

The Impact of Cash Conversion Cycle Components on Financial Performance  
of Firms Listed in Egyptian Stock Exchange: Empirical Evidence.

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## *Abstract*

This research aims to achieve the following objectives. Firstly, it examines the relationship between cash conversion cycle and size and liquidity of firms listed in the Egyptian stock exchange. Secondly, it scrutinizes the difference among the Egyptian firms and its industries concerning the length of the cash conversion cycle and its components. Thirdly, it inspects the linkage between cash conversion cycle and its components from one side and profitability measures from another side. Finally, it distinguishes whether the length of the cash conversion cycle and its components have a significant impact on the profitability proxies especially return on assets, return on equity, return on investment and return on sales. The sample comprises of 20 firms within 8 industries in the Egyptian stock exchange and data is collected throughout the period 2011-2018. The findings refer to a negative relationship between cash conversion cycle and each of quick ratio and the firm size. The results reveal that there is a significant difference among each of firms and industries concerning the length of the cash conversion cycle. Regression analysis results indicate that the cash conversion cycle and accounts payable period has a highly significant impact on the return on sales. In the same context, the accounts receivable period has a significant impact on each of return on assets, return on equity and return on sales. Valuable recommendations increase the efficiency of working capital of listed firms via decreasing inventory conversion age, reducing the accounts receivables age and increasing the accounts payable age as possible. Avenue for further research includes several aspects. First, estimating the cash gap in the Egyptian industries separately in order to examine the efficiency of working capital in each industry. Second, advances collections from customers create somewhat adjustments on the cash conversion cycle and it would be interesting to extend this topic in emerging markets.

## 1. Introduction

A worldwide debate is taking place among researchers concerning the theme of working capital components and profitability. For instance, in USA (e.g. Moss and Stine,1993; Borgia and Burgess, 2000; Gill et al,2010; Ebben and Johnson,2011), India (e.g. Sharma and Kumar,2011;Panigrahi,2013), Croatia (e.g. Tusek et al ,2014), Turkey (e.g.Uyar,2009;Eda and Mehmet,2009; Konuk and Zeren,2014), Pakistan (e.g. Qazi et al,2011; Anser and Malik,2013; Khidmat and Rehman,2014;Javid,2014; Bagh et al,2016;Naseer and Bibi,2018), Kenya (e.g. Mutua Mathuva,2014; Makori and Jagongo,2013),Ghana(e.g. Akoto et al ,2013),Nigeria (e.g. Uremandu et al ,2012), Kingdom of Saudi Arabia (e.g. Almazari,2013), Jordon (e.g. Al-Shubiri and Aburumman,2013), Thailand (e.g. Napompech,2012), UAE (e.g. Mehta,2014), Finland (e.g.Talopoika,2014), Greece (e.g. Charitou et al ,2010), Singapore (e.g. Mansoori and Muhammad,2012), Nerway (e.g. Lyngstadaas and Berg ,2016),Belgium (e.g.Deloof,2003),Iran (e.g Alipour,2011),Plastine (e.g Abbadi and Abbadi,2013) and Sweden (e.g. Yazdanfar and Öhman ,2014).

However, the controversy concerning the impact of the cash conversion cycle on the firm financial performance has raged unabated over the last decades. More recently, extant literature offers contradictory findings regarding the influence of cash conversion cycle on the firm's performance. In addition, no research has been found to examine the impact of the cash conversion cycle on the firm's performance from the Egyptian perspective. Subsequently, the current research aims to cover this gap in order to shine new light on this debate throughout an investigation of Egyptian firms.

A stream of extant literature has used the cash conversion cycle as a proxy of working capital management (e.g. Azami and Tabar,2016;Chauhan and Banerjee,2018; Haron and Nomran,2016; Naser et al.,2013; Mansoori and Muhammad,2012; Kieschnick et al.,2006; Mongrut et al.,2014; Zariyawati et al.,2010; Zariyawati et al.,2016). Accordingly, the shorter of the cash conversion cycle indicates that the working capital is more efficient. Vice versa, the longer cash conversion cycle decreases the efficiency of working capital.

A large literature has reported that the cash conversion cycle is a dynamic measure of liquidity based on the balance sheet and income statement data with time dimension (Moss and Stine,1993; Naseer and Bibi,2018). Generally, the length of the

cash conversion cycle varies according to the firm and industry type. Consequently, cash conversion cycle is considered as a summative measure comprises of three focal components which are days of inventory conversion, days of collecting accounts receivable and days of payment of accounts payable (Qazi et al.,2011; Knauer and Wöhrmann,2013). However, a bunch of the research up to now has measured the liquidity from a static perspective throughout the current ratio and quick ratio that derived from the balance sheet at a specific date (Farris and Hutchison, 2002). Financial decisions according to the dimension of time are divided into two main categories. The first one refers to the long term decisions that related to the capital budget of fixed assets and capital structure. Whereas, the second focuses on working capital efficiency that measured throughout the cash conversion cycle as a dynamic approach of liquidity analysis (Nobanee et al.2011).Accordingly, a longer cash conversion cycle may harm the profitability of the firm as result of decreasing the working capital efficiency.

The issue of working capital efficiency has been a highly controversial topic within the extant accounting literature especially after the financial crisis because of lack of liquidity to cover the firm's obligations. Thereby, working capital requires more investigations and one of the sufficient criteria to manage working capital is the cash conversion cycle (Javadi and Nikoumaram,2017).

Little research has scrutinized the impact of cash conversion cycle on the financial performance of Egyptian listed firm and to the best of knowledge, only one paper reported by Mousa (2019) has attempted to determine the behavior of working capital in 68 industrial firms throughout the period 2000-2010. Moreover, prior work itself has recommended revising the empirical evidence concerning working capital behavior in Egypt after revolutions especially in 2011 and 2013 because of their potential critical economic consequences on demand and other total economic variables such as general domestic production.

In the light of the above discussion, the key research problem is to analyze the impact of cash conversion and its components on the financial performance of firms listed in Egyptian stock exchange via the period 2011-2017 covering all types of firms without banks and financial services firms excluding banks. Accordingly, the research seeks to answer the following questions to clarify more attention on crucial scientific

themes that related to difference between Egyptian industries according to the length of the cash conversion cycle.

