Relationship between Capital Cost and Market Measures of Corporate Performance Evaluation: Evidence from the Tehran Stock Exchange

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ABSTRACT: The main objective of this study is to investigate the effect of capital cost on the market measures of performance evaluation of listed companies in the Tehran Stock Exchange. For this purpose, a sample of 350 firm-years during the year 2006 to 2010 was reviewed and was tested. To determine the appropriate method for estimating regression models and hypotheses testing, we used the F-Limer test and Hausman test which in both, the fixed effects (panel method) was used to estimate the models. In the present study, the ratio of Tobin’s Q (market value) (TQ), Price to Earnings (P/E) and market value to book value (M/B) have been used as market measures of corporate performance evaluation. The results indicate that there is negative and significant relationship between weighted average cost of capital (WACC) and the ratios of price to earnings and market value to book value. But significant relationship between the weighted average cost of capital and Tobin Q ratio has not been observed. The results showed that there is positive and significant relationship between firm size (SIZE) and ratios of Tobin Q and market value to book value. But significant relationship was not found between firm size and the ratio of price to earnings.

Keywords: weighted average cost of capital, Tobin Q ratio, price to earnings ratio, the ratio of market value to book value of equity, panel method.

INTRODUCTION

By separation the ownership from management, managers run the company as representative of shareholder. By existence the agency relationship, the managers who have more information than shareholders, may have an opportunistic behavior and make decisions which are in direction of their interests and opposite to the interests of shareholders. Also due the shareholders cannot trace continuously managers’ activities and given the more information that is available to managers, information asymmetry between managers and shareholders create.

Since the companies require liquidity and financial resources to advance their goals, they refer to two groups
of fund supplier that is, creditors and investors. Creditors seek principal and interest of granted loans and investors seek expected return of the operational activities of the companies. To payment financial resources needed to the companies, they consider to one of the main items in the financial statements of companies that is accounting profit. If accounting profit reported in the financial statements is the lack of quality and transparency, it creates uncertainty for creditors and investors. This uncertainty on the one hand and asymmetry of information on the other hand, leads to create information risk for creditors and investors. As a result, creditors demand a higher interest rate and investors demand a higher return rate from managers of companies.

Given that interest rate of creditors for company consider cost rate of financing from debt and the expected return rate of investors for company consider cost rate of financing from equity, the weighted average of these two cost rates form weighted average cost of capital (WACC) of the company. Finally, increase the risk information will lead to increase the weighted average cost of capital. Weighted average cost of capital is the minimum rate of return that company must obtain to provide the expected returns of investors and creditors (Rimondpi, 1999).

The cost of capital concept is also based on this assumption that the goal of the company is to maximize shareholder wealth (Abbasi, 2003). As a result, if the company cannot meet cost of capital or expected rate of investors, the stock value of company will decline (Panahiyavan and Arabzadeh, 2008). Thus, management is trying to close the expected return of investors at least to the level of capital cost; which through this way can protect the value of the business unit. Corporate executives to achieve minimum capital cost and also realize a sustainable profit that is acceptable to shareholders thought to control weighted average cost of capital (WACC).

From a financial management perspective, if the relationship between the cost of capital, capital structure and firm value is specified clearly, can be influenced on the company’s total value using the capital structure. So one of the most important issues for investors, creditors and in general external and internal decision-makers of companies is the corporate performance evaluation. Meanwhile, the company’s performance is the result of activities and its return on investment in a given time period. As a result, we can be added the value of company by improving performance of business unit (Agrawal and Knoeber, 1996).

Performance evaluation measures are divided into two categories based on accounting information measures (accounting measures of corporate performance evaluation) and measures based on accounting information and market information (market measures of corporate performance evaluation). Given that the market information is changing every moment, its evaluation measures are relative instability and have lower reliability, however, in general these measures are preferred to the measures based on historical information and more accurately measure the performance of the company. These measures include price to earnings ratio (P/E), market value to book value of equity (M/B) and Tobin Q (market value) (Jhahankhani and Zariffard, 1995).

So the capital cost is the minimum rate of return that the company must achieve to it in order to satisfy its investors. Managers of companies as representatives of shareholders should try to adjust capital structure so that minimize capital cost of company and thus maximize firm value and shareholder wealth (Lotfi, 2004).

According to the above theoretical bases, the main objective of this study is to investigate whether is there relationship between the weighted average cost of capital and market measures of performance evaluation of listed companies in Tehran stock exchange?

