Cash conversion cycle across industries

Airlines *versus* fast-moving consumer goods industry

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ABSTRACT

The purpose of this research is to assess whether the Cash Conversion Cycle differs between industries, by looking at Days Inventory Outstanding, Days Sales Outstanding and Days Payables Outstanding. This research provides an overview of Cash Conversion Cycle in two different industries and discusses how each component influences Cash Conversion Cycle. It uses a sample of 172 data points (43 firms) from multinational companies operating worldwide. Based on data retrieved from Bloomberg and from the annual reports of 23 Fast-Moving Consumer Goods companies and 20 major airline companies, a univariate and bivariate (correlation) analysis was done. The analyses for both industries cover four years, from 2009 to 2012, a time span that includes a period of economic downturn. The findings suggest that Cash Conversion Cycle differs between industries. It also differs depending on the size of the company. While its components – Days Inventory Outstanding, Days Sales Outstanding and Days Payables Outstanding – directly affect Cash Conversion Cycle, there are also other factors at play, such as inventory costing system, bargaining power with suppliers and customer credit policies. The economic downturn, and particularly the specificities of each industry make this overview relevant. The research addresses managers who should take Working Capital Management decisions, which can extend or reduce Cash Conversion Cycle, as it contributes to a better understanding of how the size of a firm, its inventory system, liquidity, and payables are associated to the Cash Conversion Cycle and consequently affect companies' profitability.

Keywords: Cash conversion cycle; Days inventory outstanding; Days payable outstanding; Days sale outstanding, Working capital management; Airlines; Fast-moving consumer goods.

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1. Introduction

Working Capital Management (WCM) is a strategic priority for generating cash. It can prevent liquidity shortage through efficient inventory, receivables management and timely discharge of liabilities (Shin & Soenen, 1998). This is mainly affected by the Cash Conversion Cycle (CCC), which is a key factor for successful WCM. In the past, these two concepts have been of paramount importance due to economic and financial challenges, such as banking crises (Fukuda et al., 2007; Chen et al., 2022). Cash has been harder and harder to obtain and, as a result, companies are managing working capital to be able to extract Cash from their balance sheets instead of seeking it from external financing. By managing this capital, looking particularly at the CCC, companies are able to negotiate payment terms, trade credits and the optimal inventory they should have in order to fulfil their requirements. This obviously impacts on *liquidity* and, moreover, on *profitability*, in terms of individual ratios and general results per industry. So, how do industries differ from each other in terms of the Cash Conversion Cycle? Does CCC impact on profitability? Are some specific characteristics of a company and its particular industry in general associated to CCC?

Cash Conversion Cycle is normally defined as a metric that expresses the length of time that it takes for a company to convert resources into cash flows. The CCC may have a negative impact on a company's profitability and liquidity, as shown in many works (Christopher & Kamalavalli, 2009; Deloof, 2003; Lazaridis & Tryfonidis, 2006; Padachi, 2006; Shin & Soenen, 1998; ; Uyar, 2008 and many others). However, there is no consensus in the main results of previous literature on the subject regarding the direction and intensity of the association and even whether such a relationship exists.

Thus, the purpose of this research is to assess whether the Cash Conversion Cycle differs between industries, by looking at its components: Days Inventory Outstanding, Days Sales Outstanding and Days Payables Outstanding. This research provides an overview of CCC in two different industries, based on a sample of 172 data points (43 firms). Twenty-three companies belong to multinational Fast-Moving Consumer Goods companies and the remaining 20 companies are major airlines operating worldwide. Data was retrieved from Bloomberg and from the annual reports, and a univariate and bivariate (correlation) analysis was performed. The analyses for both industries cover four years, from 2009 to 2012, a time span that includes a period of economic downturn. The findings suggest that Cash Conversion Cycle differs between industries. These two industries are similar in that they have low levels of CCC, however such levels are the result of quite different characteristics and Working Capital Management decisions, thus each CCC component contributes in a different way for liquidity of a Fast Moving Consumer Goods (FMCG) company or an airline.

The two industries have been studied in the past, but previous literature on CCC has not yet analysed these two industries on a comparative basis. The comparison can provide evidence of concerns regarding CCC for these two types of industries, and the discussion addresses managers by bringing to their notice how Working Capital Management is sensitive to the specificities of the industry, and how liquidity and profitability can improve, given the association between CCC, and its components, to profitability, proxied by Operating Income.

The research addresses managers making Working Capital Management decisions, as they can extend or reduce Cash Conversion Cycle. This paper contributes to a better understanding of how the size of a firm, its inventory costing system, liquidity, and payables are associated to CCC and consequently affect companies' profitability.

This paper is organized as follows: Section 2 provides definitions of ratios and metrics that are key to the analysis of CCC, reviews the empirical research on the topic and highlights the relevant findings in previous papers. Section 3 introduces the research questions. Section 4 outlines how the sample was selected, and the data collected, and the methodology used to obtain the final results. Section 5 presents univariate data analysis. Section 6 presents bivariate data analysis and interprets the findings. Section 7 is the conclusion, showing the limitations of the paper, along with suggestions for future researchers.

2. Literature review

2.1. Key concepts

Cash Conversion Cycle (CCC) is a key concept, measuring how quickly a company can convert inventories into cash through sales. It is the sum of Days Sales Outstanding (DSO) and Days Inventory Outstanding (DIO) minus Days Payable Outstanding (DPO).

Cash Conversion Cycle can be expressed in number of days, but it is also possible to calculate it in months.

$$CCC_t = DIO_t + DSO_t - DPO_t \ [1]$$

Figure 1 illustrates the concept of CCC.

