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Optimal Working Capital Management and Stock Returns: Evidence from European Listed Firms

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Abstract

Based on the working capital management trade-offs, this paper investigates the existence of an optimal point not only of the cash conversion cycle, but also of its components, which maximizes the stock returns of European listed firms. Most studies analyze the non-linear relationship between working capital management and accounting profitability. Studies analyzing stock returns focus on a linear relationship. Therefore, this work adds new knowledge for the literature. The relation between working capital management and stock returns is analyzed with panel data models, in which the quadratic function of cash conversion cycle, or of its components (days sales outstanding, days sales inventory, and days payable outstanding), is considered to capture the existence of an optimal point. The results confirm the existence of an optimal cash conversion cycle point that maximizes stock returns. The conclusions are relevant for managers, investors, and shareholders, as they prove that firms able to efficiently manage working capital trade-offs reward shareholders with higher returns.

1. Introduction

Traditionally, corporate finance focuses on studying long-term decisions, especially capital structure, dividend policy, and investment decisions (Afza & Nazir, 2008). However, it is through working capital management (WCM), performed by analyzing the working capital and cash conversion cycle (CCC), that firms can conduct their day-to-day operations, ensuring that they can meet their short-term obligations and simultaneously increase their profitability (Padachi, 2006).

Despite its importance in fundamental analysis, there is a lack of empirical evidence on its implications for asset pricing (C. H. Chen et al., 2022), even after Smith and Begemann (1997) suggested that working capital management can serve as a mechanism to enhance firm market value. Most works continue focusing on accounting profitability (e.g., Chen et al., 2005; Jaworski & Czerwonka, 2024; Jose et al., 1996; Kayani et al., 2023; Özkaya & Yaşar, 2023), being unclear about the relationship between working capital management and stock returns. Therefore, this

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article sheds light on the relation between working capital management and stock returns, contributing for the debate on this thematic.

The few papers that analyze this relationship focused on a linear relation and found mixed results. While Almeida and Eid (2014), Karadagli (2013), and Shin and Soenen (1998), among others, found a positive relation, Beauchamp et al. (2014), Kieschnick et al. (2013), and Lin and Lin (2021), among others, found a negative relation.

The lack of consensus in the previous literature highlights the trade-offs associated with working capital management. Firms that practice lower cash conversion cycle can convert their inventories faster into cash, guaranteeing liquidity (Shin & Soenen, 1998). However, to improve profitability firms may need to practice a higher CCC, by granting credit to clients, avoiding the risk of stockout, and obtaining discounts for early payment (Blinder & Maccini, 1991; Deloof, 2003; Jose et al., 1996). Therefore, it is plausible to expect an optimal point of cash conversion cycle that maximizes shareholder wealth, as suggested by Deloof (2003), Eljelly, (2004), and Lazaridis and Tryfonidis (2006).

In this context, we investigate the existence of an optimal point of working capital management and its components. Inspired by a new strand of studies that have found evidence of a non-linear relation between WCM and stock returns (e.g., Aktas et al., 2015; Baños-Caballero et al., 2014; Saravanan et al., 2017), our work distinguishes from the extant by analyzing not only the existence of an optimal cash conversion cycle, as Campomanes (2020), Filbeck et al. (2017), Lin and Lin (2021), Wang (2019), among others, but also its components (days sales outstanding – DSO, days sales inventory – DSI, and days payable outstanding – DPO), adding new knowledge to the thematic. This disaggregation is needed, since trade-offs are presented in individual literature of each cash conversion cycle component, and consequently the optimal point of CCC can be driven by a specific component, or alternatively, by the management of all components simultaneously. Therefore, we offer the literature a more in-depth analysis that is likely to yield a further understanding of the impact of WCM on stock returns.

Moreover, studies typically analyze United States (US) firms (e.g., C.H. Chen et al, 2022; Filbeck et al., 2017; Hilmola, 2020; Wang, 2020), and studies on European firms are scarce. We can highlight the work of Baños-Canallero et al. (2014) that focus on firms from United Kingdom, and Campomanes (2020) that analyze German firms, but both in a single country perspective. Different countries manage working capital in a different way, depending on the market maturity, legislation and cash focus (PwC, 2019). European firms tend to invest more in working capital than US firms (PwC, 2019), which may lead to different conclusions. Even if after 2017 days sales outstanding, days sales inventory, and days payable outstanding ratios of European firms have decreased as firms have focused on receivables and inventories, the working capital ratios are still higher than the ones presented by US firms. In this sense, we also contribute to the literature by adding new empirical evidence that proves the existence of an optimal point of CCC on a large sample of several European stock exchanges that have not yet been studied, enabling a holistic view of the influence of WCM in the European context.

The remainder of the paper is organized as follows. Section 2 presents the literature review and the research hypotheses. Then, in section 3, the research methodology is described, explaining the process of sample selection and the definition of variables. The presentation and discussion of the empirical results obtained are carried out in section 4, where the results are compared against the proposed research hypotheses and the empirical literature. Finally, in section 5, the final conclusions, the limitations of the study, and future research proposals are presented.

2. Literature Review

2.1 Working Capital Management

Working capital management refers to the ability of firms to control and plan their current assets and current liabilities effectively and efficiently. It intends to guarantee firms liquidity, that is, to ensure their ability to meet short-term obligations (Padachi, 2006). However, this management is only possible through the cash conversion cycle analysis (Richards & Laughlin, 1980). Another objective of WCM is to increase profitability, which can conflict with the first one. If the CCC is reduced to increase liquidity, firms may reduce inventories too much, which could result in lost sales due to stockouts (Blinder & Maccini, 1991; H. Chen et al., 2005; Jose et al., 1996). On the other hand, firms that choose to unreasonably decrease their accounts receivable may end up losing sales from customers who require credit. Furthermore, firms that overextend their payments to suppliers can lose early payment discounts and flexibility for future debts to suppliers (Jose et al., 1996). Therefore, there is a trade-off between these two objectives, liquidity, and profitability (Jose et al., 1996; Padachi, 2006), leaving managers responsible for achieving an appropriate trade-off that maximizes firms value (Padachi, 2006).

