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Cash conversion cycle and its relationship with profitability as a cash management tool in companies: An application on companies trading in Borsa Istanbul

Bilgehan TEKİN
Cankiri Karatekin University, Turkey
btekin@karatekin.edu.tr
Yusuf GÖR
Cankiri Karatekin University, Turkey
yusufgor @karatekin.edu.tr

Abstract. *This study examines the relationship between companies' cash cycle and profitability ratios. For this purpose, 30 companies traded in Borsa Istanbul with the highest net profit were selected, and the data obtained were subjected to panel data analysis. In the study, statistically significant, positive and negative relationships were found between the explanatory variables and the dependent variables of ROA and ROE. There are statistically significant and negative relationships between the explanatory variables of CCC, leverage and the dependent variable of ROA, as expected. Asset turnover ratio and firm size positively and significantly affect the ROA. Asset turnover positively and significantly affects the return on equity. The short-term debt repayment period is statistically effect the return on assets but the other factors used in calculating the CCC do not have any effect.*

Keywords: cash conversion cycle, asset profitability, equity profitability.

JEL Classification: G39, L21, L25, M10.

1. Introduction

Today's intense and global competition environment becomes more difficult for businesses to gain trust and reputation by providing sustainable profit maximization and increasing firm value. Firms must have the necessary assets for effective management, and an efficient resource structure ensures that these assets are obtained. While carrying out the daily activities of the companies, the liquidity and profitability decisions and the establishment of the balance between them represent complex processes (Padachi, 2006). Firms must be able to fulfil their short-term obligations; cash flows must be maintained, and working capital must be well managed. Liquidity and profitability are crucial to maintaining financial soundness (Abuzayed, 2012). Although the ideal resource structure varies according to the sector, the efficiency of resources increases with a well-managed working capital. An essential measure of the efficiency and effectiveness of operations in working capital management is the cash conversion cycle (CCC) (Chen et al., 2022). The shortness of the CCC ensures that the net present value of the cash flows and the firm's value is relatively high. The short CCC indicates that the firm collects its receivables as quickly as possible and delays payments to suppliers as much as possible (Nobanee et al., 2011). Shin and Soenen (1998) and many more researchers emphasized that managers can create value for their shareholders by reducing the CCC to an optimal minimum. Working capital managed with an appropriate CCC (Garanina and Petrova, 2015) is one factor that makes firms stand out in a challenging competitive environment. The profitability of companies is affected by working capital decisions managed by considering the cash conversion cycle (Linh and Mohanlingam 2018).

The need for working capital, shaped by the abovementioned factors, requires the effective use of working capital. Thus, increasing stock prices due to the effective use of working capital is very important for shareholders (Qazi et al., 2011). Effective use of working capital is possible with adequately selected working capital policies. While the conservative working capital policy demands long CCCs, the aggressive working capital policy demands short CCCs (Javid and Zita, 2014).

Accordingly, the cash conversion time is an important criterion used in effectively managing working capital and monitoring the liquidity status of the company (Tong and Wei, 2011). The receivables collection period (which measures the ability of enterprises to run the bottom ring in the supply chain management) and the short-term debt payment period ensure effective management of the upper ring, and the stock turnover period (which shows the efficiency of inventory management) (Luo et al., 2009). Hence, working capital managed within the framework of receivables, debt, and stock elements within the scope of CCC affects the company's profitability (Yazdanfar and Öhman, 2014). On the other hand, companies that cannot collect their receivables reduce their profitability by bearing their reduced cash deficit with financing costs (Ebben and Johnson, 2011; Wang, 2019).

Each element in the CCC is essential for the company separately. Among these factors, a company must have cash assets to protect its financial structure and effectively manage its activities (Abuzayed 2012). Accordingly, the receivables collection period should be kept short, and the long debt payment period should be preferred (Nobanee et al., 2011). Otherwise, the company may default on its debt payments due to a cash problem (Chang, 2018). The decrease in CCC also increases the company's market value (Zeidan and Shapir, 2017).

Considering the importance of cash management and CCC in terms of profitability within the scope of working capital management in firms, the effect of CCC on profitability is a matter of curiosity. Furthermore, considering the studies in the literature, CCC significantly affects profitability. Therefore, this study investigated the relationship between CCC and profitability in Türkiye's companies with the highest net profit. The study used quarterly data between 2010 and 2019, and panel data analysis was used to determine the relationships.

