{2,j}(DaysInventory^2{}_{i,t} * Industry_j) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + Year\ Dummy\ Variables + LISTED$$

3.1.8.3. Business cycle phases models

In addition to industry specificities, supplemental models have been made to analyse the effect of business cycles. The methodology remains the same compared with the previous models analysing the interactions between the NTC and the different states of the economy.

The models are as below:

$$GOI_{i,t} = \beta_0 + \beta_{1,H}(NTC_{i,t} * HIGH) + \beta_{2,H}(NTC^2{}_{i,t} * HIGH) + \beta_{1,L}(NTC_{i,t} * LOW) + \beta_{2,L}(NTC^2{}_{i,t} * LOW) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + HIGH + LOW + LISTED$$

$$ROA_{i,t} = \beta_0 + \beta_{1,H}(NTC_{i,t} * HIGH) + \beta_{2,H}(NTC^2{}_{i,t} * HIGH) + \beta_{1,L}(NTC_{i,t} * LOW) + \beta_{2,L}(NTC^2{}_{i,t} * LOW) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + HIGH + LOW + LISTED$$

3.1.8.4. Public vs private ownership models

Finally, the last two models aim to assess whether being listed has an impact on how the NTC influences the firm's profitability. To do so, the interaction between NTC and the dummy variable "Listed" will be analysed.

The last two models are the following:

$$GOI_{i,t} = \beta_0 + \beta_1(NTC_{i,t} * LISTED) + \beta_2(NTC^2{}_{i,t} * LISTED) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}{}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + Industry\ Dummy\ Variables + HIGH + LOW + LISTED$$

$$ROA_{i,t} = \beta_0 + \beta_1(NTC_{i,t} * LISTED) + \beta_2(NTC^2_{i,t} * LISTED) + \beta_3 SIZE_{i,t} + \beta_4 SALESGROWTH_{i,t} + \beta_5 LEVERAGE_{i,t} + \beta_6 \frac{FFA}{TA}_{i,t} + \beta_7 VARIABILITYNOI_{i,t} + \beta_8 R\&D_{i,t} + \varepsilon_{i,t} + \text{Industry Dummy Variables} + HIGH + LOW + LISTED$$

3.1.9. Controlling for multicollinearity

Stock and Watson (2012) defined multicollinearity as a situation where one or several independent variables are highly correlated via a linear combination of one or several of these independent variables. Craney and Surles (2002) stressed out that the presence of multicollinearity in a regression model leads to measurement approximations of parameters estimators and meaningless p-values. The aforementioned authors cited the Variance Inflation Factor (VIF) as a tool to detect and measure how present multicollinearity is in the model. The output of a VIF analysis estimates by how much the variability of an independent variable is increased due to multicollinearity with the other dependent variables. As a rule of thumb, the literature on this subject agreed that when the threshold of 5 or 10 is exceeded, multicollinearity is present. The VIF of the i[th] independent variable is computed as follows:

$$VIF_i = \frac{1}{1 - r_i^2} \; for \; i = 1, \dots, p$$

Where r_i^2 is the coefficient of determination of a regression taking the i[th] independent variable as dependent variable and the p-1 other independent variables as regressors.

The results of the VIF analyses are depicted in table 5:

NTC						
Sales Growth	Size	Var NOI	Leverage	FFA/TA	R&D	NTC
1.000031096	1.033817988	1.052229343	1.032918299	1.04696789	1.008282144	1.023539928
Days of receivables						
Sales Growth	Size	Var NOI	Leverage	FFA/TA	R&D	DR
1.000060757	1.037365234	1.052246541	1.021569852	1.047406643	1.007256446	1.011445308
Days of payables						
Sales Growth	Size	Var NOI	Leverage	FFA/TA	R&D	DP
1.000032128	1.032380588	1.052990815	1.085678483	1.05191231	1.008643615	1.076890644
Days of inventory						
Sales Growth	Size	Var NOI	Leverage	FFA/TA	R&D	DINV
1.000053675	1.033205961	1.052913034	1.017431389	1.048075554	1.007718037	1.007773162

Table 5: VIF Analyses

Even when considering the most restrictive threshold values, the different regression models do not seem to suffer from multicollinearity issues.

3.2. Summary statistics

3.2.1. Sample characteristics

As shown in Appendix 5, the sample is constituted by 48,050 firm-year observations. The industry with the largest number of observations is "Wholesale Trade" (NAICS 42) with a total of 16,099 firm-year observations representing 33.50% of the sample. The Wholesale Trade industry is closely followed by the Manufacturing industry (NAICS 31-31-33) with 14,072 observations accounting for nearly 30% of the sample. The Construction industry (NAICS 23) comes third with 4,909 observations (10.22% of the sample). It can be seen that the sample is considerably influenced by industries expected to put great emphasis on working capital management.

In contrast, the least represented industries are the Mining, Carrying, Oil & Gas Extraction (NAICS 21), the Entertainment (NAICS 71) and the Accommodation and Food Services (NAICS 72) industries respectively accounting for 0.32%, 0.53% and 0.80% of the sample.

When analysing the sample on a year-per-year basis (see Appendix 6), one can observe that the sample size increases over time (from 5,479 observations in 2009 to 6,382 observations in 2016). This is mainly due to the quality of the information made available by Bel-first, which becomes more exhaustive when considering the most recent years.

3.2.2. Dependent variables

The mean GOI has a value of 0.8358 (median is 0.6750) meaning that, on average, the firms have a gross operating income corresponding to 83% of [total assets-financial assets]. On average, the most profitable industry in terms of GOI is the Educational Services industry (NAICS 61) with a value of 1.6653 (median is 1.5728) as opposed to the Wholesale Trade industry experiencing an average GOI of 0.6061 (median is 0.5167). Five out of the thirteen industries showed negative value: The Construction, the Manufacturing, the Wholesale Trade, the Retail Trade and the Administrative and Support Services industries (NAICS 23, 31-32-33, 42, 44-48 and 56 respectively). Finally, the Administrative and Support Services industry shows the largest heterogeneity with a GOI standard deviation of 1.3469.

When considering the evolution of GOI over time, it appears that it has never stopped decreasing for both mean and median values with the exception of 2012 as depicted in Figure 1.

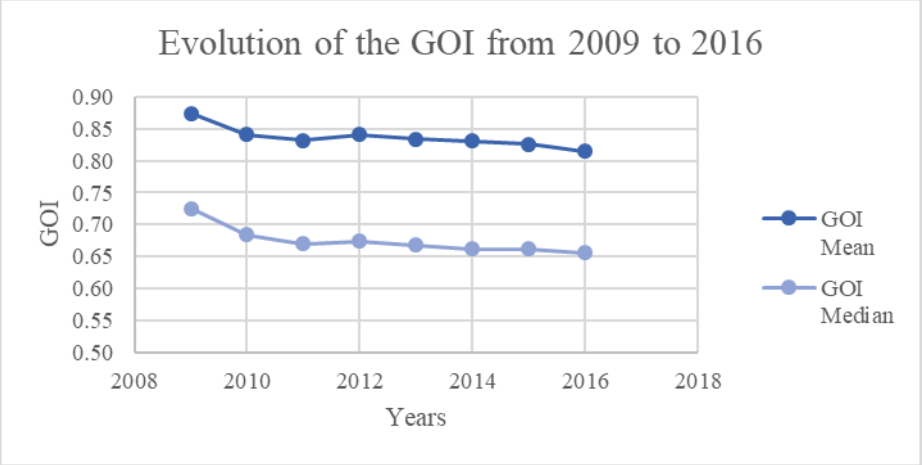


Figure 1: GOI Evolution Over Time

The mean ROA of the sample is 5.78% (median is 4.14%). The industry showing, on average, the highest ROA is the Retail Trade industry (NAICS 44-45) with a value of 7,05% (median is 5.64%) while the least performing industry on that matter is the Educational Services (NAICS 61) with a value of 2.10% (median is 1.82%[24]). It is interesting to observe that the industry performing the best under the GOI measure is also the one which performs the worst under the ROA measure meaning that it is efficient in terms of operational activities but less in terms of general profitability. It is also worth noticing that the Manufacturing industry (NAICS 31-32-33) shows the highest ROA percentage with a value of 40.66% whereas the least performing firm belongs to the Wholesale Trade industry (NAICS 42) and exhibits and value of -23.63%. About heterogeneity among industries, the Entertainment industry (NAICS 71) has the highest value with 9.01% while the Educational Services industry (NAICS 61) is the most homogeneous with a standard deviation of 3.43%.

As opposed to the GOI, the ROA shows a cyclical pattern over the years (see Figure 2). The ROA reaches its peak in 2010 and falls to its lower point in 2013. These observations go along with the results obtained following Enqvist, Graham and Nikkinen's (2013) methodology when determining the different stages of the business cycle. Consequently, one could expect a

[24] Note that in terms of median, the Healthcare and Social Assistance industry performs the least well with a value of 1.51%.

greater significance of the time dummy variables when considering the ROA as the profitability measure compared to the GOI.

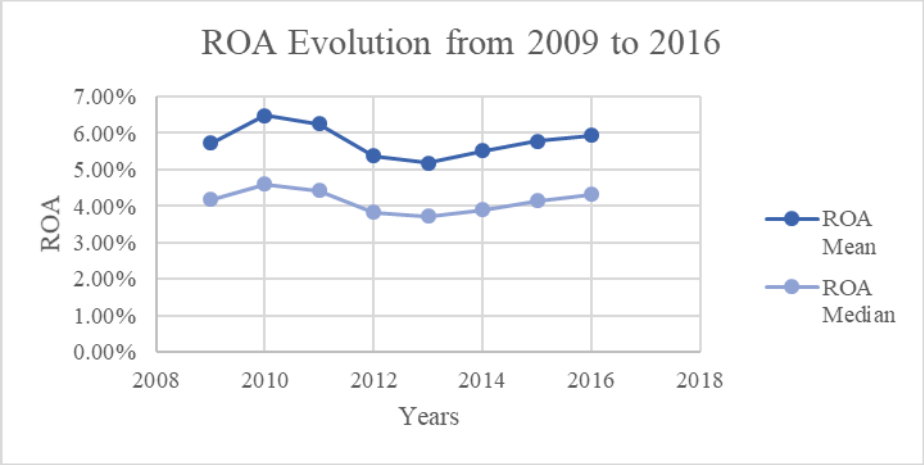


Figure 2 ROA Evolution Over Time

3.2.3. Variables under interest

3.2.3.1. NTC

On average, the Belgian firms have to finance the equivalent of 43.24 days of sales (median is 36.62 days). As expected, the NTC lengths vary between industries: the Manufacturing industry (NAICS 31-32-33) exhibits a mean NTC of 56.72 days (median is 51.32 days). This result does not come as a surprise, firms operating in this industry were expected to face a consequent need for financing day-to-day operations. Also, due to the nature of the activity, it was predicted that the mismatch between cash inflows and cash outflow would be greater than in other industries.

On the other hand, the Food and Accommodation Services, as well as the Entertainment industries (NAICS 72 and 71 respectively), show the lowest length of NTC. In fact, both have negative mean values of NTC meaning that firms derive cash flows from the NTC instead of using them to finance day-to-day activities. Once again, these results were anticipated since such type of firms often has small amount of inventory and trade directly with end-consumers who pay immediately or even in advance for the service while purchasing from other firms and thus benefiting from payment delays, common in a Business-to-Business environment. By doing so, firms can squeeze as much as possible the elements that lengthen the NTC while increasing the one that reduces it.

Regarding extreme values, the Construction industry (NAICS 23) exhibits the longest NTC length with 499.23 days as opposed to the Manufacturing industry (NAICS 31-32-33) that has the lowest length of NTC with a value of -280.50 days.

Considering heterogeneity within industries, the Information industry (NAICS 51) has the highest standard deviation with 64.05 days. On the contrary, the Educational Services industry is the most homogeneous with a standard deviation of 29.37 days.

As it can be seen in Figure 3, the evolution of the NTC remains flat over the years with a slight decrease of 1.15% from 2009 to 2016 (median is decreasing by 0.91% over the same period). This shows that Belgian firms show little concern over the working capital management efficiency.

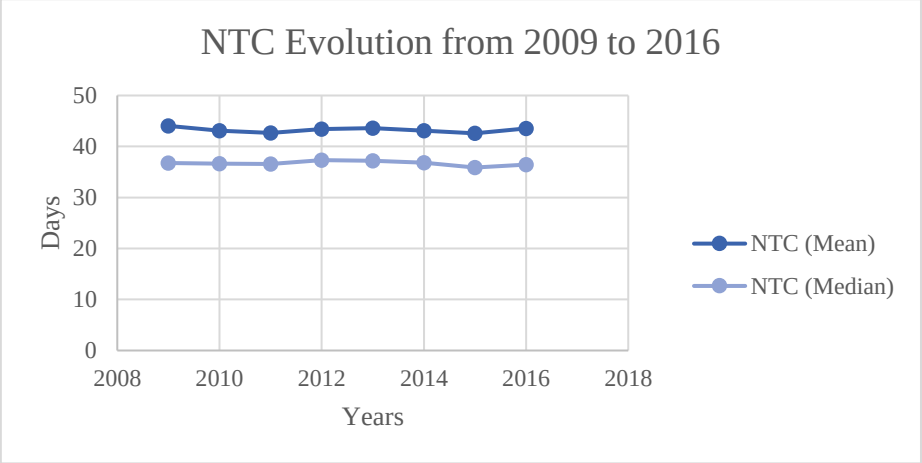


Figure 3: NTC Evolution over time

3.2.3.2. Days of receivables

Belgian firms wait, on average, 58.59 days to get paid by their customers (median is 53.78). The Construction industry (NAICS 23) wait the most with 79.52 days (median is 75.56 days) while the Educational Services (NAICS 61) get paid the fastest with a mean number of days of receivables of 19.18 days (median is 6.06 days). As it was expected, the industries that sell their products or services directly to the end-consumers exhibit shorter lengths of days of receivables than others. Unsurprisingly, the extreme values can be found in the Construction industry (NAICS 23) with 354.83 days closely followed by the Manufacturing industry (NAICS 31-32-33) with 354.29 days. These two industries often face large and very costly orders from a unique customer, this could imply several specificities concerning the relationship with that specific customer. First, given the nature of the product, the firms could benefit from letting the customers test the products before buying them which delays the payment. Then, since the

orders are substantial, the payment could be fractionated or longer delay times could be granted. Finally, dealing with few large customers at a time could expose such companies to larger doubtful receivables and longer terms of payment.

The days of receivables standard deviation of the sample is 40.44 days. The Information industry (NAICS 51) is the most heterogeneous with a standard deviation of 54.20 days while the most homogeneous industry is Agriculture, Forestry, Fishing and Hunting with 26.93 days.

Over time, Belgian firms get paid faster. Indeed, from 2009 to 2016, the mean days of receivables have decreased by 3.14% (median has decreased by 4.71%) as Figure 4 shows below.

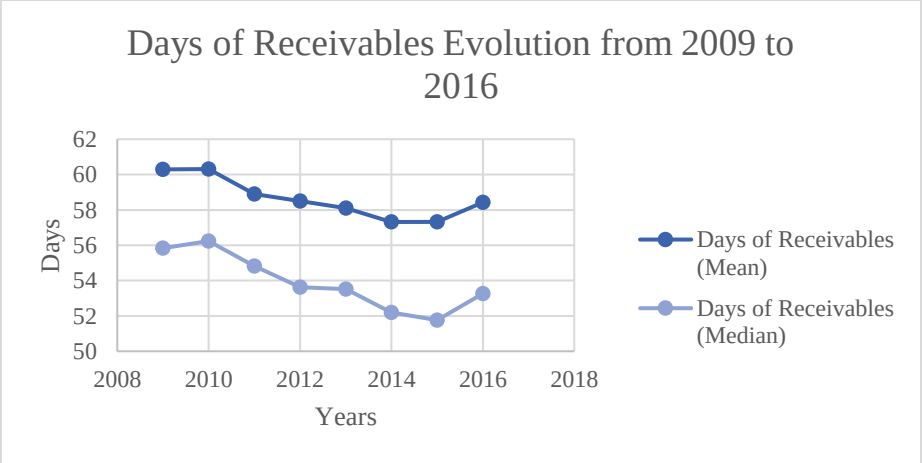


Figure 4: Days of Receivables Evolution over time

3.2.3.3. Days of inventory

The inventory of Belgian firms is sold, on average, after 30.55 days (median is 17.87 days). The gap between the mean value of days of inventory and the median value can be explained by the consequent number of firms active in the services industries that have no stock. On this matter, a good counter-example is the Wholesale Trade industry (NAICS 42) for which the mean and the median values are much closer (39.60 days and 32.68 days respectively).

The Retail Trade industry (NAICS 44-45) exhibits the most days of inventory with 45.03 days (median is 35.73 days) closely followed by the Manufacturing industry (NAICS 31-32-33) with 41.38 days (median is 32.39 days). In the case of the Retail Trade industry (NAICS 44-45), this can be explained by the necessity to hold substantial inventory level of finished

goods to sustain demand but also some buffer inventory[25] and anticipation inventory[26]. With the Manufacturing industry (NAICS 31-32-33), in addition to the two types of inventories previously mentioned, the need to hold greater level of inventory is triggered by the nature of the activity. In fact, the transformation process, related to manufacturing, requires raw materials, work-in-progress and finished goods inventories.

As said before, the shortest days of inventory can be found in the services industries. This is the Educational Services (NAICS 61) that exhibit the shortest days of inventory with 1.96 days (median is 0.58 days). Moreover, all the industries belonging to the tertiary sector do not exhibit a mean value of days of inventory above 10 days (median above 4 days).

It does not come as a surprise that most homogeneous industry is also one belonging to the tertiary sector, namely the Entertainment industry (NAICS 71) with a standard deviation of 3.12 days. In opposition, the Agriculture, Forestry, Fishing and Hunting industry (NAICS 11) is the most heterogeneous with a standard deviation of 50.21 days.

Over time, the level of inventory has increased by 5.32% (median has increased by 4.62%) as it can be seen in Figure 5. This could be explained by the level of economic uncertainty these past years in Europe but also shows the efforts to be made by Belgian firms in terms of working capital management.

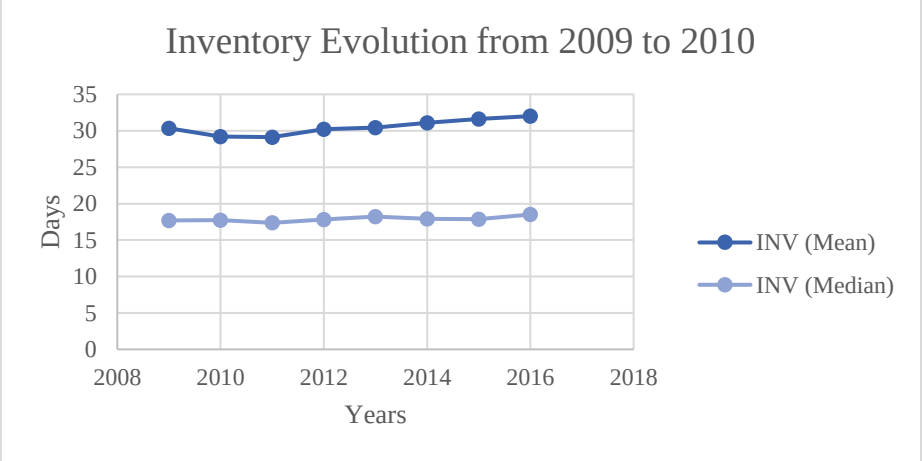


Figure 5 Inventory Evolution over time

[25] A buffer inventory is used to prevent the uncertainty in demand and supply.
[26] An anticipation inventory serves to secure the supply when a specific event is expected.

3.2.3.4. Days of payables

On average, Belgian firms pay their suppliers after 45.90 days (median is 39.80 days). The Information industry (NAICS 51) takes the longest time to pay suppliers with 63.95 days (median 51.81 days). However, the Mining, Carrying, Oil & Gas Extraction industry and the Construction industry (NAICS 21 and 23) exhibit a higher median (54.89 days and 56.58 days respectively) than the Information industry. This could be explained by the nature of the goods and the quantity bought by such firms. Indeed, the Mining, Carrying, Oil & Gas Extraction industry is expected to buy heavy and expensive machinery with long or fractionated payment deadlines while the Construction industry has to order large quantities of various raw materials. For these types of companies, account payables constitute a financing vehicle when other means of financing are scarcely accessible or too expensive.

Contrarily, the Educational Services industry (NAICS 61) pays its suppliers the fastest with a mean value of days of payables of 12.87 days (median is 7.43 days). It is very likely that such firms do not make large purchases and consequently pay quickly and do not derive great advantages to use account payables as a source of financing.

The Educational Services industry (NAICS 61) is also the most homogeneous with a standard deviation of 13.66 days. On the contrary, the Information industry (NAICS 51) is the most heterogeneous with a standard deviation of 48 days.

As shown below in Figure 6, the days of payables tend to increase slightly since 2014 after having decreased from 2009 to 2013.

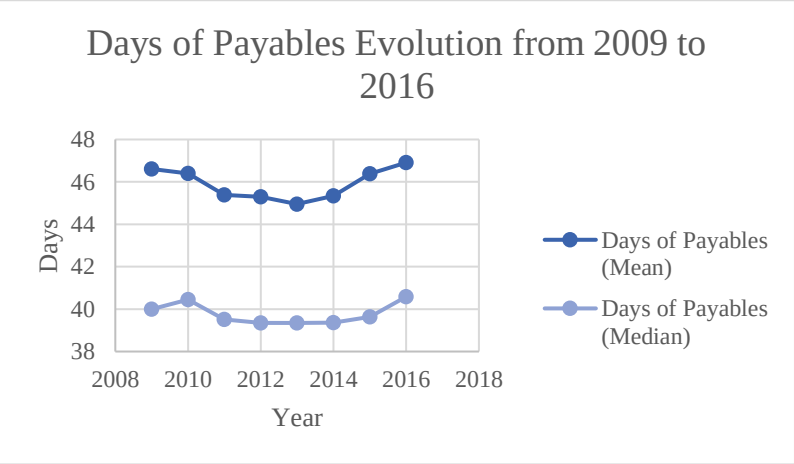


Figure 6 : Days of Payables Evolution over time

The Appendix 7 sums up the length of NTC and its components for each industry.

3.2.4. Control variables

The mean size of firms in the sample is 17.14 (median is 16.93). Unsurprisingly, the Manufacturing industry (NAICS 31-32-33) possesses the highest mean size with 17.36 while the Mining, Carrying, Oil & Gas Extraction industry (NAICS 21) has the highest median value with 17.21. In such types of industries, size is a paramount factor given the advantages provided by the economies of scale. In overall, each industry exhibits values close to each other.

The average sales growth rate of the sample is 4.26% (median is 3.05%). This value is drawn up by the 8.17% sales growth rate of the Entertainment industry (NAICS 71). The Manufacturing industry (NAICS 31-32-33) exhibits the lowest sales growth rate of the panel with 3.27% (median is 2.51%). It is also interesting to note that the median sales growth rate of the Mining, Carrying, Oil & Gas Extraction industry (NAICS 21) is negative with a value of -0.32%.

The mean leverage level of the sample is 0.58 (median is 0.61). The most leveraged industry is the Food and Accommodation Services (NAICS 72) whereas the Educational Services is the industry using the least debt with a leverage ratio of 0.42 on average (median is 0.23). One can notice that there are no substantial differences between the mean and the median values indicating that the distribution of the leverage variable in the sample is not particularly skewed.

On average, the fixed financial assets constitute 8.64% (median is 0.19%) of the total assets but it exists discrepancies between industries. The Mining, Carrying, Oil & Gas Extraction industry (NAICS 21) has a ratio of 24% (median is 3%) while the Educational Services has a ratio of 2% (median is 0%). There exist great differences between mean and median values. In this case, extreme values pull the mean up.

The variability of the net operating income goes from 3% to 9% (median from 2% to 5%). The Information industry (NAICS 51) is the most fluctuating on that matter whereas the steadiest industry is the Health Care and Social Assistance industry (NAICS 62).

Finally, it seems that Belgian firms do not invest much in R&D since the ratio of intangible assets over total assets reaches 1% for the total sample (median is 0%). The most active industry on that subject is the Information industry (NAICS 51) with a ratio of 4% as opposed to the Educational Services industry (NAICS 61) that exhibits null values for both mean and median.

