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Determinants of working capital management:

Case of Singapore firms

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Abstract

It is undeniable that firms cannot survive and continue their daily operations without sufficient level of the working capital. The crucial part of working capital is the management of working capital since it affects both liquidity and profitability of the firms. Determining the important factors affecting working capital management would able managers to manage working capital efficiently and effectively. Therefore, managers should be aware about important factors that affect working capital management. Using panel data analysis including Pooled OLS, random effects and fixed effects estimations, we revealed that firm size, operation cash flow, capital expenditures, and gross domestic products negatively are correlated to the working capital management. Moreover, we found that firms with more profitability have longer cash conversion cycle. Finally, we did not find any significant relationship between cash conversion cycle and debt ratio.

Keywords: working capital management, cash conversion cycle, panel data analysis

1. Introduction

Working capital management is important since it affects both liquidity and profitability of the firms (Smith, 1980). The main goal of working capital management is to ensure that companies have sufficient cash flow to continue normal operations in such a way that minimize risk of inability to pay short-term liabilities. Moreover, managers should try to avoid unnecessary investment in working capital since it imposes opportunity cost to the firms and decreases the firm's profitability. However, balancing firm's liquidity and profitability is not a simple task and it depends on the efficiency of working capital management.

Appropriate evaluation of the working capital and identification its basic elements can help managers decide over the company's operation more efficiently and effectively, and able them to mange working capital effectively in a way that balance between liquidity and profitability. Determining the important factors affecting working capital management, would help managers to determine the optimal level of investment in current assets as well as the appropriate sources to finance them. In addition, they will be well prepared and ready for unpredicted situations that have unexpected effects on firms performance.

However, little attention was given to the determinants of working capital management while financial managers spend most of their effort and time on working capital management (Nobanee et al., 2011; Appuhami, 2008; Deloof, 2003). This study contributes the body of knowledge by identifying the important factors, which affect working capital management in a developed market. The theoretical contribution of this research is to enrich the existing literature by the determinants of the working capital management in Singapore firms as a developed market. The reminder of the paper is organized as follows. Section 2 presents the literature review. Section 3 describes research methodology including sample, data, variables, and model specification. Results and discussion and finally conclusion were going to be considered in section 4 and 5 respectively.

2. Literature review

Cost of capital, access to external finance and capacity to generate internal sources are some yardsticks, which earlier studies underlined to explain the factors would affect the efficiency of working capital management based on internal variables and macroeconomic factors. Chiou & Cheng (2006) have tried to determine the important factors affecting

working capital management in Taiwan's firms. The study considered both external variables (macroeconomic variables) and internal variables (firm-specific variables). Their findings indicated that during the economic slump firms have more working capital requirements. In addition, debt ratio, operation cash flow to total assets negatively, and firms' age and return on assets positively associated to the working capital requirement. Caballero et al., (2009), conducted a study to determine working capital management in small & medium- size Spanish corporations (SMEs). The panel of 4076 SMEs firms over the period from 2001 to 2005 was selected. Cash Conversion Cycle (CCC) was used as a comprehensive proxy for the efficiency of working capital management. Panel data analysis, including OLS regression and fixed effect model applied. Their finding mentioned that firm's with longer cash conversion cycle are older firms with more cash flows. In addition, the cash conversion cycle correlated to the debt ratio, firm's growth, fix asset's investment, and ROA negatively. Finally, they found no evidence for the effects of interest rates and GDP on the CCC. Recent study by Zariyawati et al. (2010) investigated important factors, which affect working capital management in Malaysian firms. Panel data analyzes including pooled OLS regression was applied, and the results compared to fixed effect and random effect models for robustness tests. Their results showed that firm size, debt ratio, and sales growth have a negative relationship with the CCC. In addition, their findings revealed that firms with more debts have less working capital since the cost of external financing is higher for these firms. Moreover, a negative relationship between CCC and sales growth indicated that corporations use short-term financing to supply future demands. The positive relationship between economic growth and working capital indicated that firms expanded their investment on working capital during the economic boom. Finally, they found no evidence for the impact of corporate governance variables on working capital management.

Hill, Kelly, & Highfield (2010) tried to determine the more important factors, which affect working capital management in US corporations. Their finding disclosed that Working Capital Requirement (WCR) positively related to the operating cash flow, and negatively correlated to the financial distress and market to book ratios. They found no evidence for relationship between gross margin profit, market share, and WCR.

Gill (2011) focused on the Canadian companies to determine working capital management. Applying panel data analysis, OLS regression and correlation coefficient, his results showed that working capital requirement positively correlated to the operation cycle, return on assets. Moreover, working capital requirement negatively correlated to the firm size and Tobin's q. His findings indicated no significant relationship between working capital requirement, and debt ratio and operation cash flow.

