Advances in Management & Applied Economics, vol.2, no.2, 2012, 191-209
ISSN: 1792-7544 (print version), 1792-7552 (online)
International Scientific Press, 2012

Determining the Optimal Efficiency Index of Working Capital Management and its Relationship with Efficiency of Assets in Categorized Industries: Evidence from Tehran Stock Exchange (TSE)

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Abstract

The present study examines the relationship between efficiency index of working capital management and efficiency of assets in four industries. The efficiency of working capital management is one of the main prerequisites of success in a commercial unit and it is defined as managing the working capital in a way that sufficient amounts of working capital are used in order to stabilize the firm and obtain profitability and cash. In the current study, in order to determine the efficacy of working capital management four indexes have been used, including Performance Index of Working Capital Management (PIWCM), Utilization Index of Working Capital Management (UIWCM), Efficiency Index of Working Capital Management (EIWCM), Cash Conversion Cycle (CCC) the conventional financial

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Article Info: *Received* : February 7, 2012. *Revised* : May 20, 2012
Published online : May 31, 2012

ratio of determining the efficacy of working capital management, and the dependent variable is the efficiency of assets. The statistical samples of the study are the firms accepted in pharmaceutical, chemical, base metal and non-metal mineral industries, and a total number of 72 firms were selected as the sample. Regression method of analysis was employed to analyze the data. The result of this study is different in industry level of the industries under investigation and the total number of the firms studied. However, among efficiency indexes of working capital management and cash conversion cycle, the efficiency index was selected as the optimal index related to determining the efficiency of the assets.

Keywords: working capital management, Performance Index, Utilization Index, Efficiency Index, efficiency of the assets

1 Introduction

Considering the significant importance of working assets, especially the capital of firms and an increase in credit sales, firms can use their working capital as a short-time financial supply which does not need any interest and although it is short-time, it is a constant supply and it can be used to reduce the costs of providing finance and ultimately to increase profitability (Afza and Nazir, 2011, p. 224). Financial affairs of the firms can be divided into three main categories: capital budgeting, capital structure and capital management. The management of long-term investments relates to the budgeting and structure of the capital; whereas, the management of current assets and debts relates to the management of the working capital. Working capital relates to the investment of the organization on current assets and debts and the management of working capital is defined as determining the amount and combination of sources and uses of working capital in a way that result in the maximum wealth of the investors (Chiou and Cheng,

2006).

Therefore, in many firms, the management of working capital is one of the important issues in financial management and managers can increase the value of a firm by keeping an optimal level of working capital. Effective management of working capital is defined as managing the working capital in a way that sufficient and effective amounts of the working capital are used to stabilize the firm and reach profitability and cash (Ramachandran and Jankirman, 2009). The effectiveness of working capital management is a symbol and criterion of the firm's health and it requires reducing the investment problems or in other words, reducing the costs of providing financial supplies. The ineffectiveness of the working capital management causes the firms to get sick and the new financial management should aim at reducing the level of working assets without ignoring the risk of the loss of the assets (Santanu and Santi, 2006). The effectiveness of working capital management includes planning and controlling the current assets and debts by avoiding overinvestment of the current asserts and avoiding inappropriate flow of the working assets for fulfilling the responsibilities. Cash conversion cycle is known as a criterion indicating the effectiveness of working capital management. The success of a commercial unit in general, depends on the effectiveness of the managers and their ability to manage received accounts, paid accounts and the assets (Sen et.al., 2010).

Effective management of working capital is one of the prerequisites of a commercial unit's success. Mismanagement in the control of working assets may bear significant costs. Overinvestments of the working assets would allocate the limited financial resources of the company, which can be used in more profitability, to itself, which causes the firm suffer missed opportunities. On the other hand, underinvestment of the working capital can also be costly; for instance the insufficiency of cash causes the inability of the firm to fulfill its liabilities or keeping an insufficient amount of the assets may end in losing the sales or dissatisfied customers (Dellof, 2003). Considering the abovementioned issues, the

main objective of this study is to determine whether there is a significant relationship in the working capital management index and efficiency of assets or not and which index is the best one of the indexes mentioned.

