International Journal of Innovation and Research in Educational Sciences
Volume 8, Issue 2, ISSN (Online) : 2349–5219

Relationship between Working Capital Management Efficiency and Firm Profitability of Listed Plastic Companies in Vietnam

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Date of publication (dd/mm/yyyy): 12/04/2021

***Abstract* – This study aimed to examine the relationship between the working capital management efficiency and the profitability of plastic companies in Vietnam. Data from the financial statements of 37 listed plastics companies for the period from 2015 to 2019 has been collected. In this study, working capital management efficiency is evaluated through three indexes: Performance index of working capital management (PI), utilization index of working capital management (UI), and efficiency index of working capital management (EI). Research results have shown that there are statistically significant and positive relationships between the indexes and firm profitability in this period.**

***Keywords* – Performance Index of Working Capital Management, Utilization Index of Working Capital Management, Efficiency Index of Working Capital Management, Firm Profitability.**

1. INTRODUCTION

Working capital management is one of the important financial management activities of firms. Researchers Amajad & Hussain (2014) emphasized the importance of working capital management by stating: "Many companies fail due to lack of appropriate working capital management methods". This implies that working capital management policies are precisely what is required for the survival of a company. Adu (2013) argued that proper working capital management is essential for any company and that is the reason why it has become a metric for determining a company's performance. Mun and Jang (2015) stated that working capital plays an important role in the day-to-day operation of the business to ensure that the business operates smoothly. Similarly, Mwangi et al. (2014) suggested that the important elements of working capital should be managed in parallel by organizations if they are successful. Other researchers believe that working capital plays a key role compared to capital budget and financial decisions (Agyei & Yeboah, 2011; Mun & Jang, 2015). This means companies must have effective working capital management in order to improve the company's performance. Additionally, many empirical studies explored the relationship between working capital management and the profitability of businesses. Moreover, effective working capital management improves firm's performance.

In Vietnam, the plastic industry is increasingly playing an important role in the life. Plastics or polymers are used as materials to produce many kinds of items as well as serving the development of many other economic sectors such as electricity, electronics, telecommunications, transportation, fisheries, and agriculture. By 2019, the scale of the plastic industry is estimated at USD 15 billion, equivalent to 6.7% of Vietnam's GDP in the same period (FPTS, 2019). However, previous studies on working capital management conducted in food and pharmaceutical companies and there are no studies concerning working capital management in plastic enterprises. In addition, in previous studies, authors usually used conventional ratios to evaluate the effectiveness of working capital management such as: working capital ratio, current ratio, quick ratio, cash conversion cycle, inventory conversion period and receivables conversion period. Performance index of working capital management, utilization index of working capital management and efficiency index of working

capital management have not used to evaluate the effectiveness of working capital management in Vietnam. Moreover, there are no studies on the relationship between working capital management efficiency and firm's profitability in Vietnam. For these reasons, the purpose of this paper is to examine this relationship in selected plastic companies with these three indexes.

II. LITERATURE REVIEW

Many studies have shown that effective working capital management contributes to firms' success. Deloof (2003) in his studies analyzed a sample of Belgian firms, and Wang (2002) analyzing a sample of Japanese and Taiwanese firms, emphasized that working capital management has a significant impact on firm's profitability and the increase in profitability can be done by reducing the number of day's accounts receivables and inventories. Firms' profitability and liquidity are reported to be affected by working capital management. Research on pooled data between 2006 and 2008 to assess enlisted companies on Vietnam's stock market is an evidence of working capital impact on firms' profitability (Dong, 2010). In his (Dong, 2010) studies, Dong focused on variables" including "profitability, conversion cycle and its related elements and the relationship that exists between them". His research depicted a strong negative relationship among these variables denoting that an increase in cash conversion cycle causes a decrease in the profitability. In agreement to Deloof (2003) the research stated that a reduction in profitability is likely to increase numbers of days of accounts receivable and inventories. More over Padachi (2006) studied small manufacturing enterprises in Mauritius for the period 1998-2003 and the analytical results showed that accounts receivable, accounts payable, and cash conversion cycle were negatively related to ROA (statistical significance at the 5% level. Raheman & Nasr (2007) also studied the relationship between working capital management and a company's profitability in 94 firms listed on Karachi Stock Exchange using static measure of liquidity and ongoing operating measure of working capital management during 1999- 2004. The findings of the study suggest that there exists negative relation between working capital management measures and profitability among this firms. Similarly, Eljelly (2004) found a negative relationship between firms' profitability and liquidity. Lazaridis and Tryfonnidis (2006) also found a significant relationship between profitability and the cash conversion cycle as well as its components (accounts receivable, payables and inventories).