3.3. Correlation matrices

A first glance at the relationship between the NTC and the firm's profitability can be provided by the analysis of the correlation coefficients between these variables. Indeed, the correlation coefficient between two variables represents the linear relationship between these two variables.

However, analysing the linear relationship between two variables using correlation coefficients has a significant drawback: this method does not differentiate the dependent variable from the explanatory variable. Consequently, it is impossible to determine with certainty which variable influences the other. Notwithstanding this caveat, correlation matrices give a useful overview before carrying out deeper analyses.

After having reviewed the literature, several hypotheses can be drawn. First, negative relationships between profitability measures (GOI and ROA) and the NTC are expected. More precisely, negative coefficients are anticipated between profitability measures and both days of receivables and days of inventory while positive coefficients are expected between profitability measures and days of payables. These coefficients are also envisioned to differ in value between industries that is why industry-specific correlation matrices have been computed (see Appendix 9).

3.3.1. Total sample correlation matrix

ρ	Sales Growth	Size	Var NOI	Leverage	FFA/TA	ROA	RD	GOI	DR	DP	DI	NTC
Sales Growth	1.00											
Size	0.00	1.00										
Var NOI	0.00	-0.10	1.00									
Leverage	0.00	0.09	0.04	1.00								
FFA/TA	0.00	0.06	0.18	-0.05	1.00							
ROA	-0.01	0.02	0.08	-0.13	-0.13	1.00						
RD	0.00	0.07	0.03	0.03	-0.01	-0.02	1.00					
GOI	-0.01	-0.03	0.20	0.09	0.07	0.12	0.06	1.00				
DR	0.01	-0.06	0.01	0.06	0.05	-0.07	0.01	-0.13	1.00			
DP	0.00	0.04	0.00	0.25	0.07	-0.17	0.04	-0.19	0.42	1.00		
DI	0.00	0.03	-0.05	-0.02	-0.07	-0.03	-0.02	-0.27	-0.04	0.06	1.00	
NTC	0.00	-0.05	-0.03	-0.13	-0.05	0.03	-0.04	-0.18	0.47	-0.26	0.65	1.00

Table 6: Correlation Matrix - Total Sample

P-VAL	Sales Growth	Size	Var NOI	Leverage	FFA/TA	ROA	RD	GOI	DR	DP	DI	NTC
Sales Growth	1.00											
Size	0.82	1.00										
Var NOI	0.86	0.00	1.00									
Leverage	0.63	0.00	0.00	1.00								
FFA/TA	0.56	0.00	0.00	0.00	1.00							
ROA	0.15	0.00	0.00	0.00	0.00	1.00						
RD	0.35	0.00	0.00	0.00	0.14	0.00	1.00					
GOI	0.13	0.00	0.00	0.00	0.00	0.00	0.00	1.00				
DR	0.24	0.00	0.11	0.00	0.00	0.00	0.17	0.00	1.00			
DP	0.75	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	1.00		
DI	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
NTC	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 7: P-Values of the Correlation Matrix - Total Sample

As shown in Table 6, the NTC and the GOI are negatively and significantly correlated with $\rho = -0.18$ (p-value = 0). This result confirms the previous observations made by Deloof (2003). Also, negative and significant relationships have been found between GOI and days of receivables (RD), GOI and days of inventory (DI) and GOI and days of payables (DP) ($\rho = -0.13$, -0.19 and -0.27 respectively). Once again, these results are in line with Deloof (2003). It is interesting to note that the correlation between GOI and the days of inventory is the strongest of the three, meaning that this latter is the key NTC component impacting the firms' profitability or vice versa. If the negative relationship between the NTC and the days of payables may be counter-intuitive, Deloof (2003) had the following argument: in Belgium, companies are often granted discounts for early payment. Consequently, paying suppliers earlier could lead to greater profits.

The positive and significant correlation coefficient ($\rho = 0.03$, p-value = 0) between the NTC and the ROA comes as a surprise. One could have imagined the same behaviour between these two variables and between the NTC and the GOI. However, this result is not an isolated case since Baños-Caballero, García-Teruel, Martínez-Solano (2014) have found the same type of relationship between the NTC and the ROA in a sample composed of publicly quoted non-financial UK firms. Nevertheless, likewise the GOI, the ROA is negatively and significantly correlated with the days of receivables, the days of inventory and the days of payables ($\rho = -0.07$, -0.03 and -0.17 respectively). The fact that the ROA has the strongest correlation with the days of payables could be an explanation for the positive relationship between the ROA and the NTC. Indeed, reducing to the minimum the days of payables has a double impact: first, it lengthens the NTC and second, it increases the ROA. Therefore, it is not surprising to observe a positive correlation coefficient between the two variables mentioned previously.

Concerning the control variables, it appears that the sales growth is not significantly correlated with profitability measures nor the NTC and each of its components. The firm's size seems to be negatively and significantly correlated with the GOI ($\rho = -0.03$, p-value = 0) while

it is positively and significantly correlated with the ROA (ρ = 0.02, p-value = 0). The correlation coefficient between the firm's size and the NTC is negative and significant (ρ = -0.05, p-value = 0). This due to the negative and significant relationship between the firm's size and the days of receivables (ρ = -0.06, p-value = 0) and the positive and significant correlation between the firm's size and the days of payables (ρ = 0.04, p-value = 0). These observations are in accordance with the thought that larger companies have greater negotiation power when setting payment deadlines. The variability of the NOI is positively and significantly correlated with the GOI and the ROA (ρ = 0.20, p-value = 0 and ρ = 0.08, p-value = 0 respectively). The positive relationship with the GOI has already been observed by Deloof (2003). Two reasons could explain this: First, the NOI is increasing over the time horizon due to higher sales levels. The second reason, more related to the GOI than the ROA, is that firm experiencing high variability of NOI try to hedge the risk with financial instruments, thus inflating the number of financial assets and, as a consequence, decreasing the denominator of the GOI measure. The leverage variable is positively and significantly correlated with GOI (ρ = 0.09, p-value = 0) and negatively and significantly correlated with ROA (ρ = -0.13, p-value = 0). It seems that, in Belgium, leverage has a positive impact on operational profitability but a negative impact on overall profitability. Moreover, leverage is negatively and significantly correlated with the NTC (ρ = -0.13, p-value = 0). It was indeed expected from highly leveraged firms to conduct operational activities very efficiently. However, a closer analysis shows that the cause of this negative correlation is due to the strong positive and significant correlation between leverage and days of payables (ρ = 0.25, p-value = 0). Even though leverage is expected to have a positive impact on working capital management efficiency, it seems that highly leveraged firms in the sample have difficulties to pay their suppliers which leads to artificially reducing the NTC length. Fixed financial assets (FFA) are positively and significantly correlated with the GOI (ρ = 0.07, p-value = 0) but negatively and significantly correlated with ROA (ρ = -0.13, p-value = 0). The correlation between the FFA and the NTC is negative and significant (ρ = -0.05, p-value = 0) because of the negative correlation between the FFA and the days of inventory (ρ = -0.07, p-value = 0). The R&D and the GOI are positively and significantly correlated (ρ = 0.06, p-value = 0) while R&D and ROA are negatively and significantly correlated (ρ = -0.02, p-value = 0). At this stage of the analysis, the negative and significant correlation coefficient between NTC and R&D (ρ = -0.04, p-value = 0) cannot clarify the nature of the relationship between these two variables, whether firms with great R&D activities are able to shorten the NTC or firms that generate cash flows from their NTC invest this cash in R&D activities.

3.3.2. Industry-specific correlation matrices

This section aims to underline the differences between NTC-GOI and NTC-ROA correlation coefficients across industries. As discussed previously, the correlation coefficients can only provide information about the slope of the linear relationship between two variables without being able to distinguish the causes from the consequences. Thus, in this section, only the sign and the significance of the correlation coefficient will be analysed.

NAICS	11	21	23	3	42	44-45	48-49	51	56	61	62	71	72
NTC - GOI	- (0.00)	+ (0.69)	+ (0.01)	- (0.00)	- (0.00)	- (0.00)	+ (0.58)	- (0.14)	+ (0.00)	- (0.00)	- (0.04)	- (0.61)	+ (0.91)
NTC - ROA	- (0.05)	+ (0.68)	+ (0.06)	- (0.83)	- (0.00)	- (0.00)	+ (0.00)	+ (0.08)	+ (0.00)	+ (0.94)	+ (0.06)	- (0.31)	+ (0.03)

Table 8: Correlation Coefficients per Industry

As depicted in Table 8, eight out of the twelve industries composing the sample exhibit a negative correlation coefficient between the NTC and the GOI (six of which are significant at a 95% level). On the other hand, five industries show negative correlation coefficients between the NTC and the ROA (with only three significant at a 95% level). From the two main industries under scrutiny, namely the Manufacturing industry and the Wholesale Trade industry (NAICS 31-32-33 and 42 respectively) only the Wholesale Trade industry shows negative and highly significant correlation coefficients between the NTC and both profitability measures, in line with the previously drawn up hypotheses. However, the same cannot be said for other industries, also expected to exhibit such type of correlation like the Construction industry (NAICS 23) that shows a positive and significant correlation between the NTC and both GOI and ROA or the Mining, Carrying, Oil & Gas Extraction (NAICS 21) for which the NTC does not seem to be significantly correlated with either of the profitability measures. Also, almost all the industries active in the tertiary sector (from NAICS 51 to NAICS 72) show the same pattern with a negative NTC-GOI correlation coefficient and a positive NTC-ROA correlation coefficient. In overall, it appears that the NTC-GOI relationship is more often significant than the NTC-GOA relationship.

For the purpose of a better understanding of the relationship between firms' working capital management efficiency and corporate profitability, more thorough analyses such as regression analyses will be required.

3.4. Regressions

In this section, the results of all the different regression models described previously will be analysed. First, the "general models" will be discussed for both profitability measures. Then, the specific influence of each industry will be analysed to determine whether the sector of activity has an impact on the relationship. Third, it will be assessed whether private and public firms exhibit the same type of relationship between the NTC and the corporate profitability. Finally, the last model hereunder will provide information about the influence of business cycle phases on the NTC-GOI and the NTC-ROA relationships.

The full results of the regressions can be found in Appendix 10 (General models), Appendix 11 (Industry-specific models), Appendix 12 (Public vs private regression models) and Appendix 13 (Working capital management, profitability and business cycles).

3.4.1. General models

As it can be seen in Table 9 and Table 10, the estimates for the NTC and the NTC^2 are in line with the results obtained by Baños-Caballero, García-Teruel and Martínez-Solano (2014), that is to say a positive and significant estimate for the NTC and a negative and significant estimate for the NTC^2. These results are valid for both profitability measures. These results reinforce the hypotheses of an inverted U-shape linkage between working capital management and corporate profitability, independently of the country under scrutiny. It is also interesting to notice that the relationship between the NTC and the GOI is positive while the correlation coefficient is negative. This leads to a particular situation where the correlation matrix is aligned with the finding of Deloof (2003) and several other authors while the regression corroborates the results found by Baños-Caballero, García-Teruel and Martínez-Solano (2014). This results from the specification of the models. In the case of the correlation matrices, the NTC is considered as the working capital level whether it is low or high. However, in the regression models, the NTC represents the working capital level when it is low, the NTC^2 representing a high working capital level. This nuance is crucial because it reconciles the two angles of analysis both stating that it exists an optimal level of working capital.

When comparing the two regression models, the first major difference is the value of the coefficient of determination (the adjusted R^2). In fact, the adjusted R^2 for the NTC-GOI

model is 0.24[27] whereas the one for the ROA model is only 0.08. It seems that with the ROA as dependent variable, the predictive capacity of the model is much lower than with the GOI as dependent variable. This could be explained by the fact that the ROA is a broader profitability measure and consequently, additional exogenous variables enter the equation when trying to predict accurately the changes of the ROA. Nonetheless, the estimates of the variable under study are significant and despite a low explanatory power of the model, the NTC is still key when it comes to explain the variations of the ROA. Secondly, when looking at the parameter estimator value of the NTC^2, it appears that the coefficient when GOI is the dependent variable is greater than the one when ROA is the dependent variable. It results in an inverted parabola of lower amplitude for the GOI-NTC relationship meaning that when a firm deviates from the optimal length of NTC by a given number of days, the miss to win will be greater in terms of GOI than in terms of ROA which makes sense since more elements intervene in the ROA computation, mitigating the impact of the NTC.

Finally, applying the methodology of Baños-Caballero, García-Teruel and Martínez-Solano (2014)[28], an optimal NTC length of 31.56 days is found when considering the GOI as dependent variable while an optimal length of 50.23 days is obtained when considering ROA as dependent variable. Why such a difference? The main hypothesis relates to the days of payables. While increasing the days of payables seems to constitute a good financing alternative in order to generate more cash from operations and extend operating activities, this way of managing payables could cut some profits due to the missed opportunities to benefit from potential discounts granted by suppliers.

The same methodology has been applied to all components of the NTC with more mixed results. While all first-order parameter estimators are negative and significant (except the days of receivables for the ROA) corroborating the results previously found by Deloof (2003), only the days of receivables show an inverted U-shape type of linkage with both profitability measures, in line with the results of Baños-Caballero, García-Teruel and Martínez-Solano (2014). Both estimates of second orders for the days of inventory and the days of payables are positive, making possible only the computation of a minimum point. Nonetheless, it is interesting to compare minimum points between the two profitability measures. It seems that, with the ROA as dependent variable, the minimum point for the days of inventory is reached sooner than with the GOI as dependent variable. This could be explained first by the fact that

[27] Compared to 0.22 in Deloof's paper (2003).

[28] Namely computing the optimal number of days of NTC as $-\beta_{NTC}/2\beta_{NTC^2}$

depreciation is not taken into account in the computation of the GOI. Consequently, holding high level of inventory has more positive aspects such as being able to respond to unexpected demand. On the other hand, with the ROA, the depreciation arising from perishable or out-of-date inventories impacts negatively the profitability of the firm, forcing it to hold lower inventory levels. The same observation can be made for the days of payables which supports the hypothesis drawn up earlier to explain the difference between the NTC length considering the GOI or the ROA as dependent variable.

GOI	NTC	NTC^2	DR	DR^2	DI	DI^2	DP	DP^2
Estimate	7.34E-04	-1.16E-05	-6.91E-04	-7.37E-06	-3.38E-03	5.02E-06	-5.80E-03	1.10E-05
P-value	2.96E-19	3.75E-158	4.30E-05	1.10E-18	2.36E-92	3.64E-08	2.94E-175	8.42E-22
Days	31.56		/		337.33*		263.20*	

Table 9: Regression Estimates - General Model

Note: the * means that the number of days represents a minimum point.

ROA	NTC	NTC^2	DR	DR^2	DINV	$DINV^2$	DP	DP^2
Estimate	9.22E-05	-9.17E-07	-2.01E-05	-6.94E-07	-3.22E-04	6.31E-07	-6.18E-04	1.31E-06
P-value	1.42E-18	1.73E-61	0.35	8.43E-11	4.73E-52	5.95E-08	4.04E-122	5.40E-19
Days	50.23		0.00		255.04*		235.87*	

Table 10: Regression Estimates - General Model

Note: the * means that the number of days represents a minimum point.

3.4.2. Industry-specific models

The purpose of this section is to test the previous regression models when adding interaction terms allowing to examine the NTC and NTC² parameters estimators unique to each industry. By doing so, these new regression models will underline the discrepancies between industries in terms of working capital management or by contrast, will highlight common trends and behaviours across industries.

As in the previous section, two analyses of the results can be made separately: First, by taking first order and second order variables apart in order to distinguish their respective influence on profitability. Secondly, first order and second order variables can be analysed jointly to determine an optimal length of NTC (if $\beta_{NTC^2} < 0$) or the length of NTC that minimize profitability (if $\beta_{NTC^2} > 0$).

Results are displayed in Table 11 (considering the GOI as dependent variable) and in Table 12 (considering the ROA as dependent variable).

When the GOI is set as the dependent variable, four out of twelve industries show negative and highly significant estimate values for NTC. These results are the first sign of an industry-specific influence on the relationship between working capital management and profitability. Furthermore, such findings are in accordance with Deloof (2003) and the authors who focused on the GOI-NTC relationship. These results are also in line with the correlation coefficients discussed earlier. Consequently, it appears that some industries (the Agriculture, Forestry, Fishing and Hunting, the Manufacturing, the Wholesale Trade and the Retail trade) gain in profitability by reducing as much as possible their NTC length while it would be more profitable for other industries to lengthen their NTC.

While the examination of the NTC-GOI relationship shows heterogeneous results, the NTC²-GOI relationships are much more homogeneous with all the industries (except the Agriculture, Forestry, Fishing and Hunting industry) exhibiting negative and highly significant estimates. The hypothesis of an inverted U-shape linkage between working capital management and profitability made by Baños-Caballero, García-Teruel and Martínez-Solano (2014) is reinforced since it appears to be true not only on the aggregated sample but also taking each industry separately. Even though every industry shows negative parameters estimators, the absolute values of these latter vary from industry to another, indicating that there exist sensitivity differences between them and ultimately, there exists needs of different importance

for being as close as possible to the optimal NTC length. Firms active in services industries show the highest estimator in absolute value, translating the biggest sensibility of the GOI towards working capital management. A possible explanation is that such firms hold less, or no inventory compared to other industries, this latter acting as a buffer under the control of the firm when the NTC length is deviating from the optimal point. As a consequence, the NTC only depends on two components (the days of receivables and the days of payables) that are more directly linked to the level of activity of the firm, influencing more strongly the profitability. The shortest optimal NTC length is -109.99 days (Wholesales Trade industry NAICS 42) while the longest optimal NTC length is 90.06 days (Construction industry NAICS 23). The three industries for which the optimal NTC length is negative are those that show a negative NTC-GOI relationship (except the Agriculture, Forestry, Fishing and Hunting industry). Also, most industries of the tertiary sector display an optimal NTC length longer than their mean and median NTC values. This could explain the positive relationship between GOI-NTC since such firms could gain from rising their working capital level when this latter is low.

Estimates of the GOI-days of receivables (DR) are also disparate, six industries have a positive parameter estimator[29] and six a negative one. Given these results, it seems that some industries gain from increasing their trade credits granted to customers even if it means waiting to get paid while others mainly gain in profitability by getting paid earlier (this latter trend being the most widely spread in the sample). Most industries have a negative and highly significant GOI-DR^2 estimator demonstrating the same behaviour as the NTC. Given the parameter estimators values, only three optimal length of days of receivables can be computed (for the Agriculture, Forestry, Fishing and Hunting, the Construction and the Transportation and Warehousing industries, respectively NAICS 11, 23 and 48-49) ranging from 34.35 to 101.90 days while others cannot be computed due to negative values or represent the minimum point of the curve.

Concerning the model wherein the number of days of inventory (DI) is the variable under study, eight out of twelve industries show a negative and highly significant GOI-DI relationship while only two industries seem to significantly gain in profitability by increasing their level of inventory (the Entertainment and the Food and Accommodation services industries, respectively NAICS 71 and 72). The results for the Food and Accommodation

[29] Note that the estimates of the Construction, the Information, Administrative, Support, Waste Management and Remediation Services and the Food and accommodation services industry are not significantly different from 0 at a 95% of certainty.

service should be regarded with critical stance since it appears illogical to raise the level of inventory whilst its nature is expected to be perishable or at least of a short lifespan and a high rate of depreciation. In overall, the results are in line with the idea of shortening as much as possible the length of NTC by implementing efficient inventory management policies even if some industries seem to benefit more from the fulfilling of the demand and the seasonality management by holding greater level of inventory. On the other hand, only four industries have a negative and significant GOI-DI² relationship (including the Manufacturing and the Wholesale Trade industries, NAICS 31-31-33 and 42 respectively). This comes as a surprise since all the industries were expected to have an optimal level of inventory, the need for fulfilling the demand and mitigating uncertainty constituting an opposition to the need for restrained level of inventory meant to avoid too much depreciation, obsolescence and inventory carrying costs. In the end, only the computation of the optimal numbers of days of inventory for the Entertainment and the Food and Accommodation services industries (NAICS 71 and 72 respectively) are possible with values of 4.85 and 12.09 days[30].

Finally, concerning the GOI-days of payables (DP) relationship, most of the parameter estimators are negative but only four are significant at a 95% level. The Food and Accommodation Services industry (NAICS 72) shows a positive and significant GOI-DP estimator. It is interesting to note that the number of days of payables impacts significantly services industries while the profitability of the primary and secondary sectors does not seem to be impacted by this variable. One of the reasons could be that primary and secondary sectors are expected to have longer payment deadlines with respect to their suppliers while such long payment times could be regarded as proves of financial distress in the tertiary sector. The results for the GOI-DP² parameter estimators show that only the Food and Accommodation Services industry (NAICS 72) has a significant inverted U-shape linkage with the GOI. As a result, the optimum point in terms of days of payables can only be computed for this industry, returning a value of 71.09 days.

Concerning the relationship between the NTC and all its components with the ROA, Table 12 shows that the overwhelming majority of the parameter estimators are not significant. Consequently, industries do not seem to have an influence on the linkage between the ROA and the working capital management. The low adjusted R^2 could partially explain this: indeed, with a mean value of 0.08, the models based on the ROA as the dependent variable do not appear to

[30] Values that are above the respective means and medians for the two industries which could explain their positive and significant GOI-INV relationships.

have great explanatory power and interactions terms between NTC or one of its component and industries are not expected, in this context, to create any difference. Also, financial assets are not taken out of total assets as with the GOI ratio. This is mainly the reason why Deloof (2003) decided not to use the ROA as profitability measure arguing that when the financial assets constitute a significant part of the total assets, the operating activities are expected to have little impact to the overall profitability. Moreover, the financial assets are not likely to diverge from an industry to another, explaining why the interaction terms are not significantly different from 0. Lastly, the ROA is computed with element further down in the profit and loss statement and it is important to keep in mind, as noticed by Ross, Westerfield and Jaffe (2013), that this ratio is an accounting one and thus subject to manipulations that could alter the genuine impact of operating activities on profitability.