2 Background of the Study

Many researchers have focused on financial ratios as a part of working capital management; however, very few of them have discussed the working capital management in specific.

Shin and Soenen (1998) believed in a significant negative relationship between cash conversion cycle and profitability of American firms between 1975 and 1994. In their study, the data of 87030 American firms was analyzed a significant negative relationship between cash conversion cycle and the operational income of sales and operational cash flow was confirmed. The results also revealed a significant negative relationship between the period of collecting the received accounts and the operational income of sales and operational cash flow. Therefore shortening the cash conversion cycle and reducing the time of collecting the received accounts would optimize the function of the firm and operational cash flow. In his analyses, Dellof (2003) found that all the studies that had been done on either small or large firms were seeking to find factors to identify a significant relationship between working capital and profitability. He also stated that firms with higher profitability need a shorter time to pay their debts and the opposite is also true, that is the lower (weaker) the power to make profit (profitability) is, the more time is needed to repay the debts. Therefore, if there is a weak management resulting in reduced profitability, certainly more time will be needed to repay the debts. According to his findings, the method by which the working capital is controlled and managed has a significant effect on the firms' profitability. These results indicate that in order to have a maximum

amount of profitability, a specific level of working capital is needed. Solano and Teruel (2007) examined the working capital management and its effect on profitability. The period of their examination was 7 years starting in 1996 and ending in 2002. They found that a reduction in cash conversion cycle will optimize profitability in firms. They stated that working capital management is important because it influences the risk and profitability of the firm and consequently results in increasing the value of the firm. Nobanee and AlHajjar (2009) examined the relationship between working capital management, operational cash flow, and the firms' function and the results showed that by shortening the cash conversion cycle and reducing the time of collecting the received accounts, managers can increase the profitability and cash flow of the company. Tryfonidis.et.al. (2010) examined the relationship between working capital management and profitability of the firms in Athena's stock exchange market. After examining 101 Greek companies they concluded that managers can make profitability for their companies by appropriately controlling the cash, maintaining the different elements of received accounts, paid accounts and assets in an optimal level. Phuong-Dong and Tay-Su (2010) examined the relationship between working capital management and profitability in Vietnamese companies which supported the results obtained by Shin and Soenen and Dellof and indicated a strong negative relationship between working capital management and profitability of the firms. In their study, profitability was measured by operational profit and cash conversion cycle was an indicator of the companies' effective working capital management. The results of the study suggested that managers could create value for their beneficiaries by reducing the cash conversion cycle to an acceptable period. Hassan. et.al. (2011) studied the relationship of working capital management and profitability as they considered working capital management as a determining factor in creating value in firms. They examined a selection of firms from Turkey's stock exchange market during 2005 to 2009 and they considered cash conversion cycle as a criterion for the effectiveness of

working capital management and the efficiency of assets as a criterion for profitability and found that a reduction in cash conversion cycle had a positive and significant relationship with the efficiency of assets. Ossame and Yassine (2011) examined the effectiveness of working capital on profitability among 53 companies in Oman's stock exchange market in Jordan. According to their findings they found that there is a significant and negative relationship between profitability, the average period of receiving assets, the average cash conversion cycle and the average period of paid accounts. Their study showed a significant and positive relationship between size, sales growth and the current ratio as the controlling variables of profitability. In their study, Afza and Nazir (2011) examined the efficiency of working capital management in Pakistani cement firms in Karachi stock exchange market during 1998 and 2008. Instead of using the conventional ratios, in which cash conversion cycle is an indicator of effective working capital management, they used three other indicators; these indicators included performance index, utilization index and efficiency index. The findings of the study revealed that during the period under study of the mentioned industry, the firms did not have an acceptable performance in the effectiveness of working capital management during the period under study.