Figure 1. Cash Conversion Cycle
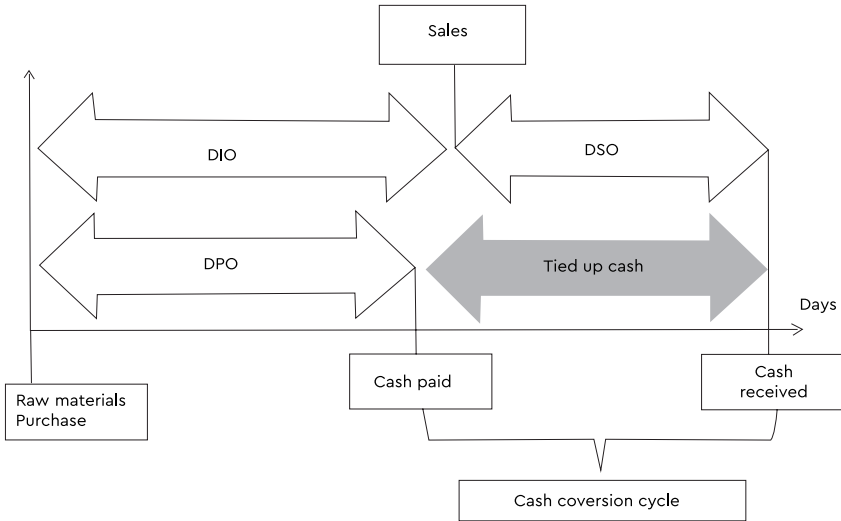
Source: Rehan (2012)

DSO is the average number of days a company takes to collect cash after the sale of the merchandises, products or services provided. A low DSO means the company collects receivables in a relatively short time. DSO measures how effective the company is in obtaining cash. The DSO ratio is calculated as follows:

$$DSO_t = \frac{Average\ Accounts\ Receivables\ during\ period\ t}{Sales\ during\ period\ t} \times 365\ days \quad [2]$$

DIO shows how long a company takes to convert its inventory into sales. Low values of DIO are the ideal for a company. Inventories must be kept at a level where sales are not lost because of stockout. DIO depends on the industry. For example, supermarkets selling fruit usually have low inventories, while companies in the automobile industry have large amounts of stock. It should be noted that DIO ratio varies with the inventory measurement system in use, either FIFO, LIFO, or the weighted average cost inventory basis.

$$DIO_t = \frac{Average\ Inventories\ during\ period\ t}{Cost\ of\ Goods\ sold\ during\ period\ t} \times 365\ days \quad [3]$$

DPO is the average number of days a company takes to pay the supplier in cash after the acquisition of a raw material, a merchandise, or a service. A low DPO means there is a long time between the purchase and the payment, which gives the company extra liquidity. This ratio varies from industry to industry. DPO depends on the duration of the operating cycle, that is the length of time in transforming raw material into finished goods. For example, the payment for a project in the construction industry is expected to take a long time, whereas a transaction in FMCG is speedy.

$$DPO_t = \frac{Average\ Accounts\ Payables\ during\ period\ t}{Cost\ of\ Sales\ during\ period\ t} \quad x\ \ 365\ days \quad [\,4\,]$$

It is generally expected that CCC will differ between industries, given the divergence in its components.

DSO depends on Sales or services rendered, credit agreements and discounts. In FMCG and in the airline industry customers tend to pay at once, therefore this ratio does not vary much between either industry.

DIO depends on the size of the inventory and how it is measured. In the airline industry, inventory levels are very low. On the contrary, inventory levels represent a high percentage of the total assets of FMCG companies. As can be seen, inventory levels vary widely depending on the industry. These differences will obviously have a bearing on the CCC levels, hence the divergence in ratio values between FMCG companies and the airline industry. DIO not only varies depending on the quantity of stock, but also on the accounting choice, i.e., how inventories are measured, FIFO (First In First Out), LIFO (Last in First Out) or the weighted average cost of acquisition or production.

DPO depends on decisions on the purchase of merchandises and raw materials, and suppliers' conditions and discounts on offer. FMCG companies' have a high bargaining power with suppliers, as the former have a large part of the total billing of the latter. Furthermore, the three components of CCC are affected by the level of activity as well as business seasonality.

2.2. Empirical research
There has been some research in the field of Working Capital Management and how it influences Cash Conversion Cycle, Profitability and Liquidity. Table 1 provides a summary of the relevant research.

Table 1. Literature review of the impact of CCC on profitability

	Gross Operating Income	Return on Assets
Significant negative linear	• Deloof (2003) only a significant negative effect. • Lazaridis and Tryfonidis (2006) for firms listed on the Athens Stock Exchange. • Enqvist et al. (2014) for Finnish companies.	• García-Teruel and Martínez-Solano (2007) for Spanish SME. • Yazdanfar and Öhman (2014) for Swedish SME. • Enqvist et al. (2014) for Finish listed firms. • Chang (2018) for a global sample.
Significant positive linear	• Gill et al. (2010) for US listed manufacturing firms.	• Chang (2018) for US firms. • Lyroudi and Lazaridis (2000) for Greek major companies of food and beverege
Insignificant linear		• Chang (2018) for German firms.
Significant Non-linear	• Banos-Caballero et al. (2012) found a concave influence for Spanish SME. •Yilmaz and Acar (2019) for non-financial Omani companies.	• Yilmaz and Acar (2019) for non-financial Omani companies.

Lamberson (1995) analyzed how small companies respond to changes in the levels of economic activity in the period 1980-1991 and did not find noticeable changes during downturns. In contrast, Gonçalves et al. (2018), based on a sample of UK unlisted companies for the years 2006-2014, found that the conditions of economic cycle stress the positive impact of WCM efficiency on profitability, especially during economic downturns. They concluded that WCM is part of overall corporate financial strategy.

PwC's annual global working capital study highlights that "within any given region around the globe there are wide variations in working capital performance, reflecting differences in market maturity, legislation and cash focus." PricewaterhouseCoopers (PwC, 2019, p.20).

An optimal WCM influences profitability of the companies (Gill, Bigger & Mathur, 2010) through the focus on key drivers of performance, leveraging technology to achieve optimal levels as well as applying EU directives (PwC, 2012). Banos-Caballero et al. (2010) found that small and medium firms "have a target CCC length to which they attempt to converge and that they try to adjust to their target quickly." (Banos-Caballero et al., 2010 p. 511).

Shin and Soenen (1998) conclude that managers can create value to shareholders by reducing CCC to a reasonable minimum, and that it also has a negative relation with profitability of companies. The study was done on 30 firms listed in the Nairobi Stock Exchange between 1975 and 1994. Similarly, Deloof (2003) found a negative relation between CCC and profitability due to the fact that smaller and less profitable firms

take longer to pay their bills (Garcia-Solano & Martinez-Teruel, 2007) and have less cash to lend to customers and consequently lower accounts receivable which results in higher profitability (Fukuda et al.,2007). Deloof tested this using a sample of 1009 large Belgian non-financial firms for a period of five years. Likewise, Lazaridis and Tryfonidis (2006) concluded that Greek listed companies took advantage of the financial debt in order to decrease CCC and so increase their profitability. WCM and Profitability are correlated across all the industries. Fillbeck and Krueger (2005) found that WCM measures differ between industries and that they are not static over time. These authors' conclusions are based on a sample of 1,000 companies from different industries during a four-year period of analysis.