Industry												
11	21	23	3	42	44-45	48-49	51	56	61	62	71	72
NTC												
-6.96 E-03	1.34 E-03	2.75 E-03	-2.23 E-04	-8.40 E-04	-1.57 E-03	1.69 E-03	1.07 E-03	6.90 E-03	1.89 E-03	2.30 E-04	3.03 E-03	2.20 E-03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTC^2												
1.77 E-05	-1.78 E-05	-1.53 E-05	-7.15 E-06	-3.82 E-06	-8.31 E-06	-2.81 E-05	-2.38 E-05	-4.08 E-05	-5.74 E-05	-2.64 E-05	-3.93 E-05	-3.02 E-05
0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Days												
196.61	37.73	90.06	-15.61	-109.99	-94.47	30.05	22.40	84.61	16.45	4.34	38.55	36.49
DR												
1.08 E-02	-3.58 E-03	5.45 E-03	-2.47 E-03	-8.26 E-04	-6.11 E-03	1.24 E-03	3.41 E-03	6.06 E-03	-2.14 E-02	-7.64 E-03	-7.03 E-03	7.01 E-03
0.01	0.01	0.17	0.00	0.00	0.00	0.01	0.06	0.23	0.00	0.00	0.00	0.38
DR^2												
-9.68 E-05	5.93 E-06	-2.67 E-05	-2.75 E-07	-4.62 E-06	1.93 E-05	-1.80 E-05	-2.29 E-05	-6.02 E-05	7.18 E-05	2.04 E-05	1.61 E-05	-3.45 E-05
0.00	0.01	0.03	0.00	0.01	0.00	0.02	0.03	0.27	0.00	0.00	0.00	0.07
Days												
55.88	301.76	101.90	/	/	158.29	34.35	74.64	50.38	148.54	187.35	218.94	101.65
DI												
-8.82 E-03	2.84 E-03	-7.17 E-04	-2.30 E-03	-3.49 E-03	-3.32 E-03	-9.43 E-03	-7.54 E-03	-2.67 E-02	-1.61 E-01	-3.16 E-02	2.43 E-01	1.43 E-01
0.00	0.07	0.00	0.00	0.00	0.00	0.84	0.54	0.00	0.00	0.00	0.00	0.00
DI^2												
2.73 E-05	-4.64 E-05	-4.16 E-06	-5.37 E-07	6.26 E-06	1.61 E-06	-1.11 E-05	1.72 E-05	7.36 E-05	3.33 E-03	3.92 E-04	-2.50 E-02	-5.92 E-03
0.00	0.34	0.00	0.00	0.00	0.00	0.37	0.29	0.00	0.00	0.00	0.00	0.00
Days												
161.25	30.56	/	/	278.94	1032.90	/	219.21	181.61	24.22	40.31	4.85	12.09
DP												
1.49 E-03	-7.27 E-03	-2.97 E-03	-3.05 E-03	-2.60 E-03	-4.13 E-03	-4.66 E-03	-1.80 E-03	-3.23 E-02	-8.21 E-02	-1.99 E-02	-1.47 E-02	1.19 E-02
0.73	0.16	0.30	0.29	0.34	0.20	0.15	0.45	0.00	0.00	0.00	0.00	0.04
DP^2												
2.59 E-06	1.27 E-05	-2.97 E-06	-1.83 E-06	8.38 E-07	3.60 E-06	5.85 E-07	-8.06 E-06	1.21 E-04	7.54 E-04	9.87 E-05	4.93 E-05	-8.40 E-05
0.95	0.83	0.89	0.91	0.96	0.98	0.96	0.79	0.00	0.00	0.02	0.28	0.04
Days												
/	287.02	/	/	1550.06	574.62	3984.07	/	133.03	54.45	100.84	149.17	71.09

Table 11: Regression Estimates - Industry-Specific Model - GOI

Industry												
11	21	23	3	42	44-45	48-49	51	56	61	62	71	72
NTC												
-3.89 E-05	6.81 E-05	9.82 E-05	1.55 E-04	2.85 E-05	-2.95 E-04	2.25 E-04	5.96 E-05	2.53 E-04	2.21 E-05	6.47 E-05	5.82 E-05	3.12 E-04
0.82	0.64	0.42	0.25	0.69	0.15	0.12	0.57	0.09	0.79	0.56	0.65	0.10
NTC^2												
-8.43 E-07	-1.66 E-06	-5.91 E-07	-1.30 E-06	-6.99 E-07	5.21 E-07	-1.56 E-06	-4.92 E-07	-1.16 E-06	1.04 E-07	-2.57 E-07	-1.56 E-06	-2.11 E-06
0.27	0.61	0.74	0.55	0.85	0.12	0.37	0.66	0.69	0.47	0.53	0.54	0.34
Days												
-23.08	20.45	83.04	59.73	20.40	282.68	72.12	60.65	108.63	-106.43	125.87	18.67	74.00
DR												
-7.63 E-04	7.89 E-04	-4.42 E-05	-9.58 E-05	6.68 E-05	-7.85 E-04	-1.00 E-04	1.08 E-04	1.55 E-04	-8.92 E-05	4.73 E-04	1.22 E-04	3.70 E-05
0.13	0.03	0.15	0.19	0.10	0.97	0.19	0.09	0.07	0.21	0.02	0.11	0.15
DR^2												
2.66E-06	-4.41 E-06	-7.90 E-07	-6.44 E-07	-1.10 E-06	3.08 E-06	1.40 E-07	-8.11 E-07	-1.84 E-06	8.34 E-07	-2.70 E-06	-1.09 E-06	3.66 E-08
0.53	0.17	0.42	0.44	0.38	0.92	0.56	0.42	0.29	0.68	0.22	0.39	0.55
Days												
143.46	89.41	/	/	30.39	127.58	358.91	66.30	42.10	53.46	87.58	56.08	/
DI												
1.33 E-07	-1.05 E-03	-1.42 E-04	-7.30 E-05	-3.81 E-04	-6.25 E-04	-2.37 E-03	-4.89 E-04	-9.35 E-04	-2.36 E-03	-5.61 E-04	-9.06 E-03	-1.95 E-03
1.00	0.20	0.51	0.73	0.07	0.01	0.00	0.07	0.00	0.32	0.21	0.08	0.38
DI^2												
-1.02 E-06	5.81 E-06	3.65 E-07	-8.83 E-07	7.72 E-07	1.32 E-06	2.25 E-05	1.62 E-06	3.18 E-06	1.44 E-05	4.85 E-06	9.83 E-04	2.64 E-05
0.28	0.49	0.16	0.89	0.06	0.03	0.00	0.03	0.00	0.80	0.42	0.04	0.80
Days												
0.07	90.17	193.81	/	246.90	237.26	52.53	151.12	146.87	81.90	57.78	4.60	36.95
DP												
-1.12 E-03	-5.03 E-04	-7.14 E-04	-8.06 E-04	-4.91 E-04	-6.80 E-04	-8.40 E-04	-3.40 E-04	-1.08 E-03	-9.71 E-04	2.37 E-04	3.87 E-04	-2.21 E-04
0.04	0.45	0.47	0.57	0.26	0.44	0.62	0.17	0.94	0.83	0.02	0.03	0.17
DP^2												
5.53 E-06	1.35 E-06	1.34 E-06	1.91 E-06	8.24 E-07	9.12 E-07	2.57 E-06	4.62 E-07	3.71 E-06	1.44 E-05	-1.48 E-06	-3.03 E-06	-7.32 E-07
0.28	0.51	0.42	0.48	0.36	0.37	0.57	0.33	0.72	0.30	0.18	0.13	0.26
Days												
101.16	186.09	265.32	210.69	297.82	372.79	163.20	368.57	145.64	33.74	80.36	63.86	/

Table 12: Regression Estimates - Industry-Specific Model – ROA

3.4.3. Public vs private ownership models

As explained earlier, the scarce number of publicly quoted Belgian firms made very difficult the analysis of the relationship between working capital management and stock market-based measures of profitability such as Tobin's Q. However, the implementation of a dummy variable controlling for the firms' ownership nature allows to study the interaction terms between the NTC and these ownership types and ultimately determine the influence of being publicly quoted on the relationship between working capital management and corporate profitability.

At first glance, the same type of linkage is expected from private and public companies. Nonetheless, public firms are believed to have greater access to different sources of financing making working capital management less of a concern compared to privately owned firms. More than the signs of the parameter estimators, it is their absolute values which could be subject to some changes. The results of the regression models incorporating the "Listed" dummy variable and the interaction terms between this latter and the NTC are depicted below in Table 13.

	Private		Public	
	GOI	ROA	GOI	ROA
NTC	7.43 E-04	9.23 E-05	5.94 E-04	9.13 E-05
P-value	0.00	0.00	0.81	0.99
NTC^2	-1.17 E-05	-9.20 E-07	-4.23 E-06	-7.23 E-07
P-value	0.00	0.00	0.03	0.65
Days	31.65	50.18	70.22 (87.78)	63.16 (50.18)

Table 13: Regression Estimates - Private vs Public Ownership

Note: The number of days under parentheses are computed using only the estimates significantly different from the "base" case.

First, parameter estimators for private firms[31] are all highly significant which is not surprising given their weight in the total sample. Logically, the results are also very close to the results obtained with the general regression models with positive relationships between the NTC and the profitability measures and negative relationships between the NTC^2 and the

[31] Note that the value "Private" of the dummy variable "Listed" represents the "base case", meaning that in the case of non-significant estimates for public firms, the true value of these estimates is the one of the "base case".

profitability measures. As expected, the optimal lengths of NTC are very close to those found earlier for the total sample as well (31.65 days and 50.18 days for GOI and ROA respectively compared to 31.56 days and 50.23 days with the general regression models).

Then, concerning the publicly quoted firms, the lack of significance of three out of four parameter estimators confirms the expectations made earlier: in most cases, there is no difference between privately owned and publicly quoted firms when it comes to the nature of the relationship between working capital management and profitability. Nonetheless, the significant (at a 95% level) value of the NTC^2-GOI estimator for publicly quoted firms gives insight on how the greater access to financial markets impacts the relationship between working capital management and corporate profitability. Indeed, the absolute value of the estimate is lower than its "private" counterpart, translating an inverted parabola of a wider amplitude that translates a smaller sensitivity of profitability towards the NTC. Furthermore, the optimal length of NTC with respect to the GOI is substantially longer for public firms. Once again, this result comforts the idea that working capital management is less important as a source of financing for public companies since they have greater access to capital markets[32].

[32] These results are in line with Baños-Caballero, García-Teruel and Martínez-Solano (2014) who found that more financially constrained firms experienced lower levels of working capital than less financially constrained firms. The authors cited financing costs and capital rationing caused by a need for working capital investment control as the main drivers of these lower levels.

3.4.4. Business cycle phases models

Instead of using year-based control variables that did not appear to be significant in previous models[33], the models presented in this section will use the dummy variables previously defined and based on business cycle phases. More than just a change of control variable, using the methodology of Enqvist, Graham and Nikkinen (2013) will allow conducting a deeper analysis on how business cycles affect the relationship between working capital management and corporate profitability thanks to interaction terms.

Downturn and upturn periods are expected to exacerbate the relationship between working capital management and corporate profitability. Indeed, during downturn periods, demand is decreasing, financing sources are difficult to find and working capital management should be an important lever to mitigate the negative impact of the economic slowdown. On the other hand, when the economy is thriving, a good working capital management could be a leveraging tool for the cash flow generated by operating activities if the firm is able to supply the increasing demand, shorten the days of receivables and use account payables as a cheap source of financing.

	Low		Stable		High	
	GOI	ROA	GOI	ROA	GOI	ROA
NTC	7.24 E-04	8.93 E-05	6.55 E-04	7.38 E-05	9.76 E-04	1.39 E-04
P-value	0.72	0.53	0.00	0.00	0.11	0.01
NTC^2	-1.14 E-05	-1.03 E-06	-1.11 E-05	-7.91 E-07	-1.39 E-05	-1.12 E-06
P-value	0.72	0.08	0.00	0.00	0.01	0.02
Days	31.68 (29.61)	43.54 (35.96)	29.61	46.65	35.19 (23.63)	62.07

Table 14: Regression Estimates - Business Cycle Phases Model

Note: The number of days under parenthesis are computed using only the estimates significantly different from the "base" case.

Table 14 sums up the results of the regression models for both the GOI and the ROA as dependent variables. The first observation is that the ROA is more significantly sensitive to the different economic periods[34]. It is interesting to note that while industries-related dummy variables have a significant influence on the NTC-GOI relationship, it is the economic conditions-related dummy variables that significantly impact the NTC-ROA relationship. As it

[33] Appendices 10, 11 and 12.

[34] As it can be seen in Appendix 13, the Low and High periods respectively impact negatively and positively the ROA with a significance level of 90% (>99% for the High period) while the Low period does not seem to significantly impact the GOI and the High period returns counter-intuitive results (negative impact).

appears, only the relationship NTC-ROA is significantly impacted during economic upturns. As expected, the estimator value is becoming greater when facing the upturn period. The NTC^2-Profitability relationship is only significant during upturn periods when considering the GOI as the profitability measure. Again, in absolute value, the estimator is greater than its "Stable" counterpart which means that a deviation from the optimal level of working capital during economic upturn will lead to a greater miss to win in terms of GOI compared to the stable period. Considering the ROA as the dependent variable, both NTC^2-ROA estimates are significant for the Low and the High periods (at respectively 92% and 98% levels) and their absolute value are greater than during the Stable period comforting the previously made hypotheses. During economic upturns, two opposite trends emerge in the optimal NTC lengths. On the GOI side, the optimal NTC length is lower than during stable periods. It seems that liquidity concerns take precedence over profitability in that case. On the ROA side, profitability appears to be favoured and the lengthening of the of NTC comes from a will to fully catch the new demand with greater level of inventory and more permissive payment terms for customers. During slowdowns, the phenomenon is opposite (at least when considering ROA since GOI estimator are not significantly different from 0).

4. CONCLUSION

Working capital management is key when speaking about corporate profitability and risk. Indeed, it alone represents the complexity of the equilibrium between liquidity and profitability concerns. The day-to-day management of a company short-term asset is a time-consuming activity for managers. Despite its crucial importance, working capital management is far from being the most covered topic in finance theory compared to other topics such as dividend policy, capital budgeting and capital structure (Chang, 2018). The first researches conducted to determine the relationship between working capital management and corporate profitability where published in the nineties (Shin and Soenen, 1998). Since then, numerous papers were published examining the aforementioned linkage using different proxies for both working capital management and corporate profitability and using samples of non-financial firms from different countries like the US, the UK, Japan and Spain. The only study of this nature carried out on a Belgian sample was made by Deloof (2003) and thus constituted the only reference point for this study. Most of the papers found a negative and significant relationship between working capital management and corporate profitability. These findings comforted the idea that an efficient working capital management could raise the profitability and went further by stated that it exists an optimal level of working capital, without determining it however.

The aim of this study was to determine the nature of the linkage between working capital management and corporate profitability for Belgian non-financial firms and if it was possible, determining an optimal level of working capital maximizing the profitability. On top of that, the specific influences of industries, business cycle phases and being publicly quoted have also been assessed to give a more thorough overview of the different elements affecting the relationship between working capital management and corporate profitability. To do so, the empirical analyses were made on a sample of Belgian non-financial firms containing 48,050 firm-year observations, covering a time window of eight years from 2009 to 2016. Correlation matrices and ordinary least squares (OLS) regressions analyses have been conducted to determine the relationship between working capital management and corporate profitability. The working capital management is measured by the net trade cycle (NTC) while corporate profitability is approximated by the gross operating income (GOI) and the return on assets (ROA).

This study found, as expected, an inverted U-shape form for the linkage between working capital management and corporate profitability, whatever the profitability measure used (GOI or ROA). Applying the methodology of Baños-Caballero, García-Teruel and Martínez-Solano (2014), an optimal NTC length of 31.56 and 50.23 days has been found when considering the GOI and the ROA respectively. Furthermore, the days of receivables, inventory and payables exhibit a negative relationship with both profitability measures in accordance with the previous findings of Deloof (2003). However, with the exception of the days of receivables, they do not show an inverted U-shape form of linkage with any of the profitability measures.

Some differences are present between industries. For those where working capital management is expected to be a paramount activity, a negative relationship between NTC and GOI is observed likewise in Deloof's paper (2003). On the other hand, all industries, except the Agriculture, Forestry, Fishing and Hunting industry, show an inverted U-shape type of relationship between working capital management and corporate profitability comforting the findings of Baños-Caballero, García-Teruel and Martínez-Solano (2014). Even though the shape is common to all industries, the absolute values of the estimators vary between them, showing a greater sensibility from industries stemming from the tertiary sector. The analysis focused on the days of receivables demonstrates heterogeneous results and stresses out that each industry has to be investigated individually. This is also the case, to a lesser extent though, for the results of the days of inventory and the days of payables. In fact, some trends can be spotted: most of the industries show a negative GOI-DI relationship and most of them exhibit a U-shape form of linkage between the two variables. Concerning the days of payables, the significant relationships with GOI are negative and have a U-shape form as well.

Then, being publicly quoted does not seem to impact significantly the nature of the relationship between working capital management and corporate profitability. The only significant effect shows through the amplitude of the inverted parabola when considering GOI as a profitability measure. In this case, public companies exhibit an inverted parabola of a wider amplitude meaning that their profitability is less sensitive to their working capital management efficiency. This constitutes a logical observation since these companies are expected to have greater access to financial markets. Related to this observation, publicly quoted firms also exhibit a higher optimal level of working capital.

Ultimately, business cycles have a significative impact on the amplitude of the inverted parabola as well. During expansion or contraction periods, the sensitivity of the profitability towards working capital management is greater, comforting the hypothesis that firms have to

be more careful while managing their short-term assets during an unusual economic context. This is mostly the case when considering the ROA as the profitability measure.

5. PROJECT MANAGEMENT

This section aims to give a critical assessment of the conduct of this master thesis based on methodologies and good practices for project management and research studies. To do so different resources will be used such as the information provided during the seminar "Project Management" but also specialized literature dealing with the specificities of research projects.

5.1. Definition

The Project Management Institute[35] (PMI) has defined a project as follows:

"A project is a temporary endeavour undertaken to create a unique product, service or result".

The PMI also links a project to a set of characteristics:

- The project has to be fundamentally unique.
- Deliverables and results have to be well-defined.
- The project is temporary.
- The project is developed progressively.

In the light of these definitions and characteristics, the master thesis clearly ticks all the boxes to be considered as a project. This project, yet, falls into a particular category: a research project. Given this particularity, the content of the five core processes of project management defined by the PMI[36] will differ from the set of activities commonly associated with these processes.

5.2. Project Initiation

The initiation of this project started in March 2017 when a short list of research subjects was provided by the HEC research team directed by Mrs. Lambert. In my opinion, the fact that interviews were required in order to get the thesis subject was beneficial. In fact, such selection procedure implies some groundworks that will allow the individual to make its mind whether

[35] Founded in 1969, the Project Management Institute is a US non-profit organization that seeks to help managers worldwide by global advocacy, collaboration, education and research. It also provides recognised certifications, standards and tools.
[36] Initiating, Planning, Executing, Monitoring & Controlling and Closing.

the research subject matches his/her affinities but also trigger a self-reflection that is useful to take inventory of his/her strengths and weaknesses prone to have an influence on the end result.

These interviews were also a good preparation for the next step: Planning. Indeed, motivating your choice implied providing a rough sketch of methodology.

5.3. Project Planning

First of all, Bell (2010) stated that the topic selection, the purpose of the study as well as primary hypotheses, the work title and project outline are part of the project planning in the case of a research project. On that matter, the task has been made easy because the subjects proposed to students already contained a title, a short summary of previous findings, some goals to achieve and a very concise methodology to guide the students during their preliminary work.

The PMI identifies 7 outputs of the planning phase that together will constitute the Project Management Plan (PMP)[37]. In this section, the four major outputs will be presented.

5.3.1. Scope

Defining the scope was more difficult than it seemed because even though the preliminary guidelines and goals gave a good view of the tasks to be done and the general scope of the project. The preliminary readings provided interesting leads that deviated a bit from the guidelines but seemed to add greater value to the work. After an informal discussion with a member of the supervision team, it appears that the plan was not rigid and could be subject to modifications depending on the will of the student. Consequently, the scope of the work evolved over time depending on the feasibility, the information at disposal as well as the skills available.

In retrospect, to have a clear view of the scope at the beginning of the work would have saved another scarce resource encompassed in the PMP: Time. Indeed, adapting the scope on the way was sometimes due to unexpected events or unforeseen lack of data but at least setting directly some boundaries would have certainly helped to manage time.

[37] Scope, Time, Resources, Communication, Risk, Cost and Quality

5.3.2. Time

By far, time resources were the trickiest to plan. First, the participation at the CFA Research Challenge 2017-2018 consumed a lot of time. In the meantime, the research for the literature review fell behind. Then, an internship of 16 weeks instead of the conventional 10 prevented a full-time work on the project starting in mid-March as expected. At this stage, it was clear that the project would be handed in second session on the 16th of August. At the moment the deadline date was known, the schedule has been organized sequentially. The month of May was dedicated to the literature review and the statistical analyses to perform. Then, during June, the data required for the study were retrieved and refined. The first half of July was dedicated to the statistical analyses on an econometric software. Finally, the last half of July and the first half of August were used to write the findings and finish the project.

On time planning, there was room for improvement. In fact, a proper time planning was set very late in the process while the first stages of the project were more informally organized, where tasks were performed when time allowed it. Before May, the project definitely came after other academic activities and only after that it mobilized all the time and resources available. Also, setting shorter deadlines for sub-activities would have helped to keep on track the overall schedule.

5.3.3. Resources

Three different types or resources had to be planned:

- Scientific literature resources
- Technological resources
- Human resources

Scientific literature resources were crucial for the understanding of unmastered concepts but also to gather enough information to generate valuable content for this project.

Technological resources were also very important for two key steps in the project: data retrieving and statistical analyses. Indeed, a comprehensive financial database available for Belgian firms has to be used to retrieve all the financial data needed for the project. The choice of database was straightforward since there are not many offers on the market and even less of those are accessible to students. The Bel-first database provided by Bureau van Dijk was the

obvious choice. Concerning, the econometric software, the choice was made according to the task at hand and the easiness to tackle it. The Matlab software was chosen because it constitutes a powerful and yet easy to use tool for statistical analyses such as regressions and large database manipulations. Previous experiences with this software also helped to gain time in the process.

Human resources were limited since this kind of project aims to be individual. Yet, I could count on external help from the supervision team but also from other people able to answer specific theoretical or practical questions.

5.3.4. Risk

Risk planning is difficult in this kind of project since much of the risk is composed of unexpected events. On that matter, IT risks such as loss of content has been mitigated by keeping copies of the work on several supports (physical like hard drives or non-physical like cloud savings). Yet, some unfortunate events like a computer theft slowed down the realization of the project by some margin. Also, a late discovery of some manipulation errors with the data led to redo some time-consuming steps of the project.

5.4. Project Execution

The first step of the project has been the preliminary readings. The aim was to have a comprehensive knowledge of the subject and a clear view of the crucial steps that would have to be performed afterwards. Then, a selection of the most pertinent scientific papers was made for the purpose of the literature review. Once this selection made, the literature review has been written with the idea of making a chronological story of the previous researches on the subject to give the readers, who are not all supposed to be experts on that domain, a comprehensive but clear view of the context and hints on how the work will be structured. Then, the regression models were developed based on the previous results of researchers and the variables to retrieve were identified. After that theoretical work, the computational work started with the retrieving of the data. This step took a certain amount of time because of the sample size. In fact, it was not feasible to retrieve the whole sample at once and this latter had to be split then recompiled afterwards, adding few steps and time in the process. Then, came the data cleaning where abnormal or missing values were deleted, variables under interest were computed and data were sorted to be imported into the econometric software. Several analyses were made such as summary statistics, correlations matrices, variance inflation factors computation and mostly the

regression analyses. Thereupon, the outputs were analysed and conclusions were drawn up. Next was the writing phase with ultimately the writing of this section. At the very end, proof-readings, adjustments and pages layout were done.

5.5. Project Monitoring and Control

In this project, the monitoring and control phase consisted in two different aspects. On the one hand, schedule monitoring was very important since an overconfidence bias (or the opposite) often led to unrealistic or too pessimist schedules. On that matter, every time a task was done, the schedule was reassessed and modified if necessary. On the other hand, there was a control on the outputs of the analysis. Results were first analysed with respect to their coherency and statistical correctness.

In retrospect, monitoring appointments with the supervision team sooner in the process would have been beneficial to define clearly the scope of the project and give advice concerning the scheduling phases.