**Literature Review**

Khanna and Sonti (2004) in their study concluded that present a better performance has led to creating demand from stakeholders in capital market and will increase the company's stock trading and consequently
improve firm value.

Osmani (2002) tested the relationship between the capital cost by industry type, debt ratio and firm size during the years 1996-2001 in the listed companies in the Tehran Stock Exchange. In this study, 86 companies have been selected as statistical sample. The results indicate that industry type has effect on the rate of capital cost and there is significant relationship between firm size and cost of capital.

Regalli and Soana (2012) in their study investigated the corporate governance quality and the capital cost in financial firms. In this study, 122 listed companies in the Stock Exchange of America in 2002, 2004 and 2006 are used as sample. The results show that there is no significant relationship between cost of capital and firm size and also results indicate that cost of capital has significant and negative relationship with growth criteria of earning per share and price to earnings ratio but has positive and significant relationship with capital cost and ratio of market value to book value.

Reverte (2012) studied the impact of corporate social responsibility disclosure on their cost of capital during 2003 to 2008 in Spanish companies. In this study, the control variables of firm size and the ratio of market value to book value was used, the results show that there is significant and negative relationship between cost of capital and the variables of firm size and ratio of market value to book value. In another study, Reverte (2009) investigated the relationship between corporate governance and capital cost in Spanish companies. The test results of control variables show that there is negative and significant relationship between variables of market value to book value and firm size with capital cost.

Wu et al. (2012) in a study along with the research of Reverte (2012), which done on 484 Taiwanese companies during the time span from 2007 to 2010, resulted that there is a positive and significant relationship between cost of capital and market ratios of corporate performance evaluation.

Pham et al. (2007) in their study investigated corporate governance, cost of capital and performance of the companies. Studied sample was selected from 136 Australian companies over the period of 1994-2003. The research results show that there is no significant relationship between book value to market value ratio and weighted average cost of capital. Lopes and Alencar (2010) in their research come to this conclusion that there is a negative and significant relationship between book value to market value ratio and capital cost. The research results of Chan et al. (2009) have shown that there is significant and positive relationship between book value to market value ratio and the capital cost. But significant and negative relationship was observed between firm size and capital cost.

Osyani et al. (2012) in their study studied the factors affecting capital cost Prediction of listed companies in Tehran stock exchange. Statistical sample of present study is formed from 106 companies during the period 2004-2008. The results indicate that there is significant and negative relationship between ratios of book value to market value and return on equity with capital cost. Also there is a significant and positive relationship between the return on assets and the cost of capital. But significant relationship between growth opportunities and the capital cost has not been observed.

**Research Hypotheses**

In order to investigate the relationship between the capital cost and market ratios of corporate performance evaluation, hypotheses are formulated as follows:

H1: There is a significant relationship between the weighted average cost of capital and market measures of corporate performance evaluation.
H₂: There is a significant relationship between the firm size and market measures of corporate performance evaluation.

In this study, three indicators have been used for market measures of corporate performance evaluation in above hypotheses: 1) Tobin Q ratio (market value), 2) Price to Earnings (P/E), and 3) the market value to book value (M/B).

RESEARCH METHOD

Statistical Population and Sample

Statistical population of this study is all listed companies in Tehran Stock Exchange during the period 2006 to 2010 that have the following conditions:
1. Companies listed before the research time period.
2. They are not among professional investment and banking companies, because the nature and classification of items in their financial statements of these companies is different.
3. Their financial period lead up to December 31 of each year. This is due to the ease of data analysis.
4. Their financial period has not changed during the studied fiscal year.
5. Companies have taxable benefit.
6. Their book value of equity is positive.

After considering the above conditions, 70 companies or about 350 firm-years during the years 2006-2010 were selected to test the research hypotheses. Data used in this study has been collected through the site of Tehran Stock Exchange (Note 1) and CDs of financial data in companies listed in Tehran Stock Exchange.

Methods of Data Analysis and Hypothesis Testing

The present study is application in terms of purpose and descriptive-correlation in terms of nature and method. The statistical model used in this study is multivariable regression model. To estimate the research model is used the method of mixed data. In this method, time series and cross sectional data are combined and they use for those things that cannot investigate issues as a time series or cross-sectional. Advantages of using mixed data are increase in sample size, reduction of collinear, increase efficiency, reduce estimation bias, limiting variance anisotropy and possibility of separation the economic effects and so on (Hsiao, 2003).