2.2 Determinants of WCM Components

Accounts receivable and accounts payable are largely determined, respectively, by trade credit offer and demand (Petersen & Rajan, 1997). What drives firms to offer trade credit is a topic already widely studied (Emery, 1984; Mian & Smith, 1992; Petersen & Rajan, 1997; Schwartz, 1974, among others) and can be grouped into financial and commercial motivations (Schwartz, 1974).

Financially, firms are motivated to extend trade credit to obtain information about default risk (Cuñat, 2006; Wilner, 2000). Additionally, it is a way for firms to finance customers with restricted access to capital markets, thus promoting their sales (Cuñat, 2006; Emery, 1984; Meltzer, 1960; Mian & Smith, 1992; Ng et al., 1999; Petersen & Rajan, 1997; Schwartz, 1974).

Commercially, trade credit is a legal way to practice price discrimination among customers (Meltzer, 1960; Mian & Smith, 1992; Petersen & Rajan, 1997; Schwartz, 1974). It also improves firms' reputation and sales by giving the customers the possibility to check the quality of the product before paying (Deloof & Jegers, 1996; García-Teruel & Martínez-Solano, 2010; Long et al., 1993). The flip side of granting trade credit is that money is locked up in working capital which can cause cash flow problems (Deloof, 2003; Lazaridis & Tryfonidis, 2006).

According to the transaction cost theory, developed by Ferris (1981), firms are operationally motivated to seek trade credit to reduce the cost of paying for each order and to obtain greater flexibility in planning their payments, regardless of the receipt of goods. Therefore, the probability of facing penalty costs due to late payment decreases (Petersen & Rajan, 1997). However, extending the payment to suppliers can be very costly if firms are offered a discount for early payment (Deloof, 2003).

Another component of working capital is inventories. These are the most illiquid components, as the recovery of funds invested in inventories requires their sale. There are three types of inventories: raw materials, work-in-process, and finished goods (Nwankwo & Osho, 2010).

Regarding raw materials, firms can purchase a larger quantity to reduce supply costs (Blinder & Maccini, 1991) and to obtain quantity discounts (Mathuva, 2010). The level of raw materials depends on firms' efficiency in managing timely supply from their suppliers, allowing them to operate at a lower inventory level (H. Chen et al., 2005). If, on one side, the amount invested in this type of inventory can absorb funds needed for other areas, on another side, a production stoppage due to a lack of inventories can be even more costly than buying "extra" inventories (Sagan, 1955).

The level of work-in-process is defined by firms' ability to efficiently manage their operations (H. Chen et al., 2005). The production of work in process should be leveled, that is, should be uniform and constant to reduce waste and meet the exact demand without overproduction (Lieberman et al., 1999).

In contrast, the literature addressing the risk of stockout advocates carrying out production above the expected demand (Blinder & Maccini, 1991; Flood & Lowe, 1995), especially when demand is volatile (Hill et al., 2010). The level of finished goods is further affected by the price speculation that firms make about the selling price of finished goods (Blinder, 1986), as they may have an interest in waiting for favorable prices or they may accelerate their production to face temporarily high prices (Blinder & Maccini, 1991).

In summary, there are multiple cost-benefit trade-offs associated with working capital management and each of its components. For example, firms are encouraged to reduce their cash conversion cycle to guarantee liquidity. However, the extent to which firms can reduce their CCC is limited by the negative impact it can have on profitability, such as lost sales to customers that require trade credit, stockout of inventories, or due to loss of early payment discounts from suppliers.

2.3 Relation between WCM and Stock Return

The influence of working capital management on the stock market goes back to Smith and Begemann (1997) work, in which they argue that WCM can serve as a mechanism for firms to increase their market value. Even so, the literature mainly focuses on the impact of working capital management on operating profitability, suggesting the existence of an optimal working capital point that maximizes shareholder wealth (Deloof, 2003; Eljelly, 2004; Lazaridis & Tryfonidis, 2006). In turn, Fama (1991) suggests that if markets are efficient, it is expected that the information reflected in financial statements will be incorporated into stock prices and, therefore, working capital decisions will be reflected in stock returns.

Another reason working capital management decisions may impact stock returns is the influence that it has on cash flows. As suggested by Almeida and Eid (2014), working capital represents a component of operating cash flows, which integrates free cash flows, influencing firms' value to shareholders. In this sense, Shin and Soenen (1998) argue that the faster inventories are converted into cash, the higher the present value of free cash flows, which increases shareholder wealth.

On the other hand, Fazzari and Petersen (1993) advocate that working capital should be seen as an internal source of funds, which enables the implementation of viable projects in firms that suffer shocks in their cash flows and present financial difficulties, thus contributing to the increase of shareholder wealth (Almeida & Eid, 2014; Fazzari & Petersen, 1993). In contrast, working capital investment may represent "trapped" money, since, in the case of firms that do not have financial difficulties, this investment is likely to reduce the ability to implement viable projects (Almeida & Eid, 2014; Baños-Caballero et al., 2014; Deloof, 2003).

Shin and Soenen (1998) are the first authors that empirically investigate the relation between WCM and shareholder value creation by analyzing the net trade cycle (NTC) and abnormal returns measured by Jensen's alpha. Analyzing a sample of US listed firms between 1974 and 1994, the authors find a negative relation, meaning that reducing the NTC increases shareholder wealth. Similar results are obtained in several markets, for example, in the US (C. H. Chen et al., 2022; Filbeck et al., 2017; Wang, 2019), in Germany (Campomanes, 2020), in Turkey (Karadagli, 2013), in Brazil (Almeida & Eid, 2014), in Vietnam (Le, 2019) and in Malaysia (Loo & Lau, 2019), with the use of cash conversion cycle and working capital as representative measures of WCM. More recently, C. H. Chen et al. (2022) also prove the existence of a negative relation between CCC and expected returns while analyzing a large sample of firms quoted in 22 developed markets and 25 emerging stock markets, between 1993 and 2018.