- To what extent the length of the cash conversion cycle is related negatively with the size of the firms listed in the Egyptian stock exchange?
- To what extent the difference among firms listed in the Egyptian stock exchange concerning the length of the cash conversion cycle and its components is significant?
- To what extent the length of the cash conversion cycle and its components are related negatively with profitability proxies of firms listed in the Egyptian stock exchange?
- To what extent the length of the cash conversion cycle is related negatively with a quick ratio of the firms listed in the Egyptian stock exchange?
- To what extent the length of the cash conversion cycle impact significantly the financial performance of Egyptian firms especially return on assets, return on equity, return on investment and return on sales?

Based on the above questions this research seeks to achieve the following major objectives:

- Describing the relationship between the length of the cash conversion cycle and size of firms listed in the Egyptian stock exchange.
- Exploring the key differences among industries in the Egyptian exchange regarding the length of cash conversion cycle and its components.
- Describing the relationship between the length of the cash conversion cycle and its components from one side and profitability proxies of firms listed in the Egyptian stock exchange.
- Describing the relationship between the length of the cash conversion cycle and the liquidity of firms listed in the Egyptian stock exchange.
- Determining the significant impact of cash conversion cycle and its component on the financial performance of firms listed in the Egyptian stock exchange especially return on assets, return on equity, return on investment and return on sales.

## **2. Literature review and hypotheses development**

### **2.1 CCC & firm size**

Numerous studies have attempted to examine and analyze the relationship between the length of the cash conversion cycle and the firm size but the results are still controversial. For example, Uyar (2009) has concluded that there was a significant negative correlation between the cash conversion cycle and the firm size. Also, the results of prior study indicated that the lowest mean value of the length of the cash conversion cycle was detected in the retail industry whereas the greatest and the mean value of the cash conversion cycle was detected in the textile industry. The analysis of the firm's cash conversion cycle must be considered with its industry benchmark. Additionally, the cash conversion cycle measures dramatically the firm liquidity throughout the dynamic perspective. In the same vein, Moss and Stine (1993) have examined the relationship between the cash conversion cycle and retail firm size. The results revealed that smaller retail firms were classified to have longer cash conversion periods because of greater inventory and receivables conversion periods comparing with payable deferred periods. In addition, I conjecture that the cash conversion cycle varies across industries because of their different financial features, especially in Egypt. Accordingly, the hypotheses that will be tested are stated as follow:

*H1: There is a negative relationship between the length of the cash conversion cycle and the size of firms in the Egyptian exchange.*

*H2: There is a significant difference among industries listed in the Egyptian exchange regarding the cash conversion cycle and its components.*

### **2.2 CCC & profitability**

Prior studies have investigated the relationship between cash conversion cycle and the profitability, however, there is a continuing debate concerning the empirical conclusions of this relationship. Accordingly, Deloof (2003) has investigated the relationship between determinants of working capital management and profitability of Belgian firms throughout the period 1992 to 1996 using the length of cash conversion cycle as an inclusive measure of working capital management. The findings indicated that there was a negative relationship between cash conversion cycle and each of

gross operating income and net operating income by  $-0.189$  and  $-0.085$  respectively. Uyar (2009) has concluded that there was a significant negative correlation between the length of the cash conversion cycle and profitability. Similarly, Charitou et al (2010) have utilized data of 43 non-financial firms listed in Cyprus Stock Exchange during the period 1998-2007 in order to investigate the impact of the length of cash conversion cycle and its components on profitability and their results indicated that firm's profitability measured by ROA is related negatively with the length of the cash conversion cycle and its components.

Qazi et al (2011) have explored the impact of working capital on profitability ratios of 20 Pakistani firms listed in Karachi Stock Exchange especially automobile sector and oil and gas sector throughout the period 2004-2009. Profits after tax were used as a proxy of profitability where working capital was measured according to several proxies such as net working capital, inventory turnover, accounts receivable days, the ratio of financial assets to total assets. Their results indicated that profitability was related positively with net working capital, inventory turnover, and accounts receivable days by approximately 47.4%, 10.9%, and 11.2% respectively. Contrariwise, it was related negatively with financial assets by  $-12.6\%$  and working capital measures explained approximately 21% of changes in profitability. Congruently, Napompech (2012) has investigated the impact of cash conversion cycle as a proxy of working capital management on profitability of 255 firms throughout seven industries during the period 2007-2009 and the results referred to a negative linkage between the length of the cash conversion cycle and profitability as shorter cash conversion cycle leads to higher profitability.

In the same context, Mansoori and Muhammad (2012) have examined the impact of the cash conversion cycle and its components on firm's profitability using 92 firms listed in Singapore stock exchange during the period 2004-2011. Their results indicated that profitability is related negatively with the cash conversion cycle, days of accounts receivable collection, days of inventory conversion and days of accounts payable by  $-0.15$ ,  $-0.28$ ,  $-0.09$  and  $-0.11$  respectively. Moreover, Anser and Malik (2013) have scrutinized how cash conversion cycle affects the profitability of manufacturing firms listed at Karachi stock exchange of Pakistan throughout the period 2007-2011 and their results denoted that the cash conversion cycle is having significantly inverse relationship with each of return on assets and return on equity

representing that slighter the cash conversion cycle superior would be the return on assets and equity. Likewise, Panigrahi (2013) has examined the relationship between the length of cash conversion and profitability of cement industrial Indian firms throughout the period 2001-2010 and the results referred to a significant negative relationship among prior variables considering that profitability was measured by ROA and ROE.

Furthermore, Mehta (2014) has examined the relationship between the length of cash conversion cycle and ROA as a proxy of firm profitability in real estate and construction in UAE throughout the period 2007-2010 and the results mentioned that there was a negative and high significant linkage between length of cash conversion cycle and ROA approximately by  $-.0430^{**}$ . Additionally, regression model's result referred to that the cash conversion cycle, size, liquidity, financial crisis explain approximately about 34.5% of changes in ROA. Ceteris paribus, keeping a longer cash conversion cycle impacts negatively the firm profitability. Subsequently, a shorter cash conversion cycle increases working capital efficiency and vice versa. Accordingly, the cash conversion cycle is utilized as a key measure of working capital efficiency. In recent years, there has been an increasing amount of literature on the possible determinants of cash conversion cycle especially the ability to produce internal resources, profitability, firm size, growth opportunities, leverage, age, Economic conditions and industry controls (Mutua Mathuva, 2014).