Afza and Nazir (2011) used the Bhattacharya's indexes (1997) to examine the working capital management efficiency of the cement firms in Pakistan for the period from 1988 to 2008. The study found that the cement firms under this study have good working capital management efficiency during the period. After that, Press, Valipour and Jamshidi (2012) also used the Bhattacharya's indexes to evaluate working capital management efficiency. The study found that there is positive relationship between performance index, efficient index, and utilization index with the efficiency of the asset. However, the results show that cash conversion cycle has inversely significant relationship on efficiency of the assets.

The research is motivated by previous studies and limited research from the plastic enterprises in Vietnam. This study thus examines the relationship between working capital management efficiency and firm performance of plastic firms in Vietnam by using the Bhattacharya's indexes.

III. METHODOLOGY

3.1. *Hypotheses and Panel Data Model*

In order to study the relationship between working capital management efficiency indexes and the profitability of the business, the research has proposed the following hypotheses:

Hypothesis 1: There is a significant relationship between utilization Index of working capital management and return on asset.

Hypothesis 2: There is a significant relationship between performance index of working capital management and return on asset.

Hypothesis 3: There is a significant relationship between Efficiency index of working capital management and return on asset.

Based on the models of Hashem Valipour and Ali Jamshidi (2012) the author used three models to test the hypotheses as follows:

$ROAit = \beta0 + \beta1\ U_{iit} + \beta2\ DR_{it} + \beta3\ SG_{it} + \beta4\ INVEST_{it} + \beta5\ Size_{it} + \varepsilon_{it}$

$ROAit = \beta0 + \beta1\ P_{iit} + \beta2\ DR_{it} + \beta3\ SG_{it} + \beta4\ INVEST_{it} + \beta5\ Size_{it} + \varepsilon_{it}$

$ROAit = \beta0 + \beta1\ E_{iit} + \beta2\ DR_{it} + \beta3\ SG_{it} + \beta4\ INVEST_{it} + \beta5\ Size_{it} + \varepsilon_{it}$

3.2. *Variables for this Study*

In accordance with the research objectives, the dependent and independent variables used in this study and their measurement were adopted from existing literature in order to produce or construct a worthwhile comparison with previous empirical studies. The variables used in the study are described in the Table 1 below:

Table 1. Variables and their Measurements.

Type of Variables	Name of Variable	Abbreviation	Measurement
Dependent	Return on Assets	ROA	Net profit/total asset
Independent	Utilization Index of working capital management (UI_{WCM})	Ui	$UI_{WCM} = \frac{A_{t-1}}{A_t}$ A = Current assets / Sales
Independent	Performance index of working capital management (PI_{WCM})	Pi	$PI_{WCM} = \frac{I_S \sum_{i=1}^{N} \frac{W_{i(t-1)}}{W_{it}}}{N}$ I_s = Sales index defined as: *St* / *St*-1 W_i = Individual group of current assets N = Number of current assets group i= 1, 2, 3...N.
Independent	Efficiency index of working capital management	Ei	$EI_{WCM} = PI_{WCM}$ x UI_{WCM}
Independent	Debt to asset ratio	DR	Total debt/total asset
Independent	Sale growth	SG	(Sales in the assumed year - sales in the base year)/ sales in the base year
Independent	Investment	INVEST	(Total amount of short term) and long time investments) / Total assets
Independent	Size	Size	The natural logarithm of sales

3.3. *Data Collection and Data Analysis*

In this research, financial statements of 37 plastic companies listed on Vietnam's stock market (HOSE and HNX) for the period 2015-2019 were collected to calculate the working capital management indexes and other financial indicators.