2. Literature review

The literature review that examines the relationship between the CCC and profitability revealed the following studies classified in specific periods according to the study intensity.

Studies show that working capital management is a strong predictor of profitability in companies (Shin and Soenen, 1998; Wang, 2002; Deloof, 2003; Eljelly, 2004; Appuhami, 2008; Raheman and Nasr, 2007). Studies investigating the relationship between working capital and profitability have generally concluded that there is an inverse relationship between these two variables (Long et al., 1993; Shin and Soenen, 1998; Eljelly, 2004; Hutchison et al., 2007; Dalci et al., 2019). Titman and Wessels (1988) stated that large firms not only have higher turnover, but they are also able to generate higher revenues and have better access to capital markets. Rajan and Zingales (1995) also used total assets and turnover as a proxy for size and found a positive effect on profitability (Nanda and Panda, 2019).

Soenen (1993) investigated the relationship between the net trade cycle as a measure of working capital and return on investment in US firms. Jose et al. (1996) investigated the impact of CCC on profitability for 2,718 corporate firms operating in seven industries in the US over 20 years. The result demonstrates that the shorter the CCC, the higher the profitability for some industries such as manufacturing, service, and retail/wholesale. Wang (2002) examined the relationship between liquidity management and operating performance and that between liquidity management and corporate value for firms in Japan and Taiwan. The empirical findings for both Japan and Taiwan show negative CCC-ROA and CCC-ROE relationships sensitive to industry factors (Sharma and Kumar, 2011). Garcia-Teurel and Martinez-Solano (2007) find similar results showing that shorter CCC positively impacts ROA for small firms. By focusing on companies listed on Vietnam Stock Exchange, Dong and Su (2010) add to evidence of CCC's strong negative impact on profitability. In Japan, Nobanee et al. (2011) explore the impact of CCC on profitability measured by Return on Investment (ROI) from 1990 to 2004. In that study, except for consumer goods and services companies, a strong inverse relationship is found between the CCC and ROI (Dalci et al., 2019).

Farris et al. (2005) examined the CCCs of companies in the production and service sector between 1986-2001 in the USA. They found that the cash cycle elements of companies in the service sector were short. Lazaridis and Tryfonidis (2006) investigated the relationship between corporate profitability and working capital management on the Athens Stock Exchange (ASE) from 2001 to 2004. The results of the study showed that there is a statistical significance between profitability and the cash conversion cycle.

Luo et al. (2009) examined the relationship between CCCs and companies' return on assets in various sectors between 1980 and 2006 in China. Nazir and Afza (2009) analyzed the relationship between working capital policy preferences and profitability of 204 companies listed on the stock exchange in Pakistan between 1998-2005 with panel data analysis. As a result, it was determined that the aggressive policy affected profitability negatively. Ramachandran and Janakiraman (2009) observed a negative relationship between CCC and profit before interest and tax at the companies in the paper industry in India. Mohama and Saad (2010) examined the ratio analysis's effect on business performance by using the data of 172 companies on the Malaysian stock exchange between 2003 and 2007. They found that profitability was associated with low CCC. Raheman et al. (2010) determined that cash cycle factors affect company performance.

Autukaite and Molay (2011) used panel data analysis and the data of companies listed on the stock exchange in France between 2003-2009. They determined that cash management was seen as more important than company value. Qazi et al. (2011) observed that net working capital affected profitability in Pakistan's fuel and automotive sector between 2004-2009. Shahid and Khan (2011) revealed that working capital and its elements were affected by different sectors and macro variables. Shah (2011) used panel data analysis in his study and indicated that the CCC was short in Pakistan. Coşkun and Kök (2011) analyzed manufacturing companies' data between 1991-2005. They found a positive correlation between profitability and the debt repayment period. They also found out that there is a negative relationship between the receivable collection period and inventory turnover period, and profitability. Ebben and Johnson (2011) conducted their study in the USA between 2002 and 2004. They examined the relationship between the CCC and company performances in the manufacturing and retail sectors. As a result of their study, they found out that companies with ideal CCC made higher earnings. Attari and Raza (2012) investigated the relationship between CCCs and profitability in different sectors between 2006 and 2010 in Pakistan. They found a negative relationship between return on assets and the CCC. Al-Shubiri and Aburumman (2013) aimed to determine the relationship between CCCs and the profitability of companies listed on the stock exchange from 2005 to 2011 in Jordan. However, they found no relationship. In another study conducted in Pakistan by Anser and Malik (2013), the relationship between CCCs and the return on assets of companies listed in Pakistan between 2007-2011 was determined, and a negative relationship was found. In another study by Majeed et al. (2013) in Pakistan, companies' data in the manufacturing sector between 2006 and 2010 were analyzed with panel data analysis. A negative relationship was found between CCC and return on asset profitability.