Javid (2014) has examined the impact of components of working capital management on performance of small and medium enterprises using data of 54 enterprises in Pakistan throughout the period 2006-2010 and the results revealed that the accounts receivable period and accounts payable period are the furthestmost effective components of working capital management that inspire the performance ratios of small and medium firms. Yazdanfar and Öhman (2014) have explored the impact of cash conversion cycle on profitability in Swedish small and medium-sized enterprises throughout the period 2008-2011 and their results referred to a significant and negative influence of cash conversion cycle on profitability in these firms, that the longer cash conversions cycle the lower profitability.

Recent research concerning the length of the cash conversion cycle refers to its inverse significant relationship with profitability (e.g. Tripathi and Ahamed, 2016).

Furthermore, it is noticed that the cash conversion cycle has a negative impact on financial measures especially ROA, ROE and EPS of Pakistan manufacturing firms (Bagh, et al,2016). Moreover, Lyngstadaas and Berg (2016) have inspected whether the working capital management empirically affects the profitability of Norwegian firms throughout the period 2010-2013 and their results indicated that profitability of small and medium-sized firms was related negatively and significantly with the length of cash conversion cycle by  $-0.12$ . Additionally, the relationship between the length of cash conversion cycle and ROA of merchandizing firms and manufacturing firms was negative and significant by  $-0.146^*$  and  $-0.255^{**}$  respectively (Naseer and Bibi,2018). Recently, Mousa (2019) has tried to explore the key determinants of working capital behavior using two proxies which are working capital requirement and the length of the cash conversion cycle. The results revealed that working capital requirement has a significant and positive relationship with profitability, firm value and gross domestic production. Whereas; the cash conversion cycle was related negatively and significantly with each of operating cash flows, growth, and profitability.

Conversely, there is another stream of extant research has inconsistent conclusions regarding the relationship between cash conversion cycle and profitability, For instance, Tusek et al (2014) have examined the relationship between the cash gap and profitability in the hotel industry in Croatia throughout the period 2009-2012 and their results revealed that there is no statistical relationship between cash gap from one side and return on equity, return on assets and profit before tax from another side. Moreover, Al-Shubiri and Aburumman (2013) have inspected the association between the length of cash conversion cycle and financial characteristics using data of eleven sectors in Amman stock exchange throughout the period 2007-2011 and their results revealed that there is no significant relationship between cash conversion cycle and profitability.

Debate continues about profitability measurement as it is inconsistent between researchers about a specific measure. For example, return on assets is used widely as a proxy of profitability (e.g. Bagchi,2012;Uremadu,2012;Makori and Jagongo, 2013;Naseer and Bibi,2018), however, it is computed according to 11 accepted methods and each one has its pros and cons (Jewell and Makin,2011), return on equity (e.g. Jose,1996), return on sales and return on capital employed.

In the light of the previous discussion, it can be noticed that the extant accounting researches regarding the linkage between cash conversion cycle and profitability are divided into two main categories which support or oppose the negative and significant relationship between cash conversion cycle and profitability. This notion can be extended from the Egyptian perspective in order to shine the light on the impact of the cash gap on the firm performance by examining the following hypotheses:

*H3: There is a negative relationship between the return on assets and the length of the cash conversion cycle and its components of firms listed in the Egyptian stock exchange.*

*H4: There is a negative relationship between the return on equity and the length of the cash conversion cycle and its components of firms listed in the Egyptian stock exchange.*

*H5: There is a negative relationship between the return on sales and the length of the cash conversion cycle and its components of firms listed in the Egyptian stock exchange*

*H6: There is a negative relationship between the return on invested capital and the length of the cash conversion cycle and its components of firms listed in the Egyptian stock exchange.*

*H7: There is a negative relationship between return on capital employed and the length of the cash conversion cycle and its components of firms listed in the Egyptian Stock Exchange.*

*H8: There is a negative relationship between earnings per share and the length of the cash conversion cycle and its components of firms listed in the Egyptian Stock Exchange.*

### **2.3 CCC & liquidity**

In view of all these have been mentioned so far, the cash conversion cycle is a key way to assess the liquidity of the firm, therefore, it is beneficial to the firm to decrease the length of cash conversion cycle as much as possible without harming the operational activities in the firm. Ideally, a firm would like to score a negative cash

conversion cycle period that comprises of the length of the operating cycle concerning inventory and sales to the customer is less than the payable deferred period. Basically, cash conversion cycle measures dramatically the liquidity of the firm throughout the dynamic perspective. Upon the small and medium enterprises level, Ebben and Johnson (2011) have examined the relationship between the length of the cash conversion cycle and each of liquidity level, invested capital and performance and their results revealed that firms with smaller cash conversion cycle had greater levels of liquidity and performance. More recently, Naseer and Bibi (2018) have achieved a comparison between manufacturing and merchandising Pakistani firms concerning the theme of managing the liquidity using the data of 50 firms throughout the period 2010-2014 and their results showed similarity in manufacturing and merchandizing firms concerning the positive and significant relationship between ROA and current ratio.