6. APPENDICES

6.1. Appendix 1 – Glossary

Term	Acronym
Financial Needs for Operation	FNO
Cash Conversion Cycle	CCC
Weighted Cash Conversion Cycle	WCCC
Net Trade Cycle	NTC
Return On Assets	ROA
Return On Equity	ROE
Standard Industrial Classification	SIC
Jensen's Alpha	ALPHA
Treynor Index	TI
Gross Operating Income	GOI
Ordinary Least Square	OLS
Small-to-Medium Enterprise	SME
North American Industry Classification System	NAICS
Days of Receivables	DR
Days of Payables	DP
Days of Inventory	DI
Fixed Financial Assets	FFA
Project Management Institute	PMI
Project Management Plan	PMP

6.2. Appendix 2 – Past studies

Title	Authors	Model	Variables
Does Working Capital Management Affect Profitability of Belgian Firms? (2003)	Marc Deloof	$GOI_{i,t} = \beta_1 CCC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALESGROWTH_{i,t} + \beta_4 FINANCIALDEBTRATIO_{i,t} + \beta_5 \frac{FFA}{TA}_{i,t} + \beta_6 VARIABILITYNOI_{i,t} + \varepsilon_{i,t}$ + 4-year dummies + 37 industry dummies	$GOI_{i,t} = \frac{Sales_{i,t} - COGS_{i,t} + D\&A_{i,t}}{Total\ Assets_{i,t} - Financial\ Assets_{i,t}}$ $CCC_{i,t} = Days\ Account\ Receivables_{i,t} + Days\ Inventory_{i,t} - Days\ Account\ Payables_{i,t}$ $SIZE_{i,t} = Ln(Sales_{i,t})$ $SALESGROWTH_{i,t} = \frac{Sales_{i,t} - Sales_{i,t-1}}{Sales_{i,t-1}}$ $FINANCIALDEBTRATIO_{i,t} = \frac{Financial\ Debt_{i,t}}{Total\ Assets_{i,t}}$ $\frac{FFA}{TA}_{i,t} = \frac{Fixed\ Financial\ Assets_{i,t}}{Total\ Assets_{i,t}}$ $VARIABILITYNOI_{i,t} = \frac{\sigma(Net\ Operating\ Income)}{Total\ Assets_{i,t} - Financial\ Assets_{i,t}}$
Working Capital Management, Corporate Performance and Financial Constraints. (2014)	Sonia Baños-Caballero, Pedro J. García – Teruel, Pedro Martínez-Solano	$Q_{i,t} = \beta_0 + \beta_1 NTC_{i,t} + \beta_2 NTC_{i,t}^2 + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \beta_5 GROWTH_{i,t} + \beta_6 ROA_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$ + Industry dummy variables	$Q_{i,t} = \frac{Market\ Value\ of\ Equity + Book\ Value\ of\ debt}{Book\ Value\ of\ Assets}$ $NTC_{i,t} = \frac{Account\ Receivables_{i,t}}{Sales_{i,t}} \times 365 + \frac{Inventory_{i,t}}{Sales_{i,t}} \times 365 - \frac{Account\ Payables_{i,t}}{Sales_{i,t}} \times 365$ $SIZE_{i,t} = Ln(Sales_{i,t})$ $LEV_{i,t} = \frac{Total\ Debt_{i,t}}{Total\ Assets_{i,t}}$ $GROWTH_{i,t} = \frac{Book\ Value\ of\ Intangible\ Assets_{i,t}}{Total\ Assets_{i,t}}$ $ROA_{i,t} = \frac{EBIT_{i,t}}{Total\ Assets_{i,t}}$ λ_t = Dummy variable aiming to control for external economic factors η_i = unobservable heterogeneity Optimal working capital level = $-\beta_1/2\beta_2$
The relationship between working capital management and profitability of listed companies in the Athens Stock Exchange. (2006)	Dr Ioannis Lazaridis Msc Dimitrios Tryfonidis	$GOI_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 FINANCIALDEBTRATIO_{i,t} + \beta_4 \frac{FFA}{TA}_{i,t} + \varepsilon_{i,t}$ + 8 industry dummy variables	$GOI_{i,t} = \frac{Sales_{i,t} - COGS_{i,t}}{Total\ Assets_{i,t} - Financial\ Assets_{i,t}}$ $CCC_{i,t} = Days\ Account\ Receivables_{i,t} + Days\ Inventory_{i,t} - Days\ Account\ Payables_{i,t}$ $SIZE_{i,t} = Ln(Sales_{i,t})$ $FINANCIALDEBTRATIO_{i,t} = \frac{Short\ term\ loans_{i,t} + Long\ term\ loans_{i,t}}{Total\ Assets_{i,t}}$

			$\frac{FFA}{TA}_{i,t} = \frac{Fixed\ Financial\ Assets_{i,t}}{Total\ Assets_{i,t}}$
The impact of Working capital management of firm profitability in different business cycles: evidence from Finland (2013).	Julius Enqvist Michael Graham Jussi Nikkinen	$Profitability_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 CR_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 SALES_{i,t} + \beta_5 D1 + \beta_6 D2 + \beta_7 (D1 * CCC_{i,t}) + \beta_8 (D2 * CCC_{i,t}) + \mu$	$Profitability_{i,t} = ROA_{i,t}\ or\ GOI_{i,t}$ $CCC_{i,t} = Days\ Account\ Receivables_{i,t} + Days\ Inventory_{i,t} - Days\ Account\ Payables_{i,t}$ $CR_{i,t} = \frac{Current\ Assets_{i,t}}{Current\ Liabilities_{i,t}}$ $DEBT_{i,t} = \frac{Total\ Debt_{i,t}}{Total\ Assets_{i,t}}$ $SALES_{i,t} = Ln(Sales_{i,t})$ $D1 = Recession\ dummy\ variable$ $D2 = Boom\ dummy\ variable$
Is Working Capital value-enhancing? Evidence from firm performance and investments. (2015)	Nihat Aktas Ettore Croci Dimitris Petmezas	$V_{i,t} = \alpha_t + \eta_i + \gamma_1 [Excess\ NWC_{i,t-1} \times D] + \gamma_2 [Excess\ NWC_{i,t-1} \times (1 - D)] + \gamma_3 Control_{i,t-1} + \varepsilon_{i,t}$	$V_{i,t} = ROA_{i,t}\ or\ Excess\ Return_{i,t}\ where\ Excess\ Return_{i,t} = \prod_{m=1}^{T}(1 + R_{i,m}) - \prod_{m=1}^{T}(1 + R_{p,m})\ with\ R_{i,m}$ $= return\ of\ the\ firm\ and\ R_{p,m}$ $= return\ of\ the\ benchmark$ $\alpha_t = year\ fixed\ effect$ $\eta_i = firm\ ficed\ effect$ $Excess\ NWC_{i,t-1} = NWC\ to\ sales\ ratio_{i,t-1} - NWC\ to\ sales\ ratio_{median\ firm,t-1}$ $D = dummy\ variable\ whether\ Excess\ NWC_{i,t-1} > 0\ or < 0$ $Control_{i,t-1} =$ set of variables that are known impacting the performance such as: Total assets Sales Market value of equity Tobin's Q R&D Cash flow (operating) Fixed asset growth Sales growth Intangible assets Leverage Age 1 Book-to-market Cash reserves Sales volatility

Working Capital Management and Firm Performance in Emeging Economies: Evidence from India. (2016)	Shikha Bhatia Aman Srivastava	$GOP_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALESGROWTH_{i,t} + \beta_4 LEVERAGE_{i,t} + \beta_5 \frac{FFA}{TA}_{i,t} + \beta_6 VARIABILITYNOI_{i,t} + \beta_7 GDP + \varepsilon_{i,t}$ OR $TOBIN'S\ Q_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SALESGROWTH_{i,t} + \beta_4 LEVERAGE_{i,t} + \beta_5 \frac{FFA}{TA}_{i,t} + \beta_6 VARIABILITYNOI_{i,t} + \beta_7 GDP + \varepsilon_{i,t}$	$GOP_{i,t} = \frac{Sales_{i,t} - COGS_{i,t}}{Total\ Assets_{i,t} - Financial\ Assets_{i,t}}$ $CCC_{i,t} = Days\ Account\ Receivables_{i,t} + Days\ Inventory_{i,t} - Days\ Account\ Payables_{i,t}$ $SIZE_{i,t} = Ln(Sales_{i,t})$ $SALESGROWTH_{i,t} = \frac{Sales_{i,t} - Sales_{i,t-1}}{Sales_{i,t-1}}$ $LEVERAGE_{i,t} = \frac{Financial\ Debt_{i,t}}{Total\ Assets_{i,t}}$ $\frac{FFA}{TA}_{i,t} = \frac{Fixed\ Financial\ Assets_{i,t}}{Total\ Assets_{i,t}}$ $VARIABILITYNOI_{i,t} = \frac{\sigma(Net\ Operating\ Income)}{Total\ Assets_{i,t} - Financial\ Assets_{i,t}}$ $TOBIN'S\ Q_{i,t} = \frac{Market\ Value\ of\ Equity + Book\ Value\ of\ debt}{Book\ Value\ of\ Assets}$
Effect of Working Capital Management on SME Profitability. (2007)	Pedro Juan García-Teruel Pedro Martínez-Solano	$ROA_{i,t} = \beta_0 + \beta_1 CCC_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 SGROW_{i,t} + \beta_4 DEBT_{i,t} + \beta_5 GDPGR_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t}$	$CCC_{i,t} = Days\ Account\ Receivables_{i,t} + Days\ Inventory_{i,t} - Days\ Account\ Payables_{i,t}$ $SIZE_{i,t} = Ln(Sales_{i,t})$ $SGROWTH_{i,t} = \frac{Sales_{i,t} - Sales_{i,t-1}}{Sales_{i,t-1}}$ $DEBT_{i,t} = \frac{Financial\ Debt_{i,t}}{Total\ Assets_{i,t}}$ $GDPGR_{i,t} = \frac{GDP_{i,t} - GDP_{i,t-1}}{GDP_{i,t-1}}$ η_i = unobservable heterogeneity of each firm and the explanatory variables of the model $\lambda_t = Time\ dummy\ variable$
Efficiency of Working Capital Management and Corporate profitability. (1998)	H.H. Shin L. Soenen	$Profitability_t = \beta_0 + \beta_1 NTC_t + \beta_2 CurrentRatio_t + \beta_3 DebtRatio_t + \beta_4 SalesGrowth_t$	$Profitability_t =$ $IA = \frac{Operating\ income + Depreciation}{Total\ Assets}$ OR $IS = \frac{Operating\ income + Depreciation}{Net\ Sales}$ OR $ALPHA = Jensen's\ alpha$ OR $TI = Treynor\ Index$ $SalesGrowth_t = \frac{Sales_{i,t} - Sales_{i,t-1}}{Sales_{i,t-1}}$ $DebtRatio_t = \frac{Total\ Debt_{i,t}}{Total\ Assets_{i,t}}$

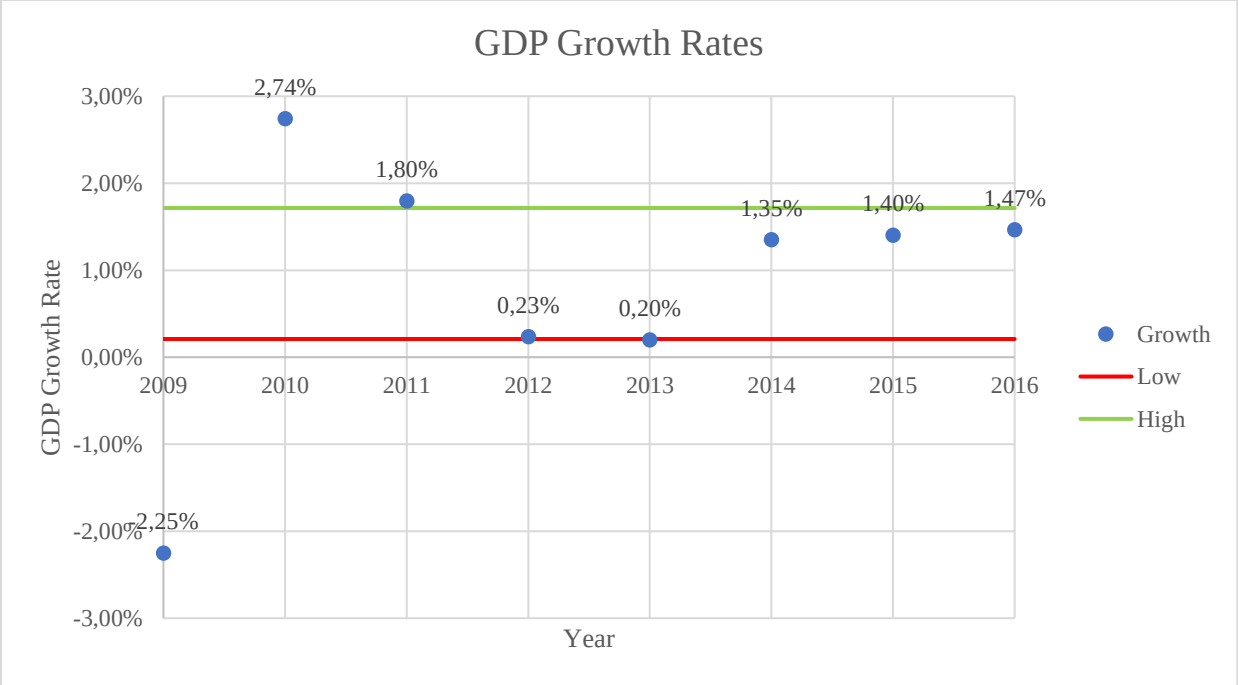
Cash Conversion cycle and corporate performance: Global Evidence (2018)	C-C. Chang	$IndAdjROA_{i,t} = \beta_0 + \beta_1 IndAdjCCC_{i,t} + \beta_2 IndAdjCCC_{i,t} * LOWCCC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 DIV_{i,t} + \beta_5 CAPEXP_{i,t} + \beta_6 LEV_{i,t} + \beta_7 LagROA_{i,t} + \beta_8 RDR_{i,t} + \beta_9 STDROA_{i,t} + \beta_{10} MB_{i,t} + Industrydummies + Countrydummies + yearsdummies + \varepsilon_{i,t}$ $IndAdjTobin'sQ_{i,t} = \beta_0 + \beta_1 IndAdjCCC_{i,t} + \beta_2 IndAdjCCC_{i,t} * LOWCCC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 DIV_{i,t} + \beta_5 CAPEXP_{i,t} + \beta_6 LEV_{i,t} + \beta_7 LagROA_{i,t} + \beta_8 RDR_{i,t} + \beta_9 STDROA_{i,t} + Industrydummies + Countrydummies + yearsdummies + \varepsilon_{i,t}$	$IndAdjROA_{i,t} = ROA_{i,t} - ROA_{industry\ median}$ $IndAdjTobin's_{i,t} = Tobin's\ Q_{i,t} - Tobin's\ Q_{Industry\ median}$ $IndAdjCCC_{i,t} = CCC_{i,t} - CCC_{Industry\ median}$ $LOWCCC_{i,t} = 1\ if\ IndAdjCCC_{i,t} < 1, \quad 0\ otherwise$ $SIZE_{i,t} = \ln(mkt\ value\ of\ equity)$ $DIV_{i,t} = \frac{Dividends_{i,t}}{Operating\ Revenue_{i,t}}$ $CAPEXP_{i,t} = \frac{Capex_{i,t} + Other\ Investments_{i,t}}{total\ assets_{i,t}}$ $LEV_{i,t} = \frac{Total\ Debts_{i,t}}{Total\ Assets_{i,t}}$ $LagROA_{i,t} = ROA_{i,t-1}$ $RDR_{i,t} = \frac{R\&D\ Investments_{i,t}}{total\ assets_{i,t}}$ $STDROA_{i,t} = \sigma(ROA_{i,t})\ for\ t = 1, \dots, 5\ year$

6.3. Appendix 3 – NAICS classification

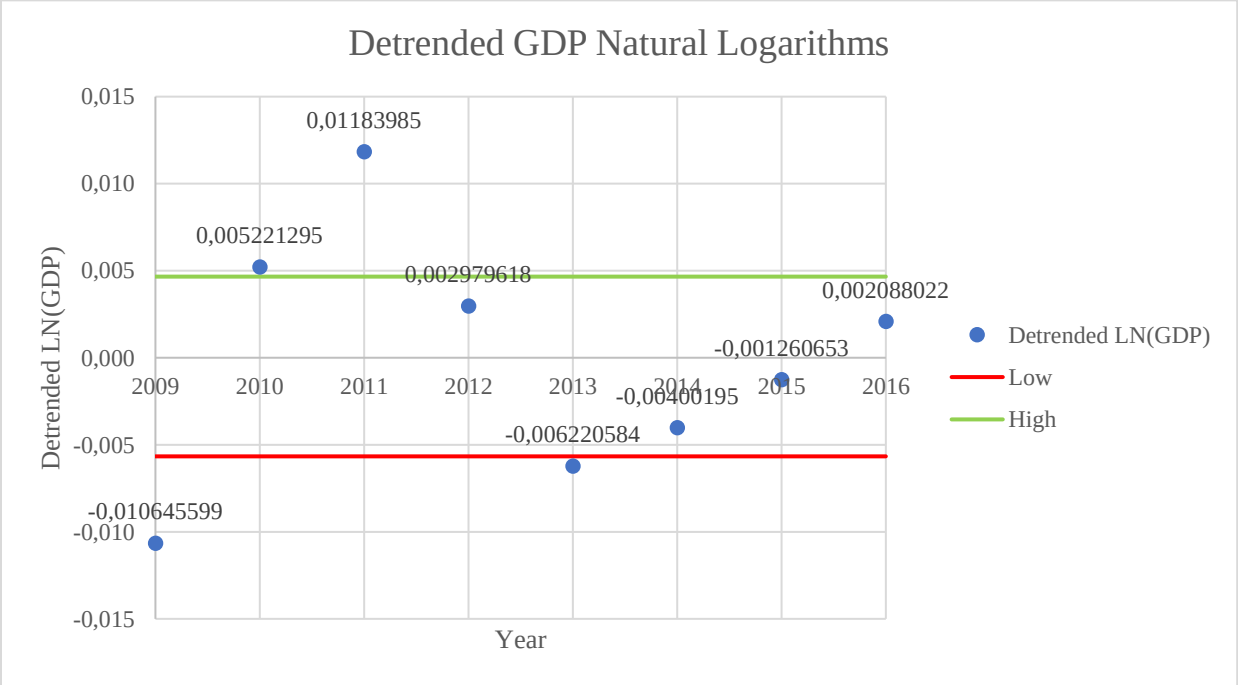
Industry Code	Label
11	Agriculture, Forestry, Fishing and Hunting
21	Mining, Carrying, Oil & Gas Extraction
22	Utilities
23	Construction
31	Manufacturing
32	
33	
42	Wholesale Trade
44	Retail Trade
45	
48	Transportation and Warehousing
49	
51	Information
52	Finance and Insurance
53	Real Estate, Rental and Leasing
54	Professional, Scientific and Technical Services
55	Management of Companies and Enterprises
56	Administrative, Support, Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment and Recreation
72	Accommodation and Food Services
81	Other Services (Except Public Administration)
92	Public Administration

6.4. Appendix 4 – Business cycle identification

1. Methodology 1: GDP Growth Rates



2. Methodology 2: Detrended GDP Natural Logarithms



6.5. Appendix 5 – Summary statistics per industry

Independent variables

NAICS Number	Industry	Observations	Percentage	Days Receivables Min	Days Receivables Mean	Days Receivables Median	Days Receivables Max	Days Receivables SD	Days Inventory Min	Days Inventory Mean	Days Inventory Median	Days Inventory Max	Days Inventory SD	Days Payables Min	Days Payables Mean	Days Payables Median	Days Payables Max	Days Payables SD	NTC Min	NTC Mean	NTC Median	NTC Max	NTC SD
11	Agriculture, Forestry, Fishing and Hunting	309	0.64%	0.55	49.46	50.34	147.37	26.93	0.00	38.64	22.56	299.08	50.21	4.82	37.17	31.66	133.93	23.76	-63.91	50.93	41.23	326.13	52.67
21	Mining, Carrying, Oil & Gas Extraction	156	0.32%	2.86	72.67	69.04	201.12	34.98	0.00	26.83	22.67	96.95	22.32	2.18	57.77	54.89	202.38	28.23	-155.71	41.73	42.97	173.45	44.45
23	Construction	4909	10.22%	0.07	79.52	75.56	354.84	45.69	0.00	20.73	5.15	344.02	43.57	1.69	61.08	56.58	332.75	34.63	-242.90	39.17	33.35	459.56	57.86
31																							
32	Manufacturing																						
33		14072	29.29%	0.02	62.88	57.79	353.29	35.00	0.00	41.38	32.39	314.37	36.83	1.50	47.54	42.57	299.73	29.30	-280.50	56.73	51.32	415.64	52.39
42	Wholesale Trade	16099	33.50%	0.04	55.80	49.97	341.49	38.98	0.00	39.60	32.68	356.64	38.28	1.46	45.38	38.88	323.76	33.00	-238.23	50.02	41.88	499.24	51.46
44																							
45	Retail Trade	1966	4.09%	0.01	22.19	11.36	342.63	31.95	0.00	45.04	35.73	331.07	37.00	1.62	37.69	31.10	264.53	27.12	-194.63	29.53	24.57	313.22	46.50
48																							
49	Transportation and Warehousing	3612	7.52%	0.08	65.12	61.09	341.35	39.23	0.00	2.53	0.00	117.58	7.47	1.82	49.24	42.53	291.42	34.01	-234.24	18.41	17.88	308.78	39.97
51	Information	1068	2.22%	0.01	76.07	65.61	347.20	54.20	0.00	9.80	0.00	288.48	29.78	1.64	63.95	51.82	326.96	48.01	-277.38	21.92	17.41	303.12	64.06
56	Administrative Support, Waste Management and Remediation Services	1981	4.12%	0.09	61.00	57.55	341.24	40.30	0.00	5.06	0.00	349.49	21.46	1.50	38.37	29.52	282.81	36.14	-263.75	27.69	28.70	363.55	47.88
61	Educational Services	798	1.66%	0.07	19.18	6.06	248.40	31.55	0.00	1.08	0.13	46.31	4.35	1.47	12.87	7.43	117.38	13.67	-59.84	7.39	-0.14	233.73	29.37
62	Health Care and Social Assistance	2441	5.08%	0.01	40.01	34.79	268.22	29.87	0.00	3.74	1.00	103.40	8.32	1.48	21.83	13.87	225.87	24.23	-177.42	21.91	20.84	257.59	31.19
71	Entertainment	256	0.53%	0.19	37.29	14.39	296.22	52.79	0.00	1.96	0.58	12.80	3.12	1.69	43.24	35.29	194.43	32.75	-121.12	-3.98	-11.35	258.07	49.88
72	Accomodation and Food Services	383	0.80%	0.78	30.91	22.15	334.20	34.01	0.00	4.32	3.08	27.43	4.19	1.98	39.23	35.48	237.63	24.63	-120.71	-4.00	-3.78	237.80	32.39
	Total Sample	48050	100.00%	0.01	58.60	53.78	354.84	40.44	0.00	30.55	17.87	356.64	37.94	1.46	45.91	39.80	332.75	33.12	-280.50	43.24	36.67	499.24	52.49

Dependent Variables

NAICS	Industry	Observations	Percentage	ROA Min	ROA Median	ROA Mean	ROA Max	ROA SD	GOI Min	GOI Median	GOI Mean	GOI Max	GOI SD
11	Agriculture, Forestry, Fishing and Hunting	309	0.64%	-0.18	0.03	0.04	0.29	0.07	0.00	0.54	0.71	4.08	0.56
21	Mining, Carrying, Oil & Gas Extraction	156	0.32%	-0.16	0.03	0.05	0.32	0.08	0.01	0.75	0.80	3.17	0.47
23	Construction	4909	10.22%	-0.22	0.04	0.06	0.38	0.07	-0.02	0.67	0.73	4.60	0.46
31													
32	Manufacturing												
33		14072	29.29%	-0.24	0.05	0.06	0.41	0.08	-0.06	0.72	0.77	4.47	0.42
42	Wholesale Trade	16099	33.50%	-0.24	0.05	0.07	0.40	0.08	-0.06	0.52	0.61	4.65	0.45
44													
45	Retail Trade	1966	4.09%	-0.23	0.06	0.07	0.41	0.09	0.00	0.79	0.89	4.71	0.55
48													
49	Transportation and Warehousing	3612	7.52%	-0.22	0.03	0.04	0.38	0.08	0.00	0.98	1.25	4.79	0.96
51	Information	1068	2.22%	-0.23	0.05	0.06	0.39	0.09	0.00	0.91	1.14	4.66	0.85
56	Administrative Support, Waste Management and Remediation Services	1981	4.12%	-0.20	0.04	0.06	0.40	0.09	-0.02	1.07	1.58	4.79	1.35
61	Educational Services	798	1.66%	-0.16	0.02	0.02	0.20	0.03	0.07	1.57	1.67	4.62	1.08
62	Health Care and Social Assistance	2441	5.08%	-0.22	0.02	0.02	0.40	0.06	0.00	0.93	1.20	4.78	0.90
71	Entertainment	256	0.53%	-0.19	0.02	0.04	0.35	0.09	0.02	0.86	1.09	4.73	0.94
72	Accomodation and Food Services	383	0.80%	-0.23	0.03	0.03	0.31	0.07	0.07	0.85	1.15	4.69	0.86
	Total Sample	48050	100.00%	-0.24	0.04	0.06	0.41	0.08	-0.06	0.68	0.84	4.79	0.68