On the other hand, Panigrahi (2013) in India investigated companies' data in the cement industry between 2001-2010. The author used regression analysis. The author found a positive relationship between return on assets and the CCC. Mathuva (2014) examined the companies between 1993 and 2008 with panel data analysis in Kenya. They determined internal and macro factors that affect CCC. Muscettola (2014) examined the relationship between CCCs and the profitability of small and medium-sized enterprises in Italy and found no significant relationship. Valahzaghard and Ghalhari (2014) analyzed the relationship between the companies' CCCs and profitability on the stock exchange between 2005-2011 in Iran. They observed no significant relationship.

On the other hand, in the study conducted by Yazdanfar and Öhman (2014) in Sweden, the data of small and medium-sized enterprises between 2008-2011 were examined with panel data analysis. In the study, it has been determined that the CCC affects profitability. Furthermore, Garanina and Petrova (2015) analyzed the relationship between the CCC and return on assets between 2001-2012 in Russia, and a negative relationship was found.

Al-Abass (2017) investigated the relationship between the CCC and return on assets in Pakistan by regression analysis between 2012 and 2016, and no significant relationship was found. The study conducted by Linh and Mohanlingam in Thailand in 2018 aimed to determine whether the CCC affects profitability for companies in the agriculture and food sectors. As a result, it was determined that they had an inverse relationship. Nwude et al. (2018) observed a negative relationship between CCC and asset profitability using a multiple regression method between 2000 and 2011 in Nigeria insurance companies. Chang (2018) made a global empirical analysis of the relationship between the cash conversion cycle (CCC) and corporate performance. As a result of the study, results were obtained that support the hypothesis that an aggressive working capital policy can increase corporate performance. He found a negative relationship between CCC and firm's profitability and value.

The study conducted by Al-Mohareb (2019) in Jordan found a significant negative relationship between profitability and CCC in the manufacturing sector firms between 2016 and 2018. Amponsah-Kwatiah and Asiamah (2020) examined the effect of working capital management on the profitability of listed manufacturing companies in Ghana for 2015-2019. Results showed a strong positive and significant relationship between inventory management, account receivables, account payables, cash conversion cycle, current assets, current ratio, firm size, and ROA and ROE. However, there was a negative relationship between leverage and ROA and ROE.

Fernández-López, Rodeiro-Pazos, and Rey-Ares (2021) used a sample of Spanish cheese manufacturing companies, applied a dynamic panel data methodology over the period 2010-to 2016, and examined the impact of crucial components defining working capital management policies on firms' profitability. Empirical evidence demonstrates that days inventory outstanding and CCC negatively impacts firms' profitability. It also demonstrates the need for cheese-producing companies to lower their inventory level. Similarly, empirical evidence confirms a negative relationship between days payable outstanding and firms' profitability.

Based on the literature review, the hypotheses determined in the study are as follows:
H1: There is a negative relationship between the CCC and ROA.
H2: There is a negative relationship between the CCC and ROE.
H3: There is a negative relationship between the leverage and ROA.
H4: There is a negative relationship between the leverage and ROE.
H5: There is a positive relationship between the firm size and ROA.
H6: There is a positive relationship between the firm size and ROE.
H7: There is a positive relationship between the asset turnover and ROA.
H8: There is a positive relationship between the asset turnover and ROE.