Concentrating solely on Fast Moving Consumer Goods, Bagchi and Khamrui (2012) conclude that CCC and debt used by the firm are negatively associated to a firm's profitability. They argue that in order to improve this, firms should manage their working capital in more efficient ways. Their study is based on 10 FMCG companies in India for a period of 10 years. As for Portugal, to the best of our knowledge there is only one study on FMCG industry in Portugal (PwC, 2012), which was only a part of a simultaneous analysis of Portugal and Spain. Therefore, the difference in the market size of each Iberian country, which would influence CCC in each country, was not taken into account. The PwC (2012) study concludes that the Iberian Peninsula has one of the lowest values in Days Working Capital (on average) with the retail industry having the lowest value and the pharmaceutical industry having the highest value. The Days Sales Outstanding and Days Payable Outstanding observed in the Iberia countries do not differ very much from the Italian ratios.

Days Inventory Outstanding in Portugal and Spain ranks between the Nordic countries and Germany. Even though DPO is directly related to a lower CCC a higher DSO and DIO implies a higher number of days in collecting cash. Consequently, Iberian companies tend to be less liquid and make less profit. There is little literature regarding the airline industry and WCM apart from a book about the foundations of airline finance which deals in particular with WCM in the airline industry (Vasigh et al., 2010).

This paper aims to study CCC and understand how it differs between industries. It also analyses how specific components impact the overall CCC in those industries, and how they can contribute to differences in CCC. Noting a void to be filled as to research on CCC and its relationship to various industries, this research adds to the literature a comparison between FMCG and airlines. These two industries have been chosen since a comparative CCC analysis would provide insights to managers in view of improving Working Capital Management decisions, and thus liquidity and profitability, although given their nature these industries may differ *a priori* regarding CCC components.

3. Research questions

This research provides an overview of Cash Conversion Cycle (CCC) in two different industries and discusses how each component influences CCC. The purpose of this research is to assess whether the Cash Conversion Cycle differs between industries, by looking at Days Inventory Outstanding, Days Sales Outstanding and Days Payables Outstanding. A negative relationship between Cash Conversion Cycle and profitability is expected. There is an analysis of CCC over a period of years as well as between the two industries. There is also a focus on the relationship between CCC and some variables such as the profitability, size, accounting inventory valuation model, payables, liquidity, and the industry. In order to obtain an insight and understand CCC. six research questions (RQ) were formulated:

RQ1: *Is CCC related to company profitability?*

A longer period of time is analysed in this research, including a diversity of related variables and a wide range of companies. In this, it differs from any other studies that may have been done about the same topic. Profitability is proxied by Operating Income since this is the only measure of profitability common to both industries.

RQ2: *Is CCC related to the size of the company?*

Do larger companies necessarily have a lower CCC? In general, size can be measured in three different ways: by the Average number of employees, by Sales or by Total assets. Total Assets are less volatile than Sales, the latter being greatly affected during 2008 and 2009 due to the economic downturn. The fleet size, each playing a different role in an airline's operational activities in order to achieve parity in comparisons, Total assets was taken as proxy for size.

RQ3: *Does the inventory costing system impact CCC?*

Accounting choice implies financial reporting differences. One area where these differences can happen is in the valuation of inventory, which is part of CCC. As stated in accounting regulation, inventories can be measured according to several valuation criteria. Three common inventory valuation criteria are the weighted average cost, Last-In-First-Out (LIFO), and First-In.First-Out (FIFO). Under the weighted average cost measurement, cost of inventory is based on the average cost of the goods available for sale during the period. Nowadays, LIFO is not generally very common in Europe as International Accounting Standard (IAS) 2 does not allow its use. During periods of inflation, LIFO results in lower profits and inventories becoming understated in terms of replacement costs related to exercise period. On the other hand, FIFO results in higher reported profits and

higher income taxes. Inventory valuation can thus be biased during inflation or deflation times. Despite, requiring inventories to be measured either at the lower cost or net realizable value, IAS 2 outlines three methods for cost calculation. These are FIFO, weighted average cost, and specific cost.

This research question is only answered for the FMCG industry because in airlines the inventory is not relevant due to the nature of the business[4]. Another assumption is that DIO is measured through Sales since there is a 93% correlation in FMCG and 80% in airlines between DIO measured through Sales and DIO measured through COGS. This avoids a biased result, mainly in the airline industry where it is very hard to estimate COGS, yet a non-important item in the industry.

RQ4: *Do payment terms to suppliers affect CCC?*

During economic recessions, payment terms tend to be extended due to lack of liquidity and profitability of entities. In airlines, fuel is the main raw material bought from suppliers and its price fluctuations may vary greatly from the norm. This can and has been avoided through fuel hedging contracts, fixing the prices of fuel via swaps or options reducing the exposure to volatility of fuel prices. There is a negative relationship between days of accounts payable and profitability (Deloof, 2003), but does this impact the length of CCC?

RQ5: *Does more liquidity mean more profitability for companies (via a low CCC)?*

Liquidity and profitability are related through CCC, i.e. liquidity is impacted by Cash Conversion Cycle, as the faster a company takes to collect cash from customers and inventories on sales and pay its suppliers, the more liquidity it has. At the same time, as the amounts of available cash increase, so does profitability since the company has more resources available to invest in itself.

RQ6: *Does CCC length differ between industries?*

Specific characteristics of each industry can affect CCC components such as DIO due to the huge differences in inventory that represents a big slice of retailers' assets. DIO, however, has little or no relevance in an airline's balance sheet.

To answer this research question, compels a comparison between both industries, FMCG and airlines, and therefore observe how they differ from each other and why.

4. Methodology

4.1. Sampling
The research is based on a sample of multinational companies from FMCG and the airline industry, for the period of 2009-2012. The criteria for selecting companies to the sample were size, proxied by total assets in the last year of the period of analysis, as well as being listed, since they require more strict presentation and disclosure of financial information and audits, and so information is more reliable.

Convenience sampling is "perhaps the best way of getting some basic information quickly and efficiently" (Sekaran, 2004. p. 277).

In the initial sample, companies of the FMCG and airline industry were selected from Blomberg, thus companies which were not included in the Blomberg database were out of the sampling process. This means that the findings from the study of the sample cannot be confidently generalized to the population (Sekaran, 2004, p. 276).