In order to estimate efficiency of a regression model using mixed data, it is necessary to select from one of the common effects, fixed effects and random effects models using appropriate tests. For this purpose, first is used F-Limer test to select between the common effects Model (compilation data method) and fixed effects (panel method). If the fixed effects model is selected, the Hausman test is performed to select between the fixed effects and random effects models. If the results of F-Limer test confirm using panel data method, Hausman test is not necessary anymore and the model is estimated using common effect method.

Research Variables and How They Are Calculated

In this study, the weighted average cost of capital (WACC) was used as the independent variable, firm size (SIZE) as a control variable and variables of Tobin Q ratio (market value), price to earnings ratio (P/E) and market value to book value ratio (M/B) were used as dependent variables.
Weighted Average Cost of Capital (WACC)

Capital cost of companies consisted of two components: cost of debt and cost of common equity. In this study, capital cost used by the company is obtained from weighted average of these two components. Formula for calculating weighted average cost of capital (WACC) is as follows:

\[
WACC = w_d \times k_d (1 - t) + w_e \times k_e
\]

Where:

- **WACC**: Weighted Average Cost of Capital
- **w_d**: percentage of interest-bearing debts participation in total capital
- **w_e**: percentage of common equity participation in total capital
- **k_d**: rate of interest-bearing debts cost before tax
- **k_e**: rate of common equity cost
- **t**: corporate tax rate

To calculate the actual annual tax rate (t) of each of the studied companies is used from the proportion of paid tax to income before tax.

\[
t = \frac{\text{paid tax}}{\text{income before tax}}
\]

To calculate rate of interest-bearing debts cost before tax (k_d) has been used from the proportion of financing costs related to these debts to total interest-bearing debts of last year (the interest-bearing current debts + long term debt).

\[
k_d = \frac{\text{financing costs}}{\text{interest-bearing current debts} + \text{long term debt}}
\]

In order to measure the rate of common equity cost (k_e) is used the Gordon growth model:

\[
k_e = \frac{D_0 (1 + g)}{P_0} + g
\]

Where; **D_0**: Cash dividend of per share in the last year, **P_0**: Market price of per share at the beginning of the year and **g**: annual dividend growth rate that by assumption of relative resistance of dividend accumulation ratio and return on specific value (return on equity), it is calculated as follows:

\[
g = \text{rate of dividend accumulation} \times \text{ROE}
\]

rate of dividend accumulation = \[1 - \frac{\text{cash dividend of per share}}{\text{dividend of per share}}\]

Percentage contribution of each component (the cost of debt and cost of common equity) in total capital resources is calculated as follows:

- **Total resources** = Market value of common equity + Book value of interest-bearing debts
- **Market value of common equity** = Number of issued common stock × Market price of per share
- **Book value of interest-bearing debts** = long-term debt + Interest-bearing current debts
- \[w_d = \frac{\text{Book value of interest-bearing debts}}{\text{Total resources}}\]
The variable of firm size is used as a control variable. In this study is used the natural logarithm of market value of equity to calculate the firm size.

\[ \text{SIZE} = \ln(\text{market value of equity}) \]

**Tobin Q ratios (TQ)**

It is measured by dividing the total market value of equity and book value of total debts on the book value of total assets of the company.

**Price to earnings ratio (P/E)**

It is calculated by dividing the market price of per share on net income per share.

**Market value to book value Ratio (M / B)**

It is measured by dividing the market value of equity (market price of per share multiplied by the number of issued ordinary shares) on the book value of equity.

**Research Models**

In this study to test the hypotheses is used the following models. It should be noted, control variable firm size (SIZE) (Note 2) is added to the model to better clarify.

\[ TQ_i = \beta_0 + \beta_1 \text{WACC}_i + \beta_2 \text{SIZE}_i + \epsilon_i \]  
(1)

\[ P/E_i = \beta_0 + \beta_1 \text{WACC}_i + \beta_2 \text{SIZE}_i + \epsilon_i \]  
(2)

\[ M/B_i = \beta_0 + \beta_1 \text{WACC}_i + \beta_2 \text{SIZE}_i + \epsilon_i \]  
(3)

In these models:

- \( TQ_i \) = Tobin Q ratio (market value) of firm \( i \) in the year \( t \).
- \( P/E_i \) = the price to earnings ratio of firm \( i \) in the year \( t \).
- \( M/B_i \) = market value to book value ratio of firm \( i \) in the year \( t \).
- \( \text{WACC}_i \) = weighted average cost of capital of firm \( i \) in the year \( t \).
- \( \text{SIZE}_i \) = size of firm \( i \) in the year \( t \).
- \( \epsilon_i \) = Error component of model of firm \( i \) in the year \( t \).

