Investigating the role of different industries on relationship between working capital management and Tobin's Q

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CHRONICLE	ABSTRACT
	This paper presents an empirical investigation to study the effect of industry type on relationship between Tobin's Q and working capital management among selected firms from Tehran Stock Exchange. The proposed study gathers the necessary financial information from 219 different firms over the period 2001-2011 and categorizes them based on different sectors. There are five independent variables including current ratio, the ratio of current assets to total assets, debt ratio, the ratio of current liabilities to total assets and total cash. Using a linear regression by considering type of industry as dummy variable, the study detects that there was a positive and meaningful relationship between working capital and Tobin-Q in various industries.

1. Introduction

Working capital plays essential role on financial management and there are many studies to find how this could increase profitability of an organization (Filbeck & Krueger, 2005). Deloof (2003) investigated the relationship between working capital management and corporate profitablity for a sample of 1,009 large Belgian non-financial companies over the period 1992-1996. The author computed trade credit policy and inventory policy by number of days' accounts receivable, accounts payable and inventories, and applied the cash conversion cycle as a comprehensice measure of working capital management. They reported that managers could increase corporate profitablity by reducing the number of days' accounts receivable and inventories. Eljelly (2004) investigated the relationship between profitability and liquidity measured by current ratio and cash gap on a sample of

joint stock companies in Saudi Arabia. Using correlation and regression analysis the study reported substantial negative relationship between the firm's profitability and its liquidity level, as measured by current ratio. This relationship was more evident in firms with high current ratios and longer cash conversion cycles. At the industry level, nevertheless, the study detected that the cash conversion cycle or the cash gap was of more importance as a measure of liquidity than current ratio that influences profitability. The size variable was also detected to have significant impact on profitability at the industry level. Samiloglu and Demirgunes (2008) investigated the effect of working capital management on firm profitability by looking into some evidence from Turkey. García-Teruel and Martínez-Solano (2007) provided some empirical evidence on the effects of working capital management on the profitability of a sample of small and medium-sized Spanish firms. Gardner et al. (1986) investigated working capital policy and operating risk. Padachi (2006) studied trends in working capital management and its impact on firms' performance.

2. The proposed study

This paper presents an empirical investigation to study the effect of industry type on relationship between Tobin's Q and working capital management among selected firms from Tehran Stock Exchange (Gundavelli, 2006). The proposed study gathers the necessary financial information from 219 different firms over the period 2001-2011 and categorizes them based on nine different sectors. There are five independent variables including current ratio, the ratio of current assets to total assets, debt ratio, the ratio of current liabilities to total assets and total cash.

$CR_{it}(nt)$ =Cash of the firm (industry) $i(n)$ in time t,
$CACLR_{it}(nt)$ = Current assets to current liabilities of firm (industry) $i(n)$ for time t,
$CATAR_{it}(nt)$ = Current assets to total assets of firm (industry) $i(n)$ in time t,
$CLTAR_{it}(nt)$ = Current liabilities to total assets of firm (industry) $i(n)$ in time t,
$DR_{it}(nt)$ =Total debt to total assets of firm (industry) $i(n)$ in time t,
e = error term of the model

There are two regression models and two dependent variables as follows,

TQ_{it} = Tobin's Q of firm i for time t,
TQ_{nt} = Tobin's Q of industry i for time t.

Tobin's Q is calculated as *Tobin's Q= (MVE+BVE)/ TAE* where *MVE* represents market value of equity, *BVE* is equal to total liabilities of the firms, which are subject to interest and *TAE* is equal to total assets of the firm (Chung & Pruitt, 1994). The proposed model of this paper uses the following two models to verify the hypothesis of this survey,

$$TQ_{it} = \beta0+ \beta1\ (cr_{i,t}) + \beta2\ (caclr_{i,t}) + \beta3\ (catarit_{i,t})+ \beta4\ (cltar_{i,t})+ \beta5\ (d_{ri,t}) + \varepsilon_{i,t} \qquad (1)$$
$$TQ_{nt} = \beta0+ \beta1\ (cr_{n,t}) + \beta2\ (caclr_{n,t}) + \beta3\ (catarit_{n,t}) + \beta4\ (cltar_{n,t}) + \beta5(dr_{n,t}) + \varepsilon_{n,t} \qquad (2)$$

Table 1 demonstrates the summary of some basic statistics on some selected data.