6.6. Appendix 6 – Summary statistics per year

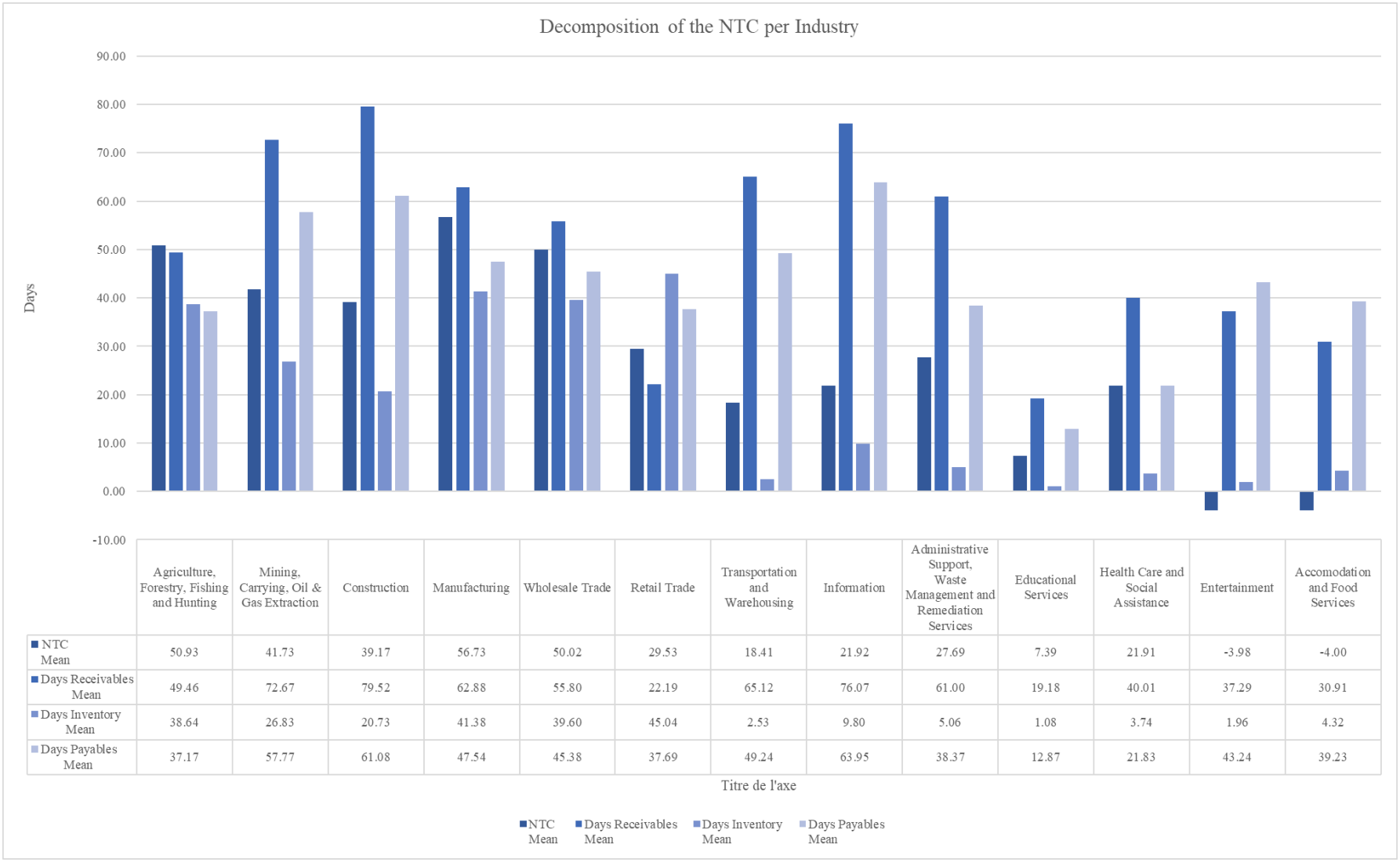
Independent variables

Years	Observations	Days Receivables Min	Days Receivables Mean	Days Receivables Median	Days Receivables Max	Days Receivables SD	Days Payables Min	Days Payables Mean	Days Payables Median	Days Payables Max	Days Payables SD	Days Inventory Min	Days Inventory Mean	Days Inventory Median	Days Inventory Max	Days Inventory SD	NTC Min	NTC Mean	NTC Median	NTC Max	NTC SD
2009	5479	0.01	60.29	55.83	353.29	41.71	1.71	46.61	40.00	332.75	34.88	0.00	30.36	17.68	322.74	38.40	-277.38	44.04	36.79	449.82	54.87
2010	5641	0.02	60.31	56.24	302.16	40.03	1.46	46.39	40.46	278.71	33.00	0.00	29.19	17.75	234.83	34.68	-242.90	43.11	36.66	415.64	50.98
2011	5822	0.05	58.91	54.83	283.33	39.11	1.62	45.38	39.52	251.55	31.52	0.00	29.14	17.37	263.85	35.05	-219.95	42.66	36.55	403.29	49.86
2012	6000	0.03	58.50	53.62	304.19	40.38	1.55	45.30	39.35	234.73	31.81	0.00	30.20	17.83	306.04	37.15	-172.63	43.40	37.33	396.66	51.55
2013	6134	0.13	58.09	53.51	298.80	39.46	1.62	44.95	39.35	246.74	31.35	0.00	30.44	18.23	302.25	37.32	-170.40	43.57	37.23	363.13	50.97
2014	6246	0.10	57.32	52.20	290.50	39.50	1.54	45.35	39.37	238.87	32.35	0.00	31.12	17.92	316.17	38.64	-197.75	43.09	36.84	388.28	51.97
2015	6346	0.07	57.32	51.76	354.84	41.83	1.57	46.38	39.63	306.92	35.27	0.00	31.64	17.88	344.02	40.49	-280.50	42.59	35.88	499.24	54.64
2016	6382	0.13	58.43	53.26	338.03	41.28	1.47	46.91	40.58	276.68	34.42	0.00	32.01	18.51	356.64	40.67	-234.24	43.54	36.45	497.97	54.69
Growth	15.26%	325.32%	-3.14%	-4.71%	-4.42%	-1.05%	-14.80%	0.64%	1.44%	-18.45%	-1.34%	0.00%	5.32%	4.62%	9.99%	5.76%	-16.90%	-1.15%	-0.91%	10.17%	-0.32%

Dependent variables

Years	Observations	GOI Min	GOI Mean	GOI Median	GOI Max	GOI SD	ROA Min	ROA Mean	ROA Median	ROA Max	ROA SD
2009	5479	0.01	0.87	0.72	4.35	0.65	-0.24	0.06	0.04	0.40	0.09
2010	5641	-0.01	0.84	0.68	4.50	0.66	-0.21	0.06	0.05	0.40	0.08
2011	5822	-0.06	0.83	0.67	4.63	0.68	-0.17	0.06	0.04	0.41	0.08
2012	6000	-0.03	0.84	0.67	4.69	0.69	-0.21	0.05	0.04	0.39	0.08
2013	6134	-0.01	0.83	0.67	4.66	0.69	-0.22	0.05	0.04	0.39	0.08
2014	6246	-0.03	0.83	0.66	4.79	0.70	-0.19	0.06	0.04	0.38	0.08
2015	6346	-0.02	0.83	0.66	4.79	0.69	-0.18	0.06	0.04	0.39	0.08
2016	6382	-0.03	0.81	0.66	4.62	0.68	-0.17	0.06	0.04	0.38	0.08
Growth	15.26%	-501.29%	-7.01%	-9.95%	6.05%	4.27%	-30.06%	3.69%	3.12%	-4.17%	-11.69%

6.7. Appendix 7 – Decomposition of the NTC per industry



	Agriculture, Forestry, Fishing and Hunting	Mining, Carrying, Oil & Gas Extraction	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Information	Administrative Support, Waste Management and Remediation Services	Educational Services	Health Care and Social Assistance	Entertainment	Accomodation and Food Services
NTC Mean	50.93	41.73	39.17	56.73	50.02	29.53	18.41	21.92	27.69	7.39	21.91	-3.98	-4.00
Days Receivables Mean	49.46	72.67	79.52	62.88	55.80	22.19	65.12	76.07	61.00	19.18	40.01	37.29	30.91
Days Inventory Mean	38.64	26.83	20.73	41.38	39.60	45.04	2.53	9.80	5.06	1.08	3.74	1.96	4.32
Days Payables Mean	37.17	57.77	61.08	47.54	45.38	37.69	49.24	63.95	38.37	12.87	21.83	43.24	39.23

X

6.8. Appendix 8 – Summary statistics of the control variables

NAICS	Industry	Observations	Percentage	Size Mean	Size Median	Sales Growth Mean	Sales Growth Median	Leverage Mean	Leverage Median	FFA/TA Mean	FFA/TA Median	VarNOI Mean	VarNOI Median	R&D Mean	R&D Median
11	Agriculture, Forestry, Fishing and Huntin	309	0.64%	16.80	16.66	0.06	0.03	0.55	0.59	0.06	0.00	0.05	0.04	0.01	0.00
21	Mining, Carrying, Oil & Gas Extraction	156	0.32%	17.33	17.21	0.05	0.00	0.51	0.52	0.24	0.03	0.06	0.04	0.03	0.00
23	Construction	4909	10.22%	16.79	16.66	0.06	0.04	0.63	0.67	0.07	0.01	0.06	0.04	0.00	0.00
31															
32															
33	Manufacturing	14072	29.29%	17.36	17.11	0.03	0.03	0.53	0.54	0.11	0.00	0.07	0.05	0.01	0.00
42	Wholesale Trade	16099	33.50%	17.23	17.03	0.04	0.03	0.62	0.65	0.06	0.00	0.05	0.04	0.01	0.00
44															
45	Retail Trade	1966	4.09%	17.30	16.92	0.04	0.02	0.59	0.58	0.09	0.00	0.07	0.04	0.02	0.00
48															
49	Transportation and Warehousing	3612	7.52%	17.05	16.88	0.05	0.03	0.65	0.68	0.11	0.00	0.07	0.04	0.01	0.00
51	Information	1068	2.22%	17.18	17.03	0.05	0.02	0.62	0.64	0.17	0.02	0.09	0.05	0.05	0.01
56	Administrative Support, Waste Management and Remediation Services	1981	4.12%	16.90	16.83	0.07	0.04	0.58	0.63	0.09	0.00	0.06	0.04	0.02	0.00
61	Educational Services	798	1.66%	16.38	16.30	0.03	0.03	0.42	0.42	0.02	0.00	0.03	0.02	0.00	0.00
62	Health Care and Social Assistance	2441	5.08%	16.63	16.43	0.07	0.04	0.46	0.43	0.04	0.00	0.03	0.02	0.01	0.00
71	Entertainment	256	0.53%	16.78	16.81	0.08	0.04	0.54	0.53	0.09	0.00	0.08	0.04	0.03	0.00
72	Accomodation and Food Services	383	0.80%	16.72	16.56	0.05	0.03	0.78	0.77	0.10	0.00	0.06	0.04	0.02	0.00
	Total Sample	48050	100%	17.14	16.93	0.04	0.03	0.58	0.61	0.09	0.00	0.06	0.04	0.01	0.00

6.9. Appendix 9 – Industry-specific correlation matrices

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.03	1.00										
Variability NOI	0.12	0.32	1.00									
Leverage	-0.04	0.23	0.12	1.00								
FFA/TA	0.14	-0.39	-0.02	-0.11	1.00							
ROA	0.12	0.35	0.23	-0.09	-0.15	1.00						
R&D	0.00	-0.08	-0.13	0.09	-0.07	0.00	1.00					
GOI	-0.06	0.02	-0.05	0.20	-0.06	-0.02	0.15	1.00				
Days Receivables	-0.22	-0.06	-0.26	0.05	-0.18	-0.17	-0.13	-0.03	1.00			
Days Payables	-0.18	-0.10	-0.24	0.39	-0.04	-0.25	-0.02	0.12	0.58	1.00		
Days Inventory	-0.04	-0.07	-0.05	0.11	-0.19	-0.14	0.15	-0.30	0.01	0.13	1.00	
NTC	-0.08	-0.05	-0.07	-0.05	-0.25	-0.11	0.09	-0.35	0.26	-0.03	0.90	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.58	1.00										
Variability NOI	0.04	0.00	1.00									
Leverage	0.52	0.00	0.03	1.00								
FFA/TA	0.01	0.00	0.79	0.05	1.00							
ROA	0.04	0.00	0.00	0.11	0.01	1.00						
R&D	0.96	0.15	0.02	0.10	0.22	0.94	1.00					
GOI	0.33	0.71	0.42	0.00	0.27	0.73	0.01	1.00				
Days Receivables	0.00	0.26	0.00	0.37	0.00	0.00	0.02	0.64	1.00			
Days Payables	0.00	0.07	0.00	0.00	0.54	0.00	0.68	0.04	0.00	1.00		
Days Inventory	0.44	0.24	0.36	0.06	0.00	0.01	0.01	0.00	0.87	0.02	1.00	
NTC	0.18	0.37	0.19	0.43	0.00	0.05	0.11	0.00	0.00	0.64	0.00	1.00

Appendix 9.1 : Correlation Matrix NAICS 11

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	-0.03	1.00										
Variability NOI	-0.17	-0.16	1.00									
Leverage	0.21	-0.06	0.09	1.00								
FFA/TA	-0.12	0.51	0.33	0.04	1.00							
ROA	-0.02	-0.31	-0.17	-0.13	-0.24	1.00						
R&D	-0.05	0.42	-0.26	-0.35	-0.14	-0.07	1.00					
GOI	0.11	-0.07	0.18	0.33	0.04	0.17	-0.25	1.00				
Days Receivables	-0.17	-0.20	0.11	-0.04	0.07	0.01	-0.15	-0.19	1.00			
Days Payables	0.02	0.05	0.02	0.03	0.25	-0.18	-0.02	-0.28	0.19	1.00		
Days Inventory	-0.14	0.10	0.17	-0.04	-0.03	-0.17	0.28	0.01	-0.04	0.08	1.00	
NTC	-0.21	-0.14	0.16	-0.07	-0.12	0.03	0.03	0.03	0.65	-0.44	0.42	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.67	1.00										
Variability NOI	0.03	0.04	1.00									
Leverage	0.01	0.42	0.28	1.00								
FFA/TA	0.14	0.00	0.00	0.63	1.00							
ROA	0.80	0.00	0.04	0.09	0.00	1.00						
R&D	0.50	0.00	0.00	0.00	0.09	0.39	1.00					
GOI	0.17	0.36	0.03	0.00	0.63	0.03	0.00	1.00				
Days Receivables	0.04	0.01	0.17	0.64	0.39	0.93	0.06	0.02	1.00			
Days Payables	0.81	0.51	0.79	0.71	0.00	0.03	0.84	0.00	0.02	1.00		
Days Inventory	0.09	0.22	0.04	0.63	0.69	0.03	0.00	0.90	0.61	0.31	1.00	
NTC	0.01	0.07	0.05	0.39	0.14	0.68	0.69	0.69	0.00	0.00	0.00	1.00

Appendix 9.2: Correlation Matrix NAICS 21

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	-0.03	1.00										
Variability NOI	0.00	-0.16	1.00									
Leverage	-0.04	0.13	-0.08	1.00								
FFA/TA	-0.01	-0.06	0.31	-0.16	1.00							
ROA	-0.01	0.04	0.09	-0.18	-0.10	1.00						
R&D	0.00	0.07	0.01	-0.03	0.00	0.00	1.00					
GOI	-0.02	0.06	0.28	0.04	0.05	0.22	0.05	1.00				
Days Receivables	0.03	0.17	0.05	0.07	0.00	-0.13	0.07	0.03	1.00			
Days Payables	0.02	0.20	-0.09	0.27	0.01	-0.26	-0.03	-0.23	0.42	1.00		
Days Inventory	-0.01	-0.06	-0.01	-0.09	0.06	-0.04	-0.02	-0.17	-0.16	-0.05	1.00	
NTC	0.01	-0.04	0.08	-0.17	0.04	0.03	0.06	0.04	0.42	-0.30	0.65	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.02	1.00										
Variability NOI	0.91	0.00	1.00									
Leverage	0.00	0.00	0.00	1.00								
FFA/TA	0.62	0.00	0.00	0.00	1.00							
ROA	0.37	0.00	0.00	0.00	0.00	1.00						
R&D	0.85	0.00	0.45	0.07	0.78	0.87	1.00					
GOI	0.12	0.00	0.00	0.01	0.00	0.00	0.00	1.00				
Days Receivables	0.02	0.00	0.00	0.00	0.90	0.00	0.00	0.02	1.00			
Days Payables	0.22	0.00	0.00	0.00	0.33	0.00	0.02	0.00	0.00	1.00		
Days Inventory	0.61	0.00	0.39	0.00	0.00	0.01	0.27	0.00	0.00	0.00	1.00	
NTC	0.51	0.01	0.00	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.00	1.00

Appendix 9.3: Correlation Matrix NAICS 23

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.00	1.00										
Variability NOI	-0.01	-0.10	1.00									
Leverage	0.01	0.08	0.02	1.00								
FFA/TA	0.00	0.19	0.20	0.03	1.00							
ROA	-0.01	-0.02	0.05	-0.17	-0.16	1.00						
R&D	0.00	0.11	0.03	0.03	-0.02	-0.01	1.00					
GOI	0.01	-0.04	0.26	0.15	0.16	0.20	0.03	1.00				
Days Receivables	0.01	-0.16	-0.04	0.07	-0.03	-0.10	0.00	-0.22	1.00			
Days Payables	0.01	0.03	0.01	0.29	0.07	-0.21	0.04	-0.16	0.35	1.00		
Days Inventory	-0.01	-0.02	-0.07	-0.02	-0.08	-0.08	-0.01	-0.23	0.04	0.03	1.00	
NTC	0.00	-0.13	-0.08	-0.13	-0.12	0.00	-0.03	-0.22	0.50	-0.30	0.71	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.60	1.00										
Variability NOI	0.52	0.00	1.00									
Leverage	0.15	0.00	0.04	1.00								
FFA/TA	0.55	0.00	0.00	0.00	1.00							
ROA	0.55	0.01	0.00	0.00	0.00	1.00						
R&D	0.90	0.00	0.00	0.00	0.01	0.15	1.00					
GOI	0.41	0.00	0.00	0.00	0.00	0.00	0.00	1.00				
Days Receivables	0.14	0.00	0.00	0.00	0.00	0.00	0.97	0.00	1.00			
Days Payables	0.31	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	1.00		
Days Inventory	0.50	0.05	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	1.00	
NTC	0.96	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	1.00

Appendix 9.4: Correlation Matrix NAICS 31-32-33

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.01	1.00										
Variability NOI	0.00	-0.13	1.00									
Leverage	0.01	0.14	-0.02	1.00								
FFA/TA	0.00	-0.01	0.11	-0.13	1.00							
ROA	-0.01	-0.04	0.11	-0.15	-0.15	1.00						
R&D	0.01	0.01	0.03	0.00	0.01	-0.03	1.00					
GOI	-0.01	-0.06	0.26	0.00	0.07	0.29	0.10	1.00				
Days Receivables	0.00	-0.10	-0.01	0.01	0.05	-0.07	0.02	-0.14	1.00			
Days Payables	0.00	-0.04	-0.03	0.25	0.05	-0.19	0.05	-0.13	0.39	1.00		
Days Inventory	-0.01	-0.09	-0.09	0.01	-0.13	-0.12	-0.05	-0.25	-0.08	0.08	1.00	
NTC	0.00	-0.12	-0.06	-0.14	-0.09	-0.02	-0.05	-0.21	0.45	-0.29	0.64	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.21	1.00										
Variability NOI	0.75	0.00	1.00									
Leverage	0.19	0.00	0.04	1.00								
FFA/TA	0.74	0.06	0.00	0.00	1.00							
ROA	0.20	0.00	0.00	0.00	0.00	1.00						
R&D	0.22	0.12	0.00	0.89	0.45	0.00	1.00					
GOI	0.22	0.00	0.00	0.84	0.00	0.00	0.00	1.00				
Days Receivables	0.94	0.00	0.17	0.10	0.00	0.00	0.00	0.00	1.00			
Days Payables	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00		
Days Inventory	0.33	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	1.00	
NTC	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Appendix 9.5: Correlation Matrix NAICS 42

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.04	1.00										
Variability NOI	-0.01	-0.04	1.00									
Leverage	-0.02	0.09	0.02	1.00								
FFA/TA	0.00	0.10	0.29	0.01	1.00							
ROA	-0.01	0.09	0.04	-0.13	-0.13	1.00						
R&D	0.05	-0.01	0.02	0.00	-0.07	-0.10	1.00					
GOI	0.00	0.23	0.30	0.17	0.23	0.20	0.02	1.00				
Days Receivables	0.00	-0.15	0.04	0.05	0.23	-0.15	0.05	-0.14	1.00			
Days Payables	-0.01	0.12	0.00	0.42	0.02	-0.22	0.03	-0.08	0.31	1.00		
Days Inventory	0.00	-0.17	-0.09	-0.12	-0.17	-0.15	0.01	-0.26	-0.12	0.07	1.00	
NTC	0.01	-0.30	-0.04	-0.31	0.01	-0.09	0.02	-0.26	0.41	-0.32	0.67	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.06	1.00										
Variability NOI	0.58	0.06	1.00									
Leverage	0.41	0.00	0.28	1.00								
FFA/TA	0.95	0.00	0.00	0.59	1.00							
ROA	0.52	0.00	0.07	0.00	0.00	1.00						
R&D	0.03	0.72	0.49	0.97	0.00	0.00	1.00					
GOI	0.95	0.00	0.00	0.00	0.00	0.00	0.40	1.00				
Days Receivables	0.95	0.00	0.05	0.03	0.00	0.00	0.03	0.00	1.00			
Days Payables	0.61	0.00	0.87	0.00	0.28	0.00	0.15	0.00	0.00	1.00		
Days Inventory	0.92	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	1.00	
NTC	0.79	0.00	0.11	0.00	0.67	0.00	0.38	0.00	0.00	0.00	0.00	1.00

Appendix 9.6: Correlation Matrix NAICS 44-45

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.04	1.00										
Variability NOI	0.00	-0.12	1.00									
Leverage	0.01	-0.04	0.14	1.00								
FFA/TA	0.00	-0.13	0.11	-0.04	1.00							
ROA	0.00	-0.01	0.04	-0.11	-0.10	1.00						
R&D	0.10	0.03	-0.02	0.02	-0.04	-0.05	1.00					
GOI	-0.02	0.06	0.16	0.14	0.02	0.06	-0.01	1.00				
Days Receivables	0.00	-0.18	-0.04	0.00	0.10	-0.06	0.01	-0.10	1.00			
Days Payables	0.00	0.03	-0.01	0.08	0.05	-0.19	0.01	-0.15	0.41	1.00		
Days Inventory	-0.01	0.16	-0.06	-0.07	-0.08	-0.09	-0.02	-0.09	-0.07	0.02	1.00	
NTC	0.00	-0.17	-0.04	-0.08	0.04	0.08	0.00	0.01	0.62	-0.44	0.10	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.02	1.00										
Variability NOI	0.87	0.00	1.00									
Leverage	0.48	0.01	0.00	1.00								
FFA/TA	0.96	0.00	0.00	0.02	1.00							
ROA	0.97	0.76	0.01	0.00	0.00	1.00						
R&D	0.00	0.06	0.30	0.19	0.01	0.01	1.00					
GOI	0.33	0.00	0.00	0.00	0.16	0.00	0.59	1.00				
Days Receivables	0.90	0.00	0.03	0.96	0.00	0.00	0.42	0.00	1.00			
Days Payables	0.84	0.12	0.60	0.00	0.00	0.00	0.58	0.00	0.00	1.00		
Days Inventory	0.70	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.27	1.00	
NTC	0.91	0.00	0.02	0.00	0.02	0.00	0.96	0.58	0.00	0.00	0.00	1.00