In contrast, other authors show the presence of a positive relation between working capital management and stock returns, which may occur because firms with higher returns are less motivated to improve their WCM, or due to the lack of a market penalty for firms that exhibit inefficiency in their WCM (Loo & Lau, 2019). For example, the results obtained by Kieschnick et al. (2013), Lin and Lin (2021), and Oseifuah and Gyekye (2017) show the existence of a positive relation between working capital and stock returns.

Baños-Caballero et al. (2014) are the first authors to study the existence of a working capital management optimal point that maximizes shareholder wealth. Through the study of 258 United Kingdom listed firms between 2001 and 2007, the results show a concave down relation between net trade cycle and market value, which suggests the existence of an optimal NTC point that maximizes the value of firms for shareholders. This optimal point is lower for firms in financial distress, as access to finance is more expensive for these firms, leading to a lower investment in working capital to reduce the need for external financing. Aktas et al. (2015) and Saravanan et al. (2017) find similar evidence that proves the existence of a non-linear relation between working capital and stock returns. Nevertheless, Aktas et al. (2015) conclude that the resources that are not invested in working capital are applied in projects, with the benefit of increasing shareholder wealth, which is in line with what is suggested by Almeida and Eid (2014).

Aktas et al. (2012) investigate whether firms' use of trade credit provides valuable information to outside investors of US listed firms between 1992 and 2007. Their analysis reveals that the use of trade credit reduces information asymmetry between management and shareholders, and this is reflected in higher abnormal returns in the long term. Comparable results are found by Beauchamp et al. (2014). Otherwise, Beauchamp et al. (2014), Hill et al. (2012), and Hill et al. (2015) find that an increase in accounts receivable leads to an increase in excess returns. However, X. Chen et al. (2022) proved the existence of a negative relation between DPO, DSO and expected returns, while studying a sample of 1737 Chinese listed firms, between 2002 and 2019. Similarly, C. H. Chen et al. (2022) and Wang (2019) found the existence of a negative relation between DSO and expected returns.

In the literature, there is also evidence that inventory management is a factor that influences stock returns. For example, Hendricks and Singhal (2001) provide empirical evidence that production disruption announcements negatively impact stock prices. Moreover, Hendricks and Singhal (2009) show that announcements of excess inventories have a negative impact on stock prices. In turn, H. Chen et al. (2005), analyzing a sample of 7,433 US listed firms between 1981 and 2000, find that firms with lower DSI generate higher excess returns compared to firms exhibiting higher DSI. However, firms with excessively low DSI have lower excess returns, also indicating the existence of an optimal point in inventory management. Similar results are found by Wang (2019), Alan et al. (2014), Hilmola (2020), and Mishra et al. (2013) when applying inventory turnover as a valuation measure. In contrast, Beauchamp et al. (2014), when studying US listed firms between 1981 and 2010, found a positive coefficient between the level of inventories and stock returns, suggesting that shareholders consider the benefits of inventories higher than their maintenance costs. They also show that this relation is maintained even in periods of crisis but in a weaker form.

Table 1 presents a summary of the results obtained by the empirical studies presented above, which relate to WCM and stock returns.

As is evident from previous literature, the theoretical arguments and empirical evidence supporting the relation between working capital management and stock returns are not consensual. For example, Karadagli (2013) and Wang (2019) document a negative relation, while authors such as Filbeck et al. (2017) and Shin and Soenen (1998) highlight a positive relation. Given this theoretical and empirical divergence resulting from the trade-offs associated with WCM, Deloof (2003) suggests the existence of an optimal CCC point that maximizes shareholder wealth. This optimal point is empirically proven by Aktas et al. (2015), Baños-Caballero et al. (2014), and Saravanan et al. (2017).

Table 1 Summary of Empirical Results on the Relation between WCM and Stock Returns

Author(s)	*Country*	*Years*	*Return measure(s)*	*WCM measure(s)*
Panel A – Negative relation between WCM and profitability				
Shin and Soenen (1998)	US	1974-1994	Jensen's alpha	NTC
C. H Chen et al. (2022)	47 Stock Markets	1993-2018	Expected return	CCC and DSO
Filbeck et al. (2017)	US	1997-2012	Excess return and Jensen's alpha	CCC
Wang (2019)	US	1976-2015	Expected return	CCC, DSO and DSI
Campomanes (2020)	Germany	1991-2019	Expected return	CCC
Karadagli (2013)	Turkey	2001-2010	Observed return	CCC
Almeida and Eid (2014)	Brazil	1995-2009	Excess return	WC
Le (2019)	Vietnam	2007-2016	*Market-to-book value*	CCC and WC
Loo and Lau (2019)	Malaysia	2001-2007	Log (Share price)	CCC
H. Chen et al. (2005)	US	1981-2000	Excess return	DSI
X. Chen et al. (2022)	China	2002-2019	Expected return	DSO and DPO
Panel B – Positive relation between WCM and profitability				
Kieschnick et al. (2013)	US	1990-2006	Excess return	WC
Lin and Lin (2021)	US	1956-2018	Expected return	CCC
Oseifuah and Gyekye (2017)	South Africa	2003-2012	Market capitalization	CCC
Aktas et al. (2012)	US	1992-2007	Jensen's alpha	Accounts payable
Beauchamp et al. (2014)	US	1981-2010	Excess return	Accounts payable, accounts receivable, and inventories
Hill et al. (2012)	US	1971-2006	Excess return	Accounts receivable
Hill et al. (2015)	US	1971-2006	Excess return	Accounts receivable
Alan et al. (2014)	US	1985-2010	Excess return	Inventory turnover
Hilmola (2020)	US	2010-2018	Share price	Inventory turnover
Mishra et al. (2013)	US	2002-2006	Excess return	Inventory turnover
Panel C – Concave relation between WCM and profitability				
Baños-Caballero et al. (2014)	United	2001-2007	Market value of equity	NTC
Aktas et al. (2015)	US	1982-2011	Jensen's alpha	WC
Saravanan et al. (2017)	India	2004-2015	*Enterprise value*	CCC
H. Chen et al. (2005)	US	1981-2000	Excess return	DSI

Adding to this strand of literature, we innovate by being the first, to the best of our knowledge, to perform an analysis of the optimal point not only of cash conversion cycle but also of its components, which maximizes the stock returns. Thus, the hypotheses to be analyzed are the following:

H1. There is an optimal point of CCC that maximizes the stock returns.