The analyses for both industries cover four years, from 2009 to 2012. This time span includes a period of economic downturn, and this will allow understanding of whether there are any effects of the economic recession on the CCC length.

Regarding FMCG, it is a very competitive industry. More and more, companies feel the need to improve and innovate within this industry: multi-channel distribution, online customer engagement and advertising activity are key factors to retain and attract new customers. The whole industry is customer focused and therefore it is an extremely high-value industry specially in the U.S. The global FMCG market size was valued at $11,490.9 billion in 2021 and is projected to reach $18,939.4 billion by 2031, registering a CAGR of 5.1% from 2022 to 2031 (Seehttps://www.alliedmarketresearch.com/fmcg-market).Even though growth has slowed, it still benefits from gross margins and strong balance sheets.

In FMCG the final sample is 23 companies. The initial sample consisted of 40 listed companies (see Appendix 1 and Appendix 3). However, 17 companies were excluded from the sample, 12 due to lack of information and 5 because they had been acquired by a group. The final sample in the FMCG industry includes 23 companies with 92 data points (which cover four years).

Not only is FMCG analysed, but also the airline industry. The airline industry nowadays is highly competitive, being characterized by low profit margins and a heavy cost-structure in terms of fixed costs. The expenses of an aircraft flight do not vary significantly with the number of passengers and a simple variation in pricing or in the number of passengers can have a disproportionate effect on

an airlines financial result. In addition, this industry is very tough in terms of competition, while it is very susceptible to discount prices because without these, this will result in losses due to unsold seats.

The airline industry is almost unique since it is very conservative regarding the data availability and its classification on General Ledger (G/L) accounts which differs from what is standardized, such as in COGS which is very hard to define in this industry's case. It is important to note that in the airline industry there are three main alliances to which airline companies belong with the aim of cooperating to reduce costs, share flights, improve services, and provide a higher range of flights to its customers: they are Star Alliance, Skyteam and Oneworld.

It is also worth noting that airlines have a contractual instrument to mitigate their exposure to fuel price volatility. It consists of establishing fixed prices, so even when the fuel price decreases, the company must pay the fixed price regardless of the market price. This procedure can even be a source of revenue rather than a cost, i.e. if an airline buys a fuel call option and the fuel price increases, the company will get a return on the option that offsets their actual cost of fuel. On the other hand, if the price of fuel decreases, the company will not receive the return on the option.

The initial sample of companies in the airline industry comprised 44 companies (see Appendix 2 and Appendix 4). Seven companies are now part of a group while another 16 airline companies were excluded due to lack of information. In the case of Japan Airlines, the company underwent restructuring during the period of analysis, as a consequence of the economic downturn. Therefore, the final sample for this industry has 20 companies with 80 data points.
The final sample is compounded of 172 data points (43 firms) from multinational companies operating worldwide.

4.2. Variables
Based on data retrieved from Bloomberg for 23 Fast-Moving Consumer Goods companies and 20 airline major companies.

The variables in the database are numerical and categorical. The former includes CCC, and its components, DIO, DSO and DPO, and Operating profit, taken as the proxy for profitability, as well as Total Assets, Annual Sales, Cost of Goods Sold, Receivables, Payables, and Inventories. Categorical variables are Inventory costing system, year of analysis, Industry, this later a dichotomic variable. All these variables, CCC and its components, DIO, DSO and DPO, are calculated for each company in the sample. This paper considers the exchange rates observed on December, 31st of each year. Size is proxied by Total Assets. For both industries,

descriptive statistics such as minimum, maximum, mean and standard deviation help to get a first insight of the data. Furthermore, correlation coefficient is calculated, and tested for a 5% level of significancy, both for the whole sample and for all the companies in both the industries analysed.

To better understand whether inventory valuation is associated to CCC through Inventories and DIO (RQ 3), the inventory valuation criteria for each company was retrieved from the annual reports in FMCG for the year 2012.

Along with data retrieved from Bloomberg, data was also obtained from annual reports of the majority of the companies. This was particularly so in variables for which Bloomberg did not have available data, such as Cost of Goods Sold (COGS). Data collected from databases was matched with the financial reports available in the websites for companies' validity purposes. The resultant database thus created could well be a contribution for future research to be used with the whole data on the two industries 3,258 data points.

5. Data analysis

5.1. Size
Figure 2 shows the distribution of the sample by size group and Table 2 presents the sample breakdown by industry and company size. In the database, code zero is assigned to FMCG industry while 1 stands for the airline industry.

Table 2. Sample breakdown by industry and companies' size

Category Code	Total Assets	FMCG	Airlines	#
1	Above 50K USB	7	0	7
2	Between 5K-50K USD	11	12	23
3	Between 1K-5K USD	3	9	12
4	Below 1K USD	2	0	2
# Companies		23	21	44

Company size, proxied by Total Assets, was codified using a scale ranging from 1 to 4, where 1 stands for the largest ones and 4 for micro companies (a company is classified as: large when its Total Assets are above 50K USD, medium size between 5K and 50K, small size between 1K and 5K, and micro size below 1K). It was originally expressed in the local currency; it was converted from local currency to Euros to better conclude about the size and put all data in the same currency.

Figure 2. Companies' size
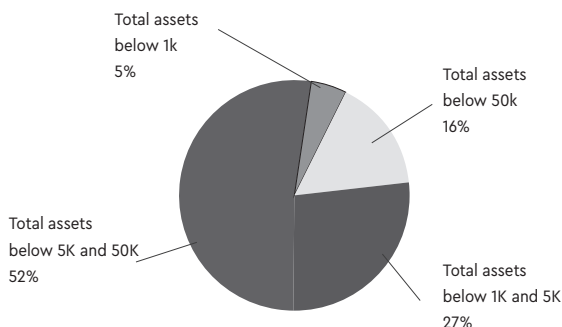
Asset Turnover shows how the Sales amount generated for every euro's worth of assets varies. In both industries the Asset Turnover (Sales / Total assets) is high. In FCMG, 48% of companies are considered medium against 30% of big companies. In part, this is due to different average size of companies in both industries. Regarding airlines, 60% of companies are medium while 40% are small.

5.2. CCC and CCC components

Preliminary results show CCC decreased for both industries during the economic recession. From 2010 to 2011, CCC decreased by 27%, on average in FMCG, and was five days shorter throughout the next year. In contrast, in airline industry CCC decreased from minus seven days to minus 11days from 2009 to 2010, an average decrease of 58%. In 2012, CCC decreased even further, by 19%. Regarding each CCC component *per se* and how it influences CCC, it is important to note that the components differ a lot from one industry to another.