3 Research Methodology and Hypothesis

The present study, based on its objectives, is a practical research and its results can be used by managers, investors and in general all users. Methodologically speaking, this is a correlational research which examines the relationship between efficiency indexes of working capital management and profitability in firms which were accepted in Tehran stock market. In order to fulfill the objectives of the study, four hypotheses were made as follows:

Hypothesis 1: There is a significant relationship between performance index,

working capital management and efficiency of the assets.

Hypothesis 2: There is a significant relationship between utilization index, working capital management and efficiency of the assets.

Hypothesis 3: There is a significant relationship between efficiencyindex, working capital management and efficiency of the assets.

Hypothesis 4: There is a significant relationship between cash conversion cycle and efficiency of the assets.

The models used in order to test the hypotheses are explained below:

1- The model used to test the first hypothesis is as follows:

$$\text{EOA}= \beta_0 + \beta_1(PI_{it}) + \beta_2(FFAR_{it}) + \beta_3(CS_{it}) + \beta_4(SG_{it}) + \beta_5(Size_{it}) + \varepsilon_{it}$$

2- The model employed to test the second hypothesis is as follows:

$$\text{EOA}= \beta_0 + \beta_1(UI_{it}) + \beta_2(FFAR_{it}) + \beta_3(CS_{it}) + \beta_4(SG_{it}) + \beta_5(Size_{it}) + \varepsilon_{it}$$

3- For the third hypothesis the following model was used:

$$\text{EOA}= \beta_0 + \beta_1(EI_{it}) + \beta_2(FFAR_{it}) + \beta_3(CS_{it}) + \beta_4(SG_{it}) + \beta_5(Size_{it}) + \varepsilon_{it}$$

4- And finally, for the fourth hypothesis, the following model was employed:

$$\text{EOA}= \beta_0 + \beta_1(CCC_{it}) + \beta_2(FFAR_{it}) + \beta_3(CS_{it}) + \beta_4(SG_{it}) + \beta_5(Size_{it}) + \varepsilon_{it}$$

Efficiency of the Assets (EOA), In this study, based on the research model, the efficiency of the assets has been considered as a dependent variable (Pranowo et.al., 2010. p. 84). Performance Index of the Working Capital Management (PI_{WCM}). This index shows the quality of using the working assets in the operation and especially its role in selling commercial units. In other words, it represents the efficiency of using working assets and whether the working assets are reduced compared to the previous period. If this index is equal to 1 or is bigger than that, is shows the appropriate function and efficiency of the company based on this index and if it is smaller than 1 (Afza and Nazir, 2011. p. 226).

Utilization Index of Working Capital Management (UI_{WCM}), discusses whether the company has had the ability to use all its current assets in order to increase its

sales objectives. If this index is 1 or bigger than 1, it shows an appropriate function and efficiency of the company based on this index and if it is smaller than 1, the opposite is true. Efficiency Index of Working Capital Management (EI_{WCM}), discusses whether the company has had the ability to use all its current assets in order to increase its sales objectives. If this index is 1 or bigger than 1, it shows an appropriate function and efficiency of the company based on this index and if it is smaller than 1, the opposite is true (ibid. p. 227). In the past research, cash conversion cycle (CCC) has been considered as an index and criterion of the working capital management efficiency (Osame and Yassine, 2011. p. 71).

3.1 The Variables of the Study and Measuring

The independent variables of the study include performance index of working capital management, utilization index of working capital management, performance index of working capital management and cash conversion cycle. The dependent variable is the efficiency of the companies' assets and the controlling variables include capital structure, sales growth, company size, and the ratio of financial assets to all assets.