3. Research methodology

3.1 Data and sample selection

The data needed for the empirical testing of research hypotheses were gathered from DataStream database that included the secondary data of the financial statement of firms listed in the main board of Singapore Exchange (SGE). All active firms with completed required data over the whole periods were selected, and firms with incomplete data were excluded from the sample. Because of specific nature of firms being active in banking and finance, insurance, mutual funds and business services, these firms were kept out from the sample. To investigate the industry effects, the sectors with less than 5 firms are eliminated from the sample. Final sample consists of 752 firm-year observations that include the observation of 94 firms for the 8 years from 2003 to 2010. Table 1 shows the sample distribution based on economic sector. The electronic sector with 20 firms is the major sample, while the general retailers sector is the least sector with 7 firms.

3.2 Variables

3.2.1 Independent variables

A review of the literature of determinants working capital management reveals that both firm specific variables (internal variables) and macroeconomic variables (external variables) would affect the efficiency of working capital management (Zariyawati et al., 2010; Caballero et al., 2009; Lamberson, 1995). Firm specific variables related to the firm's operational capacity and the capability of the corporations to access external financing. This research takes into consideration six firm specific variables as well as one macroeconomic variable (GDP) as explanatory variables. Table 2 represents the summary of variable measurement.

Firms size: Berger et al., (2001) and Jordan et al., (1998) did argue that the cost of investment in working capital would be lower for larger firms compared to smaller one since larger corporations have lower information asymmetry and thus lower cost of external financing. Moreover, Larger firms have better access to capital markets and have larger capacity to extend more trade credits that enable them to have more investment in working capital as compared to smaller firms (Niskanen & Niskanen, 2006; Petersen & Rajan, 1997). We use natural logarithm of total assets as a proxy for firm size.

Leverage: As the firm's debt is increased, the information asymmetry increase between creditors and shareholders and as the result, the cost of external financing would increase (Jensen & Meckling, 1976). More leverage firms have to keep lower their working capital since cost of funds invested in working capital would be higher for corporations with larger leverage (Caballero et al., 2009). We use the ratio of total debt to total assets as a proxy for leverage.

Firm growth: The effect of growth opportunities on working capital can be done via trade credit grant or investment in inventories. Anticipation of the future sales growth might cause to increase the amount of investments in inventories. We use the ratio of sales growth as a proxy for firm growth as used by Gill (2011), Zariyawati, et al (2010) and Caballero, et al,(2009).

Cash flow: Pecking order theory (Myers and Majluf, 1984) demonestrate that companies prioritize their sources of financing from internal financing to equity since internal sources are cheaper than other finance alternatives. As a result, working capital management would be sensitive to the cash flow and firms with more cash flow would afford to have more investment in working capital requirment. Fazzari et al., (1993) did argue that firms with larger cash flow have more working capital because these firms have more internal sources to financing working capital and enable to have higher current asset levels. We use the ratio of operation cash flow to sales as a proxy for cash flow.

Profitability: Working capital and profitability have double-edge relationships. On the one hand, more profitability makes firms stronger to negotiate with both suppliers and customers, and firms can use these competitive advantages to improve their liquidity (Shin & Soenen, 1998; Petersen & Rajan, 1997). On the other hand, working capital has important effects on profitability. More investment in working capital means more sources engaged and make more opportunity cost for firms (Deloof, 2003).

Capital expenditures: The level of investment in fixed aasets would affect the effeciency of working capital management. Fazzari and Petersen (1993) believed that during financial constrains, the level of working capital might competes with the fixed investment for the available pool of finance. Therefor, firms may try to reduce the amount of working capital investments to handle their financial constraints.

Gross Domestic Products (GDP): Empirical evidence suggests that macroeconomic factors such as GDP would influence trade credit and investment in inventories. Smith (1987) and Walker (1991) argued that the state of the economy influences the level of accounts receivable. Moreover, Lamberson (1995) have found that the amount of working capital of the small firms had increased during economic slowdown.

3.2.2 Dependent variable

Previous studies (e.g. Zariyawati, et al., 2010; Caballeroet al., 2009; Śamiloġlo & Demirgũneş, 2008, deloof 2003) used Cash conversion Cycle (CCC) as a comprehensive measure for the efficiency of working capital management. It measures the number of days a firm's sources is invested on the operations of business and as the sum of the Receivables Collection Period (RCP), plus the Inventory Conversion Period (ICP), minus the Payment Deferral Period (PDP). That is the shorter the cash conversion cycle the less time capital is tied up to the business process, less opportunity cost, more efficiency in working capital management and better cash flows that lead to improvement in financial and operational process (Banomyong, 2005). The longer the cash conversion cycle associated with more opportunity cost and less efficiency in working capital management.