Descriptive statistics were calculated for average, median, minimum, maximum and standard deviation (See Table 3). This type of analysis is done for each industry individually.

Table 3. Descriptive statistics of CCC and CCC components

(in days)	FMCG				Airlines			
	DSO	DPO	DIO	CCC	DSO	DPO	DIO	CCC
Average	45	106	36	-24	26	74	10	-38
Median	41	90	32	-12	26	26	9	-9
Minimum	20	35	19	-257	4	2	0	-311
Maximum	84	317	135	96	66	396	38	41
SD	14	58	22	65	13	96	8	86

Cash Conversion Cycle in the FMCG industry is negative. On average CCC is minus 24 days, meaning that companies in this industry collect from customers before paying to suppliers, but after converting inventories into units sold. Therefore, it can be inferred that, on the whole, companies in the FMCG industry are using their working capital in an efficient manner. One reason that may explain this result could be only big companies with high bargaining power among their suppliers being in the sample, and so credit to them is extended. The nature of the industry would *per se* explain this, as normally FMCG customers pay immediately, and therefore Receivables are set at an average of 10% Total Sales.

During the crisis period of 2009-2010, companies took 24 days to collect money. The CCC stood at negative values (in days) since, as stated before, companies collected from customers in a shorter time when compared to the deadlines given to pay suppliers and to convert inventory into sales. This was even better than in the post crisis period because FMCG industry unlocked liquidity by reducing receivables and inventories (due to a decrease in Sales) and extending payables. In FMCG, all CCC components decreased in 2009-2010, as shown in Table 4. Between 7% and 10% for the DSO and other components respectively, and a 16% decrease in CCC overall, that is, a CCC two days shorter. In the subsequent periods all variables increased.

Table 4. Annual changes in CCC and CCC components in FMCG

Year	CCC	DPO	DSO	DIO
2009	-	-	-	-
2010	0.16	0,1	0.07	0,1
2011	-0,27	-0.08	-0.02	-0.01
2012	0.01	-0.02	-0.01	-0.03

Descriptive statistics, such as minimum, maximum, and standard deviation have been calculated, the minimum CCC in FMCG being minus 257 days and the maximum 96 days, as shown in Table 3, above.

This could be explained by the bargaining power huge companies have in relation to smaller ones. Standard deviation is also a measure that should be taken into account, as an indicator of variability within industry CCC. In FMCG this is on average 65 days.

Regarding the airline industry, CCC for each of the four years of the period analysed, is on average negative, with the maximum 41 days, and a standard deviation of 86 days.

In 2009-2010, the airline industry despite the variation in DPO being so large (21%) and DSO and DIO decreasing, the overall CCC decreased. Table 5 shows the

changes in CCC and CCC components in airlines. The largest variation was in CCC from 2011-2012, decreasing by 19%.

Table 5. Changes in CCC and CCC components in airlines

Year	CCC	DPO	DSO	DIO
2009	-	-	-	-
2010	58%	21%	-7%	-5%
2011	-3%	-4%	-4%	-5%
2012	-19%	13%	-6%	-4%

Regarding the sample, higher values of payables and receivables are expected during the first two years of analysis. The opposite is expected for Sales and Cash during the same period. The CCC should behave as the highest variation of each of its components.

6. Bivariate analysis

Bivariate analysis stands for the analysis of two variables in order to obtain empirical evidence of whether a relationship exists between variables and then determining the magnitude and direction of the relationship between them. For each specific research question a correlation analysis was done.

The correlation coefficient tells you how much one variable changes when the other one does. It provides a linear relationship between two variables, which can be positive or negative. Appendix 5 presents the correlation coefficients for the FMCG and Appendix 6 shows the correlation coefficients for the airlines.

6.1. Is CCC related to company profitability (RQ1)?

CCC and profitability are negatively correlated in both FMCG and airlines, showing a significant impact on profitability. In the case of FMCG, CCC correlates to profitability at a value of minus 14% (p-value = 0.000261; confidence level=95%), That is, the longer it takes companies to collect cash from its operations, the less profitable they are. Within FMCG, this could be explained mainly through payables, since DPO is the variable that most influences CCC in this industry. Likewise, in airlines CCC correlates negatively with profitability, at minus 31% (p-value=0.0013; confidence level=95%). Just like in FMCG, this would be explained through DPO, the component with highest influence (in number of days) on CCC as a whole. Payables are very important in this analysis since there is a negative relation between them and profitability because less profitable firms wait longer to pay suppliers' bills and inventory remains much more time within the warehouse due to the low level of sales.

Several authors, such as Deloof (2003) and Rehn (2012) and Shin and Soenen

(1998), studied the question of how WCM affects profitability. More specifically, Rehn (2012) researched on how CCC affects Finnish and Swedish companies' profitability.

It was found that WCM and profitability are correlated, and managers can create value for shareholders by reducing CCC to a reasonable minimum.

6.2. Is CCC related to the size of the company (RQ2)?

There is a negative correlation between the length of CCC and company size in both FMCG and airline industries. The larger the company, the less time it takes to collect cash from its operations. This is due to the bargaining power big companies have with suppliers and their high level of sales during the period analysed. In FMCG, on average, a 7% decrease in CCC length corresponds to an increase in company size, proxied by Total Assets, while in airlines, the former will diminish by 40%. In FMCG the two variables are negatively correlated by 27% (p-value = 0.01, with confidence level set at a 95%), while in airline industry this stands by 63.2% (p-value = 0.04; confidence level = 95%). These results are in line with Uyar (2008) who concludes that there is a negative relationship between the length of CCC and firm size. These results are due to the fact that total assets represent a huge part of the airline's balance sheet, as opposed to the impact of a high level of inventory in FMCG. The former fact is because airplanes carry such a weight within tangible fixed assets in airlines, and thus total assets.

6.3. What is the impact of the inventory costing system on CCC (RQ3)?

Companies may choose which inventory costing system to use. Regarding measurement, this will make a difference in their financial reporting. This analysis is only relevant for FMCG, given that the airlines inventory is almost zero. Figure 3 shows the inventory costing system used by FMCG companies in the sample.