Table 1: The variables of the research

EOA	$\frac{\text{Profit before Tax and Interest}}{\text{Total Assets}}$
PI	$\frac{I_S \sum_{i=1}^{n} \frac{W_{i(t-1)}}{W_{it}}}{N}$
Is	$\frac{\text{sales in the current period}}{\text{sales in the previous period}}$

W_{it} N	It is the different elements of the current assets of the "i" company in the year "t" the number of current assets
UI	$\frac{A_{t-1}}{A_t}$
A_t	$\frac{\text{current assets}}{\text{sales}}$
EI	$PI_{WCM} \times UI_{WCM}$
CCC	(the period of received accounts + asset flow period) – paid period to creditors
CS	$\frac{\text{total debt}}{\text{total assets}}$
SG	$\frac{\text{sales in the assumed year} - \text{sales in the base year}}{\text{sales in the based year}}$
FFAR	$\frac{\text{total amount of short} - \text{time and long} - \text{time investments}}{\text{total assets}}$
SIZE	Company size equals the natural logarithm of sales

3.2 Statistical Society, Sampling Method and Sample Size

The subject area of the research is the relationship between efficiency indexes in working capital management and the efficiency of the assets in the pharmaceutical, chemical, non-metal minerals and base metal industries of the companies accepted in Tehran stock exchange. The range of the study was the beginning of 1379 (2000) to the end of 1389 (2011). In order to carry out this research, random samples of the companies accepted in Tehran stock exchange were selected based on the following criterions:

1- It had been accepted in the stock exchange market from the beginning of the year 1379 (2000).

2- The ending period of the financial year was the 29th of December.

3- In order to make the samples more homogeneous, banks, financial institutions and investment companies were not included.

Table 2: The company samples

Titel	Chemical	Base metals	Pharmaceutical	Non-metal minerals	Total no. of companies
No. of Samples	16	17	18	21	72

3.3 Data Collection Method

The main data about the aims of the study such as background, characteristics and other features were collected through library research. Different data such as the efficiency of assets, the efficiency indexes of working capital management and other information required by the research related to the companies of the Tehran stock exchange were gathered through the published statistics of Tehran stock exchange and other data banks.

4 The Results of the Study

In order to examine the relationship between efficiency indexes of working capital management and efficiency of the assets, first the descriptive statistics of the data and then the correlation of the variables and finally the model are analyzed. In Table 3, the descriptive statistics is presented. According to the table, the average of the dependent variable of the efficiency of the assets during the period under investigation is 0.1985, and the maximum and minimum are respectively 0.66 and -0.30.

In Table 4, the relationship of different variables and the dependent variable of the efficiency of the assets have been shown, that is in all the

companies under study. If the significance level of each of the variables is equal or smaller than 5% , the H0 is nullified, otherwise it is confirmed.

Table 3: Descriptive statistics of the research variables

EOA	CCC	PI	UI	EI	CS	SG	FFAR	Size	All the years
0.20	197.24	1.04	1.05	1.23	0.66	0.18	.0.82	11.94	Mean
720	720	720	720	720	720	720	720	720	No.
0.14	358.36	0.68	0.70	2.02	0.16	0.36	0.12	1.14	SD
-0.30	-175.3	0.001	0.04	0.03	0.12	-1.00	0.00	9.23	Min.
0.66	510.8	15.01	16.37	46.53	1.04	3.80	0.66	15.97	Max.

Considering all the firms, the results of Table 4 show that at a 95% level there is a positive and significant relationship between Performance index, Utilization index, working capital management Efficiency index, Sales Growth, cash conversion cycle, and Financial asset ratio with the efficiency of the assets, however, there is a negative significant relationship between capital structure and the efficiency of assets.

Table 4: Correlational Matrix

Log Sale	FFAR	SG	CS	EI	UI	PI	CCC	EOA	
0.018	0.174	0.377	-0.358	0.288	0.310	0.321	0.115	1	coefficient
0.637	0.000	0.000	0.000	0.000	0.000	0.000	0.002	.	Significance level
720	720	720	720	720	720	720	720	720	No.

*Correlation is significant at the 0.05 level.

