Studying the Determinants of of the Companies Capital Cost Admitted to Tehran Stock Exchange in Various Industries

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Abstract—The purpose of this study is to investigate the impact of some of financial ratios, age and size of the companies on the cost of capital of them in different industries.

For conducting the research, 5 active industries within the time scope of the research, i.e. 2002-2010, were categorized, then a sample consisting of 59 companies from 5 industries was selected by screening method. The used statistical method was multiple regression model using the pooled least squares method (fixed effects). Results indicate the influence of variables: fixed assets to total assets ratio, long-term debts to equity ratio, size of company, earnings per share, current ratio, company's age, tax to net profit before tax ratio, for first, second and fifth industries and lagged variable on companies's current period capital cost.

Keywords— Cost of capital, Panel data, Tehran Stock Exchange, Type of industry.

I. INTRODUCTION

One of the main challenges of today's companies is affordable financing. On the other hand, the most important task to be fulfilled by financial managers in the companies is maximizing shareholders' wealth. In this regard, the various dimensions of financial issues and recognizing the factors affecting the companies' financial situation and structure is a matter of great importance, and cost of capital is one of the most important of them. (Afrasiabi, 2005, p. 11) The data related to the cost of capital has always had a fundamental role in corporate decisions. Achieving suitable cost of capital plays a vital role in determining the optimum combination for corporate financial structures and especially for obtaining the best results from the operations in terms of profitability and increase of stock prices. Several studies have shown the role of choosing policies with the aim of minimizing the cost of capital for attaining the best operations results (Easley & Maureen, 2001). Assessing the cost of capital of corporate is important for managers for the following 4 reasons:

1) Cost of capital is the expected rate of return demanded by investors of the company for investment. The more the rate of return demanded by investors for a company would be for investment, the higher will be the costs of financing for that company.

2) Cost of capital is the rate that investors use it to discount the future cash flows of the company. The higher will be the cost of capital; the lower will be the present value of future cash flows of the company. Therefore the companies with lower capital cost will be more valuable than the companies with higher capital cost. Investors assess the costs of capital of a firm by risk assessment of cash flows in comparison with other available investment opportunities (SharPman and Fernando, 2008, 570).

3) Managers can assess investment projects and can perform budgeting for their investments and consequently investors are also willing to assess the activities of the company for risk assessment of their expected profit. (Pagano, 2003, 3).

4) Capital cost is used for some cases such as design of optimal structure, decision making for long-term leasing, replacement of bonds, working capital management and other similar cases. (Nasirpour, 2000, p. 17)

Considering the importance of the cost of capital, determining the factors influencing it will become highly important.

II. REVIEW OF LITERATURE

Gode and Moharam (2001) in their paper titled: "What affects the implied cost of equity capital in the manufacturing companies?" have investigated the factors affecting the cost of common stock. Since the cost of common stock is a risk criterion, measuring the cost of common stock required a considerable attention. The research was based on Ohlson – Juettner Model (2000) where the cost of common stock was determined on the basis of predictions of analysts regarding profit. In this paper, the effects of these factors on the cost of common stock were analyzed during the period 1984-1998.

The paper recounted some factors such as: coefficient of efficiency variation, information environment, variability factor for profit and leverage ratio as influencing factors on cost of common stock. The results of their study were as follows:

1. There was a strong negative correlation between profit prediction by analysts and cost of common stock.
2. There was a strong positive correlation between systematic risk (β) and cost of common stock, even after controlling the effect on the industry.
3. There was a positive correlation between standard deviation of profit and cost of common stock.
4. There was a positive correlation between leverage ratio and cost of common stock.
5. There was a positive correlation between the measure of type of industry and cost of common stock. (Gode and Moharam, 2001)

Gebhard, Swaminatan and Lee (2001) in their research titled: "Toward an implied cost of capital" used a new approach to estimate the capital cost of common stock. In this study, the model of discounted excess profit was used to calculate implied cost of capital of market. Then, the correlation between characteristics of the firms and the implied cost of capital was studied. Results of their study showed that there is a significant correlation between different characteristics of companies, type of industry and implied cost of capital. In fact, the main objective of their study was the market perception of risk to investment for common stock of companies and also estimating it so that the difference in market perception of investment risk can be expressed for different industries. The research was a cross-sectional investigation of the correlation between the implied equity risk premium and 14 characteristics of the companies. The characteristics were classified into 5 classes as follows: market volatility, leverage, liquidity and information environment, variability and profit predictability, and other pricing fluctuations. Results showed that:

1) The implied equity risk premium is different among various industries.
2) Dividend-to-book (D/B) leverage and dividend-to-market (B/M) leverage showed positive and significant correlation for implied equity risk premium. Although the correlation between market leverage and implied equity risk premium was stronger.
3) In case of the liquidity and information environment variables, results showed that the larger companies, those that are analyzed by more analysts and the companies with the higher volume of securities transactions all have lower implied equity risk premium.
4) The results also confirmed the positive correlation between profit variability and implied equity risk premium, i.e. investors expect higher implied equity risk premium for investment on stock with higher profit variability.
5) The evidences of the study confirmed that implied equity risk premium for common stock is less for book-to-market and common stock with high long-term growth is lower.
6) Also stock with higher sale price has less cost of capital. There was also a weak positive correlation between the implied equity risk premium and the volume of monetary transactions. The results showed that the B/M ratio is the only highly important variable in explaining the cross-sectional differences in the cost of capital of the next period. The other three variables, namely the dispersion in profit predictions by analysts, long-term growth estimate and the implied equity risk premium of the industry, have an important role in explaining the implied cost of capital. The company's implied cost of capital, therefore, is a function of the type of industry, the M/B ratio, predicted long-term growth rate and dispersion in profit predictions by analysts. (Gebhard, Swaminathan & Lee 2001)

Lewellen examined the power of financial ratios in prediction of stock returns and the time scope of his study was 1995-2000. He used CAPM model to calculate stock returns and analyzed the prediction power of benefit-cost ratio, book value to market value, and the dividend ratio. Results showed that dividend ratio can significantly predict the stock returns. But the benefit-cost ratio and book value to market value are less capable in prediction of stock returns (Lewellen, 2003, 211-221).

Omran and Pointon (2004) in their paper named: "The determinants of cost of capital industry within an emerging economy: evidence from Egypt" examined several models for measuring the costs of equity and the cost of capital on the basis of a sample including 119 companies. They used book and market values for presenting their models. To determine the factors influencing capital cost, they used regression models and step by step procedure. They identified business and financial risks as important factors for private companies active in heavy industry sector. For real estate and contracting sector which had higher cost of capital, rate of return on fixed assets was identified as the key variable. In the food industry, liquidity was an important determinant. But ultimately, a good model to explain the cost of capital in the service sector was not found (Omran and Pointon, 2004).

Mohammad Qasim Osmani (2002) conducted a study titled: "Identification of capital cost model and affecting factors" and tried to both provide a reliable model for calculating cost of capital and to study some factors affecting cost of capital including size of the company, disclosure level, type of industry and debt ratio. In that study, 86 corporations were selected as the sample and the time scope of the research was 1996-2001. In order to conduct the research, first the cost of capital was calculated using five models: Average Realized Return Model, Capital Assets Pricing Model, E/P Model, Gordon Model and Accounting-based Assessment Model and then, significance testing was conducted. Subsequently, by multiple regression model, the effects of other variables on the cost of capital were calculated. The results of that research suggest that there were significant differences in determining cost of capital using the five models.

Accounting-based assessment model had higher relative validity than other models, while capital assets pricing model had the lowest validity. Also the sizes of the firm and industry type were effective on the cost of capital (Osmani, 2002).

III.   RESEARCH HYPOTHESES

The main hypothesis: there are significant relationships between capital cost and its determinants.
Sub-hypotheses:
1.   There is a significant relationship between cost of capital and fixed assets to total assets ratio.
2.   There is a significant relationship between cost of capital and long-term debts to equity ratio.
3.   There is a significant relationship between cost of capital and earnings per share.
4.   There is a significant relationship between cost of capital and current ratio.
5.   There is a significant relationship between cost of capital and net growth of fixed assets ratio.
6.   There is a significant relationship between cost of capital and sales growth ratio.
7.   There is a significant relationship between the companies' age and cost of capital of the companies admitted to Tehran Stock Exchange.
8.   There is a significant relationship between cost of capital and tax to net profit before tax ratio.
9.   There is a significant relationship between cost of capital and size of the company.