Additionally, Khidmat and Rehman (2014) have scrutinized the influence of liquidity and solvency on profitability ratios especially ROA and ROE using data of 36 Pakistani chemical firms throughout the period 2001-2009 and their results revealed that there was a positive and significant linkage between ROE and current ratio. Moreover, both debts to equity and debts to assets ratios were negative and significant with each of ROE and ROA. Unfortunately, the prior results were based on static view analysis as the ratios of liquidity were derived from the balance sheet in a specific date not during the period. Naser et al. (2013) have referred to an unambiguous relationship between cash conversion cycle from one side and industry type, sales growth, operating cash flows, return on equity, leverage and size from another side. In particular, their results revealed that sales growth, size and leverage level have an effective impact on the length of cash conversion cycle as a proxy of working capital management. It has been demonstrated that cash conversion cycle is a dynamic measure of liquidity because it is based on information that derived from income statement throughout the duration of the accounting period (Upadhyay and Smith, 2016). Controversy, traditional measures of liquidity especially current ratio and quick ratio are static measures which mainly derived from balance sheet data in a specific date at the end of the accounting period. Furthermore, Al-Shubiri and Aburumman (2013) have examined the relationship between cash conversion cycle and financial characteristics using data of firms listed in Amman Stock Exchange

throughout the period 2007-2011 and their results referred to a significant positive relationship between the length of cash conversion cycle and each of debts, market value, productivity, liquidity and dividends.

In view of contradicting results of prior studies which has been mentioned above regarding the relationship between the length of the cash conversion cycle and liquidity of the firm we tend to give more attention to this theme from Egyptian business environment perspective through investigating the following hypotheses:

*H9: There is a negative relationship between the length of the cash conversion cycle and the quick ratio of Firms listed in the Egyptian Stock Exchange.*

Overall, prior studies (e.g. Gill et al, 2010; Alipour, 2011; Uremandu, 2012; Bagchi et al, 2012; Makori and Jagongo,2013; Akoto et al,2013;Goel et al ,2015) highlight the need to investigate the impact of the length of the cash conversion cycle of the financial performance especially profitability aspect and we verify this approach in firms listed in the Egyptian Stock Exchange throughout examining the following hypotheses:

*H10: The length of the cash conversion cycle impacts significantly each of the return on assets, return on equity and return on investment of firms listed in Egyptian Stock Exchange.*

*H11: The inventory conversion period impacts significantly each of the return on assets, return on equity and return on investment of firms listed in Egyptian Stock Exchange.*

*H12: The accounts receivable collection period impacts significantly each of the return on assets, return on equity and return on investment of firms listed in the Egyptian Stock Exchange.*

*H13: The accounts payable payment period impacts significantly each of the return on assets, return on equity and return on investment of firms listed in the Egyptian Stock Exchange.*

## **Research methodology**

### ***3.1 Sample and data collection***

The sample of the research comprises of 20 firms listed in the biggest eight sectors of Egyptian stock exchange which are real estate, industrial goods and automobiles, chemicals, telecommunications, personal and household products, foods and beverages, basic resources and the sector of travel and leisure. Financial institutions such as banks and financial services are excluded because they are controlled by special laws and legislation. Firms of the sample are chosen in order to clarify the real impact of the cash conversion cycle and its components on the financial performance via the period 2011-2018 according to the following criteria. First, financial statements of the firms are issued annually on 31 December during the period 2012-2018(e.g. Egypt of chemical industries is excluded because of issuing its financial statements annually on 30 June). Second, financial statements of the firms are issued in Egyptian pound. Third, the availability of data via the period of the study from 2012 to 2018 that collected manually from firms' financial statements.

### ***3.2 Variables measurement***

The research employs several dependent variables which are related to the financial performance of firms. First, it uses the return on assets to measure the financial performance of firms especially profitability. Although continuing debate about methods of computing the return on assets as there are nearly 11 methods to compute the return on assets (Jewell and Makin,2011),the return on assets is computed throughout net income divided to total assets. Second, it uses the return on equity which measures the ability of a firm to create profits from its shareholders investments, briefly, this ratio is an indicator of managerial efficiency at using equity to fund the operational activities in the firm and it is calculated by dividing net income to shareholder's equity. Third, the return on sales which computed by net income divided by net sales. Forth, return on investments which calculated by dividing earnings at bottom line by invested capital. In addition, the research discusses the linkage between the length of the cash conversion cycle and other profitability measures such as return on capital employed and earning per share.

Following to the prior studies (e.g. Gill et al, 2010; Alipour, 2011; Bagchi et al, 2012; Uremandu, 2012; Makori and Jagongo, 2013; Tauringana and Afrifa,2013) the cash conversion cycle and its components are used as independent variables in order to clarify their impact on financial performance of firms listed in Egyptian Stock Exchange. Accordingly, the length of the cash conversion cycle equals inventory days plus accounts receivable days minus accounts payables days. Inventory days are computed by dividing inventory to cost of goods sold and the quotient is multiplied by 365. Accounts receivable collection days are calculated by dividing accounts receivable to net sales and the quotient is multiplied by 365. Accounts payable payment days are computed by dividing the accounts payable to the cost of goods sold and the quotient is multiplied by 365.

Some common control variables in the related literature are used in the analysis especially firm size which measured by the log of total assets(Azami and Tabar,2016), the firm growth which measured by changes of sales throughout the current and previous accounting period(Javid,2014),liquidity that measured by quick ratio(Javid,2014),operating cash flow margin that measured by dividing operating cash flow to net sales (Goel et al,2015).

### 3.3 Model specification

To date, numerous models have been developed and introduced to determine the impact of the working capital management on the profitability of firms listed in different environments (e.g. USA, Norway, Sweden, Croatia, India, Iran, Greece, UAE and Pakistan). In the same context, a novel model is developed in order to investigate the impact of the length of the cash conversion cycle and its components on the financial performance of firms listed in Egyptian Stock Exchange using four dependent proxies which are ROA, ROE, ROI, and ROS. We are motivated to cover this scientific gap in Egypt throughout employing the following models:

$$ROA_{it} = \beta_0 + \beta_1 (\text{Cash Conversion Cycle})_{it} + \beta_2 (\text{Size})_{it} + \beta_3 (\text{Growth})_{it} + \beta_4 (\text{Quick ratio})_{it} + \beta_5 (\text{Debt ratio})_{it} + \varepsilon_{it} \dots\dots\dots(1)$$

$$ROE_{it} = \beta_0 + \beta_1 (\text{Cash Conversion Cycle})_{it} + \beta_2 (\text{Size})_{it} + \beta_3 (\text{Growth})_{it} + \beta_4 (\text{Quick ratio})_{it} + \beta_5 (\text{Debt ratio})_{it} + \varepsilon_{it} \dots\dots\dots(2)$$

$$ROI_{it} = \beta_0 + \beta_1 (\text{Cash Conversion Cycle})_{it} + \beta_2 (\text{Size})_{it} + \beta_3 (\text{Growth})_{it}$$



## 4. Research results

### 4.1 Results of the relation between CCC and firm size

Person correlation was used to examine the relationship between the length of the cash conversion cycle and the size of the firms listed in the Egyptian stock exchange. The coefficient was  $-0.010$  which refers to a negative relationship between the length of the cash conversion cycle and the firm size of Egyptian listed firms. One plausible interpretation is that the larger firms have more ability to manage effectively working capital. This conclusion is consistent with prior research (e.g. Attari and Raza, 2012; Naser et al, 2013). Thereby, this conclusion supports the first hypothesis that refers to the negative relationship between the length of the cash conversion cycle and the size of Egyptian listed firms.