3. Data and method

In this study, the effects of the CCC, leverage (total debt/equity), firm size (total assets), asset turnover, and the components of the CCC on the profitability of large-scale enterprises are examined. The data set used in the study covers the period between the first quarter of 2010 and the fourth quarter of 2019. The data was obtained from the Financial Information News Network (FINNET) website. Finnet has been developing market research and analysis software since 1994 in Türkiye (finnet.com.tr, accessed on 05/02/2020). The panel data analysis method was used as the analysis method.

The study's data set includes 30 companies traded on the Borsa İstanbul and 40 periods. One thousand two hundred observations were placed in total. Similar studies show that companies operating in a particular sector are generally taken as a sample. This study considered 30 companies with the highest average profitability between the 1st quarter of 2010 and the 4th quarter of 2019. Financial institutions, insurance pension companies, and REITs are not included in the data set. The companies whose data were used in the study are shown in Table 1.

Table 1. *Companies subject to the study*

Stock Code	Company Name
KCHOL	Koç Holding
EREGL	Erdemir
TCELL	Turkcell
TUPRS	Tüpraş
ENKAI	Enka İnşaat
THYAO	Turkish Airlines
TTKOM	Türk Telekom
SISE	Şişecam
FROTO	Ford Otosan
ASELS	Aselsan
TOASO	Tofaş
ARCLK	Arçelik
BIMAS	BİM
TAVHL	TAV Airports
KOZAL	Koza Gold Corporation
KOZAA	Koza Mining
AEFES	Anadolu Efes
IPEKE	İpek Natural Energy Resources
SODA	Soda Industry
TKFEN	Tekfen Holding
PETKM	Petkim
ULKER	Ülker
TRKCM	Trakya Cam
AYGAZ	Aygaz
CCOLA	Coca Cola
TTRAK	TürkTraktör
SELEC	Selçuk Ecza Deposu
DOHOL	Doğan Holding
GUBRF	Gübretaş
VESBE	Vestel Beyaz Eşya

The analysis covers the period between 2010:Q1-2019:Q4. The variables used in the analysis are shown in Table 1.

Table 2. *Variables*

Financial Ratio	Notation	Calculation
Return on Assets	ROA	Net Profit / Total Assets
Return on Equity	ROE	Net Profit / Equity
Total Assets	TA	Total Assets
Active Turnover Ratio	ATR	Net Sales / Total Assets
Leverage Ratio	LVR	Total Debt / Equity
Cash Conversion Cycle	CCC	RCP + STP-SDP
Receivable Collection Period	RCP	365 / (Net Sales / T. Receivables)
Stock Turnover Period	ITP	365 / Inventory Turnover Speed)
Short Term Debt (STD) Payment Period	SDP	365 / (Cost of Goods Sold / STD)

Two different profitability ratios were used, and three different models were tested in the study. In the first model, ROA was taken as the dependent variable, and the independent variables were determined as CCC, ATR, LVR, and TA.

In the second model, ROE was taken as the dependent variable, and the independent variables were determined as CCC, ATR, LVR, and TA.

In the third model, ROA was taken as the dependent variable, and the independent variables were determined as CCC components (RCP, ITP, SDP), ATR, LVR, and TA.

Model 1: $ROA = \alpha i + \beta 1CCC + \beta 2ATR + \beta 3LVR + \beta 4TA + \varepsilon i$

Model 2: $ROE = \alpha i + \beta 1CCC + \beta 2ATR + \beta 3LVR + \beta 4TA + \varepsilon i$

Model 3: $ROA = \alpha i + \beta 1CCC + \beta 2ATR + \beta 3LVR + \beta 4TA + \beta 5RCP + \beta 6ITP + \beta 7SDP + \varepsilon i$

4. Findings

4.1. Descriptive statistics

The mean value in the descriptive statistical information table gives the averages of each variable included in the analysis. Accordingly, the average return on assets of the companies in the sample is 8.525, and the average CCC is approximately 56.39 days. Since the management of receivables and stock items and debt payment policies in companies differ depending on the geographical location, industry branch, and market conditions in which they operate, CCCs also differ from firm to firm, and an optimal CCC cannot be in question (Çakır, 2013). A negative CCC in businesses may indicate that they do not need working capital and are financed by their suppliers (Sakarya, 2008). The negativity of CCC is generally seen in large market chains operating in Turkey's fast-moving consumer goods sector. Negative CCC is formed due to the low stock holding period and cash-weighted sales processes of businesses that buy goods in large quantities and with maturities (Sakarya, 2008). On the other hand, shortening or negative CCC cannot always be considered a financial success. Therefore, the firm should establish a receivable policy that will not cause customer loss, keep its worthless receivables at a minimum level, and shorten the debt collection period accordingly (Çakır, 2013).