H1a. There is an optimal point of DSO that maximizes the stock returns.

H1b. There is an optimal point of DSI that maximizes the stock returns.

H1c. There is an optimal point of DPO that maximizes the stock returns.

3. Methodology

3.1 Sample and Sources of Information

The initial sample includes all firms listed on Euronext, for the period between January 1st, 2011, and December 31st, 2019. Two arguments justify the sample selection. First, only Baños-Caballero et al. (2014), Campomanes (2020), and Karadagli (2013) analyzed the impact of WCM on stock returns of listed firms in Europe, but from a single country perspective. In addition, the cash conversion cycle is longer for European companies than for US companies (PwC, 2019). This could have a different impact on how information about the WCM is incorporated into the stock price. Therefore, studying simultaneously multiple European markets allows to improve international empirical evidence and check the robustness of the previous findings.

The Eikon-Datastream database was used to obtain daily market data and the Orbis database for annual accounting data. Firms belonging to the financial industry were excluded due to their specific legislation, accounting, and working capital management practices, as applied by Deloof (2003) and Wang (2019). Firms that during the sample period did not have data in the Eikon-Datastream and Orbis databases were eliminated. Finally, to mitigate the influence of outliers, a 5% winsorization was performed, in line with Deloof (2003), Le (2019), Mathuva (2010), Shin and Soenen (1998), among others. We include firms that during the period ceased to be listed on the stock exchange or went bankrupt, to avoid survivorship bias.

Table 2 presents the composition of the sample by industries and stock exchanges.

Table 2 Composition of the Sample per Industry and Stock Exchange

	Number of firms	***%***
Panel A – Industries		
1010 – Technology	180	15.72%
1510 – Telecommunications	44	3.84%
2010 – Health Care	113	9.87%
3510 – Real Estate	106	9.26%
4010 – Automobiles and Parts	242	21.14%
4510 – Consumer Staples	98	8.56%
5010 – Industrials	236	20.61%
5510 – Basic Materials	60	5.24%
6010 – Energy	32	2.79%
6510 – Utilities	34	2.97%
Total	**1.145**	**100%**
Panel B – Stock exchanges		
Amsterdam	114	9.96%
Brussels	115	10.04%
Dublin	46	4.02%
Lisbon	51	4.45%
Paris	819	71.53%
Total	**1.145**	**100%**

It can be seen from the table above that the sample consists of 1,145 firms listed on Euronext, spread over 10 industries[2]. The most representative industry of the sample is the Automobile and Parts industry (21.14%), followed by the Manufacturing industry (20.61%), and the Information Technology industry (15.72%). The sample also includes firms listed on 5 different stock exchanges belonging to Euronext that have not yet been studied in the literature, and the stock exchange with the highest representation in the sample is Euronext Paris (71.53%), followed by Euronext Brussels (10.04%), and Euronext Amsterdam (9.96%).

3.2 Variables

3.2.1 Dependent Variable

Stock returns are captured with excess returns, calculated through the difference between observed and expected benchmark returns. Expected benchmark returns are estimated using the Fama and French (1993) model, as other authors do (e.g., Almeida & Eid, 2014; Beauchamp et al., 2014; Campomanes, 2020; Filbeck et al., 2017; Wang, 2019).

3.2.2 Independent Variables

Cash conversion cycle is a frequently used measure to represent working capital efficiency (e.g., X. Chen et al., 2022; Deloof, 2003; Lazaridis & Tryfonidis, 2006; Le, 2019; Wang, 2019). Furthermore, CCC intuitively realizes the breakdown of the various working capital components, as it is calculated as follows:

$$CCC_{it} = DSO_{it} + DSI_{it} - DPO_{it}$$

where CCC_{it} is the time between paying to suppliers, selling inventories, and receiving from customers for firm *i* in year *t*; DSO_{it} denotes the firm's credit policy, corresponding to the average number of days it takes customers to pay to firm *i* in year *t*; DSI_{it} translates the average number of days inventories remain in storage for firm *i* in year *t*; DPO_{it} is the payment policy and reflects the average number of days it takes firm *i* to pay its suppliers in year *t*.

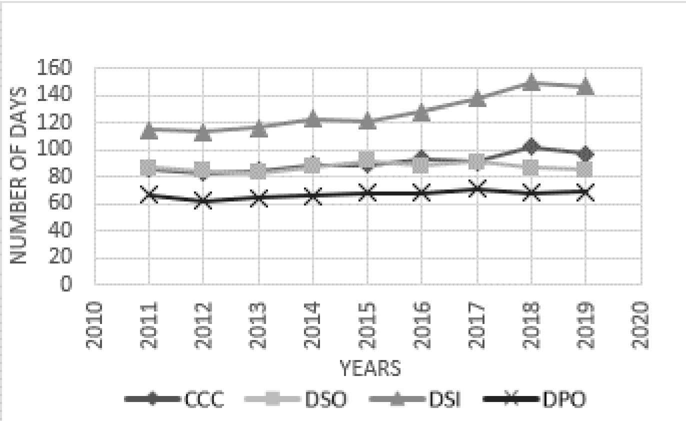
In addition to the analysis of the *CCC*, the analysis of each of its components (*DSO, DSI*, and *DPO*) is also performed individually.