To analyze the relationship between working capital management and financial performance, the author used Stata 15 software to run regression models to measure the influence of working capital management indexes on the financial performance of companies. Fixed effects model (FEM) and random effects model (REM) were used in the panel data analysis. Therefore, the Hausman test (1978) is used to select the appropriate method.

IV. DATA ANALYSIS AND RESULTS

4.1. *Panel Unit Root Test*

Due to the time series dimension of the panel data, the author first test for the existence of unit roots. When time series have unit roots or they are non-stationary, results generated from such series normally tend to be spurious and hence leads to inconsistent outcomes. To check this, the Levin-Chin-Chu test is used to examine whether the series are contain unit root. As indicated earlier, the null hypothesis is that the series contain a unit root and the alternative is that the series is stationary. This test assumes a common autoregressive parameter for all panels so it does not allow for the possibilities of some firms variables containing unit roots while others do not. The Levin-Chin-Chu test involves fitting an augmented Dickey-Fuller regression for each panel.

From the results as presented in Table 2, it is realized that all variables are stationary at level.

Table 2. Levin, Lin and Chu panel unit root test results.

Variable	P-value	Status
ROA	0.0000	Level
Ui	0.0000	Level
Pi	0.0000	Level
Ei	0.0000	Level
DR	0.0000	Level
SG	0.0000	Level
INVEST	0.0000	Level
SIZE	0.0000	Level

(Data Source: Stata output)

4.2. *Descriptive Data Analysis*

Table 2 shows descriptive data in the model on the relationship between working capital management indexes and the financial performance of 37 plastic companies listed on Vietnam's stock market in the 2015-2019 period. The data is collected by year, so the total observations are 185 observations.

Table 3. Summary of descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	185	0.059	0.147	-1.693	0.178
Ui	185	0.971	0.172	0.660	1.321
Pi	185	0.950	0.362	0.453	1.939
Ei	185	0.971	0.522	0.359	2.448
DR	185	0.454	0.207	0.083	0.755
SG	185	0.071	0.199	-0.263	0.543
INVEST	185	0.138	0.171	0	0.564
SIZE	185	26.667	1.174	24.775	28.896

(Data Source: Stata output)

ROA:

The dependent variable that shows the financial performance of listed plastic enterprises has an average value of 5.9%, and the standard deviation is 14.7%. The maximum value of ROA is 17.8% while the minimum one is up to -169.32%.

Utilization Index:

In general, selected companies did not effectively use their existing assets. The mean value of utilization index is less than 1. The standard deviation is 17.2%. The maximum value of utilization index is 1.321 and the lowest index is 0.66.

Performance Index:

In the period 2015-2019, the performance index mean value is approximately 1. The standard deviation is 36.2%. While the highest value is 1.939, the lowest figure is 0.453.

Efficiency Index:

Generally, the results show that selected companies did not have effective working capital management with the mean value of efficiency index less than 1. The standard deviation is quite high at 52.2%. The maximum and minimum values are 2.4448 and 0.359 respectively.

Debt to Asset Ratio:

The mean value of this indicator is 0.454. The standard deviation is 20.7%. The maximum percentage of the ratio is 75.5% and the lowest percentage one is 8.3%.

Sale Growth:

The mean value of sale growth is 0.071. The standard deviation is 19.9%. The maximum percentage of sale growth is 0.543 and the lowest one is -0.263.

Investment:

The mean value of total long term and short term investment on total asset is 0.138. The standard deviation is 0.171. The maximum percentage of debt is 0.564 and the lowest percentage one is 0.

Size:

The mean value of the natural logarithm of sales is 26.667. The standard deviation is 1.174. The maximum indicator is and the lowest one is 28.896 and 24.775 respectively.

4.3. *Correlation Test Results*

Table 4. Correlation matrix between variables.

	ROA	Ui	Pi	Ei	DR	SG	Invest	Size
ROA	1							
Ui	0.365*	1						
Pi	0.336*	0.545*	1					
Ei	0.360*	0.726*	0.950*	1				
DR	-0.39*	-0.084	0.021	-0.005	1			
SG	0.026	0.351*	0.120	0.213*	0.202*	1		
Invest	0.123	-0.074	-0.007	-0.019	-0.106	-0.1	1	
Size	0.215*	0.211*	0.197*	0.186*	0.367*	0.32*	0.059	1

(Data Source: Stata output)

The correlation matrix table shows that the variables Ui, Pi, Ei and Size have a statistically significant positive relationship with the ROA, and the variable DR has a statistically significant negative relationship with the ROA.

