Evidence for using the cash conversion cycle to test the relationship with the corporate profitability: an empirical analysis on a sample of textile Italian SMEs

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Abstract: The cash conversion cycle (CCC) is a financial index with increasing importance in recent years since analysts and investors consider it effective for financial analyses. The index provides a correct and truthful situation of the company's ability to cope with its liabilities and allows the company to monitor the cash cycle with reference to purchase operations, production, and sales of products. The CCC is an index expressed by days, so it is necessary to know the days inventory outstanding, the days sales outstanding, and the days payable outstanding to calculate it. The purpose of this research is to analyse characteristics of the CCC and differences with respect to the other liquidity ratios and its relationship with the most relevant financial ratios through empirical applications to verify if it is a reliable index for making decisions regarding a company's cash flow strategy.

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1   Introduction

The company insolvency is highlighted by defaults or other external events attesting the debtor is no longer able to meet the obligations regularly (Riva et al., 2018). The insolvency appears in different forms: liabilities superior to the assets, expenses greater than revenues, and registration of judicial mortgages. An important tool for assessing business insolvency is financial reporting analysis through ratios. To appreciate solvency, it is essential to assess the liquidity of a company, which is the ability to honour short-term obligations through its financial resources without fixed assets forced sale to meet obligations. The main indicators used by professional practices to assess short-term liquidity are: current liquidity, net financial working capital, deferred liquidity, treasury margin, interest coverage ratio, and Ebitda/NFP. In recent years, a new index assumed relevance to assess liquidity and insolvency: the cash conversion cycle (CCC). This new analysis tool is extremely important because it can attest to a clear and truthful situation of the company's ability to meet its assumed liabilities and to identify a strategy to solve critical financial situations.

The objective of this research is to illustrate the characteristics of the CCC, its determination, the importance of its constituent elements, and the relation between the CCC and corporate profitability. The CCC is an important extent of a business's effective working capital management (WCM) and, particularly, cash management. Moreover, the CCC is the most significant part in WCM. The CCC measures the time it takes to convert cash into new cash from when inventory is bought until inventory is sold, and bills are recovered (Padachi, 2006). The CCC is the investment in current assets and current liabilities and is very decisive for a business's survival.

In literature, many empirical studies examine the relationship of CCC with size, sectors, geographical location, and profitability of the firms, but no similar ones regard the Italian context (Moss and Stine, 1993; Muscettola, 2014; Nobanee et al., 2011; Richards and Laughlin, 1980; Yin and Zhang, 2018). This paper, considering previous studies, attempts to contribute to existing literature by exploring the relationship between

CCC and profitability and studies a sample of Italian no-listed companies (SMEs) from the textile sector, with no default problem. It has several implications, can be useful to managers, industries, and academics to understand how different CCC can affect companies' profitability.

The paper is organised into eight sections: Section 1 is introduction, Section 2 is literature review, Section 3 is cash conversion cycle, Section 4 is days inventory outstanding, Section 5 is days sales outstanding, Section 6 is days payable outstanding, Section 7 is study design, and Section 8 is conclusion.

2 Literature review

In the last two decades, the interest in WCM and liquidity held a significant position among the financial decisions because these affect the business's profitability, risk, and market value. Researchers have studied WCM in different areas and in different ways, as several studies focused on the relationships among inventory management, account receivables, accounts payable, and the CCC. The corporate liquidity can be assessed in two different aspects: static or dynamic (Farris and Hutchison, 2002; Moss and Stine, 1993). The first static aspect view relates to the use of conventional ratios like working capital ratios and liquidity ratios to evaluate company liquidity at a specific time. The dynamic view takes into account the firm's ongoing or concurrent liquidity position based on firm's operations. The CCC days are the very outcome of this dynamic view of cash management on the part of the firm. The CCC has been considered an important extent of a firm's effective WCM and particularly the cash management. Furthermore, the CCC is the most significant part in WCM.

Gitman (1974) recognised CCC as a measure of the company ongoing liquidity and introduced it to estimate company's liquidity requirements, since it represents the period the company has to finance on its own the operating cycle.