3.3 Model specification

To determine working capital management in Singapore firms we have seven explanatory variables that consist of six firm's specific variables and one macroeconomic variable. Firm specific variables consist of operation cash flow

to sales, capital expenditures to sales, return on assets, firm size, and debt ratio. Gross domestic product was selected as a proxy for macroeconomic condition. Dependent variable is cash conversion cycle that was used as a comprehensive measure for working capital management. Industry dummies are included to capture the industry effects. The model presents as follows;

$$CCC = \beta_0 + \beta_1 CEX + \beta_2 SIZE + \beta_3 LEV + \beta_4 GROWTH + \beta_5 ROA + \beta_6 CFL + \beta_7 GDP + IND + \epsilon \quad (1)$$

Where;

CCC is cash conversion cycle, CEX is capital expenditures to sales, SIZE is firm size, GROWTH is firm growth, ROA is returned on assets, CFL is operation cash flow to sales, and finally, GDP is the growth domestic products. IND is the dummy variables for each industry to capture the effect of industry effects.

Panel data analysis was used to determine working capital management in singapore firms. Panel data was defined by Gujarati (2003) as the same cross-section data, which observed over time. Several advantages of panel data analysis made researchers more interested to use it (Hsiao, 2003: Gujarati, 2003). First, the control for unobservable firm-specific effects or time-invariant omitted variables would be possible for researchers from using a proper panel data estimation and modelling. Second, the efficiency of econometric estimates would improve, since both dimensions of the data, including cross-section and time-series available in panel data, and it would make more facilities for researchers to have a large number of data points that increase the degree of freedom and reduce the collinearity between explanatory variables. So, researchers can test the hypothesis when they have a few numbers of observations. Third, the individual differences between cross-sections and period was considered by panel data via implying dummy variables into the model specification.

4. Result and discussion: Table 3 presents the Pooled OLS, fixed effect and random effect estimations of determinants working capital management with several explanatory variables. According to the OLS estimation, five out of seven explanatory variables have significant relationship with cash conversion cycle. The ratio of operating cash flow to sales is negatively correlated to the working capital management at significant level 10%. Both GDP and firm size are correlated negatively to CCC at significant level 1%. Meanwhile, the debt ratio is positively correlated to the cash conversion cycle. It reveals that Singapore firms might use long-term debts to finance their working capital. Moreover, firm's sales growth positively is correlated to the working capital management.

At next stage, we are investigated the appropriation of Pooled OLS estimation for the determinants of working capital management. The result of F[1] test rejected the null hypothesis that the cross-section effects are redundant (P-value = 0.000). That is, slopes and intercepts are not same across the firms. Consequently, fixed effect estimation is preferable in compare to the Pooled OLS estimation.

The result of fixed effect estimation shows that the CFL, CEX and GDP negatively and significantly are correlated to the cash conversion cycle. Moreover, ROA and sales growth are positively correlated to the CCC.

Based on the panel data analysis, we should compare the fixed effect with random effect estimation to select the appropriate estimation. The **Hausman** test was used by the majority of economic researchers as a standard rule to choose between fixed effects and random effects (Baltagi et al., 2003; Hsiao, 2007). The result of Hausman test implies that the random effect estimation is preferable than fixed effect estimation (Table 3). That is, there is no relationship between individual effects and regressors.

The result of random effects (Table 3) show that CEX, CFLOW, SIZE and GDP negatively and significantly correlated to the cash conversion cycle. This imply that firms with more operation cash flow, less capital expenditures, and biger size have shorter CCC.

[1] - Redundant Fixed Effects- Likelihood Ratio

The negative relationship between CFLOW and CCC approved the argument of Boisjoly (2009) and Chiou et al (2006) that aggressive working capital management resulted to the significance improvements in cash flow. Howover, Steyn et al., (2002) did argued that negative relationship between operation cash flow and working capital management would be analyzed with care, because it can be a sign that management inverts non-cash working capital to cash because of cash-flow problems.

The negative relationship between capital expenditures and CCC may be in line with Fazzari and Petersen's (1993) study. They did argued that when firms face financial constrains, the level of working capital competes with the fixed investment for the available pool of finance. In this situation, it is costly for firms to change the level of fixed investment. Therefor, firms may try to reduce the amount of working capital investments to handle their financial constraints.