Appendix 9.7: Correlation Matrix NAICS 48-49

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.01	1.00										
Variability NOI	0.07	-0.18	1.00									
Leverage	0.08	0.04	0.33	1.00								
FFA/TA	0.00	-0.10	0.12	-0.09	1.00							
ROA	-0.03	0.05	0.07	-0.08	-0.10	1.00						
R&D	0.10	0.17	-0.04	0.20	-0.09	-0.05	1.00					
GOI	-0.06	0.10	0.18	0.26	0.14	0.20	0.04	1.00				
Days Receivables	-0.02	0.03	-0.01	0.05	-0.01	-0.05	-0.07	-0.12	1.00			
Days Payables	0.03	0.15	-0.05	0.13	-0.01	-0.16	0.20	-0.18	0.35	1.00		
Days Inventory	-0.01	0.09	-0.06	0.00	-0.09	-0.05	-0.04	-0.17	0.19	0.29	1.00	
NTC	-0.04	-0.05	0.00	-0.06	-0.04	0.05	-0.23	-0.04	0.67	-0.32	0.41	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.67	1.00										
Variability NOI	0.02	0.00	1.00									
Leverage	0.01	0.19	0.00	1.00								
FFA/TA	0.88	0.00	0.00	0.00	1.00							
ROA	0.30	0.13	0.02	0.01	0.00	1.00						
R&D	0.00	0.00	0.21	0.00	0.00	0.09	1.00					
GOI	0.06	0.00	0.00	0.00	0.00	0.00	0.23	1.00				
Days Receivables	0.47	0.30	0.65	0.12	0.82	0.08	0.02	0.00	1.00			
Days Payables	0.36	0.00	0.08	0.00	0.66	0.00	0.00	0.00	0.00	1.00		
Days Inventory	0.84	0.01	0.06	0.94	0.00	0.10	0.22	0.00	0.00	0.00	1.00	
NTC	0.17	0.12	0.95	0.06	0.20	0.08	0.00	0.14	0.00	0.00	0.00	1.00

Appendix 9.8: Correlation Matrix NAICS 51

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	-0.01	1.00										
Variability NOI	0.03	-0.15	1.00									
Leverage	0.02	0.21	0.04	1.00								
FFA/TA	-0.01	-0.11	-0.01	-0.17	1.00							
ROA	-0.04	0.07	0.20	-0.08	-0.12	1.00						
R&D	0.01	0.01	0.02	0.12	-0.05	-0.03	1.00					
GOI	0.03	0.14	0.23	0.37	-0.11	0.28	0.03	1.00				
Days Receivables	0.01	-0.02	0.08	0.04	0.05	-0.08	-0.04	-0.12	1.00			
Days Payables	-0.01	-0.05	-0.09	0.05	0.06	-0.24	-0.01	-0.38	0.36	1.00		
Days Inventory	-0.01	0.06	-0.03	-0.03	-0.03	-0.04	-0.03	-0.16	0.05	0.08	1.00	
NTC	0.02	0.05	0.12	-0.02	-0.02	0.10	-0.04	0.12	0.59	-0.41	0.43	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.67	1.00										
Variability NOI	0.25	0.00	1.00									
Leverage	0.46	0.00	0.06	1.00								
FFA/TA	0.55	0.00	0.57	0.00	1.00							
ROA	0.06	0.00	0.00	0.00	0.00	1.00						
R&D	0.52	0.53	0.42	0.00	0.04	0.23	1.00					
GOI	0.18	0.00	0.00	0.00	0.00	0.00	0.23	1.00				
Days Receivables	0.60	0.37	0.00	0.08	0.02	0.00	0.07	0.00	1.00			
Days Payables	0.61	0.02	0.00	0.02	0.01	0.00	0.71	0.00	0.00	1.00		
Days Inventory	0.74	0.01	0.23	0.16	0.15	0.10	0.23	0.00	0.03	0.00	1.00	
NTC	0.50	0.02	0.00	0.38	0.44	0.00	0.08	0.00	0.00	0.00	0.00	1.00

Appendix 9.9: Correlation Matrix NAICS 56

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	-0.05	1.00										
Variability NOI	-0.02	0.10	1.00									
Leverage	-0.06	0.11	0.12	1.00								
FFA/TA	-0.01	0.04	0.69	0.17	1.00							
ROA	-0.02	-0.04	-0.10	0.01	-0.08	1.00						
R&D	0.00	0.03	0.18	0.08	0.09	0.10	1.00					
GOI	-0.05	-0.01	0.03	0.14	-0.07	0.18	0.01	1.00				
Days Receivables	0.07	0.16	0.03	0.10	0.15	-0.03	0.01	-0.30	1.00			
Days Payables	0.06	-0.12	0.22	-0.02	0.46	-0.13	0.03	-0.47	0.42	1.00		
Days Inventory	-0.01	-0.01	-0.03	-0.07	-0.04	-0.20	-0.03	-0.14	0.19	0.26	1.00	
NTC	0.05	0.23	-0.07	0.11	-0.05	0.00	-0.01	-0.12	0.91	0.02	0.23	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.14	1.00										
Variability NOI	0.62	0.01	1.00									
Leverage	0.10	0.00	0.00	1.00								
FFA/TA	0.79	0.23	0.00	0.00	1.00							
ROA	0.51	0.25	0.01	0.82	0.03	1.00						
R&D	0.95	0.35	0.00	0.02	0.01	0.00	1.00					
GOI	0.19	0.78	0.44	0.00	0.07	0.00	0.69	1.00				
Days Receivables	0.04	0.00	0.40	0.01	0.00	0.47	0.78	0.00	1.00			
Days Payables	0.12	0.00	0.00	0.54	0.00	0.00	0.47	0.00	0.00	1.00		
Days Inventory	0.78	0.70	0.42	0.05	0.22	0.00	0.46	0.00	0.00	0.00	1.00	
NTC	0.15	0.00	0.04	0.00	0.13	0.94	0.88	0.00	0.00	0.54	0.00	1.00

Appendix 9.10: Correlation Matrix NAICS 61

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.00	1.00										
Variability NOI	0.07	-0.15	1.00									
Leverage	0.07	0.09	0.12	1.00								
FFA/TA	0.00	-0.07	0.29	0.14	1.00							
ROA	0.02	0.03	0.05	-0.11	0.05	1.00						
R&D	0.10	0.05	0.15	0.21	0.16	-0.01	1.00					
GOI	0.03	0.01	0.30	0.30	0.07	-0.02	0.12	1.00				
Days Receivables	-0.02	0.31	-0.04	0.22	0.11	0.02	0.13	-0.15	1.00			
Days Payables	0.00	0.20	0.02	0.31	0.12	-0.03	0.13	-0.17	0.44	1.00		
Days Inventory	-0.04	0.00	0.02	-0.14	0.10	-0.03	-0.02	-0.12	0.16	0.03	1.00	
NTC	-0.03	0.14	-0.05	-0.06	0.03	0.04	0.02	-0.04	0.66	-0.34	0.40	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.83	1.00										
Variability NOI	0.00	0.00	1.00									
Leverage	0.00	0.00	0.00	1.00								
FFA/TA	0.92	0.00	0.00	0.00	1.00							
ROA	0.39	0.14	0.01	0.00	0.01	1.00						
R&D	0.00	0.01	0.00	0.00	0.00	0.77	1.00					
GOI	0.08	0.48	0.00	0.00	0.00	0.22	0.00	1.00				
Days Receivables	0.33	0.00	0.05	0.00	0.00	0.25	0.00	0.00	1.00			
Days Payables	0.92	0.00	0.27	0.00	0.00	0.13	0.00	0.00	0.00	1.00		
Days Inventory	0.04	0.92	0.27	0.00	0.00	0.12	0.35	0.00	0.00	0.11	1.00	
NTC	0.16	0.00	0.01	0.00	0.13	0.06	0.25	0.04	0.00	0.00	0.00	1.00

Appendix 9.11: Correlation Matrix NAICS 62

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.00	1.00										
Variability NOI	0.00	-0.10	1.00									
Leverage	0.06	-0.05	0.16	1.00								
FFA/TA	0.14	-0.15	0.06	0.11	1.00							
ROA	0.29	0.15	-0.04	0.02	0.07	1.00						
R&D	-0.02	0.09	0.25	0.25	-0.10	-0.05	1.00					
GOI	0.08	0.07	0.42	0.38	-0.03	0.13	0.11	1.00				
Days Receivables	-0.06	-0.20	0.07	0.12	0.07	-0.09	0.26	-0.17	1.00			
Days Payables	0.00	-0.20	0.00	0.28	-0.02	-0.06	0.09	-0.23	0.40	1.00		
Days Inventory	-0.06	0.11	-0.10	0.13	0.21	-0.03	-0.02	-0.04	0.07	0.11	1.00	
NTC	-0.07	-0.08	0.07	-0.05	0.10	-0.06	0.21	-0.03	0.80	-0.23	0.06	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.95	1.00										
Variability NOI	0.96	0.11	1.00									
Leverage	0.30	0.38	0.01	1.00								
FFA/TA	0.02	0.02	0.35	0.08	1.00							
ROA	0.00	0.02	0.52	0.80	0.27	1.00						
R&D	0.81	0.15	0.00	0.00	0.11	0.45	1.00					
GOI	0.18	0.25	0.00	0.00	0.58	0.04	0.09	1.00				
Days Receivables	0.34	0.00	0.26	0.06	0.26	0.13	0.00	0.01	1.00			
Days Payables	1.00	0.00	0.96	0.00	0.76	0.34	0.14	0.00	0.00	1.00		
Days Inventory	0.38	0.09	0.11	0.03	0.00	0.63	0.75	0.51	0.26	0.08	1.00	
NTC	0.29	0.22	0.28	0.44	0.11	0.31	0.00	0.61	0.00	0.00	0.31	1.00

Appendix 9.12: Correlation Matrix NAICS 71

ρ	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.03	1.00										
Variability NOI	0.01	-0.16	1.00									
Leverage	0.02	-0.06	0.11	1.00								
FFA/TA	0.03	0.06	0.27	-0.01	1.00							
ROA	-0.05	0.25	0.05	-0.15	0.00	1.00						
R&D	0.11	0.06	0.01	0.11	-0.11	-0.15	1.00					
GOI	0.04	0.51	0.26	0.03	0.17	0.32	0.08	1.00				
Days Receivables	-0.09	-0.06	0.03	0.01	0.11	0.01	-0.16	-0.01	1.00			
Days Payables	-0.05	-0.05	0.07	0.14	0.01	-0.14	0.20	0.01	0.47	1.00		
Days Inventory	0.00	0.10	0.04	-0.13	-0.16	-0.01	0.00	0.15	0.26	0.13	1.00	
NTC	-0.05	-0.01	-0.02	-0.11	0.09	0.11	-0.32	0.01	0.73	-0.25	0.31	1.00

P-Val	Sales Growth	Size	Variability NOI	Leverage	FFA/TA	ROA	R&D	GOI	Days Receivables	Days Payables	Days Inventory	NTC
Sales Growth	1.00											
Size	0.57	1.00										
Variability NOI	0.87	0.00	1.00									
Leverage	0.68	0.25	0.03	1.00								
FFA/TA	0.50	0.21	0.00	0.87	1.00							
ROA	0.29	0.00	0.37	0.00	1.00	1.00						
R&D	0.03	0.23	0.90	0.04	0.04	0.00	1.00					
GOI	0.44	0.00	0.00	0.61	0.00	0.00	0.10	1.00				
Days Receivables	0.09	0.26	0.62	0.85	0.02	0.91	0.00	0.88	1.00			
Days Payables	0.31	0.30	0.19	0.01	0.88	0.00	0.00	0.90	0.00	1.00		
Days Inventory	0.96	0.04	0.39	0.01	0.00	0.78	0.95	0.00	0.00	0.01	1.00	
NTC	0.31	0.89	0.72	0.03	0.06	0.03	0.00	0.91	0.00	0.00	0.00	1.00

Appendix 9.13: Correlation Matrix NAICS 72

6.10. Appendix 10 – General regression models

The following tables display the results of the general regression models. The first column of each table represents the estimate value (ESTIMATE), the second column represents the standard error (SE) of the estimate, the third column displays the T-Statistic (T-STAT)[38] and the last column displays the p-value (P-VAL) linked to the T-Statistic. The adjusted R^2 (coefficient of determination) is also displayed, indicating the prediction power of the model.

NTC-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.3213375	0.0532937	6.03	0.00
SalesGrowth	- 0.0000014	0.0000009	- 1.51	0.13
Size	0.0116497	0.0023946	4.87	0.00
VariabilityNOI	0.1383420	0.0302170	45.78	-
Leverage	0.2640455	0.0102286	25.81	0.00
FFA/TA	0.1523150	0.0144980	10.51	0.00
R&D	0.4730126	0.0554166	8.54	0.00
NTC	0.0007340	0.0000818	8.97	0.00
Year_2010	- 0.0264975	0.0112974	- 2.35	0.02
Year_2011	- 0.0290257	0.0112174	- 2.59	0.01
Year_2012	- 0.0115496	0.0111390	- 1.04	0.30
Year_2013	- 0.0136562	0.0110850	- 1.23	0.22
Year_2014	- 0.0124010	0.0110420	- 1.12	0.26
Year_2015	- 0.0100737	0.0110057	- 0.92	0.36
Year_2016	- 0.0178096	0.0109993	- 1.62	0.11
Industry_21	0.0372677	0.0585485	0.64	0.52
Industry_23	- 0.0032039	0.0349345	- 0.09	0.93
Industry_3	0.0405696	0.0342811	1.18	0.24
Industry_42	- 0.1303690	0.0342111	- 3.81	0.00
Industry_4445	0.1244142	0.0364777	3.41	0.00
Industry_4849	0.4694418	0.0353501	13.28	0.00
Industry_51	0.3479965	0.0386113	9.01	0.00
Industry_56	0.8219474	0.0364451	22.55	0.00
Industry_61	1.0188932	0.0400278	25.45	0.00
Industry_62	0.5195245	0.0360079	14.43	0.00
Industry_71	0.3355000	0.0504678	6.65	0.00
Industry_72	0.3473943	0.0456889	7.60	0.00
Listed_Public	- 0.2542642	0.0316902	- 8.02	0.00
NTC^2	- 0.0000116	0.0000004	- 26.90	0.00
Adjusted R^2	0.2371732			

NTC-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0356635	0.0068239	5.23	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.68	0.09
Size	0.0020149	0.0003066	6.57	0.00
VariabilityNOI	0.0947274	0.0038691	24.48	0.00
Leverage	- 0.0462838	0.0013097	- 35.34	0.00
FFA/TA	- 0.0636499	0.0018564	- 34.29	0.00
R&D	- 0.0456287	0.0070958	- 6.43	0.00
NTC	0.0000922	0.0000105	8.80	0.00
Year_2010	0.0076543	0.0014466	5.29	0.00
Year_2011	0.0053840	0.0014363	3.75	0.00
Year_2012	- 0.0032125	0.0014263	- 2.25	0.02
Year_2013	- 0.0052545	0.0014194	- 3.70	0.00
Year_2014	- 0.0019719	0.0014139	- 1.39	0.16
Year_2015	0.0010892	0.0014092	0.77	0.44
Year_2016	0.0028569	0.0014084	2.03	0.04
Industry_21	0.0078271	0.0074968	1.04	0.30
Industry_23	0.0158783	0.0044731	3.55	0.00
Industry_3	0.0155397	0.0043895	3.54	0.00
Industry_42	0.0229944	0.0043805	5.25	0.00
Industry_4445	0.0272180	0.0046708	5.83	0.00
Industry_4849	0.0013947	0.0045264	0.31	0.76
Industry_51	0.0258632	0.0049439	5.23	0.00
Industry_56	0.0146311	0.0046666	3.14	0.00
Industry_61	- 0.0297318	0.0051253	- 5.80	0.00
Industry_62	- 0.0270584	0.0046106	- 5.87	0.00
Industry_71	- 0.0000645	0.0064621	- 0.01	0.99
Industry_72	- 0.0001346	0.0058502	- 0.02	0.98
Listed_Public	- 0.0054016	0.0040577	- 1.33	0.18
NTC^2	- 0.0000009	0.0000001	- 16.57	0.00
Adjusted R^2	0.0835997			

[38] The T-Statistic takes the form $t_{\hat{\beta}} = \frac{\hat{\beta} - \beta_0}{\sigma(\hat{\beta})}$ where $\hat{\beta}$ is the computed estimate, β_0 is set to 0 and $\sigma(\hat{\beta})$ is the standard error of the computed estimate. This ratio is used when conducting a hypothesis test where H_0: $\hat{\beta} = 0$ and H_1: $\hat{\beta} \neq 0$. This kind of test helps determining if the computed estimate $\hat{\beta}$ is statistically different from 0.

Days Receivables-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.3303797	0.0533569	6.19	0.00
SalesGrowth	- 0.0000012	0.0000009	- 1.30	0.19
Size	0.0123398	0.0023930	5.16	0.00
VariabilityNOI	0.1387325	0.0302508	45.86	-
Leverage	0.2845471	0.0101686	27.98	0.00
FFA/TA	0.1617774	0.0144728	11.18	0.00
R&D	0.4803802	0.0554385	8.67	0.00
DaysReceivables	- 0.0006911	0.0001689	- 4.09	0.00
Year_2010	- 0.0223680	0.0113081	- 1.98	0.05
Year_2011	- 0.0261888	0.0112276	- 2.33	0.02
Year_2012	- 0.0105931	0.0111499	- 0.95	0.34
Year_2013	- 0.0133143	0.0110959	- 1.20	0.23
Year_2014	- 0.0141010	0.0110541	- 1.28	0.20
Year_2015	- 0.0135751	0.0110194	- 1.23	0.22
Year_2016	- 0.0202626	0.0110110	- 1.84	0.07
Industry_21	0.0887745	0.0586351	1.51	0.13
Industry_23	0.0512945	0.0350255	1.46	0.14
Industry_3	0.0610743	0.0343298	1.78	0.08
Industry_42	- 0.1153542	0.0342498	- 3.37	0.00
Industry_4445	0.1028977	0.0366583	2.81	0.01
Industry_4849	0.5124790	0.0353659	14.49	0.00
Industry_51	0.3916672	0.0386561	10.13	0.00
Industry_56	0.8543004	0.0364701	23.42	0.00
Industry_61	1.0076215	0.0401482	25.10	0.00
Industry_62	0.5341805	0.0360169	14.83	0.00
Industry_71	0.3269130	0.0504688	6.48	0.00
Industry_72	0.3310101	0.0457035	7.24	0.00
Listed_Public	- 0.2491978	0.0317236	- 7.86	0.00
DaysReceivables^2	- 0.0000074	0.0000008	- 8.83	0.00
Adjusted R^2	0.2356513			

Days Receivables-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0391858	0.0068252	5.74	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.55	0.12
Size	0.0019590	0.0003061	6.40	0.00
VariabilityNOI	0.0947532	0.0038696	24.49	0.00
Leverage	- 0.0455576	0.0013007	- 35.02	0.00
FFA/TA	- 0.0635126	0.0018513	- 34.31	0.00
R&D	- 0.0460665	0.0070915	- 6.50	0.00
DaysReceivables	- 0.0000201	0.0000216	- 0.93	0.35
Year_2010	0.0079328	0.0014465	5.48	0.00
Year_2011	0.0055691	0.0014362	3.88	0.00
Year_2012	- 0.0031343	0.0014263	- 2.20	0.03
Year_2013	- 0.0052218	0.0014194	- 3.68	0.00
Year_2014	- 0.0021031	0.0014140	- 1.49	0.14
Year_2015	0.0008206	0.0014096	0.58	0.56
Year_2016	0.0026789	0.0014085	1.90	0.06
Industry_21	0.0112993	0.0075004	1.51	0.13
Industry_23	0.0193989	0.0044803	4.33	0.00
Industry_3	0.0172024	0.0043913	3.92	0.00
Industry_42	0.0242073	0.0043811	5.53	0.00
Industry_4445	0.0256701	0.0046892	5.47	0.00
Industry_4849	0.0035800	0.0045239	0.79	0.43
Industry_51	0.0282368	0.0049448	5.71	0.00
Industry_56	0.0163112	0.0046651	3.50	0.00
Industry_61	- 0.0314689	0.0051356	- 6.13	0.00
Industry_62	- 0.0267627	0.0046071	- 5.81	0.00
Industry_71	- 0.0020503	0.0064558	- 0.32	0.75
Industry_72	- 0.0025531	0.0058462	- 0.44	0.66
Listed_Public	- 0.0048964	0.0040580	- 1.21	0.23
DaysReceivables^2	- 0.0000007	0.0000001	- 6.49	0.00
Adjusted R^2	0.0835998			

Days Inventory-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.3508512	0.0529952	6.62	0.00
SalesGrowth	- 0.0000015	0.0000009	- 1.68	0.09
Size	0.0151548	0.0023818	6.36	0.00
VariabilityNOI	0.1353117	0.0302154	44.78	-
Leverage	0.2633387	0.0101328	25.99	0.00
FFA/TA	0.1048949	0.0144873	7.24	0.00
R&D	0.4147066	0.0553217	7.50	0.00
DaysInventory	- 0.0033836	0.0001656	- 20.43	0.00
Year_2010	- 0.0242094	0.0112846	- 2.15	0.03
Year_2011	- 0.0262010	0.0112039	- 2.34	0.02
Year_2012	- 0.0087565	0.0111257	- 0.79	0.43
Year_2013	- 0.0097461	0.0110715	- 0.88	0.38
Year_2014	- 0.0081484	0.0110290	- 0.74	0.46
Year_2015	- 0.0082210	0.0109931	- 0.75	0.45
Year_2016	- 0.0153561	0.0109872	- 1.40	0.16
Industry_21	0.0318567	0.0584920	0.54	0.59
Industry_23	- 0.0578040	0.0349305	- 1.65	0.10
Industry_3	0.0532207	0.0342644	1.55	0.12
Industry_42	- 0.1215443	0.0341872	- 3.56	0.00
Industry_4445	0.1614224	0.0364590	4.43	0.00
Industry_4849	0.3851156	0.0354144	10.87	0.00
Industry_51	0.2608451	0.0386008	6.76	0.00
Industry_56	0.7380364	0.0365105	20.21	0.00
Industry_61	0.9302150	0.0400488	23.23	0.00
Industry_62	0.4443456	0.0360673	12.32	0.00
Industry_71	0.2282978	0.0503874	4.53	0.00
Industry_72	0.2642397	0.0456318	5.79	0.00
Listed_Public	- 0.2543141	0.0316539	- 8.03	0.00
DaysInventory^2	0.0000050	0.0000009	5.51	0.00
Adjusted R^2	0.2389130			

Days Inventory-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0440262	0.0067788	6.49	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.80	0.07
Size	0.0021429	0.0003047	7.03	0.00
VariabilityNOI	0.0912906	0.0038650	23.62	0.00
Leverage	- 0.0471760	0.0012961	- 36.40	0.00
FFA/TA	- 0.0683921	0.0018531	- 36.91	0.00
R&D	- 0.0513648	0.0070764	- 7.26	0.00
DaysInventory	- 0.0003220	0.0000212	- 15.20	0.00
Year_2010	0.0078159	0.0014435	5.41	0.00
Year_2011	0.0055629	0.0014331	3.88	0.00
Year_2012	- 0.0030086	0.0014231	- 2.11	0.03
Year_2013	- 0.0049587	0.0014162	- 3.50	0.00
Year_2014	- 0.0016632	0.0014108	- 1.18	0.24
Year_2015	0.0011779	0.0014062	0.84	0.40
Year_2016	0.0030418	0.0014054	2.16	0.03
Industry_21	0.0073439	0.0074819	0.98	0.33
Industry_23	0.0106506	0.0044681	2.38	0.02
Industry_3	0.0172450	0.0043829	3.93	0.00
Industry_42	0.0240711	0.0043730	5.50	0.00
Industry_4445	0.0300698	0.0046636	6.45	0.00
Industry_4849	- 0.0072469	0.0045300	- 1.60	0.11
Industry_51	0.0174166	0.0049376	3.53	0.00
Industry_56	0.0062963	0.0046702	1.35	0.18
Industry_61	- 0.0395884	0.0051228	- 7.73	0.00
Industry_62	- 0.0351222	0.0046135	- 7.61	0.00
Industry_71	- 0.0114033	0.0064452	- 1.77	0.08
Industry_72	- 0.0092870	0.0058369	- 1.59	0.11
Listed_Public	- 0.0051290	0.0040490	- 1.27	0.21
DaysInventory^2	0.0000006	0.0000001	5.42	0.00
Adjusted R^2	0.0875489			