4.3. *Regression Model Specifications and Results from a Sample of Plastic Companies in Vietnam*

Several panel estimators including OLS, fixed effect, random effect are employed in testing the hypotheses. The fixed effects model and the random effects model were used in conjunction with the Hausman test to check whether there is a correlation between the unobserved variables of the companies affecting the explanatory variables.

In order to check the heteroskedasticity and autocorrelation phenomenon in the model, Modified Wald test and Wooldridge test were used. Therefore, the GLS (Generalized Least Square) method and the regression with Driscoll-Kraay standard errors method were used to adjust the models.

Model 1:

Regression result of the relationship between utilization index of working capital management and return on asset.

Table 5. Regression result for Model 1.

Variables	VIF	Pool OLS	FEM	REM	GLS regression with AR(1) Disturbances
Ui	5.60	0.0929***	0.0762***	0.0777***	0.0718***

Variables	VIF	Pool OLS	FEM	REM	GLS regression with AR(1) Disturbances
		(0.0183)	(0.0118)	(0.0118)	(0.0119)
DR	4.87	-0.0786***	-0.00947	-0.0425**	-0.0440**
		(0.0146)	(0.0237)	(0.0187)	(0.0185)
SG	1.23	-0.00232	0.00122	0.00231	0.00361
		(0.0162)	(0.0121)	(0.0119)	(0.0115)
INVEST	1.64	0.0297*	-0.0163	0.00670	0.00974
		(0.0173)	(0.0283)	(0.0224)	(0.0227)
Constant		0.00110	-0.00797	0.00234	0.00773
		(0.0202)	(0.0169)	(0.0163)	(0.0161)
Obs		185	185	185	185
R^2		0.2801			
Within			0.2444	0.2320	0.2285
Between			0.1206	0.3206	0.3246
Overall			0.1408	0.2595	0.2666
F-stats/Wald chi2		17.51	10.18	54.57	47.16
Prob>F/Prob>Wald Chi 2		0.0000	0.0000	0.0000	0.0000
Hausman (Chi2)			3.70		
Prob>chi2			0.4475		
Wooldridge test F-stats Prob > F				8.191 0.0070	

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1(Data Source: Stata output)

According to the results of the multicollinearity test, the size variable was removed from the model to deal with the multicollinearity.

The OLS estimation results showed that the coefficient of R^2 = 0.2801, the F statistical value of 17.51 is statistically significant at the 1% level, indicating that the OLS estimate can be an appropriate estimate.

The results of estimating the fixed effects model show that the F statistical result is 10.18 with a statistical significance level of 1%. The results shows the difference between the objects (enterprises). In this case the fixed impact model is more suitable than the OLS Pool.

The results of estimating the random effects model also show that Wald value-chi squared is 54.57 (statistical significance level of 1%). The figures indicate that the random effects model is more suitable than the Pool OLS.

Hausman test results with chi-square value is 3.7 with P value > 0.05 so the random effects model is more suitable to use than the fixed effects model.

To check the autocorrelation phenomenon in the model, Wooldridge test was used, the F statistical result is 8.191 with a significance level of 1% so the equation exists the autocorrelation phenomenon. This phenomenon will make the estimates obtained by the conventional regression method on the table data unreliable. Therefore, the author has used the GLS (Generalized Least Square) method to overcome the first-order autocorrelation between errors to ensure a reliable estimate. After using the GLS method we have the following results:

The analysis results show that there is a statistically significant positive relationship between ROA and utilization index of working capital management. This is consistent with empirical research result by Hashem Valipour and Ali Jamshidi (2012). In addition, the research results show a statistically significant negative relationship between debt to asset ratio and ROA. This result is consistent with many previous studies such as the study of Kester (1986), Rajan and Zingales (1995), Hall et al. (2004), Marco Muscettola Francesco Naccarato (2016). Meanwhile, the coefficient of sales growth and total investment on asset are not statistically significant.