The empirical analysis of the relationship between the length of the cash conversion cycle and the firm size throughout chosen Egyptian industries refer to a controversy result. As the correlation coefficients between firm size and the length of the cash conversion cycle across three industries are positive. In particular, the correlation coefficient in the telecommunications sector, personal and household products sector and foods and beverages sector are  $.737$ ,  $.211$  and  $.214$  respectively. Otherwise, the correlation coefficients between firm size and the length of the cash conversion cycle in the other five sectors in the sample are negative. Briefly, the correlation coefficients in the real estate sector, industrial goods and services and automobiles sector, chemicals sector, travel and leisure sector and basic resources sector are  $-0.071$ ,  $-0.643$ ,  $-0.471$ ,  $-0.439$  and  $-0.013$  individually. It thereby reflects a somewhat difference between Egyptian industries concerning the relationship between the length of the cash conversion cycle and firm size.

As shown in table (1), one way ANOVA was conducted to examine the key differences among industries regarding the length of the cash conversion cycle and its components. ANOVA results revealed that there is a significant difference among firms listed in the scanned industries in the theme of the length of the cash conversion cycle and its components. Particularly, the values of significance among scanned industries regarding the length of the cash conversion cycle, inventory days, receivable days, payables days are  $.004$ ,  $.000$ ,  $.000$ ,  $.001$  respectively. It is worth

nothing that prior conclusions support the conjecture that involved in the second hypothesis which based on the existence of significant differences among Egyptian industries concerning the notion of the length of cash conversion cycle and its components. Additionally, the results indicate that there is a significant difference among scanned industries regarding the firm size as the value of significance in one way ANOVA analysis is .000

Table (1)  
Significance of ANOVA analysis of the sample

Variable	Mean	SD	ANOVA sig.
CCC	1382.68	3594.79	.004
Inventory days	1102.25	2891.37	.000
Receivable days	1010.09	4847.06	.000
Payable days	728.79	3102.91	.001
Size	8.98	.91	.000

#### 4.2 Results of the relation between CCC and profitability

The relationship between performance measures (e.g. ROA, ROE, ROI, ROS, ROCE, and EPS) and the length of the cash conversion cycle was tested. As shown in table (2) the profitability measures are related negatively with the length of the cash conversion cycle of firms listed in the Egyptian Stock exchange. Pearson correlation analysis showed that ROA before and after tax was related negatively with the length of the cash conversion cycle of scanned firms by -.059 and -.068 respectively. A potential explanation of prior result is that longer length of the cash conversion cycle presents less working capital efficiency and more liquidity risks. This conclusion is consistent with extant research in accounting thought (e.g. Charitou et al, 2010; Makori, 2013; Mehta, 2014; Bagh et al,2016, Lyngstadaas and Berg,2016). Otherwise, there was a strong, positive and highly significant linkage between ROA before and after tax by .874<sup>\*\*</sup> which can be developed as a proxy of tax aggressiveness. In sum, the length of the cash conversion cycle is negatively related with return on assets as shorter cash conversion cycle improves higher return on assets

**Table (2)**  
**Correlation coefficients between variables**

	EPS	ROA after	ROA before	ROE	ROI	ROS	ROCE	CCC days	Inventory days	Receivable days	Payables days
EPS	1										
ROA after	.121	1									
ROA before	.147	.874**	1								
ROE	.381**	.908**	.863**	1							
ROI	.183*	.960**	.895**	.957**	1						
ROS	.029	.329**	.340**	.338**	.327**	1					
ROCE	.258**	.027	.043	.088	.036	-.005	1				
CCC days	-.053	-.068	-.059	-.061	-.089	-.462**	-.016	1			
Inventory days	-.046	.077	.103	.076	.053	.141	-.019	.749**	1		
Receivable days	-.037	-.154	-.105	-.154	-.156	-.796**	-.011	.550**	-.015	1	
Payables days	-.038	-.090	.001	-.099-	-.090	-.577**	-.016	.398**	.041	.911**	1
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											

and vice versa. In the light of the above discussion, the results support the third hypothesis that stated on the notion of negative linkage between the length of cash conversion cycle and the return on assets of listed firms in Egyptian Security Exchange.

As can be seen from the table (2), ROE is connected negatively with the length of cash conversion cycle within the firms listed in Egyptian stock exchange throughout the period 2012-2018 as the Pearson correlation coefficient between both variables was  $-.061$  and this result is consistent with the drawn conclusions of previous research (e.g. Anser and Malik, 2013; Panigrahi, 2013; Bagh et al,2016). A plausible interpretation of this result is a longer length of cash conversion cycle pushes the firm management to receive more loans to match its obligations and this exactly harm the bottom line income. According this view, the results support the fourth hypothesis that refers to negative relationship between the cash conversion cycle and the return on equity.

In the same context, ROS is associated negatively and significantly with the length of cash conversion cycle and the Pearson correlation coefficient was  $-.462^{**}$  which is consistent with prior literature. And this view supports the fifth hypothesis that established on the conjecture of negative linkage between the return on sales and the length of cash conversion cycle which amounts liquidity on an ongoing basis.