Table 1
The summary of some basic statistics

Variable	#	Mean	Standard dev.	Variance	Skewness	Kurtosis	Deviation	
							Skewness	Kurtosis
Current ratio	1971	1.089	0.565	0.319	2.521	12.931	45.732	117.334
Current assets to total assets	1971	0.616	0.208	0.043	-0.630	-0.377	11.428	-3.420
Current liabilities to total assets	1971	0.659	0.416	0.173	5.581	53.650	101.230	486.811
Total debt to total assets	1971	0.760	0.421	0.177	5.541	51.899	100.500	470.917
Cash of the firm	1971	0.068	0.077	0.006	3.977	31.052	72.144	281.755
Tobin's Q	1971	0.925	1.174	1.377	3.772	18.488	68.418	167.754

As we can observe from the results of Table 4, all F-value statistics are significant with α = 5%. In addition, all Durbin-Watson values are within acceptable limit, which means there is no autocorrelation among residuals. Finally, we have considered the correlation ratios among independent variables and we may precede the regression analysis.

3. The results

In this section, we present details of our investigation on measuring the impact of various factors on Tobin's Q. The results of linear regression model are given in Eq. (3) as follows,

$$TQ = 1.217 + 0.114*CACLR + 0.068*CATAR + 1.284*CLTAR - 1.218*DR + 1.091*CR - 0.8469*DUM1 - 0.7763*DUM2 - 0.82*DUM3 - 0.703906620522*DUM4 - 0.919*DUM5 - 0.828*DUM6 - 0.81*DUM7 + 1.27*DUM8 \tag{4}$$

In Eq. (4), F-value = 17.61734, Durbin-Watson = 1.584184 and Adjusted R-Square = 0.104768. In addition, all t-student values are statistically significance with α=5%. Therefore, we can confirm the main hypothesis of this survey and conclude that working capital positively influences Tobin-Q.

3.1. The effect of working capital on Tobin-Q in Sugar industry

The first sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in Sugar industry, which is summarized in Eq. (5) as follows,

$$TQ = 0.392 + 0.349*CACLR - 0.535*CATAR - 0.328*CLTAR + 0.399*DR + 1.044*CR \tag{5}$$

In Eq. (5), F-value = 6.059623, Durbin-Watson = 1.546586 and Adjusted R-Square = 0.142687. In addition, all t-student values are statistically significance with α=5%. Therefore, we can confirm the first sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in sugar industry.

3.2. The effect of working capital on Tobin-Q in Food industry excluding sugar

The second sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in Food industry excluding sugar, which is summarized in Eq. (6) as follows,

$$TQ = 0.805 + 0.232*CACLR - 0.766*CATAR + 0.472*CLTAR - 0463*DR + 0.810*CR \tag{6}$$

In Eq. (6), F-value = 6.566695, Durbin-Watson = 1.519414 and Adjusted R-Square = 0.093768. In addition, most t-student values are statistically significance with α=5%. Therefore, we can confirm the second sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in food industry.

3.3. The effect of working capital on Tobin-Q in Rubber and Plastic

The third sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in Rubber and Plastic industry, which is summarized in Eq. (7) as follows,

$$TQ = 0.805 + 0.232*CACLR - 0.766*CATAR + 0.472*CLTAR - 0463*DR + 0.810*CR \tag{7}$$

In Eq. (7), F-value = 2.567749, Durbin-Watson = 1.736060 and Adjusted R-Square = 0.023637. In addition, most t-student values are statistically significance with α=5%. Therefore, we can confirm the third sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in Rubber and Plastic industry.

3.4. The effect of working capital on Tobin-Q in Basic metals

The fourth sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in basic metals industry, which is summarized in Eq. (8) as follows,

$$TQ = 0.332 + 0.297*CACLR - 0.227*CATAR + 0.823*CLTAR - 0.718*DR + 2.174*CR \qquad (8)$$

In Eq. (8), F-value = 5.356019, Durbin-Watson = 1.603270 and Adjusted R-Square = 0.088616. In addition, most t-student values are statistically significance with α=5%. Therefore, we can confirm the fourth sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in basic metals industry.

3.5. The effect of working capital on Tobin-Q in machinery and equipment

The fifth sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in machinery and equipment industry, which is summarized in Eq. (9) as follows,

$$TQ = 0.663 + 0.107*CACLR - 0.349*CATAR + 0.0657*CLTAR - 0.164*DR + 1.047*CR \qquad (9)$$

In Eq. (9), F-value = 2.962216, Durbin-Watson = 1.721660 and Adjusted R-Square = 0.238213. In addition, most t-student values are statistically significance with α=5%. Therefore, we can confirm the fifth sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in machinery and equipment industry.