IV.   METHODOLOGY

The method used in this study is correlation method because its objective is explaining the effects of intended financial ratios on capital cost. This is an applied research because in applied research we seek answers to the raised problems. The data related to the Tehran Stock Exchange was obtained from Rahavard Novin software program. Data analysis and obtaining descriptive statistics was conducted using SPSS software program. Inferential statistics were resulted from Eviews software program.

V.   STATISTICAL POPULATION AND SAMPLE

The companies admitted to Tehran Stock Exchange were chosen as the statistical population. Sample companies were selected on the basis of sampling criteria and then were classified into the following five classes.

Table (1)

Di	Classified industry group	Di	Classified industry group
D1	Pharmaceuticals	D2	Auto and auto parts
D3	Chemical products	D4	Food industry except sugar
D5	Plaster and cement		

The sampling criteria:
*   The companies should be admitted to Tehran Stock Exchange before the year 2004.
*   Fiscal year of all of them should end in March.
*   Companies' data for the time scope of the research would be available.
*   Maximum three-month trading halts in stock trading of sample companies.
*   They should not be intermediary firms, banks, investment and holding companies because the nature of their operations is different.

Finally, after applying the above criteria and sampling, the 59 companies were selected among 426 companies of Tehran Stock Exchange up to the end of the year 2010.

Research Variables:

Table (2)

Dependent variable		
Cost of capital	$WAcc$	$$WAcc = \frac{L}{L+E} Kd(1-t) + \frac{E}{L+E} K_e^c$$
	K_e^c	$$\frac{1}{P \Big/ \left(E - \frac{e_0 - d_0}{e_0} \right)}$$
Independent variable		

Where:

P = Closing price of the share in the fiscal period

d_0 = Cash earnings per share at the beginning of the fiscal period

E = Net earnings per share at the end of the fiscal period

K_e^c = Cost rate of common stock

e_0 = Net earnings per share at the beginning of financial period

Table (3-3): **Financial ratios and their calculation method**

	Financial ratio	Calculation method
1.	Fixed assets to total assets ratio	Book value of fixed assets at year-end to book value of total assets at year-end
2.	Long-term debts to equity ratio	Book value of long-term debt at year-end to book value of equity at year-end
3.	Earnings per share	$\dfrac{EPS_i - EPS_{i-1}}{EPS_{i-1}}$
4.	Tax to net profit before tax ratio	Book value of tax at year-end to book value of net profit before tax at year-end
5.	Net growth of fixed assets ratio	$\dfrac{NFAG_{i+1} - NFAG_i}{NFAG_i}$
6.	Sales growth ratio	This year sales - last year sales / last year sales
7.	Age of the company	The difference between admission year of the company to Tehran Stock Exchange and the end of fiscal year 2007
8.	Current ratio	Current assets / current liabilities

Finally, after applying the above criteria and sampling, the 59 companies were selected among 422 companies of Tehran Stock Exchange up to the end of the year 2010.

Table (4): **Required statistical tests for analysis of research issues**

Description	Type of used test	Type of used statistic
Analysis of independent variables	Reliability and stability of variables co-linearity among independent variables	Augmented Dickey-Fuller test (ADF) Pearson correlation coefficient
Select the appropriate model	Choice test between mixed effects and fixed effects models Choice test between fixed effects and random effects models	F-statistic Limer Hausman test (H)
Test of all hypotheses	Testing significance of individual coefficients of each model Testing overall significant of regression equation Testing self-correlation Testing restrictions on coefficients Heteroskedasticity of weighted-based type	T-statistic F-statistic Durbin- Watson (DW) F-statistic and chi-square (x^2) White test

VI. POOLING OF CROSS SECTION AND TIME SERIES DATA

The variables introduced in this study will be examined from two different aspects. These variables have been chosen from different companies on one hand and from the time period of 2003-2010 on the other hand. The proposed solutions for such cases are polling cross section and time serried data together and estimating the intended model on the basis of the new data. If the extracted data from different cross-section units for different years would be put together, our data will become pooled. Data arrangement of this procedure can be conducted into two types: in the first type, the data for a cross-section unit will be put together for T years, and then we repeat the same procedure for the second cross-section unit and also the following units. This type of data arrangement is called "pooled data". In the second type, the data of cross-section units of each year will be put together, and the same procedure will be repeated for the next years and this type of data arrangement is called "panel data". In this study, the pooled data arrangement will be used.