Days Payables-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.2793376	0.0521827	5.35	0.00
SalesGrowth	- 0.0000013	0.0000009	- 1.46	0.14
Size	0.0199775	0.0023615	8.46	0.00
VariabilityNOI	0.1332542	0.0298828	44.59	-
Leverage	0.3919885	0.0103598	37.84	-
FFA/TA	0.1890844	0.0142992	13.22	0.00
R&D	0.5542941	0.0547369	10.13	0.00
DaysPayables	- 0.0058004	0.0002047	- 28.34	0.00
Year_2010	- 0.0214679	0.0111578	- 1.92	0.05
Year_2011	- 0.0271180	0.0110789	- 2.45	0.01
Year_2012	- 0.0122742	0.0110022	- 1.12	0.26
Year_2013	- 0.0151662	0.0109489	- 1.39	0.17
Year_2014	- 0.0133060	0.0109062	- 1.22	0.22
Year_2015	- 0.0116324	0.0108702	- 1.07	0.28
Year_2016	- 0.0169469	0.0108638	- 1.56	0.12
Industry_21	0.1389605	0.0578647	2.40	0.02
Industry_23	0.0900267	0.0345619	2.60	0.01
Industry_3	0.0816854	0.0338718	2.41	0.02
Industry_42	- 0.1067097	0.0337941	- 3.16	0.00
Industry_4445	0.1254617	0.0360162	3.48	0.00
Industry_4849	0.5217166	0.0348881	14.95	0.00
Industry_51	0.4251760	0.0381497	11.14	0.00
Industry_56	0.8227762	0.0359849	22.86	0.00
Industry_61	0.9360845	0.0395552	23.67	0.00
Industry_62	0.4773048	0.0355803	13.41	0.00
Industry_71	0.3526867	0.0497233	7.09	0.00
Industry_72	0.3363151	0.0450318	7.47	0.00
Listed_Public	- 0.2472960	0.0313007	- 7.90	0.00
DaysPayables^2	0.0000110	0.0000011	9.60	0.00
Adjusted R^2	0.2558459			

Days Payables-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0393499	0.0066890	5.88	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.65	0.10
Size	0.0026022	0.0003027	8.60	0.00
VariabilityNOI	0.0883545	0.0038305	23.07	0.00
Leverage	- 0.0340571	0.0013280	- 25.65	0.00
FFA/TA	- 0.0602422	0.0018329	- 32.87	0.00
R&D	- 0.0377238	0.0070164	- 5.38	0.00
DaysPayables	- 0.0006183	0.0000262	- 23.57	0.00
Year_2010	0.0080442	0.0014303	5.62	0.00
Year_2011	0.0054223	0.0014201	3.82	0.00
Year_2012	- 0.0033726	0.0014103	- 2.39	0.02
Year_2013	- 0.0055105	0.0014035	- 3.93	0.00
Year_2014	- 0.0021644	0.0013980	- 1.55	0.12
Year_2015	0.0008597	0.0013934	0.62	0.54
Year_2016	0.0029382	0.0013926	2.11	0.03
Industry_21	0.0179212	0.0074174	2.42	0.02
Industry_23	0.0252039	0.0044303	5.69	0.00
Industry_3	0.0202181	0.0043418	4.66	0.00
Industry_42	0.0255056	0.0043319	5.89	0.00
Industry_4445	0.0265037	0.0046167	5.74	0.00
Industry_4849	0.0054443	0.0044721	1.22	0.22
Industry_51	0.0331514	0.0048902	6.78	0.00
Industry_56	0.0136575	0.0046127	2.96	0.00
Industry_61	- 0.0407335	0.0050704	- 8.03	0.00
Industry_62	- 0.0333060	0.0045608	- 7.30	0.00
Industry_71	- 0.0000083	0.0063738	- 0.00	1.00
Industry_72	- 0.0031494	0.0057724	- 0.55	0.59
Listed_Public	- 0.0043448	0.0040123	- 1.08	0.28
DaysPayables^2	0.0000013	0.0000001	8.91	0.00
Adjusted R^2	0.1040689			

6.11. Appendix 11 – Industry-specific regression models

The following tables display the results of the industry-specific models. The first column of each table represents the estimate value (ESTIMATE), the second column represents the standard error (SE) of the estimate, the third column displays the T-Statistic (T-STAT)[39] and the last column displays the p-value (P-VAL) linked to the T-Statistic. The adjusted R^2 (coefficient of determination) is also displayed, indicating the prediction power of the model.

A. NTC as independent variable

NTC-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.6246875	0.0670184	9.32	0.00
SalesGrowth	- 0.0000014	0.0000009	- 1.57	0.12
Size	0.0079245	0.0023849	3.32	0.00
VariabilityNOI	0.1353233	0.0299834	45.13	-
Leverage	0.2538946	0.0101653	24.98	0.00
FFA/TA	0.1453559	0.0144050	10.09	0.00
R&D	0.4785426	0.0551626	8.68	0.00
NTC	- 0.0069608	0.0012959	- 5.37	0.00
Year_2010	- 0.0251935	0.0111911	- 2.25	0.02
Year_2011	- 0.0274387	0.0111121	- 2.47	0.01
Year_2012	- 0.0098836	0.0110352	- 0.90	0.37
Year_2013	- 0.0126763	0.0109817	- 1.15	0.25
Year_2014	- 0.0110546	0.0109395	- 1.01	0.31
Year_2015	- 0.0077832	0.0109040	- 0.71	0.48
Year_2016	- 0.0162910	0.0108981	- 1.49	0.13
Industry_21	- 0.1969301	0.0853818	- 2.31	0.02
Industry_23	- 0.2980239	0.0544144	- 5.48	0.00
Industry_3	- 0.1636665	0.0540185	- 3.03	0.00
Industry_42	- 0.3240194	0.0538858	- 6.01	0.00
Industry_4445	- 0.0493161	0.0557568	- 0.88	0.38
Industry_4849	0.2519633	0.0545806	4.62	0.00
Industry_51	0.1657367	0.0572306	2.90	0.00
Industry_56	0.5069086	0.0555900	9.12	0.00
Industry_61	0.8138433	0.0576474	14.12	0.00
Industry_62	0.3152621	0.0554360	5.69	0.00
Industry_71	0.1800769	0.0681057	2.64	0.01
Industry_72	0.1409663	0.0624158	2.26	0.02
Listed_Public	- 0.2589513	0.0314003	- 8.25	0.00
NTC:Industry_21	0.0083003	0.0017944	4.63	0.00
NTC:Industry_23	0.0097081	0.0013146	7.39	0.00
NTC:Industry_3	0.0067377	0.0013056	5.16	0.00
NTC:Industry_42	0.0061204	0.0013045	4.69	0.00
NTC:Industry_4445	0.0053898	0.0013631	3.95	0.00
NTC:Industry_4849	0.0086493	0.0013216	6.54	0.00
NTC:Industry_51	0.0080265	0.0013323	6.02	0.00
NTC:Industry_56	0.0138651	0.0013367	10.37	0.00
NTC:Industry_61	0.0088477	0.0017508	5.05	0.00
NTC:Industry_62	0.0071906	0.0013665	5.26	0.00
NTC:Industry_71	0.0099938	0.0016553	6.04	0.00
NTC:Industry_72	0.0091617	0.0016540	5.54	0.00
NTC^2	0.0000177	0.0000059	3.01	0.00
NTC^2:Industry_21	- 0.0000355	0.0000126	- 2.81	0.01
NTC^2:Industry_23	- 0.0000330	0.0000060	- 5.52	0.00
NTC^2:Industry_3	- 0.0000248	0.0000059	- 4.19	0.00
NTC^2:Industry_42	- 0.0000215	0.0000059	- 3.63	0.00
NTC^2:Industry_4445	- 0.0000260	0.0000067	- 3.87	0.00
NTC^2:Industry_4849	- 0.0000458	0.0000062	- 7.38	0.00
NTC^2:Industry_51	- 0.0000415	0.0000062	- 6.64	0.00
NTC^2:Industry_56	- 0.0000585	0.0000062	- 9.48	0.00
NTC^2:Industry_61	- 0.0000751	0.0000101	- 7.40	0.00
NTC^2:Industry_62	- 0.0000441	0.0000073	- 6.04	0.00
NTC^2:Industry_71	- 0.0000570	0.0000091	- 6.24	0.00
NTC^2:Industry_72	- 0.0000479	0.0000103	- 4.64	0.00
Adjusted R^2	0.2515420			

NTC-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0454889	0.0086527	5.26	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.69	0.09
Size	0.0018299	0.0003079	5.94	0.00
VariabilityNOI	0.0937341	0.0038711	24.21	0.00
Leverage	- 0.0471282	0.0013124	- 35.91	0.00
FFA/TA	- 0.0637434	0.0018598	- 34.27	0.00
R&D	- 0.0452076	0.0071220	- 6.35	0.00
NTC	- 0.0000389	0.0001673	- 0.23	0.82
Year_2010	0.0077164	0.0014449	5.34	0.00
Year_2011	0.0054557	0.0014347	3.80	0.00
Year_2012	- 0.0030953	0.0014247	- 2.17	0.03
Year_2013	- 0.0052199	0.0014178	- 3.68	0.00
Year_2014	- 0.0019000	0.0014124	- 1.35	0.18
Year_2015	0.0011992	0.0014078	0.85	0.39
Year_2016	0.0029868	0.0014070	2.12	0.03
Industry_21	0.0054049	0.0110235	0.49	0.62
Industry_23	0.0078425	0.0070254	1.12	0.26
Industry_3	0.0080682	0.0069743	1.16	0.25
Industry_42	0.0189169	0.0069571	2.72	0.01
Industry_4445	0.0281428	0.0071987	3.91	0.00
Industry_4849	- 0.0059300	0.0070468	- 0.84	0.40
Industry_51	0.0185051	0.0073890	2.50	0.01
Industry_56	0.0047179	0.0071771	0.66	0.51
Industry_61	- 0.0366385	0.0074428	- 4.92	0.00
Industry_62	- 0.0338192	0.0071573	- 4.73	0.00
Industry_71	- 0.0048617	0.0087930	- 0.55	0.58
Industry_72	- 0.0040771	0.0080584	- 0.51	0.61
Listed_Public	- 0.0052813	0.0040540	- 1.30	0.19
NTC:Industry_21	0.0001070	0.0002317	0.46	0.64
NTC:Industry_23	0.0001371	0.0001697	0.81	0.42
NTC:Industry_3	0.0001940	0.0001686	1.15	0.25
NTC:Industry_42	0.0000675	0.0001684	0.40	0.69
NTC:Industry_4445	- 0.0002559	0.0001760	- 1.45	0.15
NTC:Industry_4849	0.0002635	0.0001706	1.54	0.12
NTC:Industry_51	0.0000986	0.0001720	0.57	0.57
NTC:Industry_56	0.0002916	0.0001726	1.69	0.09
NTC:Industry_61	0.0000610	0.0002260	0.27	0.79
NTC:Industry_62	0.0001037	0.0001764	0.59	0.56
NTC:Industry_71	0.0000971	0.0002137	0.45	0.65
NTC:Industry_72	0.0003507	0.0002136	1.64	0.10
NTC^2	- 0.0000008	0.0000008	- 1.11	0.27
NTC^2:Industry_21	- 0.0000008	0.0000016	- 0.50	0.61
NTC^2:Industry_23	0.0000003	0.0000008	0.33	0.74
NTC^2:Industry_3	- 0.0000005	0.0000008	- 0.59	0.55
NTC^2:Industry_42	0.0000001	0.0000008	0.19	0.85
NTC^2:Industry_4445	0.0000014	0.0000009	1.57	0.12
NTC^2:Industry_4849	- 0.0000007	0.0000008	- 0.89	0.37
NTC^2:Industry_51	0.0000004	0.0000008	0.44	0.66
NTC^2:Industry_56	- 0.0000003	0.0000008	- 0.40	0.69
NTC^2:Industry_61	0.0000009	0.0000013	0.72	0.47
NTC^2:Industry_62	0.0000006	0.0000009	0.62	0.53
NTC^2:Industry_71	- 0.0000007	0.0000012	- 0.61	0.54
NTC^2:Industry_72	- 0.0000013	0.0000013	- 0.95	0.34
Adjusted R^2	0.0858445			

[39] The T-Statistic takes the form $t_{\hat{\beta}} = \frac{\hat{\beta}-\beta_0}{\sigma(\hat{\beta})}$ where $\hat{\beta}$ is the computed estimate, β_0 is set to 0 and $\sigma(\hat{\beta})$ is the standard error of the computed estimate. This ratio is used when conducting a hypothesis test where $H_0: \hat{\beta} = 0$ and $H_1: \hat{\beta} \neq 0$. This kind of test helps determining if the computed estimate $\hat{\beta}$ is statistically different from 0.

B. Days Receivables as independent variable

Days Receivables-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0933019	0.1122556	0.83	0.41
SalesGrowth	- 0.0000013	0.0000009	- 1.41	0.16
Size	0.0093909	0.0023953	3.92	0.00
VariabilityNOI	0.1373067	0.0300037	45.76	-
Leverage	0.2879238	0.0100898	28.54	0.00
FFA/TA	0.1735377	0.0143773	12.07	0.00
R&D	0.5076522	0.0550364	9.22	0.00
DaysReceivables	0.0108163	0.0038884	2.78	0.01
Year_2010	- 0.0232926	0.0111979	- 2.08	0.04
Year_2011	- 0.0288611	0.0111190	- 2.60	0.01
Year_2012	- 0.0125746	0.0110430	- 1.14	0.25
Year_2013	- 0.0143127	0.0109892	- 1.30	0.19
Year_2014	- 0.0153196	0.0109472	- 1.40	0.16
Year_2015	- 0.0146945	0.0109142	- 1.35	0.18
Year_2016	- 0.0217799	0.0109068	- 2.00	0.05
Industry_21	0.4971618	0.2049368	2.43	0.02
Industry_23	0.0114824	0.1072680	0.11	0.91
Industry_3	0.4233943	0.1057732	4.00	0.00
Industry_42	0.1662958	0.1052364	1.58	0.11
Industry_4445	0.4694989	0.1062431	4.42	0.00
Industry_4849	0.7342938	0.1082401	6.78	0.00
Industry_51	0.4997012	0.1138150	4.39	0.00
Industry_56	1.0099416	0.1092385	9.25	0.00
Industry_61	1.5816641	0.1082426	14.61	0.00
Industry_62	1.0284894	0.1077543	9.54	0.00
Industry_71	0.7510576	0.1179198	6.37	0.00
Industry_72	0.4343009	0.1173854	3.70	0.00
Listed_Public	- 0.2535412	0.0314300	- 8.07	0.00
DaysReceivables:Industry_21	- 0.0143931	0.0056729	- 2.54	0.01
DaysReceivables:Industry_23	- 0.0053663	0.0039173	- 1.37	0.17
DaysReceivables:Industry_3	- 0.0132877	0.0039044	- 3.40	0.00
DaysReceivables:Industry_42	- 0.0116424	0.0038989	- 2.99	0.00
DaysReceivables:Industry_4445	- 0.0169293	0.0039703	- 4.26	0.00
DaysReceivables:Industry_4849	- 0.0095798	0.0039347	- 2.43	0.01
DaysReceivables:Industry_51	- 0.0074054	0.0039934	- 1.85	0.06
DaysReceivables:Industry_56	- 0.0047542	0.0039607	- 1.20	0.23
DaysReceivables:Industry_61	- 0.0321816	0.0041432	- 7.77	0.00
DaysReceivables:Industry_62	- 0.0184524	0.0039985	- 4.61	0.00
DaysReceivables:Industry_71	- 0.0178488	0.0043300	- 4.12	0.00
DaysReceivables:Industry_72	- 0.0038013	0.0043068	- 0.88	0.38
DaysReceivables^2	- 0.0000968	0.0000330	- 2.93	0.00
DaysReceivables^2:Industry_21	0.0001027	0.0000399	2.58	0.01
DaysReceivables^2:Industry_23	0.0000700	0.0000331	2.12	0.03
DaysReceivables^2:Industry_3	0.0000965	0.0000331	2.92	0.00
DaysReceivables^2:Industry_42	0.0000922	0.0000330	2.79	0.01
DaysReceivables^2:Industry_4445	0.0001161	0.0000333	3.49	0.00
DaysReceivables^2:Industry_4849	0.0000788	0.0000331	2.38	0.02
DaysReceivables^2:Industry_51	0.0000739	0.0000332	2.23	0.03
DaysReceivables^2:Industry_56	0.0000366	0.0000332	1.10	0.27
DaysReceivables^2:Industry_61	0.0001686	0.0000341	4.94	0.00
DaysReceivables^2:Industry_62	0.0001172	0.0000338	3.47	0.00
DaysReceivables^2:Industry_71	0.0001128	0.0000341	3.31	0.00
DaysReceivables^2:Industry_72	0.0000623	0.0000339	1.84	0.07
Adjusted R^2	0.2505854			

Days Receivables-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0681176	0.0144828	4.70	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.53	0.13
Size	0.0017915	0.0003090	5.80	0.00
VariabilityNOI	0.0947289	0.0038710	24.47	0.00
Leverage	- 0.0454693	0.0013017	- 34.93	0.00
FFA/TA	- 0.0638692	0.0018549	- 34.43	0.00
R&D	- 0.0461993	0.0071006	- 6.51	0.00
DaysReceivables	- 0.0007632	0.0005017	- 1.52	0.13
Year_2010	0.0079028	0.0014447	5.47	0.00
Year_2011	0.0055048	0.0014345	3.84	0.00
Year_2012	- 0.0031913	0.0014247	- 2.24	0.03
Year_2013	- 0.0052185	0.0014178	- 3.68	0.00
Year_2014	- 0.0021371	0.0014124	- 1.51	0.13
Year_2015	0.0008203	0.0014081	0.58	0.56
Year_2016	0.0027124	0.0014071	1.93	0.05
Industry_21	- 0.0493178	0.0264402	- 1.87	0.06
Industry_23	- 0.0040088	0.0138393	- 0.29	0.77
Industry_3	- 0.0043154	0.0136465	- 0.32	0.75
Industry_42	- 0.0048243	0.0135772	- 0.36	0.72
Industry_4445	0.0108989	0.0137071	0.80	0.43
Industry_4849	- 0.0220972	0.0139647	- 1.58	0.11
Industry_51	- 0.0064870	0.0146840	- 0.44	0.66
Industry_56	- 0.0143366	0.0140935	- 1.02	0.31
Industry_61	- 0.0584221	0.0139651	- 4.18	0.00
Industry_62	- 0.0676560	0.0139021	- 4.87	0.00
Industry_71	- 0.0318224	0.0152136	- 2.09	0.04
Industry_72	- 0.0320003	0.0151446	- 2.11	0.03
Listed_Public	- 0.0043134	0.0040550	- 1.06	0.29
DaysReceivables:Industry_21	0.0015526	0.0007319	2.12	0.03
DaysReceivables:Industry_23	0.0007190	0.0005054	1.42	0.15
DaysReceivables:Industry_3	0.0006675	0.0005037	1.33	0.19
DaysReceivables:Industry_42	0.0008300	0.0005030	1.65	0.10
DaysReceivables:Industry_4445	- 0.0000218	0.0005122	- 0.04	0.97
DaysReceivables:Industry_4849	0.0006630	0.0005076	1.31	0.19
DaysReceivables:Industry_51	0.0008708	0.0005152	1.69	0.09
DaysReceivables:Industry_56	0.0009180	0.0005110	1.80	0.07
DaysReceivables:Industry_61	0.0006741	0.0005345	1.26	0.21
DaysReceivables:Industry_62	0.0012367	0.0005159	2.40	0.02
DaysReceivables:Industry_71	0.0008850	0.0005586	1.58	0.11
DaysReceivables:Industry_72	0.0008002	0.0005556	1.44	0.15
DaysReceivables^2	0.0000027	0.0000043	0.62	0.53
DaysReceivables^2:Industry_21	- 0.0000071	0.0000051	- 1.38	0.17
DaysReceivables^2:Industry_23	- 0.0000034	0.0000043	- 0.81	0.42
DaysReceivables^2:Industry_3	- 0.0000033	0.0000043	- 0.77	0.44
DaysReceivables^2:Industry_42	- 0.0000038	0.0000043	- 0.88	0.38
DaysReceivables^2:Industry_4445	0.0000004	0.0000043	0.10	0.92
DaysReceivables^2:Industry_4849	- 0.0000025	0.0000043	- 0.59	0.56
DaysReceivables^2:Industry_51	- 0.0000035	0.0000043	- 0.81	0.42
DaysReceivables^2:Industry_56	- 0.0000045	0.0000043	- 1.05	0.29
DaysReceivables^2:Industry_61	- 0.0000018	0.0000044	- 0.42	0.68
DaysReceivables^2:Industry_62	- 0.0000054	0.0000044	- 1.23	0.22
DaysReceivables^2:Industry_71	- 0.0000037	0.0000044	- 0.85	0.39
DaysReceivables^2:Industry_72	- 0.0000026	0.0000044	- 0.60	0.55
Adjusted R^2	0.0859866			

C. Days Inventory as independent variable

Days Inventory-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.4540035	0.0641610	7.08	0.00
SalesGrowth	- 0.0000015	0.0000009	- 1.66	0.10
Size	0.0165058	0.0023767	6.94	0.00
VariabilityNOI	0.1350071	0.0300274	44.96	-
Leverage	0.2544823	0.0100960	25.21	0.00
FFA/TA	0.1039934	0.0144119	7.22	0.00
R&D	0.3950917	0.0550001	7.18	0.00
DaysInventory	- 0.0088191	0.0015879	- 5.55	0.00
Year_2010	- 0.0246197	0.0112071	- 2.20	0.03
Year_2011	- 0.0264169	0.0111274	- 2.37	0.02
Year_2012	- 0.0085414	0.0110501	- 0.77	0.44
Year_2013	- 0.0096364	0.0109968	- 0.88	0.38
Year_2014	- 0.0081644	0.0109543	- 0.75	0.46
Year_2015	- 0.0078276	0.0109195	- 0.72	0.47
Year_2016	- 0.0156202	0.0109135	- 1.43	0.15
Industry_21	- 0.1936609	0.1090384	- 1.78	0.08
Industry_23	- 0.2116461	0.0509885	- 4.15	0.00
Industry_3	- 0.0957999	0.0508230	- 1.88	0.06
Industry_42	- 0.2414785	0.0505549	- 4.78	0.00
Industry_4445	0.0495126	0.0562485	0.88	0.38
Industry_4849	0.2815426	0.0510916	5.51	0.00
Industry_51	0.1701424	0.0537768	3.16	0.00
Industry_56	0.7026561	0.0518929	13.54	0.00
Industry_61	0.9125662	0.0552736	16.51	0.00
Industry_62	0.3964416	0.0519256	7.63	0.00
Industry_71	- 0.0356899	0.0706788	- 0.50	0.61
Industry_72	- 0.2728672	0.0762211	- 3.58	0.00
Listed_Public	- 0.2577295	0.0314389	- 8.20	0.00
DaysInventory:Industry_21	0.0116550	0.0063895	1.82	0.07
DaysInventory:Industry_23	0.0081019	0.0016602	4.88	0.00
DaysInventory:Industry_3	0.0065180	0.0016185	4.03	0.00
DaysInventory:Industry_42	0.0053264	0.0016069	3.31	0.00
DaysInventory:Industry_4445	0.0055029	0.0017627	3.12	0.00
DaysInventory:Industry_4849	- 0.0006113	0.0029847	- 0.20	0.84
DaysInventory:Industry_51	0.0012838	0.0020732	0.62	0.54
DaysInventory:Industry_56	- 0.0179023	0.0021269	- 8.42	0.00
DaysInventory:Industry_61	- 0.1524051	0.0186411	- 8.18	0.00
DaysInventory:Industry_62	- 0.0227716	0.0035073	- 6.49	0.00
DaysInventory:Industry_71	0.2513925	0.0405557	6.20	0.00
DaysInventory:Industry_72	0.1520494	0.0174311	8.72	0.00
DaysInventory^2	0.0000273	0.0000073	3.74	0.00
DaysInventory^2:Industry_21	- 0.0000737	0.0000773	- 0.95	0.34
DaysInventory^2:Industry_23	- 0.0000315	0.0000076	- 4.14	0.00
DaysInventory^2:Industry_3	- 0.0000279	0.0000076	- 3.69	0.00
DaysInventory^2:Industry_42	- 0.0000211	0.0000075	- 2.83	0.00
DaysInventory^2:Industry_4445	- 0.0000257	0.0000086	- 2.99	0.00
DaysInventory^2:Industry_4849	- 0.0000385	0.0000426	- 0.90	0.37
DaysInventory^2:Industry_51	- 0.0000102	0.0000097	- 1.05	0.29
DaysInventory^2:Industry_56	0.0000462	0.0000091	5.06	0.00
DaysInventory^2:Industry_61	0.0033014	0.0004688	7.04	0.00
DaysInventory^2:Industry_62	0.0003645	0.0000565	6.46	0.00
DaysInventory^2:Industry_71	- 0.0250120	0.0038059	- 6.57	0.00
DaysInventory^2:Industry_72	- 0.0059490	0.0008424	- 7.06	0.00
Adjusted R^2	0.2494220			