Figure 3. Inventory costing system - FMCG
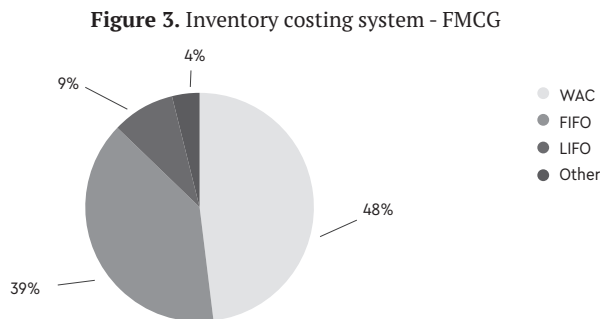
With LIFO, the inventory values are higher, with an average of 190 days. On the other hand, FIFO companies show the best CCC score with -71 days. This happens because LIFO overstates the value of inventory in terms of replacement costs

during recession periods (2009-2012), influencing DIO and therefore, increasing CCC levels. Therefore, income will be higher in contrast to FIFO, where there is a lower profit and lower income taxes. Thus, the choice of inventory costing systems impacts CCC regardless of whether there is a boom or a recession.

6.4. Does payment terms to suppliers affect CCC (RQ4)?

The amount of time taken to pay suppliers increased during the period of economic downturn. Big companies have a great bargaining power with suppliers, especially when it comes to multinationals companies, and within FMCG industry. Likewise, companies with lower profitability show larger payment periods particularly during downturns. This was the conclusion reached in the research done by Bernardo (2013) and Ganso (2013).

Payables are highly correlated to CCC in both industries, showing a negative correlation coefficient of -54% in the FMCG and -92% in the airline industry (with extremely low p-values for a 95% confidence level). The longer a company takes to pay suppliers, the less time it takes to collect cash from its operations (self-financing). Payables influence CCC via Days Payable Outstanding, which on average account for 79% and 96% of CCC in FMCG and the airline industry respectively. In the airlines payables account for 83% of CCC, while in FMCG they only account for 28%.

6.5. Are companies with higher liquidity more profitable (via a low CCC) (RQ5)?

There is, effectively, a positive correlation between liquidity, proxied by cash, and profitability, measured by operating income. In FMCG this correlation is around 72% while in airlines it is 21%. This can be explained by airlines having, on average, less liquidity, due to its major assets being fixed tangible. P-values and ANOVA tables have been calculated for the two industries. In FMCG, 51% of profits are in cash in hand (r square values) (p-value = 0.000454). In airlines, only 4% of profitability is down to cash, with the remainder coming from fixed assets turnover, the main driver of airlines profitability.

Due to its reliance on aircrafts, the airline industry shows high fixed assets on the balance sheet and thus heavy fixed costs. Moreover, the enormous capital intensity of the airlines demands external financing, thus resulting in high debt ratios and increased financial risk (Vasigh et al., 2010).

These results are not in line with the conclusions of Bhunia, Bagchi and Khamrui (2012), who researched 50 small medium Indian private companies from the steel industry. They concluded there is a relationship between WCM and profitability and that liquidity and solvency are important regarding the financial position of the company, although liquidity does not seem to have an impact on profitability.

6.6. Does CCC length differ between industries (RQ6)?

Once CCC is constituted by DPO, DIO and DSO, and since the weight of each component varies depending on the industry, CCC will also vary from industry to industry. Airlines typically rely heavily on fixed tangible assets, while FMCG are more inventory-oriented. In the latter industry, liquidity measures such as Cash are abundant while in the former it represents no more than 10% of Total Assets.

CCC differs not only across industries but also with time. As shown in Figure 4, 2010 was the best year for both industries when the CCC length was lowest. It is worth noting that having an extremely low CCC does not necessarily mean an optimal performance for a company. As Rehn (2012) concludes, working capital cannot be reduced to a minimum without the company being compromised. There is a permanent need for optimization, as suppliers could be lost because of over-long payment extensions. Furthermore, reducing too much credit to customers can make these latter to move to the company's competitors. Fillbeck and Krueger (2005) also agree that significant differences develop between industries over time. They found that food stores and food services have the lowest DSO and a quick inventory turnover while having a high bargaining power with suppliers.

Figure 4. CCC per industry along time (2009-2012)

Evolution of Cash Conversion Cycle
FMCG versus Airline Industries
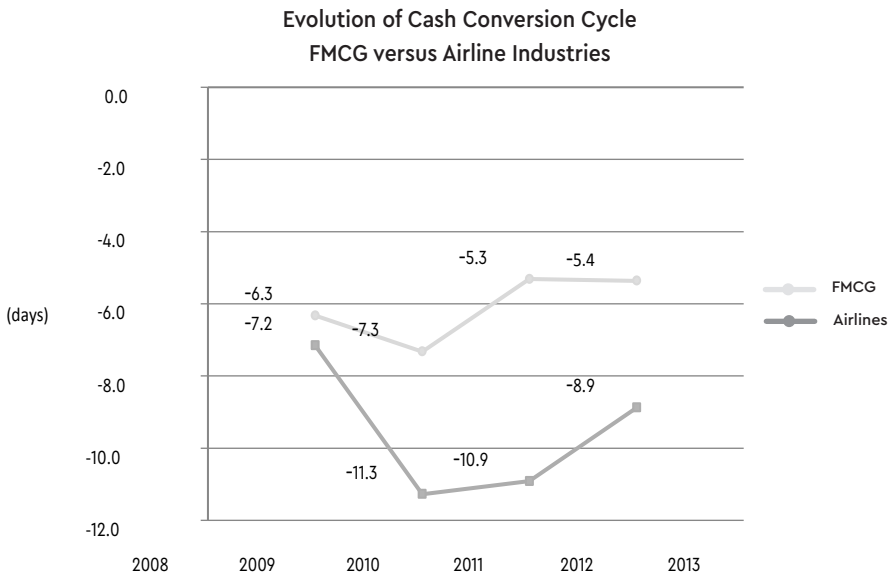
Summing up, CCC differs between industries not only due to their nature but also depending on the way each company manages each variable that constitutes CCC: payment to suppliers, inventories, receivables, and sales, as can be seen in Figure 5 and Figure 6. In addition, these factors also vary, not just with the nature and the management of each specific industry, but also depend on the state of the economy.