Model 2:

The regression result of the relationship between performance index of working capital management and return on asset.

Table 6. The regression result for the Model 2.

Variables	VIF	Pool OLS	FEM	REM	Regression with Driscoll-Kraay Standard Errors
Pi	4.06	0.0427***	0.0452***	0.0440***	0.0452***
		(0.00805)	(0.00512)	(0.00512)	(0.00463)
DR	3.85	-0.0912***	-0.00186	-0.0375**	-0.00186
		(0.0143)	(0.0217)	(0.0180)	(0.00806)
SG	1.20	0.0187	0.0154	0.0171	0.0154**
		(0.0150)	(0.0108)	(0.0106)	(0.00401)
INVEST	1.57	0.0250	-0.0261	-0.00372	-0.0261
		(0.0172)	(0.0259)	(0.0215)	(0.0243)
Constant		0.0557***	0.0201*	0.0342***	0.0201**
		(0.0107)	(0.0120)	(0.0119)	(0.00664)
Observations		185	185	185	185

Variables	VIF	Pool OLS	FEM	REM	Regression with Driscoll-Kraay Standard Errors
R-Squared		0.288			0.3668
Within			0.3668	0.3519	
Between			0.0054	0.1925	
Overall			0.0857	0.2204	
F-stats/Wald chi2		18.24	12.73	84.83	615.53
Prob>F/Prob>Wald Chi 2		0.0000	0.0000	0.0000	0.0000
Hausman (Chi2)			10.06		
Prob>chi2			0.0394		
Modified Wald test Chi 2 Prob>chi2			51601.04 0.0000		
Wooldridge test F-stats Prob > F			7.539 0.0094		

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (Data Source: Stata output)

According to the results of the multicollinearity test, the size variable was removed from the model to deal with the multicollinearity.

The OLS estimation results showed that the coefficient of R^2 = 0.288, the F statistical value of 18.24 is statistically significant at the 1% level, indicating that the OLS estimate can be an appropriate estimate.

The results of estimating the fixed effects model show that the F statistical result F is 12.73 with a statistical significance level of 1% shows the difference between the objects (enterprises). In this case the fixed impact model is more suitable than the OLS Pool.

The results of estimating the random effects model show that the Wald value - chi squared is 84.83 (statistical significance level of 1%). This figures show that the random impact model is more suitable than the Pool OLS.

Hausman test results with chi-square value is 10.06 and P value is less than 0.05. Hence, the fixed effects model is more suitable to use than the random effects model.

To check the heteroskedasticity phenomenon in the model, Modified Wald test was used, the chi squared is 51601.04 with P value is less than 0.05. Therefore the model exists the heteroskedasticity phenomenon.

To check the autocorrelation phenomenon in the model, Wooldridge test was used, the F statistical result is 7.539 with a significance level of 1%. Therefore the model exists the autocorrelation phenomenon.

The heteroskedasticity and autocorrelation phenomenon will make the estimates obtained by the conventional regression method on the table data unreliable. Therefore, the author has used the regression with Driscoll-Kraay standard errors method to overcome the first-order autocorrelation and heteroskedasticity to ensure a reliable estimate. The results are as follows:

The analysis results show that there is a statistically significant positive relationship between ROA and performance index of working capital management and sales growth. This is consistent with empirical research result by Hashem Valipour and Ali Jamshidi (2012), Afza and Nazir (2011) and Ossame and Yassine (2011). Meanwhile, the coefficient of DR and INVEST are not statistically significant.

Model 3:

The regression result of the relationship between efficiency index of working capital management and return on asset.

Table 7. The regression result for the Model 3.