The median values are the values that divide the data set into two when the data set is sorted from smallest to largest. In addition, the skewness, kurtosis values, and Jarque-Bera

statistics show that the data set does not fit the normal distribution frequently observed in financial data sets. The data set consists of 1200 observations in total.

Table 3. *Descriptive statistics*

	ROA	ROE	CCC	ITR	LVR	ATR	RCP	TA
Mean	8.525	19.89468	56.39	60.871	51.27	1.07	55.68	9.865
Median	7.090	17.20	46.92	46.750	55.63	0.80	51.79	9.825
Maximum	67.08	86.16	351.95	315.68	87.39	5.63	370.09	11.17
Minimum	-11.36	-73.13	-73.32	0.000	7.470	0.00	0.00	8.559
Std. Dev.	7.973	15.69	57.63	47.304	19.62	0.85	34.10	0.480
Skewness	2.632	0.602	0.833	1.103	-0.598	2.695	1.014	0.307
Kurtosis	15.35	5.403	3.609	4.248	2.402	11.89	8.239	2.673
Jarque-Bera	9004.5	361.0	157.4	321.4	89.4	5408.8	1577.2	24.2
Observations	1200	1200	1200	1200	1200	1200	1200	1200

4.2. First and second generation unit root tests

Non-stationary time series may cause correlation and spurious regression relationships between independent variables. The result of the empirical analysis will have no statistical significance in such a case. Hence, to determine the data's stability, unit root tests of the panel data should be performed first. Unit root tests were carried out to determine whether the variables are stationary or not by determining the time-series properties. Although there are many unit root tests in the literature, ADF (Augmented Dickey-Fuller) and PP (Phillips-Perron) unit root tests were applied in this study. The results show that the series, except for the total assets variable, all the variables are stationary at level. The total assets (TA) variable is stationary in the first difference.

Table 4. *First generation unit root test results*

Variables	Intercept		Intercept & Trend	
	Stat.	p	Stat.	p
ROA	82.0920[1]	0.0307*	93.5927[1]	0.0036*
	67.2475[2]	0.2429	79.4746[2]	0.0470*
ROE	94.0745	0.0033*	90.6409	0.0065*
	88.1609	0.0104*	71.0838	0.1549
CCC	164.742	0.0000*	399.936	0.0000*
	174.032	0.0000*	199.590	0.0000*
ATR	79.1662	0.0493*	90.5320	0.0066*
	94.8535	0.0028*	120.061	0.0000*
LVR	102.894	0.0005*	109.672	0.0001*
	140.170	0.0000*	161.651	0.0000*
TA	12.8513	1.0000	50.8103	0.7951
	13.6247	1.0000	68.9440	0.2007
RCP	134.030	0.0000*	221.251	0.0000*
	143.432	0.0000*	299.904	0.0000*
ITP	128.489	0.0000*	134.851	0.0000*
	115.609	0.0000*	314.145	0.0000*
SDP	165.212	0.0000*	419.522	0.0000*
	190.868	0.0000*	219.221	0.0000*

Note: For each variable [1] is ADF, and [2] is PP; * illustrates that the Null Hypothesis is rejected at % 5 significance level; Null: Unit root (assumes individual unit root process).

It is emphasized that if the cross-section dependence and slope heterogeneity in models and parameters are ignored, the estimation results will likely have significant skewness (Breitung, 2005; Grossman and Krueger, 1995). This study tries to determine the financial ratios that affect the profitability, especially the cash cycle, with the panel data of the

companies traded in Borsa Istanbul in Turkey with up-to-date data. Some unobserved common factors, such as heterogeneous effects between companies since companies are located in different sectors, and different shocks affect companies at different levels, may cause cross-section dependence. In the case of cross-sectional dependence, using homogeneous curved models may lead to biased results. In such a case, heterogeneous sloping models will better reflect company-specific features.