Richards and Laughlin (1980) introduced WCM principal based on the traditional concepts of the CCC. It is a powerful performance measure for assessing how efficiently a company is managing its working capital. According to Richards and Laughlin, CCC is "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".

Gentry et al. (1990) argued that a short CCCis related indirectly to a firm's value. Stewart (1995) defined a CCC as "a composite metric describing the average days required to turn a dollar invested in raw materials into dollar collected from customer". Jose et al. (1996) investigate the relationship between profitability measures and management of ongoing liquidity needs for firms over two decades, and they set a similar definition of CCC since it "measures the time between cash outlays for resources and cash receipts from product sales". Besley and Brigham (2005) described CCC as "the length of time from the payment for purchase of raw materials to manufacture a product until the collection of account receivable associated with the sale of the product".

Shin and Soenen (1998) investigated the significant effects on company profitability and liquidity from efficient cash conversion management. Many studies have taken place on the subject by investigating the relations between CCC and business profitability. One of the most relevant studies, in chronological order, is when Deloof (2003) investigated the effect of WCM on corporate profitability of Belgian firms using the sample of 1.009 large Belgian non-financial firms from 1992–1996. In the same year, Ghosh and

Maji (2003) published their study concerning Indian Companies. Further studies followed on the same topic in different countries, and most of them investigated listed companies. Eljelly (2004) focused on Saudi Arabian companies. Lazaridis and Tryfonidis (2006) proved the relation for Greek firms. Raheman and Nasr (2007) focused on performances of 94 listed Pakistani companies. Samiloglu and Demirgunes (2008) analysed Turkey-listed entities. Wongthatsanekorn (2010) investigated 13 listed Thailand firms. Dong and Su (2010) researched a sample of listed Vietnamese firms. Gill et al. (2010) investigated a sample of 88 US firms listed on NYSE. Nobanee et al. (2011) focused on Japanese firms, and Muscettola (2014) focused on 4,226 Manufacturing Italian SMEs. Yin and Zhang (2018) researched 45 Chinese listed companies.

In the literature there are also studies focused on the analysis of the relationship between CCC and business performance in specific sectors, such as telecommunications, insurance (Chuke Nwude et al., 2018), banks, hotels and travels (Suganya, 2015), hospitals (Upadhyay et al., 2015), trading companies (Hsieh et al., 2013).

All mentioned studies provided similar results.

3   Cash conversion cycle

The calculation of CCC involves several items from financial reporting for a certain period of time (generally 365 days for a year or 91.25days for a quarter). The formula for calculating CCC is as follows:

$$CCC = DIO + DSO - DPO \tag{1}$$

where DIO is days inventory outstanding, DSO is days sales outstanding, and DPO is days payable outstanding.

The calculation measures how fast a company can convert cash on hand into inventory and accounts payable through sales and accounts receivable then back into cash. By combining these activity ratios, the measurement indicates the efficiency of the management's ability to employ short-term assets and liabilities to generate cash for the company. The analysis of CCC includes the knowledge of the sector to which a company belongs. For example, a food company shall sell its products faster because they have a shorter lifespan compared to an automotive company whose products are obsolescent slowly. Furthermore, the CCC is not suitable for companies running financial activities such as banks and insurances or running no financial activities but providing services.

The CCC must also be calculated with reference to different periods of business life to identify the best period for a company to make investments. In specific business, CCC is negative by definition. For example, online trade companies receiving payments from customers in advance (with an average of five days) and paying suppliers after an average of twenty days thus determining an average CCC of negative fifteen days. This has allowed these companies to develop very quickly without liquidity.

In the following paragraphs, CCC components are analysed.