The evolution over time of the average value of the *CCC* and its components is shown in Figure 1.

By analyzing Figure 1, an upward trend in the CCC can be seen over time, especially due to the increase in DSI. This trend can be explained by the improvement in macroeconomic conditions over the period, which may motivate firms to produce more finished goods to meet market demand (H. Chen et al., 2005).

[2] The Industry Classification Benchmark (ICB) is used to define the industries, available at https://www.ftserussell.com/data/industry-classification-benchmark-icb, accessed April 10th, 2021.

Figure 1 Average CCC, DSO, DSI and DPO Evolution



3.2.3 Control Variables

Control variables are also used to ensure a reliable analysis of the relation between WCM and stock returns. Liquidity is controlled because of the known negative relation with stock returns since investors demand to be remunerated for investing in less liquid stocks as proved by Amihud (2002). To capture multiple dimensions of liquidity[3] and to add robustness to the results, two alternative measures are used: Amihud (2002) and Fong et al. (2017) illiquidity measures, which are lagged one month. Leverage is considered through the ratio between liabilities and total assets. A higher level of debt may be indicative of financial difficulties, leading to a negative relation with stock returns (Fama & French, 1992). Size is controlled by the natural logarithm of the firms' total assets. Diamond and Verrecchia (1991) advocate that larger firms have more information available, reducing information asymmetry, which in turn have a positive impact on stock returns. Age is controlled through the natural logarithm of firms' age. Older firms have lower levels of asymmetric information, and have more experience and reputation, having a positive impact on stock returns (Papadogonas, 2007). Tangible fixed assets are controlled using the ratio between tangible fixed assets and total assets. The benefits associated with tangible fixed assets are easy to observe, which reduces information asymmetry and can lead to a positive impact on stock returns. The control of tangible fixed assets is also applied by Mishra et al. (2013).

3.3 Models

To test the hypotheses presented, we use unbalanced panel data, allowing for the analysis of different firms over time. Additionally, according to Hsiao (1985), the use of panel data allows to control and eliminate the influence of unobservable heterogeneity on results. Panel data regression can be performed using various methods. Thus, to choose between the use of ordinary least squares (OLS) or fixed-

[3] Two illiquidity variables are applied because they capture different dimensions of liquidity, while Amihud (2002) captures breadth and depth, Fong et al. (2017) captures rigidity and depth.

effects models, the Breusch-Pagan test is performed. The Hausman (1978) test is applied to decide between the use of fixed-effects and random-effects models.

The following models were estimated:

$$R_{it} - R_{it}^{B} = \beta_0 + \beta_1 CCC_{it} + \beta_2 CCC_{it}^2 + \beta_3 LIQ_{it-1} + \beta_4 Leverage_{it} + \beta_5 Size_{it} + \beta_6 Age_{it} + \beta_7 \text{Tangibles}_{it} + \varepsilon_{it} \quad (2)$$

$$R_{it} - R_{it}^{B} = \beta_0 + \beta_1 DSO_{it} + \beta_2 DSO_{it}^2 + \beta_3 LIQ_{it-1} + \beta_4 Leverage_{it} + \beta_5 Size_{it} + \beta_6 Age_{it} + \beta_7 \text{Tangibles}_{it} + \varepsilon_{it} \quad (3)$$

$$R_{it} - R_{it}^{B} = \beta_0 + \beta_1 DSI_{it} + \beta_2 DSI_{it}^2 + \beta_3 LIQ_{it-1} + \beta_4 Leverage_{it} + \beta_5 Size_{it} + \beta_6 Age_{it} + \beta_7 \text{Tangibles}_{it} + \varepsilon_{it} \quad (4)$$

$$R_{it} - R_{it}^{B} = \beta_0 + \beta_1 DPO_{it} + \beta_2 DPO_{it}^2 + \beta_3 LIQ_{it-1} + \beta_4 Leverage_{it} + \beta_5 Size_{it} + \beta_6 Age_{it} + \beta_7 \text{Tangibles}_{it} + \varepsilon_{it} \quad (5)$$

where LIQ_{it-1} represents either the ratio of Amihud (2002) or the measure of Fong et al. (2017).

4. Presentation and Discussion of Results

Panel A of Table 3 shows the main descriptive statistics (mean, standard deviation, maximum, median, minimum, and interquartile range) of the variables.

The average duration of the CCC is 90.4 days (the median is 63.9 days), the DSO is 93.7 days (the median is 65.0 days), the DSI is 128.2 days (the median is 76.8 days), and the DPO is 67.3 days (the median is 46.1 days). Regarding the measures of dispersion, the standard deviations of the CCC (125.8 days), DSO (96.5 days), DSI (168.0 days), and DPO (79.5 days) are above the mean, suggesting a high dispersion of the values around the mean. This dispersion can be further observed by the maximum and minimum durations and through the interquartile range. It is also interesting to observe that the firm with a more conservative WCM in the sample has a CCC of 468.3 days and the firm with the more aggressive WCM presents a CCC of -104.8 days.

Regarding monthly excess returns ($R – R^B$), they have an average value of 0.039% (the median is -0.024%). It is also possible to see that the mean is higher than the median, suggesting that it follows a positive asymmetric distribution. As far as dispersion measures, excess returns have a standard deviation greater than their mean. This dispersion of values can be justified by the distinct levels of returns across industries and stock exchanges in which the firms are inserted.

Panel B of Table 3 presents Pearson's correlation matrix. As it can be seen, there is an absence of statistical significance for the correlation between excess stock returns, CCC, and its components, except DPO which shows a statistically significant negative correlation, suggesting that firms that take longer to pay their suppliers obtain lower excess returns.