Cross-section dependence and homogeneity were investigated first using Pesaran's scaled Lagrange multiplier (LM) and Breusch-Pagan LM tests (Breusch and Pagan, 1980) for cross-section dependence and slope heterogeneity (Pesaran and Yamagata, 2008) and Swamy S (Swamy, 1971) tests for homogeneity. Since T = 40, N = 30 and T > N in panel data, Breusch-Pagan LM and Pesaran scaled LM tests were used to test the cross-sectional dependence in the model. In cases where T > N, LM tests give more consistent results (Breusch and Pagan, 1980; Pesaran et al., 2008; Hsiao et al., 2012).

Table 5 gives the results of the cross-section dependence and homogeneity tests, showing that the null hypothesis of no cross-sectional independence was rejected. The results confirm the presence of a substantial cross-section dependence in the model. However, the Slope heterogeneity and Swamy S test results confirm the presence of heterogeneity in the panel and parameters. Both p-values are statistically significant. The slope coefficients are heterogeneous because the null hypothesis has been rejected. The parameters are not homogeneous and vary from unit to unit. So we are facing heterogeneity in the parameters.

Table 5. *Cross section dependence and homogeneity tests*

Cross-Section Dependence	Breusch-Pagan LM	2973.660***
	Pesaran scaled LM	86.06864***
Homogeneity Tests	Slope heterogeneity	Δ 32.842***
		Δ_{adj} 35.625***
	Swamy S	χ^2 5945.88***

Note: *** Indicates significance at the 1% level, the cross-sectional dependence test null hypothesis is that no cross-sectional dependence and the slope homogeneity test null hypothesis is that slope coefficients are homogenous. The Swamy S homogeneity test null hypothesis is that parameters are homogeneous.

According to these results, it is more appropriate to use econometric methods that allow cross-sectional dependence and heterogeneity. Considering the panel's cross-sectional dependence and heterogeneity, first-generation conventional unit root tests for cross-sectional dependence and heterogeneity will not be sufficient. Cross-section dependence and homogeneity tests were performed for Models 2 and 3 in the same way, and cross-section dependence and heterogeneity were determined for both models.

Therefore, to test the stationarities, the Pesaran CIPS panel unit root test recommended by Pesaran (2007), which is resistant to cross-section dependence and heterogeneity, was used. The results are listed in Table 6. The null hypothesis that the series is not stationary for all variables except ATR at level values is rejected. This means that all the variables in the panel are integrated on order I(0). ATR is stationary in I(1) order.

Table 6. *Second generation unit root test (CIPS) results*

Variables	Level		1st Difference		Order of Integration
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	
ROA	-2.285**	-3.179***	-	-	I(0)
ROE	-2.381***	-3.185***	-	-	I(0)
CCC	-2.861***	-3.680***	-	-	I(0)
ATR	-1.917	-2.391	-4.449***	-4.637***	I(1)
LVR	-2.222**	-2.606**	-	-	I(0)
TA	-2.507***	-2.695**	-	-	I(0)
RCP	-2.263**	-2.961***	-	-	I(0)
ITP	-2.290**	-2.550*	-	-	I(0)
SDP	-2.863***	-3.690***	-	-	I(0)

Note: ***, ** and * illustrates that the Null Hypothesis is rejected at 1%, 5% and 10% significance levels. Null Hypothesis: Non-stationarity (assumes individual unit root process).

4.3. Model selection for Model I

Before regression, panel data should be analyzed with the F and Hausman tests to determine the model type to build. With the help of the F test, the Pooled Model – Fixed Effects Model is compared first. Since the statistic value in the table is significant at the 1% level, the H0 hypothesis that states the pooled model is appropriate was rejected. The comparison of the Hausman Test, the fixed effects, and the random-effects model was made in the second stage. According to Table 7, the H0 hypothesis that states the model is suitable for the random-effects model was rejected because the statistic value is significant at the 1% level. As a result of the F and Hausman tests, it was seen that the Fixed Effects Model was the most suitable.

Table 7. *Test results*

Test	Statistic
F	42.869***
Hausman	13.396***

Note: ***1% significance level.