4   Days inventory outstanding

DIO, also known as days sales of inventory (DSI), is an efficiency metric used to measure the average number of days a company holds inventory before selling it. It

indicates how many days, on average, a company turns its inventory into sales. As regards its formula:

$$DIO = \frac{AVERAGE\ INVENTORY}{COST\ OF\ GOODS\ SOLD} * 365 \tag{2}$$

This index calculation can also be used on a quarterly or semester basis. The index, even if considered separately, provides important indications for business decision; it expresses the average inventory of stocks, so it is able to certify whether or not the warehouse is managed efficiently. Obviously, the lower value of the index, the better the time stocking and this has a positive effect on the liquidity of the company, as well as on company's profitability.

5 Days sales outstanding

DSO is a measure of the average number of days that a company takes to collect payment after a sale has been made. DSO is often determined on a monthly, quarterly, semester or annual basis. It can be calculated by dividing the amount of average accounts receivables during a given period by the total value of (credit) sales during the same period and multiplying the result by the number of days in the period measured.

The formula for calculating DSO can be represented with the following:

$$DSO = \frac{AVERAGE\ ACCOUNTS\ RECEIVABLES}{SALES} * 365 \tag{3}$$

Usually, a short cycle is considered when its duration is around 60–80 days. The DSO can be calculated with reference to a specific customer in order to have an aging table to assess the regularity or not of payments.

This index is important for:

- credit management as it allows to assess when to make payment reminders to debtors, and to identify customers to grant rebates and discounts

- accounting management to decide whether to allocate a provision for bad debts to cover customer insolvency

- the management of investment time, that is to evaluate strategically when it is more appropriate to carry out them according to the availability of liquidity.

6 Days payable outstanding

DPO is a company's average payable period that measures how long it takes a company to pay invoices totrade creditors, such as suppliers. The formula to calculate DPO is:

$$DPO = \frac{AVERAGE\ ACCOUNTS\ PAYABLE}{COST\ OF\ GOODS\ SOLD} * 365 \tag{4}$$

The value of the DPO should be high, at least higher than the DSO, since, in addition to allowing more time to make payments, it indicates a high bargaining power towards company suppliers. On the other hand, a low value for the index attests that the company pays suppliers quickly, not being able to benefit from payment extensions or in order to take advantage of discounts for early payments. As already stated, it is essential to compare the DPO with the DSO; if the DPO is lower than the DSO, it is possible that liquidity shortages are detected as suppliers' payments are earlier than customers' collections. Often a high value of the DPO may not prove to be a good indicator as making payments over a long period could jeopardise relationships with suppliers that could reduce or suspend the disbursement of discounts.

The CCC tending to zero could be evidence of an optimal situation, but it is still necessary to analyse carefully the individual components. For example, it can happen that an insolvent company, not coping with its commitments, has a very high DPO and therefore a CCC tending to zero. This is because the DPO must be subtracted in the CCC calculation, so if its value is high, the value of CCC automatically tends to zero. For this reason, the CCC must be evaluated by analysing the individual components of the CCC to identify the weaknesses and critical points of the company management and to resolve those situations that may fuel the probability of insolvency.

7   Study design

This research has focused on the analysis of a sample of *made in Italy* companies belonging to the textile sector. The *made in Italy brand* is to attest the Italian origin of the production. Pursuant to Article 16 of the 2009 Law, to be a *made in Italy* product, it must comply the following requirements:

a   designed in Italy

b   manufactured in Italy

c   packaged in Italy.

The main Italian sectors recognised all over the world as typical of *made in Italy* can be traced back to the four – a scheme, namely: food, clothing, furniture, and machine-automation.

One of Italian excellence is certainly the textile sector, which includes clothing and fashion (especially luxury). The textile industry, generating billions of production, employees more than 450,000 workers. This sector includes many companies different by size; most of them are micro entities with few employees carrying out several activities all related to the textile sector: preparation and spinning of textile fibres, weaving, finishing of textiles, packaging of clothing articles, packaging of leather and fur articles. The textile sector is constantly growing despite different problems from recent crisis and the increasingly fierce competition of globalisation, especially from China. The textile sector's characteristics are relevant for the research, since textile firms have longer manufacturing cycle, natural raw materials may be available on seasonal basis and finished products stocks are related to seasonality and to fashion, therefore textile firms' managers have to adopt unconventional policies to manage inventories, account

receivables and account payables. All the mentioned characteristics have to be considered with reference to policy implications. The research focuses on textile companies also to test the inverse relationship existing between the number of companies operating in the textile industry that has been contracting for years and vice versa sales increase especially towards foreign countries.