To diagnose multicollinearity problems, the analysis of the Variance Inflation Factor (VIF) is used (results are in Table A.1 in Appendix A). There are no multicollinearity problems, although a VIF greater than 5 is evidenced between the CCC (or its components) and its quadratic representation, values that are justified by the nature of its calculation.

Table 3 Descriptive Statistics of the Variables Applied in the Econometric Models

Panel A - Descriptive Statistics

Variables	$R-R^B$	*CCC*	*DSO*	*DSI*	*DPO*	*ILLIQ*	*FHT*	*Leverage*	*Size*	*Age*	*Tangibles*
Mean	0.039	90.417	93.664	128.200	67.303	1.532	2.016	57.855	11.770	3.355	1.964
Standard deviation	1.225	125.790	96.492	167.971	79.527	6.599	4.704	24.390	2.169	0.826	4.844
Maximum	4.686	468.28	402.240	776.57	540.380	85.433	31.793	165.061	16.334	4.812	20.763
Median	-0.024	63.927	65.019	76.753	46.103	0.032	0.504	57.172	11.673	3.295	0.505
Minimum	-4.253	-104.820	1.329	0.000	3.785	0.000	0.000	3.432	8.584	1.791	0.007
Q3-Q1	0.927	122.83	64.755	123.73	41.759	0.279	1.324	27.642	3.367	1.216	0.580

Panel B - Correlation Coefficients

Variables	$R-R^B$	CCC	DSO	DSI	DPO	ILLIQ	FHT	Leverage	Size	Age	Tangibles
$R-R^B$	1	-0.003	-0.005	0.003	-0.012***	-0.011***	-0.021***	-0.002	0.029***	0.008**	-0.004
CCC		1	0.123***	0.062***	-0.210***	-0.022***	-0.037***	-0.040***	0.035***	0.141***	-0.034***
DSO			1	0.011***	0.279***	0.084***	0.099***	0.006	-0.185***	-0.097***	0.041***
DSI				1	0.024***	0.002	0.010**	0.017***	0.005	0.022***	0.017***
DPO					1	0.036***	0.070***	0.055***	-0.143***	-0.162***	0.012***
ILLIQ						1	0.536***	0.064***	-0.135***	-0.027***	0.046***
FHT							1	0.064***	-0.185***	-0.027***	0.046***
Leverage								1	0.043***	-0.22***	-0.050***
Size									1	0.190***	-0.172***
Age										1	-0.031***
Tangibles											1

Notes: The table summarizes the descriptive statistics and Pearson correlation coefficients of the variables applied in the estimated regression models. $\mathbf{R-R^B}$ corresponds to the excess returns on firm *i* stock in month *t*; **CCC** corresponds to firm *i* cash conversion cycle in year *t*; **DSO** represents firm *i* average customer receivable term in year *t*; **DSI** reflects firm *i* average inventory turnover term in year *t*; **DPO** represents firm *i* average supplier payment term in year *t*; **ILLIQ** represents Amihud (2002) illiquidity measure of firm *i* in month *t*; **FHT** is Fong et al. (2017) of firm *i* in month *t*; **Leverage** reflects the leverage ratio of firm *i* in year *t*; **Size** corresponds to the size of the firm captured by the Ln (Assets) of firm *i* in year *t*; **Age** represents the age of the firm, through the Ln (Age) of firm *i* in year *t*; **Tangibles** is representative of the level of tangible fixed assets of firm *i* in year *t*. *, ** and *** represent the significance levels of 10%, 5% and 1%, respectively.

Table 4 shows the results obtained when performing the multivariate analysis by regressing the models from equations (2) to (5).

Table 4 Regression Results between Excess Returns and WCM

	Dependent Variable: $R – R^B$							
	(2)		*(3)*		*(4)*		*(5)*	
CCC	0.084** (0.019)	0.072* (0.095)						
CCC^2	-0.085*** (0.006)	-0.075** (0.027)						
DSO			-0.134 (0.468)	-0.136 (0.430)				
DSO^2			0.132 (0.395)	0.133 (0.358)				
DSI					0.011 (0.782)	0.005 (0.906)		
DSI^2					-0.009 (0.654)	-0.007 (0.763)		
DPO							0.186 (0.216)	0.169 (0.236)
DPO^2							-0.108 (0.292)	-0.101 (0.311)
$ILLIQ_{t-1}$	-0.165 (0.145)		0.018 (0.834)		-0.108 (0.416)		0.024 (0.798)	
FHT_{t-1}		-0.501** (0.013)		-0.188** (0.030)		-0.474** (0.045)		-0.178 (0.191)
Leverage	-0.003 (0.884)	-0.004*** (0.004)	-0.075 (0.155)	-0.067 (0.187)	0.004 (0.887)	-0.013 (0.681)	-0.079 (0.141)	-0.073 (0.155)
Size	0.017*** (0.000)	0.016*** (0.000)	0.018** (0.034)	0.018** (0.025)	0.018*** (0.000)	0.017*** (0.001)	0.017** (0.048)	0.017** (0.049)
Age	0.005 (0.532)	0.003 (0.695)	0.017 (0.852)	0.012 (0.970)	0.009 (0.351)	0.006 (0.554)	0.012 (0.896)	0.008 (0.926)
Tangibles	0.000 (0.837)	0.000 (0.806)	0.000 (0.958)	0.000 (0.970)	0.000 (0.809)	0.000 (0.912)	0.000 (0.922)	0.000 (0.943)
$β_0$	-0.173** (0.011)	-0.153** (0.035)	-0.166 (0.395)	-0.136 (0.430)	-0.202*** (0.005)	-0.183** (0.023)	-0.173 (0.616)	-0.161 (0.633)
No. of observations	58.155	60.884	59.043	61.868	44.183	46.107	57.729	60.459
F	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Hausman	0.227	0.179	0.040**	0.068*	0.6404	0.460	0.027**	0.023**
Breusch-Pagan	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Model	Random effects	Random effects	Fixed effects	Fixed effects	Random effects	Random effects	Fixed effects	Fixed effects