4.4. Autocorrelation research

The fact that the variables in the panel regression model are meaningful due to the first estimation is not sufficient to reach a conclusion in the case of autocorrelation in the model. Durbin-Watson (DW) statistics were used to test the presence of autocorrelation in the data. The DW is a test statistic used to determine the presence of autocorrelation at lag 1 in regression analysis residuals (estimation errors).

As a result of the estimation made with the fixed effects model, it was seen that the Durbin Watson value (0.268) was well below 2, and there was a positive autocorrelation. To fix the autocorrelation problem, the AR(1) term, which represents the one-period lagged value of the error terms, was added to the model, and the estimation was performed again. Finally, due to the ongoing autocorrelation problem, the AR(2) term expressing the delayed value of the error terms of two periods was added to the model, and the autocorrelation problem was eliminated.

4.5. Investigation of heteroscedasticity problem

The Panel Cross-section and Period Heteroskedasticity LR test were performed to investigate the heteroscedasticity problem. The residuals are homoskedastic (constant variance) null hypothesis is tested. According to the results in Table 8, the hypothesis is rejected, and it is concluded that the heteroskedasticity problem is valid. In order to overcome the variance problem detected in the model, estimation was made using the White Cross-Section method.

Table 8. *Heteroscedasticity analysis results*

	Value
Likelihood ratio (Cross-section)	1195.958***
Likelihood ratio (Period)	56.5140***

Note: ***1% significance level.

4.6. Model estimation

The estimation results for Model 1 are shown in Table 9. The model is statistically significant and valid. Explanatory variables of the CCC, asset turnover, leverage, and total assets explain about 93% (R2) of the asset profitability-dependent variable changes. In the model, statistically significant and negative relationships were found between the explanatory variables of CCC, LVR and the dependent variable of ROA, as expected. However, as expected, it is seen that asset turnover ratio (ATR) and the natural logarithm of firm size (TA-Total Assets) positively and significantly affect the ROA.

Table 9. *Model 1 (dependent variable: return on Asset-ROA)*

Variable	Coefficient	t-Statistic	Prob.
CCC	-0.002737	-2.219953	0.0266
ATR	2.269371	10.47360	0.0000
LVR	-0.087517	-6.897553	0.0000
TA	1.764083	1.868803	0.0619
C	-5.009588	-0.544656	0.5861
AR(1)	1.149727	38.03280	0.0000
AR(2)	-0.293855	-9.735902	0.0000

Note: R^2: 0.928056; Adjusted R^2: 0.925705; F: 394.7298; p: 0.000000; DW: 2.014745.

4.3. Model selection for Model II

Before regression, panel data should be analyzed with the F and Hausman tests to determine the model type to build. With the help of the F test, the Pooled Model – Fixed Effects Model is compared. Since the statistic is significant at the 1% level, the H0 hypothesis stating that the pooled model is appropriate was rejected. The comparison of the fixed and the random effects were made in the second stage with the Hausman Test. According to Table 10, the H0 hypothesis states that the model is suitable for the random-effects model was rejected because the statistic value is significant at 1%. As a result of the F and Hausman tests, it was seen that the Fixed Effects Model was the most suitable.

Table 10. *Test results*

Test	Statistic
F	26.384***
Hausman	43.482***

Note: ***1% significance level.

4.4. Autocorrelation research

The estimation made with the fixed effects model showed that the DW value (0.405) was well below 2, and there was a positive autocorrelation. The AR(1) term, which represents the one-period lagged value of the error terms, was added to the estimation model to solve the autocorrelation problem. The estimation was performed again, and the autocorrelation problem was eliminated (DW: 1.82).

4.5. Investigation of heteroscedasticity problem

In order to investigate the heteroscedasticity problem, the "Panel Cross-section and Period Heteroskedasticity LR" test was performed. The residuals are homoskedastic (constant variance) null hypothesis is tested. Table 11 shows the results. The hypothesis is rejected, and it is concluded that the heteroskedasticity problem is valid. In order to overcome the heteroskedasticity problem detected in the model, estimation was made using the White Cross-Section method.

Table 11. *Heteroscedasticity analysis results*

	Value
Likelihood ratio (Cross-section)	886.4635***
Likelihood ratio (Period)	04.7339***

Note: ***1% significance level.