In this study the AIDA database was inquired in order to obtain the data set, from which 4,027 unlisted textile companies were selected, and the data used for the analysis refer to the years 2013–2015. The purpose of the analysis is to verify if the CCC is a reliable index for making decisions about the company's cash flow policies in its relationship with the profitability performances. The main income indicators of the companies were calculated in order to develop the analysis, namely: return on equity (ROE), return on assets (ROA), and return on investment (ROI).

ROE represents the return on invested capital, and it is the ratio between the earnings for the year (net income) and the shareholders investments in the company (equity). The difference between a company's ROE and the return on a free risk investment is usually referred to as a risk premium. The ROE is usually compared to the rate of return of the BOTs (risk-free investment) used as comparison parameter. In recent years, the rate of return on BOTs has declined considerably to negative values. For the determination of the reference intervals of the analysis, the range of minimum class is set between 0 and 6%.

Table 1 ROE evaluation

Third class	0% < ROE < 6%	33.82%
Second class	6% < ROE < 15%	27.85%
First class	ROE > 15%	38.33%

ROA indicates the profitability of the invested assets and it is the ratio between the result for the year (net income) and the total resources used by company (assets). Usually this value is lower than the ROE as the total assets are higher than the net assets. For the purposes of determining the benchmarks for the classification of companies, the cost of money is the reference. In 2016, the ECB stood at 4.25%, reaching the historic minimum since 2008. The companies of the sample are classified according to the following reference classes (Table 2).

Table 2 ROA evaluation

Third class	1% < ROA < 4%	44.91%
Second class	4% < ROA < 10%	34.17%
First class	ROA > 10%	20.92%

ROI indicates the ROI made by the company calculated as the ratio between Ebit and invested capital. To classify companies belonging to the sample, the ROI is compared with the rate of loans referring to companies belonging to manufacturing sector provided quarterly by the Bank of Italy. In the second quarter of 2017, the average value is equal to 3.52% for which the first reference interval is set between 5% and 10%. The company must repay the interest (3.52%) and the capital amount. Subsequently, classes are set as reported in Table 3.

Table 3   ROI evaluation

Third class	5% < ROI < 10%	44.43%
Second class	10% < ROI < 25%	26.58%
First class	ROI > 25%	28.99%

Therefore, from the analysis carried out it is possible to summarise the parameters of the three reference classes.

Table 4   ROE, ROA, and ROI synthesis evaluation

	ROE	*ROA*	*ROI*
Third class	0 < ROE < 6%	1 < ROA < 4%	5% < ROI < 10%
Second class	6 < ROE < 15%	4 < ROA < 10%	10% < ROI < 25%
First class	ROE > 15%	ROA > 10%	ROI > 25%

Subsequently, key liquidity indicators of the companies in the sample are analysed including current liquidity, immediate liquidity, net financial working capital, treasury margin, Ebitda/NFP, EBITDA/financial charges, and the CCC through the determination of DIO, DSO, and DPO.

7.1   DIO – days inventory outstanding calculation

The DIO represents the average of days a company holds inventory before selling it. The results obtained from the analysis are in Table 5.

Table 5   DIO

	DIO
Third class	64.55
Second class	39.00
First class	28.65

The data show for companies in the highest class (third class) the longest period of stock in hand, while decreasing the class the value decreases. This attests companies have a fast rotation cycle of inventory, lower inventory management costs, lower risks of product obsolescence and greater inventory space to use. As reported in Table 5, the best indicator is the one of companies belonging to the first class for which products remain in stock less than 30 days. The data are determined after having carried out a 15-days split analysis, that referring to specific companies sample analyses as shown in Table 6.