As shown in the correlation matrix included in table (2), the correlation coefficient between ROI and the length of the cash conversion cycle of listed firms in the Egyptian stock exchange was  $-.089$  and this result is corresponding with an ongoing view about negative relationship between prior variables in accounting thought (e.g Majanga,2015; Nobanee et al,2011) A possible interpretation of previous findings is that a longer cash conversion cycle reverses a higher interest expense caused by expanding loans policy in order to match the firm obligations. No doubt that when firm management behaves according to this view the return on investment decreases. In sum, the prior findings support the sixth hypothesis that refers to a negative relation between return on investment and the length of the cash conversion cycle in Egyptian listed firms. Additionally, the correlation coefficient between

ROCE and the length of the cash conversion cycle was  $-.016$  which supports the seventh hypothesis. Likewise, the correlation coefficient between ESP and the length of the cash conversion cycle in Egyptian firms was  $-.053$  and this result supports the notion of the eighth hypothesis.

Moreover, the length of the cash conversion cycle is an aggregate measure as it comprises of three components which are inventory days, accounts receivable days and accounts payable days. The correlation coefficient between the length of the cash conversion cycle and prior components was  $.749^{**}$ ,  $.550^{**}$  and  $.398^{**}$  individually. This result indicates that the inventory is related positively and significantly with the length of the cash conversion cycle and inventory conversion period is the most effective component on the cash gap of scanned Egyptian listed firms. Additionally, the general defaults regarding accounts receivable period and accounts payables period are related negatively with profitability measures especially ROA, ROE, ROI, ROCE, and EPS is negative. As shown in table(2) the correlation coefficient between ROA and each of accounts receivable days and accounts payable days was  $-.154$  and  $-.090$  respectively. Similarly, the correlation coefficient between EPS and each of accounts receivable days and accounts payable days was  $-.037$  and  $-.038$  separately. In sum, the relation between accounts receivable period and accounts payable period are related negatively with profitability measures such as ROA, ROE, ROI, ROCE, and EPS. This result refers to how to increase the profitability of Egyptian listed firms throughout managing the periods of accounts payables and accounts receivable to minimum levels as possible.

Concerning the relation between the length of the cash conversion cycle and the quick ratio and current ratio, the results are controversial. Table (3) shows that the correlation coefficient between the length of the cash conversion cycle and quick ratio in the sample was  $-.018$ . Potential explanation is that longer cash conversion cycle causes much trouble in liquidity situation. However, Pearson correlation coefficients differ dramatically in the sign and the strength regarding industries. Accordingly, industries are divided into two categories the first is related negatively with the length of the cash conversion cash such as telecommunication, personal and householding products, chemicals, foods and beverage, basic resources. The negative coefficients in

prior industries are -.692, -.065, -.015, -.221 and -.112 .Otherwise, considering industries such as real estate, industrial goods and services and automobiles and travel and leisure Pearson correlation coefficients between quick ratio and the length of the cash conversion cycle are positive by .032, .460 and .542\* correspondingly. Overall, the results of the sample support relatively the notion of a negative relationship between the quick ratio and the length of the cash conversion cycle that included in the seventh hypothesis.

Table (3)  
Pearson coefficient between CCC days and Quick ratio

Sample/Industries	Correlation coefficient
Sample level	-.018
Telecommunication	-.692
Real estate	.032
Industrial goods and services and automobiles	.460
personal and house holding products	-.065
Chemicals	-.015
Foods and beverage	-.221
Travel and leisure	.542
Basic Resources	-.112

#### 4.3 *Regression analysis of the CCC and profitability measures*

Table (4) shows the results of regression analysis in order to clarify whether the cash conversion cycle impacts significantly the profitability measures especially return on assets, return on equity, return on investment and return on sales. Concerning return on assets model, it appears that the cash conversion cycle is related negatively and insignificantly with return on assets as the regression coefficient is -.000003 which indicates that longer cash conversion cycle decreases the return on assets of Egyptian listed firms. This result is consistent with prior research that refers to a negative relation between return on assets and the cash conversion cycle. In addition, the results of model 1 indicate that dependent variables (e.g. the cash conversion cycle, firm size, growth, quick ratio, and debt ratio) explain approximately

Table 4: Regression results of the impact of the Cash Conversion Cycle and profitability measures

Variable	Model (1) :ROA		Model (2): ROE		Model (3): ROI		Model (4): ROS		Collinearity Statistics	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	VIF	Tolerance
Constant	-.036	.644	-.109	.408	-.059	.605	.898	.480		
CCC	-.000003	.091	-.000005	.140	-.000005	.076	-.000212***	.000	1.087	.920
Size	.009	.267	.022	.120	.015	.226	-.071	.605	1.107	.903
Growth	-.001	.802	-.001	.853	-.002	.721	-.000415	.995	1.022	.978
Quick ratio	.017***	.000	.022***	.000	.019***	.000	.080	.150	5.490	.182
Debt ratio	-.008***	.002	-.012***	.004	-.010***	.008	-.050	.207	5.740	.174
<b>R<sup>2</sup></b>	.207		.132		.133		.227			
<b>Adj. R<sup>2</sup></b>	.177		.100		.101		.198			
F	6.953		4.057		4.094		7.807			
Sig.	.000		.002		.002		.000			
Model (1): ROA = - .036 -.000003 (Cash Conversion Cycle) + .009 (Size) - .001 (Growth) + .017 (Quick ratio) - .008 (Debt ratio)										
Model (2): ROE = - .109 -.000005 (Cash Conversion Cycle) + .022 (Size) - .002 (Growth) + .019 (Quick ratio) - .010 (Debt ratio)										
Model (3): ROI = - .059 -.000005 (Cash Conversion Cycle) + .015 (Size) - .002 (Growth) + .019 (Quick ratio) - .010 (Debt ratio)										
Model (4): ROS = .898 -.000212 (Cash Conversion Cycle) - .071 (Size) -.000415 (Growth) +.080 (Quick ratio) - .050 (Debt ratio)										

about 17.7% of potential changes of return of assets. Moreover, each of current ratio impacts positively and highly significant with the return on assets. In sum, the regression model is highly significant.000 where the cash conversion cycle is insignificant by .091 and this conclusion refuses the notion of a significant influence of the cash conversion cycle on return on assets that stated the tenth hypothesis.