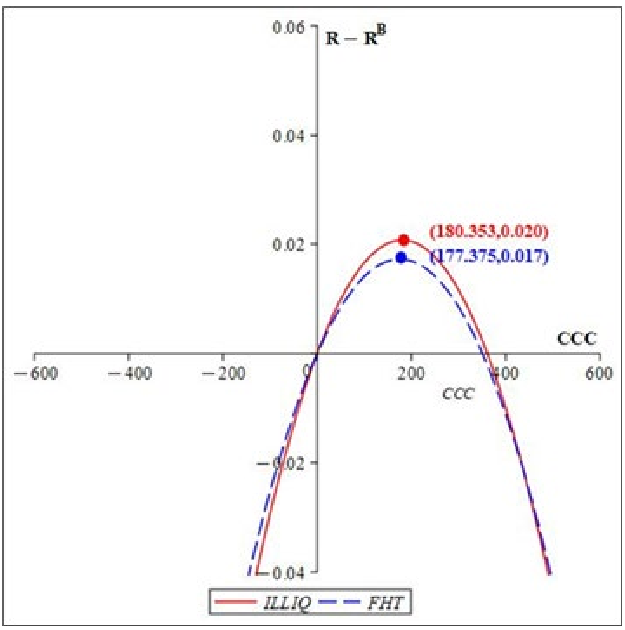
Notes: The table summarizes the results of the estimation of the models of equations (2) to (5). The dependent variable is **$R - R^B$**, and corresponds to the excess returns on firm *i* stock in month *t*; **CCC** denotes firm *i* cash conversion cycle in year *t*; **CCC^2** represents the squared variable of firm *i* cash conversion cycle in year *t*; **DSO** reflects firm *i* average customer receipt term in year *t*; **DSO^2** corresponds to the squared value of firm *i* average customer receipt term in year *t*; **DSI** denotes the average inventory turnover period of firm *i* in year *t*; **DSI^2** corresponds to the squared value of the average inventory turnover period of firm *i* in year *t*; **DPO** depicts the average payment term to suppliers of firm *i* in year *t*; **DPO^2** reflects the squared value of the average payment term to suppliers of firm *i* in year *t*; **$ILLIQ_{t-1}$** denotes Amihud (2002) illiquidity measure of firm *i* in month *t*-1; **FHT_{t-1}** is Fong et al. (2017) of firm *i* in month *t*-1; **Leverage** reflects the leverage ratio of firm *i* in year *t*; **Size** corresponds to the size of firms captured by the ln(Assets) of firm *i* in year *t*; **Age** represents the age of the firm, through the ln(Age) of firm *i* in year *t*; **Tangibles** denotes the level of tangible fixed assets of firm *i* in year *t*; **$β_0$** represents the constant of the regression models. The p-value of each coefficient is shown in parentheses. *, ** and *** represent the significance levels of 10%, 5% and 1%, respectively.

The results obtained for the model of equation (2) suggest the existence of an optimal cash conversion cycle point that maximizes excess stock returns as expected on Hypothesis 1, since the coefficient associated with CCC^2 assumes a negative and statistically significant value at a 5% level, regardless of the illiquidity measure applied as a control variable. Using the analysis of the break-even point[4], the optimal duration of the *CCC* that maximizes the excess return of stocks of the studied sample (calculated through $-\beta_1/2\beta_2$), is 180.4 days in the model with Amihud (2002) illiquidity measure as the control variable, and 177.4 days when stock illiquidity is controlled by the Fong et al. (2017) measure. Similar results are obtained by Aktas et al. (2015), Baños-Caballero et al. (2014), and Saravanan et al. (2017).

These results may occur due to the ability of firms to reduce their cash conversion cycle to a certain point, that mitigates financial costs by ensuring firms' liquidity, while simultaneously taking advantage of other factors associated with higher CCC, such as sales promotion via trade credit, quantity discounts on inventories or trade credit from suppliers, improving firms' performance. Thus, building on market efficiency these effects are incorporated into the stock price, resulting in higher stock returns. These findings support the idea of an optimal cash conversion cycle point that maximizes shareholder wealth, as suggested by Deloof (2003), Eljelly (2004), and Lazaridis and Tryfonidis (2006).

Figure 2 shows a concave down relation between CCC and excess stock returns.

Figure 2 CCC and Excess Stock Returns Relation



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[4] The CCC value and its components were divided by 365 days. Thus, to perform the break-even point analysis for the values presented, it is necessary to divide β_1 by 365 and β_2 by 365^2.

When analyzing the estimation results of equations (3), (4), and (5), the coefficients associated with the cash conversion cycle components reveal a lack of statistical significance. Thus, hypotheses H1a, H1b, and H1c are not confirmed.

Concerning the control variables in regression models (2) to (5), the Fong et al. (2017) measure shows a negative and statistically significant relation with excess stock returns, meaning that firms with lower illiquidity have higher returns than the benchmark, which is contrary to what was expected. Regarding Amihud (2002) measure, it does not reveal statistical significance. Both illiquidity measures capture depth, but while FHT captures rigidity, ILLIQ captures breadth. Therefore, the contrary sign could be due to the fact that FHT focuses on rigidity. It can also be observed that the variable Size has a positive and statistically significant relation with the excess returns, which can be explained by the greater availability of information for larger firms, which positively influences stock returns (Diamond & Verrecchia, 1991). The remaining control variables are not statistically significant.

In aggregate, the findings of our study add new evidence to the ongoing debate on the impact of working capital management on stock returns, by finding an optimal point of CCC while studying several European stock exchanges that have not yet been studied. However, during the sample period analyzed, we do not find evidence of optimal points for cash conversion cycle components. These results seem to indicate that practicing an optimal simultaneous management of CCC components rewards shareholders. However, the optimal management of any of its components by itself is insufficient to grant shareholders a higher return.