Table 6   DIO percentage data

Days	*% companies*
< 15	41.00%
15 < dd < 30	20.08%
30 < dd < 45	7.95%
45 < dd < 60	8.37%
60 < dd < 90	10.88%
> 90	11.72%

Most companies (61%) show DIO less than 30 days.

7.2 DSO – days sales outstanding calculation

It is a measure of average number of days that a company takes to collect payment after selling products. The results obtained from analysis are reported in Table 7.

Table 7 DSO

	DSO
Third class	118.47
Second class	123.00
First class	108.56

The best result is once again with the first class. The data are determined after carrying out an analysis for 30-day intervals.

Table 8 DSO percentage data

Days	% companies
< 30	4.80%
30 < dd < 60	10.33%
60 < dd < 90	19.19%
90 < dd < 120	28.78%
> 120	36.90%

The data attest that most companies have a DSO of more than 120 days as companies usually grant a high collection period to meet customer needs.

7.3 DPO – days payable outstanding calculation

It measures how long a company takes to pay invoices to trade creditors such as suppliers. The results obtained from the analysis in Table 9.

Table 9 DPO

	DPO
Third class	107.33
Second class	96.60
First class	95.50

The worst result is for the first class even if the value is very similar to the second one. To investigate better the results it is necessary to evaluate this indicator at the same time as the DSO to make a comparison between the average time to make payments and the one to collect cash.

Once again, for the estimation of this index, the data are determined after having carried out an analysis for intervals of 30 days.

Table 10   DPO percentage data

Days	% companies
< 30	5.51%
30 < dd < 60	18.75%
60 < dd < 90	25.74%
90 < dd < 120	25.37%
> 120	24.63%

The data show that most companies pay suppliers between 60 and 90 days and between 90 and 120 days. Only 24.63% make payments over 120 days. These companies might be the ones presenting a higher risk of insolvency.

7.4   CCC – cash conversion cycle calculation

To quantify the CCC, it is fundamental to analyse the margin between collection days and payment days (sales-purchases gap days: DSO – DPO).

Table 11   DSO-DPO

Days	DSO-DPO
Third class	11.14
Second class	26.40
First class	13.06

This difference provides an important signal. The optimal value should be zero or negative since this value would mean that the company collect money before making payments. In practice, the difference is commonly positive because the companies first make payments and later receive cash from customers. As a rule, a good margin is for value less than 30 because this means that the company first makes payments but cash invoices from customers within 30 days.

The data were also determined after having carried out an analysis for 30-day intervals.

Table 12   DSO-DPO percentage data

Days	% companies
< 0	39.39%
0 < dd < 30	18.94%
30 < dd < 60	20.83%
60 < dd < 90	11.75%
90 < dd < 120	5.68%
> 120	3.41%

According to the data, about 40% of companies attest a negative index, and 60% have a positive one, but about 40%, unfortunately, exceeds 30 days. For these, the indicator expresses a signal of difficulty for companies in managing its resources to face the marked difference between the time for payments and those for collections.

The best result is in the third class, but a further consideration has to be set. In fact, despite the third class presenting the lowest value, the best result is the (similar) value in the first class, because the operating cycle has an important role in the situation of business with similar DSO-DPO but different operating cycles. Companies showing a shorter operating cycle are more efficient and faster as they manage payments, collections, and products on stock in a shorter period.

Finally, it is possible to analyse the value assumed by the CCC.

Table 13 CCC

	DIO	DSO	DPO	CCC
Third class	65.44	118.47	107.33	76.58
Second class	39.00	123.00	96.60	65.40
First class	28.65	108.56	95.50	41.71

The data reported highlight that CCC increases as classes increase (do not forget that companies in third class have lowest profitability ratios). In fact, the average duration of the CCC for companies in the third class stands at an average of 77 days and for the first classis 42 days, which is almost half. A 40-days cycle allows the company to manage better its resources without chasing problems to corporate liquidity, and best profitability ratios. The analysis of the single components of the CCC attests that the DIO is the most fluctuating but also the most performing one. In fact, this indicator can be considered the discriminating coefficient because it is a value that differs more between the single classes proving that an efficient inventory management allows achieving very good performances. The data also determined after having carried out an analysis for 30-day intervals, namely (Table 14).