\( \beta_0 \) = constant coefficient (intercept), \( \beta_1 \) = coefficient of independent variable \( \beta_2 \) = coefficient of control variable.

**Research Findings**

**Statistical tests**

To determine the appropriate method of estimation, first the F-Limer test is performed to select one of the common effects and fixed effects methods and if it is necessary, the Hausman test is performed to select one of the
fixed effects and random effects methods. As it is observed from the results of Table (1), the p-value of F-Limer statistic is equal to 0.000 in all three models. Consequently, the panel data estimation method (common effect method) is rejected.

<table>
<thead>
<tr>
<th>Research models</th>
<th>F-statistic</th>
<th>Degrees of freedom</th>
<th>P-value</th>
<th>Test result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model (1)</td>
<td>11.2232</td>
<td>68.239</td>
<td>0.0000</td>
<td>fixed effects method</td>
</tr>
<tr>
<td>Model (2)</td>
<td>3.5970</td>
<td>68.243</td>
<td>0.0000</td>
<td>fixed effects method</td>
</tr>
<tr>
<td>Model (3)</td>
<td>9.5377</td>
<td>68.243</td>
<td>0.0000</td>
<td>fixed effects method</td>
</tr>
</tbody>
</table>

The results from F-Limer test show that the common effect method for estimating the regression models is not suitable. So Hausman test is done to select the appropriate method of estimation. Also, the p-value of Hausman statistic which is presented in Table (2) indicates that the fixed effects model is more appropriate option to estimate all three methods.

<table>
<thead>
<tr>
<th>Research models</th>
<th>Chi-Sq. statistic</th>
<th>Degrees of freedom</th>
<th>P-value</th>
<th>Test result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model (1)</td>
<td>19.6738</td>
<td>2</td>
<td>0.0001</td>
<td>fixed effects method</td>
</tr>
<tr>
<td>Model (2)</td>
<td>7.2292</td>
<td>2</td>
<td>0.0269</td>
<td>fixed effects method</td>
</tr>
<tr>
<td>Model (3)</td>
<td>44.9579</td>
<td>2</td>
<td>0.0000</td>
<td>fixed effects method</td>
</tr>
</tbody>
</table>

**Results of Hypotheses Testing**

The results of estimating research models is presented for all studied samples during the period 2006-2010 based on the fixed effects estimation in Table (3). The p-value of Fisher F statistic is equal to 0.000 for all three models and suggests that regression models in general are significant.

The first research hypothesis states that there is significant relationship between weighted average cost of capital and market measures of corporate performance evaluation. As it is observed from the results of Table (3), there is no significant relationship between the weighted average cost of capital (WACC) and Tobin Q ratio (the market value of companies) (TQ). However, there is significant and negative relationship between the weighted average cost of capital (WACC) and the ratio of price to earnings (P/E) and market value and book value (M/B), respectively at the error level less than 5% and 10%. Consequently, the first hypothesis to model (1) is rejected and for the model (2) and (3) is confirmed.

The second research hypothesis tested the relationship between firm size and market measures of corporate performance evaluation. The results show that there is significant and positive relationship between firm size (SIZE) and ratios of Tobin Q (TQ) and market value to book value (M/B). But significant relationship between firm size (SIZE) and the ratio of price to earnings (P/E) has not been observed. Therefore, the second hypothesis for models (1) and (3) is confirmed and for model (2) is rejected.
Table 3. Results of the models estimation