Figure 5. CCC and CCC components in FMCG industry
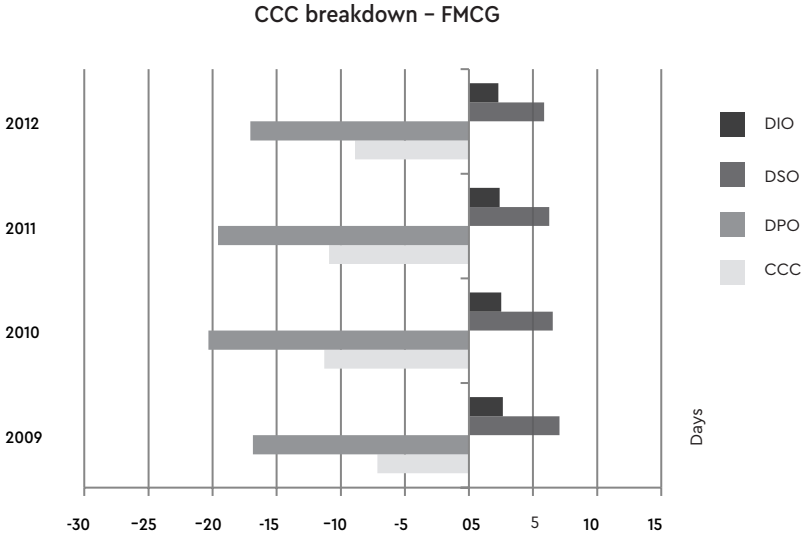
Figure 6. CCC and CCC components in airlines
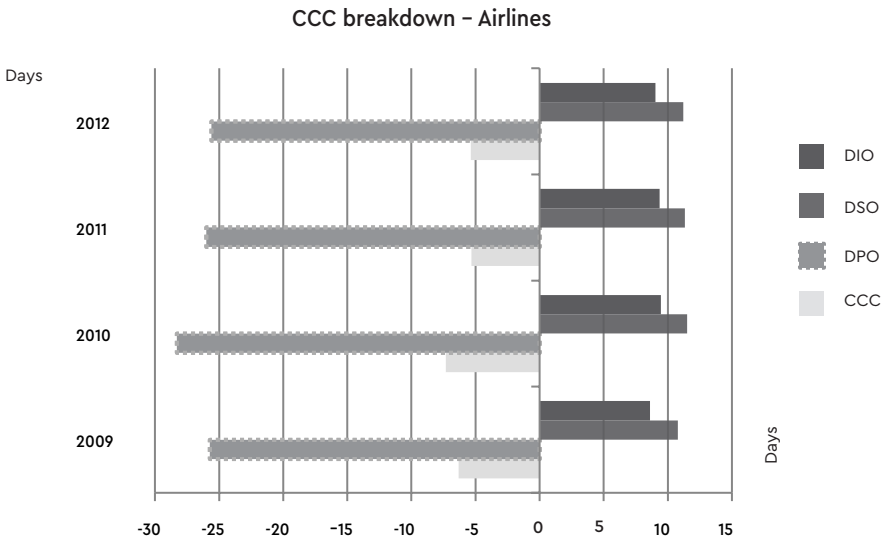
7. Conclusion

This research provides an overview of Cash Conversion Cycle in two industries, Fast Food Consumer Goods and airlines, and discusses how each component influences CCC. While these components – DPO, DSO and DIO – directly affect CCC, there are also other factors at play, such as inventory costing system, bargaining power with suppliers and customer credit policies. The recent economic downturn, and particularly the specificities of each industry make this overview relevant.

The main findings are that CCC varies between industries, with this research contributing to a better understanding of how variables such as size, inventory costing system, liquidity and payables are related to CCC and CCC components, and on companies' profitability.

Although all the topics mentioned above have been carefully looked at, some details have been excluded from this analysis. Details such as value added tax (VAT) and income taxes were omitted, as were discount policies and seasonality of sales. While seasonality of sales was not included, some care was taken to avoid, for example, the use of Sales to characterize the size of a company.

Another limitation of this study regards the COGS in airlines, as in general they are not calculated for any particular company since the most common measure to define the profitability per sale is the Cost per available seat mile (CASM).
Another aspect is that companies with many exports and imports to countries with different currencies may face differences in CCC due to gains or losses in exchange rates. These limitations could be of use to further research in this area, in order to understand how each variable impacts results.

The paper focused on two industries, and only analysed data from the airlines and Fast-Moving Consumer Goods industry. Given that CCC differs among industries, it could be of interest if future research extended to other industries, whose specific characteristics differ from the two analysed in this paper.

The results obtained are limited to a sample of 47 data points per year. The full sample of 172 data points is also relatively small, which may influence the results. Future research should expand the analysis to a larger sample of companies, and additional periods. It would be interesting to see, for example, how these and other industries have developed after the COVID-19 pandemic.

Regression analysis, alternative profitability proxies and diverse formulas of CCC components (e.g., VAT issue) should also be covered. It would ensure the robustness of this paper's findings for the FMCG and airline industries.

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APPENDICES

Appendix 1. Initial and Final Sample of FMCG Industry (by alphabetical order)

#	Company	Name Reason for Exclusion	In Final Sample?
1	Anelor SA	Owned by L'Oreal Group	
2	Anheuser-Busch InBev		Yes
3	Beiersdorf		Yes
4	Body Shop International	Owned by L'Oreal Group	
5	Britvic		Yes
6	Cadbury Schweppes	Owned by Kraft Foods	
7	Carlsberg		Yes
8	Clorox		Yes
9	Coca-Cola		Yes
10	Colgate-Palmolive		Yes
11	Coty Manufacturing	Lack of Information	
12	Danone		Yes
13	Diageo		Yes
14	Domestic & Genera	Lack of Information	
15	Estee Lauder Cosmetics		Yes
16	Fujifilm Electronic Imaging	Lack of Information	Yes
17	General Mills		Yes
18	Gillette UK	Owned by P&G	
19	Heinz		Yes
20	Helena Rubinstein	Lack of Information	
21	InBev	Owned by AB InBev	
22	Kimberly-Clark		Yes
23	Kraft		Yes
24	L'Oreal		Yes
25	Lego	Lack of Information	
26	Lever Faberge	Lack of Information	
27	Grupo Mars	Lack of Information	
28	Nestlé Yes		Yes
29	Northern Foods		
30	Pepsi		
31	Procter & Gamble		Yes
32	Reckitt Benckiser		Yes
33	Red Bull	Lack of Information	
34	Revlon International Corporation		Yes
35	Roche Products UK		Yes
36	Sara Lee	Lack of Information	
37	Unilever		Yes
38	United Biscuits	Lack of Information	
39	Warburtons	Lack of Information	
40	Sumol + Compal		Yes