Variables	VIF	Pool OLS	FEM	REM	GLS regression with AR(1) Disturbances
Ei	3.05	0.0310***	0.0297***	0.0295***	0.0277***
		(0.00566)	(0.00350)	(0.00350)	(0.00359)
DR	2.99	-0.0875***	-0.00673	-0.0399**	-0.0431**
		(0.0143)	(0.0220)	(0.0180)	(0.0178)
SG	1.24	0.00994	0.0107	0.0120	0.0117
		(0.0152)	(0.0110)	(0.0108)	(0.0107)
INVEST	1.53	0.0253	-0.0189	0.00125	0.00447
		(0.0171)	(0.0263)	(0.0215)	(0.0218)
Constant		0.0650***	0.0357***	0.0481***	0.0504***
		(0.00942)	(0.0114)	(0.0112)	(0.0109)
Observations		185	185	185	185
R-Squared		0.295			
Within			0.3501	0.3376	0.3331
Between			0.0402	0.2545	0.2736
Overall			0.1233	0.2482	0.2620
F-stats/Wald chi2		18.84	12.15	82.06	70.52
Prob>F/Prob>Wald Chi 2		0.0000	0.0000	0.0000	0.0000

Variables	VIF	Pool OLS	FEM	REM	GLS regression with AR(1) Disturbances
Hausman (Chi2)			7.54		
Prob>chi2			0.1100		
Wooldridge test F-stats Prob > F				7.380 0.0101	

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (Data Source: Stata output)

According to the results of the multicollinearity test, the size variable was removed from the model to deal with the multicollinearity.

The OLS estimation results showed that the coefficient of R^2 = 0.295, the F statistical value of 18.84 is statistically significant at the 1% level, indicating that the OLS estimate can be an appropriate estimate.

The results of estimating the fixed effects model show that the F statistical result is 12.15 with a statistical significance level of 1%. The numbers show the difference between the objects (enterprises). In this case the fixed impact model is more suitable than the OLS Pool.

The results of estimating the random effects model show that Wald value-chi squared is 82.06 (statistical significance level of 1%). Therefore the random impact model is more suitable than the Pool OLS.

Hausman test results with chi - square value is 7.54 with P value > 0.05. Therefore the random effects model is more suitable to use than the fixed impact model.

To check the autocorrelation phenomenon in the model, Wooldridge test was used, the F statistical result = 7.380 with a significance level of 1% so the autocorrelation phenomenon exists in the model. This phenomenon will make the estimates obtained by the conventional regression method on the table data unreliable. Therefore, the author has used the GLS (Generalized Least Square) method to overcome the first-order autocorrelation between errors to ensure a reliable estimate. After using the GLS method we have the following results:

The analysis results show that there is a statistically significant positive relationship between ROA and efficiency index of working capital management. This is consistent with empirical research result by Hashem Valipour and Ali Jamshidi (2012). In addition, the research results show a statistically significant negative relationship between debt to asset ratio and ROA. This result is consistent with many previous studies such as the study of Kester (1986), Rajan and Zingales (1995), Hall et al. (2004), Marco Muscettola Francesco Naccarato (2016). Meanwhile, the coefficient of sales growth and total investment on asset are not statistically significant.

V. CONCLUSION

This study analyses the relationship between the efficiency of working capital management and the profitability in the listed plastic companies for the period from 2015 to 2019. Working capital management efficiency is assessed by the working capital management efficiency indexes.

The results of testing the first hypothesis in all the companies under study revealed that the hypothesis was a-

-ccepted. It can be stated that there is a significant and positive relationship between utilization index and the return on asset in the plastic firms in Vietnam. Therefore it can be stated that the firms can increase their profitability by using the working capital appropriately.

The results of testing the second hypothesis revealed that the hypothesis was accepted and according to the statistics, it can be stated that there is a significant and positive relationship between working capital management performance index and the efficiency of the assets in the plastic firms. Therefore it can be said that changes in the utilization index of working capital management is effective on the return on assets in all the firms. Thus, performance index of working capital management can be a good criteria for anticipating the return on assets and profitability of the firms.

The results of testing the third hypothesis in all the companies under study revealed that the hypothesis was accepted. And it can be stated that there is a significant and positive relationship between working capital management efficiency index and the return on assets in the plastic firms in Vietnam.

In conclusion, it can be promising for appropriate working capital management efficiency indexes as well as the conventional ratios of working capital management to analyze and optimize the firms' management processes. Moreover, the more effective an enterprise uses short-term assets, the higher profitability will be. The study results also suggest that plastic companies should pay more attention to short-term asset management.

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