4.6. Model II estimation

The estimation results for Model 2 are shown in Table 12. The model is statistically significant and valid. According to the results, only the asset turnover ratio statistically affects the return on equity, unlike the return on assets. There is no effect of the CCC on the equity profitability of companies. However, asset turnover (ATR) positively and significantly affects the return on equity.

Table 12. *Model 2 (dependent variable: return on equity-ROE)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CCC	-0.010115	0.008713	-1.160847	0.2460
ATR	5.275332	2.169284	2.431831	0.0152
LVR	-0.174230	0.196733	-0.885615	0.3760
TA	8.156028	6.975334	1.169267	0.2425
C	-53.48199	61.61716	-0.867972	0.3856
AR(1)	0.803886	0.054931	14.63445	0.0000

Note: R^2: 0.803; Adjusted R^2: 0.797; F: 132.212; p: 0.000000; DW: 1.815.

The estimation results for Model 3 are shown in Table 13. The model is statistically significant and valid. The short-term debt repayment period (SDP) statistically affects the return on assets. However, other factors used in calculating the CCC do not have any effect. In addition, leverage (negative) and asset turnover significantly affect the return on assets. These explanatory variables explain about 0.91 (R2) of the asset profitability dependent variable changes.

Table 13. *Model 3 (dependent variable: ROA; independent variables: CCC components)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RCP	-0.008281	0.016677	-0.496551	0.6196
SDP	0.007581	0.003750	2.021624	0.0435
ITR	0.001578	0.022984	0.068661	0.9453
ATR	3.432306	0.570212	6.019354	0.0000
LVR	-0.220523	0.077716	-2.837533	0.0046
TA	5.892900	3.639601	1.619106	0.1057
C	-40.18969	32.77852	-1.226098	0.2204
AR(1)	1.035060	0.058948	17.55886	0.0000
AR(2)	-0.191408	0.052654	-3.635206	0.0003

Note: R^2: 0.908020; Adjusted R^2: 0.904833; F: 284.9504; p: 0.000000; DW (No AR Process): 0.294; DW AR(1): 1.674; DW AR(2): 2,025; Heteroskedasdicity LR Test Statistic:1167.869***; F Test Statistic: 43.059752***; Hausman Test Statistic: 25.764315***.

5. Conclusion

Working capital management occupies a large part of the time and attention of finance managers. Failure to pay attention to liquidity management in businesses is a factor that can cause severe difficulties and losses due to short-term negative developments, even if long-term expectations are positive (Richards and Laughlin, 1980). Factors such as operating cycle and CCC are robust criteria that can be used effectively in working capital management. However, traditional static ratios such as current and acid test ratios can be insufficient and misleading from time to time.

The CCC can be defined as the period from the payment for purchasing the raw material required to produce a product to collecting the receivables arising from the product's sale. The CCC or cash cycle functions as a very useful criterion in the context of adequate working capital management of businesses, especially cash management. Therefore, the cash cycle is among the essential working capital management components. The cash cycle ensures that the period in which receivables arising from purchasing or purchasing expenditures and sales of final goods are collected, taking into account the payment period made to the creditors, is effectively managed.

The relationship between the cash cycle and firms' profitability is expected to be inversely proportional. Companies' profitability, market value, or liquidity is expected to be high depending on how short the CCCs are (Shin and Soenen, 1998; Deloof, 2003). The short conversion time to cash may reflect that the company can effectively manage and melt its stocks, collect receivables quickly, or focus on deferred payments rather than cash payments in payments made to suppliers.

While this increases firm productivity, it brings positive developments such as higher profitability, net cash flow value, and market value (Gentry et al., 1990; AlShattarat et al., 2010; Nobanee and Al Hajjar, 2014). However, an excessively long CCC indicates that the firm's resources are not used effectively and efficiently. Such a situation will harm the profitability of the company. For this reason, managers should reduce the time to cash conversion as short as possible as the ultimate goal in cash management. The CCC is considered a dynamic measure of the firm's liquidity as a method that considers the relevant

elements of the balance sheet and the income statement throughout the business's operating period and economic life (Jose et al., 1996).

The study results mostly confirm the previous studies' findings. The study results show that managers should maintain the importance they attach to CCC in the context of cash management, and if they neglect it, they should pay more attention.

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