Appendix 2. Initial and Final Sample of the Airlines (by alphabetical order)

#	Company	Name Reason for Exclusion	In Final Sample?
1	Singapore Airlines		Yes
2	Malaysia Airlines		Yes
3	Virgin America	Lack of Information	Yes
4	Asiana Airlines		Yes
5	Qatar Airways	Lack of Information	
6	All Nipon Airways	Lack of Information	
7	Garuda Indonesia		Yes
8	Korean Air Yes		Yes
9	Air New Zealand		Yes
10	Cathay Pacific		Yes
11	South African Airways	Lack of Information	
12	Turkish Airlines	Lack of Information	
13	Finnair		Yes
14	AER Lingus	Lack of Information	
15	Air France	Owned by KLM Group	
16	Japan Airlines	Restructuring	
17	Thai Airways		Yes
18	Oman Air	Lack of Information	
19	Air Astana	Lack of Information	
20	Lufthansa		Yes
21	Etihad Airways	Lack of Information	
22	Spanair	Lack of Information	
23	Egyptair	Lack of Information	
24	Swiss Intern.Airlines	Lack of Information	
25	TAP		Yes
26	US Airways		Yes
27	Emirates	Lack of Information	
28	Ryanair		Yes
29	British Airways	Owned by IAG Group	
30	Continental Airlines		Yes
31	Iberia	Owned by IAG Group	
32	Air Berlin		Yes
33	Vuelling	Owned by IAG Group	
34	KLM		Yes
35	Delta Air Lines		Yes
36	American Airlines	Lack of Information	
37	Easyjet		Yes
38	Royal Air Marroc	Owned by IAG Group	
39	Brussels Airlines	Owned by Lufthansa Group	
40	United Airlines	Owned by Continental	
41	Vietnam Airlines	Lack of Information	
42	British Midland Airways	Lack of Information	
43	China Eastern Airlines		Yes
44	Air Canada		Yes

Appendix 3. Final Sample – Fast Moving Consumer Goods Companies by Country and Size

Company Name Country	Size	Group
Nestlé	Switzerland	1
Anheuser-Busch InBev Belgium	Brazil	1
Roche Products UK	UK	1
Procter & Gamble	USA	1
Pepsi	USA	1
Kraft	USA	1
Coca-Cola	USA	1
Carlsberg	Denmark	2
Unilever Eng	Nether	2
L'Oreal	France	2
Danone	France	2
Beiersdorf	Germany	2
Reckitt Benckiser	UK	2
Diageo	UK	2
Kimberly-Clark	USA	2
Heinz	USA	2
General Mills	USA	2
Colgate-Palmolive	USA	2
Britvic	UK	3
Estee Lauder Cosmetics	USA	3
Clorox	USA	3
Sumol + Compal	Portugal	4
Revlon International Corporation	USA	4

Notes:
1 - A company is considered large when its Total Assets are above 50K USD.
2 - A company is considered medium size when its Total Assets are between 5K and 50K USD.
3 - A company is considered small size when its Total Assets are between 5K USD and 1K USD.
4 - A company is considered micro when its Total Assets are below 1K USD.

Appendix 4. Final Sample - Airlines by Country and Size

Company Name Country	Size	Group
China Eastern Airlines	China	2
Air Canada	China	2
Lufthansa	Germany	2
Cathay Pacific	Hong Kong	2
Ryanair	Ireland	2
KLM	Netherlands	2
Singapore Airlines	Singapore	2
Korean Air	South Korea	2
Thai Airways	Thailand	2
US Airways	USA	2
Continental Airlines	USA	2
Delta Air Lines	USA	2
Finnair	Finland	3
Air Berlin	Germany	3
Garuda Indonesia	Indonesia	3
Malaysia Airlines	Malaysia	3
Air New Zealand	New Zealand	3
TAP	Portugal	3
Asiana Airlines	South Korea	3
Easyjet	UK	3

Notes:
1 - A company is considered large when its Total Assets are above 50K USD.
2 - A company is considered medium size when its Total Assets are between 5K and 50K USD.
3 - A company is considered small size when its Total Assets are between 5K USD and 1K USD.
4 - A company is considered micro when its Total Assets are below 1K USD.

Appendix 5. Correlation Matrix – Fast Moving Consumer Goods

	Total Assets	Sales	Receivables	Payables	Inventories	Cash	COGS	DSO	DPO	DIO (Sales)	DIO (COGS)	CCC
Total Assets	100%											
Sales	89%	100%										
Receivables	82%	86%	100%									
Payables	85%	84%	69%	100%								
Inventories	81%	88%	84%	67%	100%							
Cash	74%	70%	66%	68%	59%	100%						
COGS	85%	97%	76%	83%	85%	63%	100%					
DSO	-14%	-27%	18%	-28%	-3%	-13%	-37%	100%				
DPO	25%	4%	7%	48%	-5%	26%	-2%	15%	100%			
DIO (Sales)	-3%	-9%	4%	-16%	36%	-4%	-10%	34%	-9%	100%		
DIO (COGS)	-9%	13%	-3%	-20%	27%	-2%	-22%	40%	1%	92%	100%	
CCC	**-27%**	**-13%**	**-1%**	**-54%**	**16%**	**-28%**	**-9%**	**19%**	**-89%**	**49%**	**39%**	**100%**

Appendix 6. Correlation Matrix - Airlines

	Total Assets	Sales	Receivables	Payables	Inventories	Cash	COGS	DSO	DPO	DIO (Sales)	DIO (COGS)	CCC
Total Assets	100%											
Sales	94%	100%										
Receivables	73%	84%	100%									
Payables	77%	86%	91%	100%								
Inventories	51%	64%	90%	69%	100%							
Cash	60%	47%	33%	43%	17%	100%						
COGS	-10%	-8%	-15%	-13%	-12%	-14%	100%					
Operating Income	45%	49%	46%	40%	53%	21%	3%					
DSO	19%	28%	67%	51%	68%	-4%	-9%	100%				
DPO	60%	72%	91%	91%	79%	31%	-30%	62%	100%			
DIO (Sales)	5%	15%	52%	28%	74%	20%	-4%	78%	47%	100%		
DIO (COGS)	32%	45%	80%	55%	94%	5%	-25%	71%	77%	80%	100%	
CCC	**-63%**	**-75%**	**-87%**	**-92%**	**-71%**	**37%**	**-32%**	**-47%**	**-98%**	**-32%**	**-68%**	**100%**