The negative relationship between firm size and working capital management implies that larger firms have shorter cash conversion cycle. Moss and Stine (1993) asserted that the better access of larger firms to both capital and money market make able those to afford and keep a lower amount of current assets, since larger firms can finance their short- term needs through borrowing as quickly as possible. Moreover, Niskanen & Niskanen (2006) did argue that larger firms have stronger bargaining power with credit suppliers, and would use these advantages to finance their working capital

Meanwhile, we found positive relationships between firm's sales growth and working capital management. Anticipation of the future sales growth might cause to increase the amount of investments in inventories. Morever, increasing sales via expanding trade credit to the customers make it necessary to have more investment in working capital (Petersen & Rajan, 1997).

Positive relationship between CCC and ROA implies that firms with better profitability have longer cash conversion cycle. Firms with more profitability are more affordable to expand trade credit to their customers (Niskanen & Niskanen, 2006; Petersen & Rajan, 1997).

The negative relationship between CCC and GDP implies that Singapore firms reduce the cash conversion cycle during economic expansion. However, this is not consistent with Lamberson (1995) who did argue that the level of working capital would increase during economic boom and decrease during economic slump.

Finally, we did not find a significant relationship between working capital management and, debt ratio.

5. Conclusions

Working capital management is important since it affects both liquidity and profitability. The efficiency of working capital management would balance the trade-off between liquidity and profitability and as a result firm's value. Determining the important factors affecting working capital management would make managers able to manage working capital efficiently and effectively. Therefore, managers should be aware of important factors that affect working capital management. Panel data analysis including pooled OLS, fixed effects, and random effects, showed that random effects is preferable to determinants working capital management in Singapore firms. The results reveal that firm size, operation cash flow to sales, and capital expenditures to total sales are correlated to the cash conversion cycle negatively. Surprisingly, we found that gross domestic product is inversely correlated to the working capital management. Moreover, the results show positive relationship between the firm's profitability and the length of cash conversion cycle. Finally, we did not find any significant relationship between cash conversion cycle and debt ratio.

Table 1 Sample distribution for year 2003-2010

Economic sector	Abbreviation	Number of firms
General Retailers	GR	7
General Industries	GI	8
Food producers	FP	14
Construction & Material	C & M	14
Industrial engineering	IE	15
Technology hardware	TH	16
Electronic	EL	20
Total	**------**	**94**

Table 2 Summary of variable measurement

Variables	calculation	Abbreviation
Cash Flow	Operationg Cash Flow/ Total sales * 100	CFL
Profitability (Return on Assets)	Net income/ total assets	ROA
Capital Expenditures	Total fixed assets acquired + capital expenses / total sales	CEX
Receivables collection period	Accounts receivables/ (sales/365)	RCP
Inventory conversion period	Inventories / (Cost of good sold/365)	ICP
Payable deferral period	Accounts payable / (cost of goods sold/ 365)	PDP
Cash conversion cycle	RCP + ICP – PDP	CCC
Firm size	Natural logarithm of total assets	SIZE
Leverage (Debts ratio)	Total debts / total assets	LEV
Firm growth	(current year sales – previous year sales)/ previous year sales	GROWTH
Gross domestic product	Gross domestic product	GDP

Table 3 regression analysis of determinants of working capital management

Dependent Variable : Cash Conversion Cycle			
Independent variables	**Pooled OLS with Industry Dummies**	**Fixed Effect**	**Random Effect with Industry Dummies**
CEX	-0.1929 (0.0507)*	-0.2897 (0.0216)**	-0.3175 (0.0157)**
CFL	-0.444 (0.0022)***	-0.5410 (0.0007)***	-0.674 (0.0058)***
LEV	0.1993 (0.0088)***	0.2141 (0.1020)	0.1452 (0.4635)
ROA	0.1955 (0.1051)	0.2463 (0.0661)*	0.6474 (0.0243)**
Growth	0.0451 (0.0000)***	0.0483 (0.0000)***	0.0385 (0.0000)***
SIZE	-3.1629*** (0.0000)	2.7363 (0.2876)	-4.0420 (0.0179)**
GDP	-127.63 (0.0000)***	-148.5819 (0.0000)***	-191.87 (0.0007)***
Constant	54.9131 (0.0000)***	156.6643 (0.0000)***	86.632 (0.0013)***
R^2	0.8084	0.79	0.52
Durbin-Watson stat	1.9842	1.8655	1.69
F test	9.8372 (0.0000)*		
Hausman test	-----	4.7856 (0.6861)	

Notes: P-value presented in parenthesis (robust for heteroscedasticity)
*** Significant at 1% , ** significant at 5% and * significant at 10% .

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