4.1 Testing the Hypothesis

The results and analysis of testing the first hypothesis is tabulated below. The order of the input variables is show according to the English alphabet, otherwise, the variables have not been put into the model. According to Fischer Test (f), the results show the significance of the regression model in all levels (all the industries under study). Also, the significance of (t) coefficients in the test shows the significance of all the coefficients introduced into the model in all the firms. The results of the regression analysis of testing the hypotheses, as provided in the table below, reveals that according to the estimated models and determination coefficient for each of the models in different levels. In the level of all firms: As it was seen the related model of testing the first hypothesis, the significance level (0.000) was smaller than the 0.05 significance level and the independent variable of performance index was used in the model with a coefficient of 0.036. Therefore it can be stated that there is a positive and significant relationship between the performance index and the efficiency of the assets and the H0 is nullified and H1 is accepted. According to the related model of testing the second hypothesis, the significance level (0.000) was smaller than the 0.05 significance level and the independent variable of utilization index was used in the model with a coefficient of 0.034. Therefore it can be said that there is a positive and significant relationship between the utilization index and the efficiency of the assets, H0 is nullified and H1 is accepted. According to the related model of testing the third hypothesis, the significance level (0.000) was smaller than the 0.05 significance level and the independent variable of efficiency index was used in the model with a coefficient of 0.014. Therefore it can be said that there is a positive and significant relationship between the efficiency index and the efficiency of the assets, H0 is nullified and H1 is accepted. According to the related model of testing the fourth hypothesis, the significance level (0.000) was smaller than the 0.05 significance level and the independent variable of cash conversion cycle was used in the model with a coefficient of 0.000021 and a

significance level of 0.004. Therefore it can be said that there is a positive and significant relationship between cash conversion cycle and the efficiency of the assets, H0 is nullified and H1 is accepted.

Table 5: The effect of the variables on the efficiency of the assets

Hypothesis 4	Hypothesis 3	Hypothesis 2	Hypothesis 1	
0.352 (0.000)	0.342 (0.000)	0.325 (0.000)	0.320(0.000)	Constant coefficient
				Independent variables
----	----	----	0.036 (0.000) c	Performance Index
----	----	0.034 (0.000) c	----	Utilization Index
----	0.014 (0.000) c	----	----	Efficiency Index
0.00002 (0.004) c	----	----	----	CCC
				Controlling variables
0.134 (0.000) a	0.117 (0.000) a	0.110 (0.000) a	0.108 (0.000) a	Sales growth
-0.270 (0.000) b	-0.270 (0.000) b	-0.270 (0.000) b	-0.270 (0.000) b	Capital structure
----	----	----	----	Company size
----	----	----	----	The ratio of financial assets
0.503	0.538	0.524	0.526	Correlation coefficient
0.253	0.289	0.274	0.277	R^2
0.250	0.286	0.271	0.274	Adjusted R^2
80.796	97.105	92.157	91.494	**F statistics**
0.000	0.000	0.000	0.000	**Significance level**
1.790	1.739	1.868	1.760	Durbin-Watson
1.017	1.059	1.187	1.197	VIF

*: a, b, c and d: The order of introducing the variables to the model

4.2 Choosing the Most Relevant and Optimal working capital management Efficiency Index

In this part, based on the determination coefficients related to the final models of testing the hypotheses, we are trying to choose the best index among the four variables of performance index, utilization index, working capital management efficiency index and cash conversion cycle. The determination coefficients are presented in Table 6. According to the following table, in all the firms, the best index was the working capital management efficiency index with a coefficient of 0.289, which means that this index is more powerful compared to the other three indexes in determining the dependent variable. In the non-metal mineral industry, the determination coefficient of the efficiency index (0.274) is still more than the other indexes. However, in the pharmaceutical industry, compared to the other two variables, the performance and utilization indexes (0.398 and 0.395) are more powerful in determining the dependent variable, although they have an insignificant difference with the utilization index (0.383).