Table 14 CCC percentage data

Days	% companies
< 30	38.58%
30 < dd < 60	19.10%
60 < dd < 90	17.60%
90 < dd < 120	9.74%
> 120	14.98%

The data in the table report that the CCC of many companies is less than 30 days. This is a very good indicator because it is evidence that companies manage their resources better. Unfortunately, part of the companies have a cycle of more than 120 days, and this is definitely not a good indicator even if it might be due to (stranded) receivables that are difficult to collect.

8 Conclusions

Generally, a shorter CCC should be associated with high profitability because it improves the efficiency of using the working capital. A short CCC indicates that the company manages and processes inventory more quickly, collects cash from receivables more quickly, and slows down cash payments to suppliers. This increases the efficiency of

internal operations of a firm and results in higher profitability, higher net present value of cash flows, and higher market value of a firm (Gentry et al., 1990). The CCC is a useful instrument of assessing the liquidity of a firm, especially for small companies that are usually managed with few financial resources compared to larger companies that have better access to both money and capital markets. Shortening the CCC could be one important source of financing small firms (Nobanee et al., 2011).

Through the analysis of the companies of the sample, this research has shown that increasing profitability (e.g., ROE, ROA, and ROI)are related to best values of CCC. The analysis of the CCC and its individual components contribute to identify the main benefits that a company can get and precisely:

- identify, through the determination of the DIO, the management of its inventory and eventually correct problems encountered

- identify, through the knowledge of the difference between the DSO and DPO, the days between payment and collections

- through the comparison with its competitors it is possible to understand its strength and/or weakness and therefore to evaluate the company business continuity

- observing the duration of the cash cycle by identifying how to improve it to make it more streamlined and efficient.

With reference to the specific textile sector in addition to the analysis of the CCC, its individual factors, and its operating cycles, it is also important to know two other significant variables: the type of sales channels and inventory management.

With regard to sales channels, as data show that turnover in the last few years is constantly growing abroad, it is important that the company appropriately assess whether to use single-agent, agents, or direct sales to maximise or optimise the management of collections.

Efficient inventory management also provides a competitive advantage and a good CCC performance. The raw materials for textile companies, in addition to determining the quality of products, represent the main cost to be incurred, so firms must make appropriate assessments to choose suppliers and the best strategies to produce and to stock products.

These two relevant aspects provide important insights for policy implications. Managers should improve working capital practices by focusing on every individual component of net trade cycle to increase firm performances. Marketing efforts should aim at increasing the inventory turnover to reduce funds invested in stock. Recovery department should design policies to collect accounts receivables as early as possible, as well as payment to trade creditors should be reasonably delayed to achieve a shorter net trade cycle.

The research focused on the analysis of a specific panel data, the Italian small medium-sized companies operating in the textile sector. In order to perform a comparative analysis, authors have considered similar international studies. In international studies in English, very few works investigated the relationship between the CCC and textile small medium size companies' performance. The most similar work is the one referred to a sample of 77 listed textile companies in China, a rapidly emerging market in the period 2007–2013 (Akbar, 2014). The comparative study is in homogeneous for different reasons. Only listed companies compose the sample, in with

these are medium-sized companies whose corporate governance model is more similar to the USA public company model, than to the Italian one. The methodology represents a further difference, the analysis of the relationship between the CCC and the firm performance is investigated through the Net Trade Cycle (NTC) and ROA for Chinese listed companies, while in this research CCC for Italian small medium size companies is investigated with reference to ROA, ROI and ROE. Despite the differences, both studies achieve similar results, in accordance with previous literature, confirming the negative relationship between the CCC and the firm's profitability even for a specific sector, the textile Italian SMEs very typical for made in Italy.

The research is in progress because the final aim is to test the CCC for the defaulted textile company for some suggestions about the relevance of using the CCC to avoid or to reduce business insolvency.

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