Likewise, as shown in table (4) the cash conversion cycle has a negative coefficient with the return on equity and return on investment by -.000005 each. This result means that a shorter cash conversion cycle improves the return on equity and return on investment. However, the results of regression refer to the insignificant effect of the cash conversion cycle on each of return on equity and return on investment as the significance values are .140 and .076 respectively. Generally, the regression models (2) and (3) are highly significant by .002 each and dependent variables (e.g. the cash conversion cycle, firm size, growth, quick ratio, and debt ratio) interpret about 10% of possible changes of return on equity and return on investment. Overall, the cash conversion cycle impacts insignificantly each of the return on equity and return on investment and accordingly the results refuse the tenth hypothesis.

Otherwise, the regression results are shown in the table (4) concerning the model (4) refer to a negative and highly significant impact of cash conversion cycle on the return on sales as the coefficient regression of cash conversion cycle is -.000212 and the significance value is .000 and this result indicates the effective impact of the length of cash conversion cycle on return on sales of Egyptian listed firms. Generally, the dependent variables (e.g. the cash conversion cycle, firm size, growth, quick ratio, and debt ratio) of model (4) clarify about 19.8% of potential changes of return on sales. Interestingly, the prior results support the negative and significant impact of the length of the cash conversion cycle on the return of sales in the eleventh hypothesis.

#### ***4.4 Regression analysis of the inventory conversion period and profitability measures***

The table (5) below illustrates the results of regression analysis in the purpose of detecting whether inventory conversion period impacts significantly the four

Table 5 :Regression results of the impact of the inventory days and profitability measures

Variable	Model (5): ROA		Model (6): ROE		Model (7) :ROI		Model (8) :ROS		Collinearity Statistics	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	VIF	Tolerance
Constant	-.057	.474	-.141	.290	-.086	.459	-.327	.819		
Inventory days	.000001	.593	.000002	.579	.000001	.755	.00008	.078	1.056	.947
Size	.011	.209	.024	.092	.017	.183	.012	.940	1.119	.894
Growth	.00001	.998	.00028	.968	-.001	.919	.061	.413	1.006	.995
Quick ratio	.015***	.000	.020***	.001	.017***	.001	-.018	.773	5.382	.186
Debt ratio	-.006**	.011	-.010**	.015	-.008**	.031	.028	.527	5.628	.178
R <sup>2</sup>	.192		.120		.133		.031			
Adj. R <sup>2</sup>	.161		.087		.080		-.006			
F	6.308		3.626		3.397		.838			
Sig.	.000		.004		.006		.525			
Model (5) : ROA = - .057 +.000001 (Inventory days) + .011 (Size) - .00001 (Growth) + .015 (Quick ratio) - .006 (Debt ratio)										
Model (6) : ROE = - .141 -.000002 (Inventory days) + .024 (Size) + .00028 (Growth) + .020 (Quick ratio) - .010 (Debt ratio)										
Model (7) : ROI = - .086 +.000001 (Inventory days) + .017 (Size) -.001 (Growth) + .017 (Quick ratio) - .008 (Debt ratio)										
Model (8) : ROS = -.327 +.00008 (Inventory days) + .012 (Size) +.061 (Growth) -.018 (Quick ratio) +.028 (Debt ratio)										

profitability proxies which are the return on assets, return on equity, and return on investment and return on sales. The results reveal that inventory days have a positive coefficient with return on assets, return on equity, return on investment and return on sales as the regression coefficient is .000001, .000002, .000001 and .00008 respectively. Additionally, the results indicate that the inventory conversion period is insignificant throughout model (5), (6), (7) and (8) and this result means that inventory days have no clear effect on profitability proxies. Overall, regression model (5), (6) and (7) are highly significant as the significance value is .000, .004 and .006 individually and the independent variables involved in the prior models interpret approximately 16.1%, 8.7% and 8.0% of potential changes in profitability separately.

#### ***4.5 Regression analysis of the accounts receivable collection period and profitability measures***

Table (6) shows that the models (9), (10), (11) and (12) are highly significant as the significance value is .000 each and the independent variable (e.g. accounts receivable collection period, size, growth, quick ratio, and debt ratio) explain approximately 20.5%, 12.9%, 12.2% and 63.9% of possible changes of return on assets, return on equity, return on investment and return on sales separately. Moreover, it is noticed that accounts receivable collection period has a negative and significant coefficient with each of return on assets, return on equity and return on sales as the regression coefficient is  $-.000004^{***}$ ,  $-.000006^*$  and  $-.00026^{***}$ . This result reveals that a longer collection period of accounts receivable lower firm profitability especially returns on assets, equities and sales. It is consistent with prior research that confirms a negative and significant impact of accounts receivable on profitability proxies.

#### ***4.6 Regression analysis of the accounts payable payment period and profitability measures***

Table (7) presents an overview of regression analysis of the impact of accounts payable payment period on profitability proxies especially return on assets, return on equity, return on investment and return on sales. The results reveal that the regression models (13), (14), (15) and (16) are highly significant as the significance values are

.000, .001, .002 and .000 respectively. Additionally, the results indicate that independent variable (e.g. accounts payable payment period, size, growth, quick ratio, and debt ratio) interpret about 12.9 %, 10.6 %, 9.7% and 14.1% of potential changes of profitability proxies involved in model (13), (14), (15) and (16) individually. Moreover, the coefficient related to the accounts payable payment period in the regression models is negative. The coefficient is estimated by -.000004, -.000007, -.000005 and -.00029\*\*\* throughout the model (13), (14), (15) and (16) separately.