Table 6: Coefficient of determination

Performance Index	Utilization Index	Efficiency index	cash conversion cycle	Title
0.277	0.254	0.289	0.253	All firms
0.244	0.233	0.274	0.206	Non-metal minerals
0.398	0.395	0.383	0.353	Pharmaceutical
0.386	0.381	0.448	0.364	Base metals
0.055	0.051	0.047	0.028	Chemical

In the base metal industry, determining the dependent variable of efficiency of the assets is accounted for by the working capital management efficiency index (0.448) which is more than other indexes and is stronger among the indexes in different levels. But, in the chemical industry, the coefficient of determination is much smaller than the other industries. Ultimately, it can be said that the working capital management utilization index can be more determining than the conventional working capital management efficiency index, that is the cash conversion cycle. According to the above table, in the first and second hypotheses, noting that the pharmaceutical industry has a higher determination coefficient, therefore, compared to other industries, this industry is more powerful in these two hypotheses and has a higher determining power. And in the third and fourth hypotheses, the base metal industry has a bigger and stronger determination coefficient compared to other industries.

5 Conclusion

The main objective of these tests was to investigate the relationship between working capital management efficiency indexes and efficiency of the assets among the companies accepted in Tehran stock exchange in the mentioned industries.

In the first hypothesis, it was stated that there is a significant relationship between performance index and efficiency of the assets. The results of testing the first hypothesis in all the companies under study, 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 firms accepted in Tehran Stock Exchange. Therefore it can be said that changes in the utilization index of working capital management is effective on the efficiency of the assets in all the firms. Thus, it

can be claimed that performance index of working capital management can be a good criterion for anticipating the efficiency of the assets and profitability of the firms; of course it should be done carefully. therefore reducing the working asset (working capital) in one period compared to its previous period can result in the profitability of the firms. The results of this hypothesis have no similarities with local or foreign research, but Ramachandran and Jankirman (2009), Santanu and Santi (2004) and Afza and Nazir have stated that, in this regards, firms did not have an acceptable performance in the period of their study.

The results of testing the second hypothesis in all the companies under study revealed that the hypothesis was accepted and according to the statistics, it can be stated that there is a significant and positive relationship between utilization index and the efficiency of the assets in the firms accepted in Tehran Stock Exchange. So, this hypothesis is confirmed. The results of this hypothesis in all the firms is in accordance with all the four industries (pharmaceutical, chemical, base metals and non-metal minerals), therefore it can be stated that the firms can increase their efficacy and profitability by using the working assets appropriately and reducing the working capital and increasing their sales. The results of this hypothesis have no similarities with local or foreign research, but Ramachandran and Jankirman (2009), Santanu and Santi (2004), and Afza and Nazir (2011) have stated that, in this regards, firms did not have an acceptable performance in the period of their study.

The results of testing the third hypothesis in all the companies under study 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 efficiency index and the efficiency of the assets in the firms accepted in Tehran Stock Exchange. So, this hypothesis is confirmed. The results of this hypothesis have no similarities with local or foreign research, but Ramachandran and Jankirman (2009), Santanu and Santi (2004), and Afza and Nazir (2011) have stated that, in this regards, firms did not have an acceptable performance in the

period of their study. The results of testing the hypothesis in all the companies under study revealed that the hypothesis was accepted and according to the statistics, it can be stated that there is an insignificant and positive relationship between cash conversion cycle and the efficiency of the assets in the firms accepted in Tehran Stock Exchange. The results of this hypothesis is different from the results and findings of other research in this field, because others believed in a negative and significant relationship between cash conversion cycle and profitability, for instance in foreign research Tryfonidis and Lazaridis (2006), Ramachandran and Jankirman (2009) and Osame and Yassine (2011) can be mentioned.

In conclusion, based on the coefficient of determination in different industries, it can be stated that the working capital management efficiency index has a more determining power compared to the conventional working capital management efficiency index of (cash conversion cycle). Therefore it can be promising for appropriate indexes as well as the conventional ratios of working capital management to analyze and optimize the firms' management processes.

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