3.6. The effect of working capital on Tobin-Q in Auto industry

The sixth sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in Auto industry, which is summarized in Eq. (10) as follows,

$$TQ = 0.795 + 0.055*CACLR - 0.264*CATAR + 0.284*CLTAR - 0.402*DR - 0.060*CR \qquad (10)$$

In Eq. (10), F-value = 6.430626, Durbin-Watson = 1.540982 and Adjusted R-Square = 0.219523. In addition, most t-student values are statistically significance with α=5%. Therefore, we can confirm the sixth sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in Auto industry.

3.7. The effect of working capital on Tobin-Q in Cement industry

The seventh sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in Cement industry, which is summarized in Eq. (11) as follows,

$$TQ = 0.826 - 0.567*CACLR + 5.401*CATAR + 3.641*CLTAR - 2.450*DR + 2.254*CR \qquad (11)$$

In Eq. (11), F-value = 5.171825, Durbin-Watson = 1.587526 and Adjusted R-Square = 0.348283. In addition, most t-student values are statistically significance with α=5%. Therefore, we can confirm the seventh sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in Cement industry.

3.8. The effect of working capital on Tobin-Q in Drug industry

The eighth sub-hypothesis of this survey is associated with the effect of working capital on Tobin-Q in Drug industry, which is summarized in Eq. (12) as follows,

$$TQ = 3.465 - 0.99*CACLR - 0.674*CATAR + 0.996*CLTAR - 3.113*DR + 0.458*CR \qquad (12)$$

In Eq. (12), F-value = 7.695595, Durbin-Watson = 1.504611 and Adjusted R-Square = 0.516213. None of the t-student values is statistically significance with α=5% or even α=10%. Therefore, we cannot confirm the eighth sub-hypothesis of this survey and conclude that working capital positively influences Tobin-Q in Drug industry.

4. Conclusion

In this paper, we have presented an empirical investigation to study the effect Tobin-Q on working capital on selected firms from Tehran Stock Exchange. We have examined the main hypothesis of this survey in all industries as well as individual industries. Table 5 shows details of our findings,

Table 5
The summary of investigating various hypotheses

Industry	Cash ratio	Current ratio	Ratio of current assets to total assets	Ratio of current liabilities to total assets	Debt ratio
Sugar	√	√	√ Reverse	×	×
Food excluding sugar	√	√	√ Reverse	√	Reversed
Rubber & Plastic	×	√	×	×	×
Basic metals	×	√	×	√	Reversed
Machinery & Equipment	√	×	×	×	×
Auto industry	×	×	×	√	Reversed
Non-metal	×	×	×	×	×
Cement	√	×	√	√	Reversed
Drug	×	×	×	×	×
Confirmed	4	4	3	4	4
Not-confirmed	5	5	6	5	5
Final result	Confirme	Confirmed	Reject	Confirmed	Confirmed

References

Chung, K. H., & Pruitt, S. W. (1994). A simple approximation of Tobin's q. *Financial management*, *23*(3).

Deloof, M. (2003). Does working capital management affect profitability of Belgian firms?. *Journal of Business Finance & Accounting*, *30*(3-4), 573-588.

Eljelly, A. M. (2004). Liquidity-profitability tradeoff: an empirical investigation in an emerging market. *International Journal of Commerce and Management*,*14*(2), 48-61.

Filbeck, G., & Krueger, T. (2005). Industry related differences in working capital management. *Mid-American Journal of Business*, *20*(2), 11-18.

García-Teruel, P. J., & Martínez-Solano, P. (2007). Effects of working capital management on SME profitability. *International Journal of Managerial Finance*, *3*(2), 164-177.

Gardner, M. J., Mills, D. L., & Pope, R. A. (1986). Working capital policy and operating risk: An empirical analysis. *Financial Review*, *21*(3), 31-31.

Gundavelli, V. (2006). 7 steps to elevating working capital performance. *Financial Executive*, *22*(4), 52.

Padachi, K. (2006). Trends in working capital management and its impact on firms' performance: an analysis of Mauritian small manufacturing firms. *International Review of Business Research Papers*, *2*(2), 45-58.

Samiloglu, F., & Demirgunes, K. (2008). The effect of working capital management on firm profitability: evidence from Turkey. *The International Journal of Applied Economics and Finance*, *2*(1), 44-50.