Table 6: Regression results of the impact of the accounts receivable days and profitability measures

Variable	Model (9): ROA		Model (10): ROE		Model (11): ROI		Model (12): ROS		Collinearity statistics	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	VIF	Tolerance
Constant	-.047	.546	-.123	.339	-.075	.504	.326	.700		
AR .days	-.000004***	.007	-.000006*	.011	.000005	.012	-.00026***	.000	1.037	.965
Size	.010	.212	.024	.092	.017	.177	.013	.890	1.103	.906
Growth	-.001	.813	-.001	.852	-.002	.751	.00026	.995	1.010	.990
Quick ratio	.017***	.000	.023***	.000	.019***	.000	.095	.010	5.344	.187
Debt ratio	-.008***	.001	-.012***	.002	-.009***	.007	-.056	.033	5.523	.181
R <sup>2</sup>	.234		.160		.154		.658			
Adj. R <sup>2</sup>	.205		.129		.122		.639			
F	8.117		5.074		4.837		49.892			
Sig.	.000		.000		.000		.000			
Model (9) :ROA = - .047 -.000004 (Accounts Receivable days) + .010 (Size) - .001 (Growth) + .017 (Quick ratio) - .008 (Debt ratio)										
Model (10) :ROE = - .123 -.000006 (Accounts Receivable days) + .024 (Size) - .001 (Growth) + .023 (Quick ratio) - .012 (Debt ratio)										
Model (11) :ROI = - .075 +.000005 (Accounts Receivable days) + .017 (Size) -.002 (Growth) + .019 (Quick ratio) - .009 (Debt ratio)										
Model (12) :ROS = .326 -.00026 (Accounts Receivable days) + .013 (Size) -.00026 (Growth) +.095 (Quick ratio) - .056 (Debt ratio)										

Table 7:Regression results of the impact of the accounts payable days and profitability measures

Variable	Model (13): ROA		Model (14): ROE		Model (15): ROI		Model (16): ROS		Collinearity statistics	
	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	Coefficients	Sig.	VIF	Tolerance
Constant	-.043	.078	-.116	.373	-.070	.539	.626	.591		
AP.days	-.000004	.074	-.000007	.078	-.000005	.111	-.00029***	.000	1.029	.972
Size	.010	.248	.023	.111	.016	.206	-.055	.665	1.105	.905
Growth	-.000165	.968	-.00002***	.998	-.001	.894	.050	.415	1.004	.996
Quick ratio	.017***	.000	.022	.000	.018***	.000	.069	.170	5.340	.187
Debt ratio	-.007***	.003	-.012***	.004	-.009***	.012	-.037	.296	5.522	.181
R <sup>2</sup>	.209		.138		.129		.347			
Adj. R <sup>2</sup>	.179		.106		.097		.322			
F	7.037		4.269		3.955		14.125			
Sig.	.000		.001		.002		.000			
Model (13): ROA = - .043-.000004 (Accounts payable days) + .010 (Size) - .000165 (Growth) + .017 (Quick ratio) - .007 (Debt ratio)										
Model (14): ROE = - .116 -.000007 (Accounts payable days) + .022 (Size) - .00002 (Growth) + .022 (Quick ratio) - .012 (Debt ratio)										
Model (15): ROI = - .070 -.000005 (Accounts payable days) + .016 (Size) -.001 (Growth) + .018 (Quick ratio) - .009 (Debt ratio)										
Model (16): ROS = .626 -.00029 (Accounts payable days) - .055 (Size) +.050 (Growth) +.069 (Quick ratio) - .037 (Debt ratio)										

## 5. Conclusions

Cash conversion cycle is a dynamic measure of firm liquidity and it is used widely as a proxy of working capital management. A longer cash conversion cycle period reflects much poor performance of working capital as well as the firm's financial performance especially profitability measures. Accordingly, this research examined the relationship between the length of the cash conversion cycle and its components from one side and the firm size in the Egyptian stock exchange. In addition, the research scrutinized the key difference among the Egyptian industries concerning the length of the cash conversion cycle and its components which are inventory conversion period, accounts receivable collection period and accounts payable payment period. Moreover, the linkage between cash conversion cycle and its components from one side and profitability measures especially return on assets, return on equity, return on investment, return on sales, return on capital employed, and earnings per share from another side is scanned. Furthermore, regression analysis is employed in order to examine the impact of the length of the cash conversion cycle and its key components on the profitability proxies such as return on assets, return on equity, return on investment and return on sales using sixteen regression models.

Data is collected manually from 20 Egyptian firms via the period 2011-2018 in order to examine whether the cash conversion cycle and its elements impact significantly the profitability proxies. The sample specifically included eight industries in the Egyptian stock exchange which are telecommunication, real estate, industrial goods and services and automobiles, personal and house holding products, chemicals, foods and beverage, travel and leisure and basic resources and the scanned firms were distributed within prior industries by 1, 6, 1, 2, 2, 4, 2 and 2 respectively.

The findings refer to a negative relationship between cash conversion cycle and each of quick ratio and the size of firms listed the Egyptian stock exchange. The results reveal that there is a significant difference among Egyptian listed firms and industries concerning the length of the cash conversion cycle. Regression analysis results indicate that the cash conversion cycle and accounts payable payment period have a highly significant impact on the return on sales. In the same context, the

accounts receivable collection period has a significant impact on each of return on assets, return on equity and return on sales.

Valuable implications are derived from prior findings in order to improve the profitability measures and increase the efficiency of working capital of listed firms throughout decreasing inventory conversion age, reducing the accounts receivables collection age and increasing the accounts payable payment age as possible.

However, the primary limitation of current research is the restraining the sample in 20 listed firms which are distributed within 8 industries of Egyptian Stock Exchange. Avenue for further research includes several aspects. First, estimating the cash gap in the Egyptian industries separately in order to examine the efficiency of working capital in each industry. Second, advances collections from customers create somewhat adjustments on the cash conversion cycle, it would be interesting to extend this notion in emerging markets.

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Appendix No.1

Abbreviations, Concepts & Measurement methods		
Abbreviation	Concept	Measurement
CCC	Cash Conversion Cycle	Inventory days +Accounts receivable days - Accounts payable days
QR	Quick Ratio	(Current assets-Inventory)/Current liabilities
RD	Receivable Days	Accounts receivable/ Net sales *365
ROA	Return On Assets	Net income/ Total assets
ROCE	Return On Capital Employed	EBT/Capital Employed
ROE	Return On Equity	Net income/Equities
ROS	Return On Sales	Net income / Sales
ID	Inventory Days	Inventory/COGS*365