5. Conclusions

In academia, the relation between working capital management and stock returns is not unanimous. Multiple trade-offs affect working capital management. Nevertheless, only a few studies analyze a non-linear relation between working capital management and stock returns. Thus, this study examines the existence of an optimal point of cash conversion cycle, and its components, which maximizes the stock returns of 1,145 firms listed on five different Euronext exchanges, between 2011 and 2019.

The results show the existence of an optimal cash conversion cycle point that maximizes excess returns, suggesting that firms that can efficiently manage working capital management trade-offs reward shareholders with higher returns. These results can be justified since the practice of a higher CCC improves profitability but can cause liquidity problems, increasing the need for external financing. Moreover, it requires a higher investment in working capital, which has opportunity costs such as, for example, investing in viable projects that could maximize the value of the firms, as suggested by Fazzari and Petersen (1993). In this sense, to maximize the shareholder value, firms should achieve an optimal trade-off that ensures their liquidity and the advantages associated with a higher cash conversion cycle.

This study contributes to the growing empirical literature that analyzes the existence of an optimal WCM point that maximizes shareholder wealth (e.g., Aktas et al., 2015; Baños-Caballero et al., 2014; Saravanan et al., 2017). Two key features set this paper apart from existing literature. First, previous studies have focused only on an optimal point of cash conversion cycle, even though working capital management should not be only focused on the CCC, but also on its components and their trade-offs. Therefore, we take a step further and examine an optimal point of CCC components, offering an in-depth analysis that can yield a further understanding of the study of an optimal working capital management. Second, this is the first study to find an optimal point of CCC in a large sample of European firms. The study of European firms is important since previous literature is typically realized on US firms. European firms tend to invest more in working capital (PwC, 2019), suggesting different impact of working capital management on stock returns. Although, our work found similar conclusions of Aktas et al. (2015), who analyze US firms, suggesting that the most important is that firms manage the different trade-offs of working capital to reach the maximization of stock returns.

In addition to the possible significant contribution to academia, the results may also serve as support for management decision making. Managers need to calibrate their investment on working capital to obtain an optimal point that simultaneously guarantees profitability and liquidity, allowing firms to reward shareholders with higher returns. In other words, managers should carefully consider WCM trade-offs to ensure that they maximize shareholder returns. In this sense, the results found are also relevant to shareholders who are trying to understand the impact of WCM on their stock returns. From an investor perspective, the findings obtained may help in the selection of assets for their portfolios, since results show that including firms with an optimal CCC can improve the return of their portfolios.

For future research, we suggest to extend the results obtained in this study to different stock exchanges since they show different levels of stock returns, as well as different working capital management practices. In the same sense, it would also be pertinent to perform an analysis by industry.

APPENDIX

A –VIF ANALYSIS

Table A.1– VIF Analysis of the Models of Equations (2) to (5)

Dependent Variable: $R – R^B$							
Panel A – Models with control variable $ILLIQ_{t-1}$							
CCC	5.270	**DSO**	10.070	**DSI**	9.167	**DPO**	8.185
CCC^2	5.207	**DSO^2**	10.020	**DSI^2**	9.100	**DPO^2**	8.027
$ILLIQ_{t-1}$	1.027	**$ILLIQ_{t-1}$**	1.032	**$ILLIQ_{t-1}$**	1.023	**$ILLIQ_{t-1}$**	1.028
Leverage	1.011	**Leverage**	1.013	**Leverage**	1.026	**Leverage**	1.026
Size	1.067	**Size**	1.081	**Size**	1.060	**Size**	1.085
Age	1.060	**Age**	1.034	**Age**	1.036	**Age**	1.056
Tangibles	1.022	**Tangibles**	1.025	**Tangibles**	1.019	**Tangibles**	1.022
Panel B – Models with control variable FHT_{t-1}							
CCC	5.232	**DSO**	10.339	**DSI**	9.074	**DPO**	8.010
CCC^2	5.167	**DSO^2**	10.294	**DSI^2**	9.014	**DPO^2**	7.865
FHT_{t-1}	1.040	**FHT_{t-1}**	1.050	**FHT_{t-1}**	1.043	**FHT_{t-1}**	1.042
Leverage	1.013	**Leverage**	1.015	**Leverage**	1.030	**Leverage**	1.031
Size	1.084	**Size**	1.099	**Size**	1.037	**Size**	1.099
Age	1.060	**Age**	1.034	**Age**	1.190	**Age**	1.057
Tangibles	1.021	**Tangibles**	1.024	**Tangibles**	1.019	**Tangibles**	1.021

Notes: The table presents the results of the VIF analysis for the models of equations (2) to (5). **$R - R^B$** corresponds to the excess return of firm *i* in month *t*; **$ILLIQ_{t-1}$** denotes Amihud (2002) illiquidity measure of firm *i* in month *t*-1; **FHT_{t-1}** is Fong et al. (2017) of firm *i* in month *t*-1; **CCC** denotes the cash conversion cycle of firm *i* in year *t*; **CCC^2** represents the squared variable of the cash conversion cycle of firm *i* in year *t*; **DSO** reflects the average customer receivable term of firm *i* in year *t*; **DSO^2** corresponds to the squared value of the average customer receivable term of firm *i* in year *t*; **DSI** denotes the average inventory turnover term of firm *i* in year *t*; **DSI^2** corresponds to the squared value of the average inventory turnover term of firm *i* in year *t*; **DPO** depicts the average payment term to suppliers of firm *i* in year *t*; **DPO^2** reflects the squared value of the average payment term to suppliers of firm *i* in year *t*; **Leverage** reflects the leverage ratio of firm *i* in year *t*; **Size** corresponds to the size of firms captured by the ln(Assets) of firm *i* in year *t*; **Age** represents the age of the firm, through the ln(Age) of firm *i* in year *t*; **Tangibles** denotes the level of tangible fixed assets of firm *i* in year *t*.

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