Panel A: (Model 1)  
\[ TQ_{it} = \beta_0 + \beta_1 WACC_{it} + \beta_2 SIZE_{it} + \epsilon_{it} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-statistics</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-7.1193</td>
<td>-6.3094</td>
<td>0.0000</td>
</tr>
<tr>
<td>WACC</td>
<td>0.1387</td>
<td>0.5579</td>
<td>0.5774</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.6551</td>
<td>7.5416</td>
<td>0.0000</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel B: (Model 2)  
\[ P/E_{it} = \beta_0 + \beta_1 WACC_{it} + \beta_2 SIZE_{it} + \epsilon_{it} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-statistics</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>19.8409</td>
<td>1.2568</td>
<td>0.2100</td>
</tr>
<tr>
<td>WACC</td>
<td>-14.6090</td>
<td>-2.4885</td>
<td>0.0135</td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.6894</td>
<td>-0.5549</td>
<td>0.5795</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel C: (Model 3)  
\[ M/B_{it} = \beta_0 + \beta_1 WACC_{it} + \beta_2 SIZE_{it} + \epsilon_{it} \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-statistics</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-12.4898</td>
<td>-10.7783</td>
<td>0.0000</td>
</tr>
<tr>
<td>WACC</td>
<td>-0.3070</td>
<td>-1.8611</td>
<td>0.0645</td>
</tr>
<tr>
<td>SIZE</td>
<td>1.0930</td>
<td>12.2400</td>
<td>0.0000</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.2668</td>
<td>3.5610</td>
<td>0.0005</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the adjusted R² values in Table (3), can be claimed that about 76% of the changes in Tobin Q ratio (market value of companies), the 41% changes in price to earnings ratio (P/E) and 85% changes in market value to book value of equity (M/B) (as dependent variables) are explained by variables of weighted average cost of capital (WACC) and firm size (SIZE) (as independent variables). Also autocorrelation which exists in the model (3), first order autoregressive (AR) has been used to resolve it. Durbin-Watson statistics for research models are
respectively 1.7560, 2.2680 and 2.1326 and since these values are between 1.5 and 2.5, can be expressed that the residual component of the models are independent in studied period. In other words, the values of residual component of models were random, and assumption the existence of autocorrelation between variables is rejected.

CONCLUSIONS

Uncertainty which exists for creditors and investors because of reported accounting profit in the financial statements without quality and transparency in one hand, and on the other hand information asymmetry which exists due to the separation of management from ownership and conflict of interest between shareholders and managers will lead to increase the company’s cost of financing or otherwise weighted average cost of capital faced with liquidity shortages that as a result it is affected the market value of the firm in the capital market. Therefore the present study investigates the effect of weighted average cost of capital (WACC) on market measures of corporate performance evaluation. The statistical universe of this study is all companies that are listed in Tehran Stock Exchange from the beginning of 2006. Among member companies of statistical universe, a number of 70 companies or about 350 firm-years randomly were selected to test the hypotheses as statistical sample which were eligible for the study.

In this study, the market measures of corporate performance evaluation are the ratios of Tobin’s Q (market value of company), price to earnings (P/E) and market value to book value of equity (M/B) which are considered as dependent variables. To determine the appropriate method for estimating regression models and hypotheses test was used from F-Limer test and Hausman that in both tests, fixed effects method was selected for estimating models.

The results show that there is negative and significant relationship between weighted average cost of capital (WACC) and the ratios of price to earnings (P/E) and market value to book value (M/B). But significant relationship with Tobin Q ratios (TQ) has not been observed. Given to these results we can state, if cost rate of financing is high for companies which are faced with liquidity shortage, it causes to decrease the stock market price of those companies in capital market and thus will reduce market value and profitability of company. The results are consistent with the research results of Regalli and Soana (2012), Reverte (2012), Lopes and Alencar (2010) and Osyani et al. (2012). But are contrary to the research results of Wu et al. (2012), Pham et al. (2007) and Chan et al. (2009).

The results also indicate that there is significant and positive relationship between firm size (SIZE) and the ratios of Tobin Q (TQ) and market value to book value (M/B). However, firm size (SIZE) has not significant relationship with price to earnings ratio (P/E). It can be concluded that the large companies, due to having greater ability to meet their required financial resources than small companies, can use from these financed resources to increase market value and finally profitability of company by their proper and timely decisions. The results of this part are not consistent with the research results of Reverte (2012).

REFERENCES

Financial and Quantitative Analysis, 31(3): 377-397.

Notes
Note 2. Given that it was not recorded any evidences on existence of relationship between dependent variables and firm size in term of theoretical and tentative, it is used from redundant variable test to entering the firm size in each three research patterns. Results reject assumption to be zero for mentioned variable coefficient. In other words, existence of firm size variable in pattern causes to increase the explanatory power of ($R^2$) pattern. If needed, estimation results will be presented.