Days Inventory-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0385185	0.0082518	4.67	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.81	0.07
Size	0.0021449	0.0003057	7.02	0.00
VariabilityNOI	0.0903716	0.0038618	23.40	0.00
Leverage	- 0.0476160	0.0012985	- 36.67	0.00
FFA/TA	- 0.0691781	0.0018535	- 37.32	0.00
R&D	- 0.0518574	0.0070736	- 7.33	0.00
DaysInventory	0.0000001	0.0002042	0.00	1.00
Year_2010	0.0077745	0.0014414	5.39	0.00
Year_2011	0.0055180	0.0014311	3.86	0.00
Year_2012	- 0.0030158	0.0014212	- 2.12	0.03
Year_2013	- 0.0050354	0.0014143	- 3.56	0.00
Year_2014	- 0.0016711	0.0014088	- 1.19	0.24
Year_2015	0.0011670	0.0014044	0.83	0.41
Year_2016	0.0029824	0.0014036	2.12	0.03
Industry_21	0.0265098	0.0140235	1.89	0.06
Industry_23	0.0134206	0.0065577	2.05	0.04
Industry_3	0.0174803	0.0065364	2.67	0.01
Industry_42	0.0318631	0.0065019	4.90	0.00
Industry_4445	0.0472779	0.0072341	6.54	0.00
Industry_4849	0.0025136	0.0065709	0.38	0.70
Industry_51	0.0241024	0.0069163	3.48	0.00
Industry_56	0.0140619	0.0066740	2.11	0.04
Industry_61	- 0.0319281	0.0071088	- 4.49	0.00
Industry_62	- 0.0288048	0.0066782	- 4.31	0.00
Industry_71	- 0.0016749	0.0090900	- 0.18	0.85
Industry_72	0.0028190	0.0098028	0.29	0.77
Listed_Public	- 0.0050702	0.0040434	- 1.25	0.21
DaysInventory:Industry_21	- 0.0010479	0.0008218	- 1.28	0.20
DaysInventory:Industry_23	- 0.0001417	0.0002135	- 0.66	0.51
DaysInventory:Industry_3	- 0.0000731	0.0002082	- 0.35	0.73
DaysInventory:Industry_42	- 0.0003811	0.0002067	- 1.84	0.07
DaysInventory:Industry_4445	- 0.0006247	0.0002267	- 2.76	0.01
DaysInventory:Industry_4849	- 0.0023673	0.0003839	- 6.17	0.00
DaysInventory:Industry_51	- 0.0004896	0.0002666	- 1.84	0.07
DaysInventory:Industry_56	- 0.0009356	0.0002735	- 3.42	0.00
DaysInventory:Industry_61	- 0.0023613	0.0023974	- 0.98	0.32
DaysInventory:Industry_62	- 0.0005611	0.0004511	- 1.24	0.21
DaysInventory:Industry_71	- 0.0090553	0.0052159	- 1.74	0.08
DaysInventory:Industry_72	- 0.0019525	0.0022418	- 0.87	0.38
DaysInventory^2	- 0.0000010	0.0000009	- 1.08	0.28
DaysInventory^2:Industry_21	0.0000068	0.0000099	0.69	0.49
DaysInventory^2:Industry_23	0.0000014	0.0000010	1.41	0.16
DaysInventory^2:Industry_3	0.0000001	0.0000010	0.14	0.89
DaysInventory^2:Industry_42	0.0000018	0.0000010	1.86	0.06
DaysInventory^2:Industry_4445	0.0000023	0.0000011	2.11	0.03
DaysInventory^2:Industry_4849	0.0000235	0.0000055	4.30	0.00
DaysInventory^2:Industry_51	0.0000026	0.0000012	2.11	0.03
DaysInventory^2:Industry_56	0.0000042	0.0000012	3.58	0.00
DaysInventory^2:Industry_61	0.0000154	0.0000603	0.26	0.80
DaysInventory^2:Industry_62	0.0000059	0.0000073	0.81	0.42
DaysInventory^2:Industry_71	0.0009843	0.0004895	2.01	0.04
DaysInventory^2:Industry_72	0.0000274	0.0001083	0.25	0.80
Adjusted R^2	0.0903183			

D. Days Payables as independent variable

Days Payables-GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0473530	0.1027397	0.46	0.64
SalesGrowth	- 0.0000013	0.0000009	- 1.48	0.14
Size	0.0195670	0.0023157	8.45	0.00
VariabilityNOI	0.1340763	0.0291544	45.99	-
Leverage	0.3602805	0.0101695	35.43	0.00
FFA/TA	0.2005826	0.0139659	14.36	0.00
R&D	0.5735868	0.0535068	10.72	0.00
DaysPayables	0.0014857	0.0042321	0.35	0.73
Year_2010	- 0.0204736	0.0108792	- 1.88	0.06
Year_2011	- 0.0264668	0.0108017	- 2.45	0.01
Year_2012	- 0.0111491	0.0107267	- 1.04	0.30
Year_2013	- 0.0141523	0.0106745	- 1.33	0.18
Year_2014	- 0.0113628	0.0106335	- 1.07	0.29
Year_2015	- 0.0108594	0.0105984	- 1.02	0.31
Year_2016	- 0.0181984	0.0105929	- 1.72	0.09
Industry_21	0.4678339	0.1899749	2.46	0.01
Industry_23	0.2428132	0.0978736	2.48	0.01
Industry_3	0.2441859	0.0957008	2.55	0.01
Industry_42	0.0367861	0.0953707	0.39	0.70
Industry_4445	0.3339208	0.0991115	3.37	0.00
Industry_4849	0.7600196	0.0981067	7.75	0.00
Industry_51	0.5460867	0.1046590	5.22	0.00
Industry_56	1.7879063	0.0977552	18.29	0.00
Industry_61	1.9077127	0.1008641	18.91	0.00
Industry_62	0.9438068	0.0967739	9.75	0.00
Industry_71	0.8788237	0.1289009	6.82	0.00
Industry_72	0.1047935	0.1257795	0.83	0.40
Listed_Public	- 0.2611891	0.0305307	- 8.55	0.00
DaysPayables:Industry_21	- 0.0087565	0.0062019	- 1.41	0.16
DaysPayables:Industry_23	- 0.0044548	0.0042764	- 1.04	0.30
DaysPayables:Industry_3	- 0.0045329	0.0042491	- 1.07	0.29
DaysPayables:Industry_42	- 0.0040840	0.0042441	- 0.96	0.34
DaysPayables:Industry_4445	- 0.0056184	0.0043449	- 1.29	0.20
DaysPayables:Industry_4849	- 0.0061470	0.0042912	- 1.43	0.15
DaysPayables:Industry_51	- 0.0032865	0.0043575	- 0.75	0.45
DaysPayables:Industry_56	- 0.0337923	0.0043113	- 7.84	0.00
DaysPayables:Industry_61	- 0.0836267	0.0054079	- 15.46	0.00
DaysPayables:Industry_62	- 0.0213873	0.0043544	- 4.91	0.00
DaysPayables:Industry_71	- 0.0162034	0.0051930	- 3.12	0.00
DaysPayables:Industry_72	0.0104623	0.0050224	2.08	0.04
DaysPayables^2	0.0000026	0.0000390	0.07	0.95
DaysPayables^2:Industry_21	0.0000101	0.0000483	0.21	0.83
DaysPayables^2:Industry_23	- 0.0000056	0.0000392	- 0.14	0.89
DaysPayables^2:Industry_3	- 0.0000044	0.0000391	- 0.11	0.91
DaysPayables^2:Industry_42	- 0.0000018	0.0000391	- 0.04	0.96
DaysPayables^2:Industry_4445	0.0000010	0.0000396	0.03	0.98
DaysPayables^2:Industry_4849	- 0.0000020	0.0000392	- 0.05	0.96
DaysPayables^2:Industry_51	- 0.0000107	0.0000393	- 0.27	0.79
DaysPayables^2:Industry_56	0.0001188	0.0000394	3.02	0.00
DaysPayables^2:Industry_61	0.0007517	0.0000657	11.45	0.00
DaysPayables^2:Industry_62	0.0000961	0.0000398	2.42	0.02
DaysPayables^2:Industry_71	0.0000467	0.0000436	1.07	0.28
DaysPayables^2:Industry_72	- 0.0000866	0.0000421	- 2.06	0.04
Adjusted R^2	0.2928172			

Days Payables-ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0496073	0.0134885	3.68	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.62	0.10
Size	0.0026208	0.0003040	8.62	0.00
VariabilityNOI	0.0877910	0.0038276	22.94	0.00
Leverage	- 0.0342494	0.0013351	- 25.65	0.00
FFA/TA	- 0.0603732	0.0018336	- 32.93	0.00
R&D	- 0.0405316	0.0070248	- 5.77	0.00
DaysPayables	- 0.0011191	0.0005556	- 2.01	0.04
Year_2010	0.0081070	0.0014283	5.68	0.00
Year_2011	0.0054456	0.0014181	3.84	0.00
Year_2012	- 0.0033769	0.0014083	- 2.40	0.02
Year_2013	- 0.0055231	0.0014014	- 3.94	0.00
Year_2014	- 0.0021734	0.0013961	- 1.56	0.12
Year_2015	0.0008859	0.0013914	0.64	0.52
Year_2016	0.0029380	0.0013907	2.11	0.03
Industry_21	0.0007616	0.0249414	0.03	0.98
Industry_23	0.0204483	0.0128496	1.59	0.11
Industry_3	0.0168440	0.0125644	1.34	0.18
Industry_42	0.0108463	0.0125210	0.87	0.39
Industry_4445	0.0193327	0.0130121	1.49	0.14
Industry_4849	0.0014646	0.0128802	0.11	0.91
Industry_51	0.0105345	0.0137405	0.77	0.44
Industry_56	0.0143457	0.0128341	1.12	0.26
Industry_61	- 0.0512579	0.0132422	- 3.87	0.00
Industry_62	- 0.0594568	0.0127052	- 4.68	0.00
Industry_71	- 0.0410416	0.0169231	- 2.43	0.02
Industry_72	- 0.0246670	0.0165133	- 1.49	0.14
Listed_Public	- 0.0040745	0.0040083	- 1.02	0.31
DaysPayables:Industry_21	0.0006157	0.0008142	0.76	0.45
DaysPayables:Industry_23	0.0004056	0.0005614	0.72	0.47
DaysPayables:Industry_3	0.0003136	0.0005579	0.56	0.57
DaysPayables:Industry_42	0.0006284	0.0005572	1.13	0.26
DaysPayables:Industry_4445	0.0004391	0.0005704	0.77	0.44
DaysPayables:Industry_4849	0.0002790	0.0005634	0.50	0.62
DaysPayables:Industry_51	0.0007787	0.0005721	1.36	0.17
DaysPayables:Industry_56	0.0000395	0.0005660	0.07	0.94
DaysPayables:Industry_61	0.0001480	0.0007100	0.21	0.83
DaysPayables:Industry_62	0.0013564	0.0005717	2.37	0.02
DaysPayables:Industry_71	0.0015061	0.0006818	2.21	0.03
DaysPayables:Industry_72	0.0008978	0.0006594	1.36	0.17
DaysPayables^2	0.0000055	0.0000051	1.08	0.28
DaysPayables^2:Industry_21	- 0.0000042	0.0000063	- 0.66	0.51
DaysPayables^2:Industry_23	- 0.0000042	0.0000051	- 0.81	0.42
DaysPayables^2:Industry_3	- 0.0000036	0.0000051	- 0.71	0.48
DaysPayables^2:Industry_42	- 0.0000047	0.0000051	- 0.92	0.36
DaysPayables^2:Industry_4445	- 0.0000046	0.0000052	- 0.89	0.37
DaysPayables^2:Industry_4849	- 0.0000030	0.0000051	- 0.57	0.57
DaysPayables^2:Industry_51	- 0.0000051	0.0000052	- 0.98	0.33
DaysPayables^2:Industry_56	- 0.0000018	0.0000052	- 0.35	0.72
DaysPayables^2:Industry_61	0.0000089	0.0000086	1.03	0.30
DaysPayables^2:Industry_62	- 0.0000070	0.0000052	- 1.34	0.18
DaysPayables^2:Industry_71	- 0.0000086	0.0000057	- 1.50	0.13
DaysPayables^2:Industry_72	- 0.0000063	0.0000055	- 1.13	0.26
Adjusted R^2	0.1068543			

6.12. Appendix 12 – Public vs private regression models

The following tables display the results of the regression models taking into account the ownership type (Private or Public). The first column of each table represents the estimate value (ESTIMATE), the second column represents the standard error (SE) of the estimate, the third column displays the T-Statistic (T-STAT)[40] and the last column displays the p-value (P-VAL) linked to the T-Statistic. The adjusted R^2 (coefficient of determination) is also displayed, indicating the prediction power of the model.

GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.3187359	0.0533115	5.98	0.00
SalesGrowth	- 0.0000014	0.0000009	- 1.51	0.13
Size	0.0118139	0.0023956	4.93	0.00
VariabilityNOI	0.1382972	0.0302175	45.77	-
Leverage	0.2641801	0.0102331	25.82	0.00
FFA/TA	0.1535376	0.0145106	10.58	0.00
R&D	0.4646164	0.0555226	8.37	0.00
NTC	0.0007427	0.0000825	9.00	0.00
Year_2010	- 0.0265210	0.0112969	- 2.35	0.02
Year_2011	- 0.0290938	0.0112170	- 2.59	0.01
Year_2012	- 0.0116127	0.0111386	- 1.04	0.30
Year_2013	- 0.0136626	0.0110846	- 1.23	0.22
Year_2014	- 0.0125245	0.0110418	- 1.13	0.26
Year_2015	- 0.0102965	0.0110058	- 0.94	0.35
Year_2016	- 0.0179617	0.0109991	- 1.63	0.10
Industry_21	0.0370139	0.0585461	0.63	0.53
Industry_23	- 0.0035320	0.0349334	- 0.10	0.92
Industry_3	0.0404155	0.0342798	1.18	0.24
Industry_42	- 0.1304161	0.0342097	- 3.81	0.00
Industry_4445	0.1245103	0.0364762	3.41	0.00
Industry_4849	0.4694388	0.0353488	13.28	0.00
Industry_51	0.3489810	0.0386121	9.04	0.00
Industry_56	0.8219592	0.0364439	22.55	0.00
Industry_61	1.0188858	0.0400274	25.45	0.00
Industry_62	0.5194315	0.0360068	14.43	0.00
Industry_71	0.3358639	0.0504680	6.65	0.00
Industry_72	0.3474435	0.0456883	7.60	0.00
Listed_Public	- 0.2891637	0.0394125	- 7.34	0.00
NTC:Listed_Public	- 0.0001485	0.0006243	- 0.24	0.81
NTC^2	- 0.0000117	0.0000004	- 26.91	0.00
NTC^2:Listed_Public	0.0000075	0.0000034	2.18	0.03
Adjusted R^2	0.2372372			

ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0355974	0.0068266	5.21	0.00
SalesGrowth	- 0.0000002	0.0000001	- 1.68	0.09
Size	0.0020192	0.0003068	6.58	0.00
VariabilityNOI	0.0947165	0.0038694	24.48	0.00
Leverage	- 0.0462817	0.0013104	- 35.32	0.00
FFA/TA	- 0.0636147	0.0018581	- 34.24	0.00
R&D	- 0.0458608	0.0071098	- 6.45	0.00
NTC	0.0000923	0.0000106	8.74	0.00
Year_2010	0.0076537	0.0014466	5.29	0.00
Year_2011	0.0053822	0.0014364	3.75	0.00
Year_2012	- 0.0032140	0.0014263	- 2.25	0.02
Year_2013	- 0.0052545	0.0014194	- 3.70	0.00
Year_2014	- 0.0019750	0.0014139	- 1.40	0.16
Year_2015	0.0010835	0.0014093	0.77	0.44
Year_2016	0.0028530	0.0014084	2.03	0.04
Industry_21	0.0078197	0.0074969	1.04	0.30
Industry_23	0.0158688	0.0044733	3.55	0.00
Industry_3	0.0155354	0.0043896	3.54	0.00
Industry_42	0.0229933	0.0043806	5.25	0.00
Industry_4445	0.0272205	0.0046708	5.83	0.00
Industry_4849	0.0013939	0.0045265	0.31	0.76
Industry_51	0.0258909	0.0049443	5.24	0.00
Industry_56	0.0146307	0.0046667	3.14	0.00
Industry_61	- 0.0297335	0.0051256	- 5.80	0.00
Industry_62	- 0.0270618	0.0046107	- 5.87	0.00
Industry_71	- 0.0000568	0.0064625	- 0.01	0.99
Industry_72	- 0.0001350	0.0058505	- 0.02	0.98
Listed_Public	- 0.0064460	0.0050468	- 1.28	0.20
NTC:Listed_Public	- 0.0000010	0.0000799	- 0.01	0.99
NTC^2	- 0.0000009	0.0000001	- 16.48	0.00
NTC^2:Listed_Public	0.0000002	0.0000004	0.45	0.66
Adjusted R^2	0.0835668			

[40] The T-Statistic takes the form $t_{\hat{\beta}} = \frac{\hat{\beta} - \beta_0}{\sigma(\hat{\beta})}$ where $\hat{\beta}$ is the computed estimate, β_0 is set to 0 and $\sigma(\hat{\beta})$ is the standard error of the computed estimate. This ratio is used when conducting a hypothesis test where H_0: $\hat{\beta} = 0$ and H_1: $\hat{\beta} \neq 0$. This kind of test helps determining if the computed estimate $\hat{\beta}$ is statistically different from 0.

6.13. Appendix 13 – Working capital management, profitability and business cycles

The following tables display the results of the regression models assessing the impact of business cycles phases. The first column of each table represents the estimate value (ESTIMATE), the second column represents the standard error (SE) of the estimate, the third column displays the T-Statistic (T-STAT)[41] and the last column displays the p-value (P-VAL) linked to the T-Statistic. The adjusted R^2 (coefficient of determination) is also displayed, indicating the prediction power of the model.

GOI	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.3379554	0.0529498	6.38	0.00
SalesGrowth	-0.0000014	0.0000009	- 1.49	0.14
Size	0.0099506	0.0023876	4.17	0.00
VariabilityNOI	0.1382336	0.0301940	45.78	-
Leverage	0.2657582	0.0102328	25.97	0.00
FFA/TA	0.1323407	0.0142949	9.26	0.00
R&D	0.4576695	0.0554379	8.26	0.00
NTC	0.0006550	0.0001083	6.05	0.00
LOW	0.0039267	0.0087853	0.45	0.65
HIGH	-0.0164907	0.0088683	- 1.86	0.06
Industry_21	0.0421229	0.0585810	0.72	0.47
Industry_23	-0.0038828	0.0349556	- 0.11	0.91
Industry_3	0.0388507	0.0343008	1.13	0.26
Industry_42	-0.1301357	0.0342321	- 3.80	0.00
Industry_4445	0.1252237	0.0365002	3.43	0.00
Industry_4849	0.4694728	0.0353717	13.27	0.00
Industry_51	0.3441986	0.0386320	8.91	0.00
Industry_56	0.8230823	0.0364674	22.57	0.00
Industry_61	1.0181483	0.0400521	25.42	0.00
Industry_62	0.5192640	0.0360295	14.41	0.00
Industry_71	0.3369209	0.0504994	6.67	0.00
Industry_72	0.3484752	0.0457181	7.62	0.00
NTC:LOW	0.0000694	0.0001916	0.36	0.72
NTC:HIGH	0.0003205	0.0001989	1.61	0.11
NTC^2	-0.0000111	0.0000006	- 19.60	0.00
NTC^2:LOW	-0.0000004	0.0000010	- 0.36	0.72
NTC^2:HIGH	-0.0000028	0.0000012	- 2.42	0.02
Adjusted R^2	0.2362446			

ROA	ESTIMATE	SE	T-STAT	P-VAL
(Intercept)	0.0364109	0.0067779	5.37	0.00
SalesGrowth	-0.0000002	0.0000001	- 1.62	0.10
Size	0.0019655	0.0003056	6.43	0.00
VariabilityNOI	0.0950117	0.0038650	24.58	0.00
Leverage	-0.0462420	0.0013099	- 35.30	0.00
FFA/TA	-0.0641244	0.0018298	- 35.04	0.00
R&D	-0.0464083	0.0070964	- 6.54	0.00
NTC	0.0000738	0.0000139	5.32	0.00
LOW	-0.0020941	0.0011246	- 1.86	0.06
HIGH	0.0054263	0.0011352	4.78	0.00
Industry_21	0.0079486	0.0074987	1.06	0.29
Industry_23	0.0158590	0.0044745	3.54	0.00
Industry_3	0.0155286	0.0043907	3.54	0.00
Industry_42	0.0230239	0.0043819	5.25	0.00
Industry_4445	0.0272570	0.0046723	5.83	0.00
Industry_4849	0.0014226	0.0045278	0.31	0.75
Industry_51	0.0257774	0.0049451	5.21	0.00
Industry_56	0.0146821	0.0046681	3.15	0.00
Industry_61	-0.0296761	0.0051269	- 5.79	0.00
Industry_62	-0.0270228	0.0046120	- 5.86	0.00
Industry_71	0.0000052	0.0064642	0.00	1.00
Industry_72	0.0000091	0.0058522	0.00	1.00
NTC:LOW	0.0000156	0.0000245	0.63	0.53
NTC:HIGH	0.0000655	0.0000255	2.57	0.01
NTC^2	-0.0000008	0.0000001	- 10.95	0.00
NTC^2:LOW	-0.0000002	0.0000001	- 1.77	0.08
NTC^2:HIGH	-0.0000003	0.0000001	- 2.24	0.03
Adjusted R^2	0.0830225			

[41] The T-Statistic takes the form $t_{\hat{\beta}} = \frac{\hat{\beta}-\beta_0}{\sigma(\hat{\beta})}$ where $\hat{\beta}$ is the computed estimate, β_0 is set to 0 and $\sigma(\hat{\beta})$ is the standard error of the computed estimate. This ratio is used when conducting a hypothesis test where H_0: $\hat{\beta} = 0$ and H_1: $\hat{\beta} \neq 0$. This kind of test helps determining if the computed estimate $\hat{\beta}$ is statistically different from 0.

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EXECUTIVE SUMMARY

Working capital management is at the core of the operating activities of firms and thereby is expected to have an impact on corporate profitability. Several empirical studies have concluded that working capital management and corporate profitability have a negative relationship. The same studies also suggested the existence of an optimal level of working capital and consequently made the hypothesis of an inverted U-shape form of linkage.

This research aims to find this optimal level of working capital for a sample of non-financial Belgian firms considering a time window from 2009 to 2016. Other factors prone to impact this relationship such as the type of industry, the business cycle phases and the fact of being publicly quoted or privately owned will also be analysed.

First, a full summary of the evolution of the concept of working capital and the ways it has been measured as well as all the significant results from previous analogous studies will be made. This section aims to provide the reader an overview of all the models and variables used as well as the results found in other countries at different times.

Secondly, the methodology of this study will be detailed. This latter encompasses the choice of sample data and the procedure applied to clean the data, the variables and the way they have been computed and the regression models used to determine an optimal level of working capital.

Then, the results of the regressions will be analysed in the following order. First, the regressions carried out on the aggregate sample independently of the industry or time. Then, the results from the regression models considering the industry-specific effects. These will provide further information on how a specific industry influences the relationship between working capital management and corporate profitability. Finally, the results of both the influence of the business cycle phases representing unusual economic environments and the ownership type (privately owned versus publicly quoted) expected to depict the access to financial markets and financing means for firms will be examined.

Key words: corporate finance, working capital management, corporate profitability, short-term assets, ordinary least squares regression.

Key tools: Bel-first, Matlab, correlation matrix, ordinary least squares regression.