VII. TESTING THE HYPOTHESES

As already mentioned, it was necessary before taking any other action that the co-linearity among independent variables would be studied. The tests showed that the variables were proper in this sense. For the next step, it was necessary that an appropriate method would be selected for conducing regression with regard to theoretical discussions.

As mentioned before, there are different methods for estimating a model with pooled data, which can be summarized into the following two categories:

    a) Estimating the model assuming the same intercept for all sections (countries, companies).

    b) Estimating the model assuming different intercepts for sections (companies) using two methods of fixed effects or random effects.

Now to ensure that which methods are more efficient, first we should use Limer-test.

Results of the tests are as follows:

As noted, the calculated value of statistic significance level is 0.0000 which is smaller than 5%, so hypothesis H_0 is rejected. The rejection of this hypothesis means that the intercepts are different for all sections (companies). Therefore using OLS method is not appropriate and will not be fruitful and so the results of pooled model must be carefully treated. In the second stage, to determine whether fixed effects method should be used or random effects method, Hausman test is used. As previously mentioned, this tests review the following hypotheses:

H_0 : Consistency of estimates by random effects method

H_1 : Consistency estimates by fixed effects method

The calculated significance level of the test is 0.0000 which is smaller than 5%, so hypothesis H_0 is rejected. Consequently, fixed effects method is the best one.

Table (5): **Coefficients of regression model for data panel method by fixed effects method**

Model Components	Coefficients (β)	T-statistic	Standard Error	Significance level (Sig)
C	0.078881	1.859537	0.042420	0.0437
Fixed assets to total assets	0.325470	26.41085	0.012323	0.0000
Long-term debts to equity	-0.044989	-10.95056	0.004108	0.0000
Earnings per share	-0.003492	2.227351	0.001568	0.0265
Current ratio	-0.004483	-2.088163	0.002147	0.0374
Net growth of fixed assets	-1.14E-0.6	-0.390119	2.91E-06	0.6967
Sales growth	-0.001248	-0.490832	0.002542	0.6238
Age of the company	0.011592	5.022152	0.002308	0.0000
Tax to net profit before tax ratio	0.012984	-3.319333	0.003912	0.0010
Size of the company	0.014223	2.419286	0.034531	0.0052
D1	-0.042700	-4.182698	0.010209	0.0000
D2	0.059815	4.546440	0.013156	0.0000
D3	-0.016351	-1.609919	0.010157	0.1082
D4	-0.012397	-1.159967	0.010687	0.2468
D5	-0.033594	-4.144703	0.008105	0.0000
AR (1)	-0.226913	-3.852735	0.058897	0.0001

Table (6): **Test of overall significance of the models**

Coefficient of determination	Adjusted coefficient	F-statistic	Significance level (Sig)	Durbin-Watson statistic	F-statistic of Limer test	Hausman test statistic
0.615368	0.543372	8.547331	0.000000	2.228037	0.000000	0.000000

      Table 5 represents the results of the first model of the research. Due to using cross sectional data, for removing heteroskedasticity the generalized least squares method is used. As it can be seen, T-statistic values and 95% confidence interval in Table 6 suggests that variables that some variables, i.e. fixed assets to total assets, long-term debts to equity ratio, size of the company, earnings per share, current ratio, age of the company, tax to net profit before tax ratio and first, second and fifth industries have statistically significant correlation with capital cost (dependent variable). Also some variables, i.e. fixed assets to total assets, earnings per share, tax to net profit before tax ratio and size of the company have direct relationship with capital cost (dependent variable), while other variables, i.e. current ratio, age of the company and long-term debts to equity ratio have inverse relationship with profit (dependent variable).

      Durbin- Watson statistic calculated for the regression model of the first hypothesis is 2.228037 which is between 1.5 and 2.5 and demonstrates the lack of correlation among the components of regression model of the aforesaid model.

      The value of coefficient of determination of the model shows that approximately 0.615368% of the resulting changes in the dependent variable can be explained by means of the independent and significant variables in this model

that represents the high capacity of the model in explaining the behavior of the dependent variable. F-statistic, given that its probability value is 0.000, also shows that Remember that the regression model is correct at 99% of confidence. And the overall regression is significant.

VIII. RESEARCH PROPOSALS
1. The role of information and its impact on the cost of capital
2. Monthly and quarterly reviews of accounting variables affecting the cost of capital

IX. CONCLUSION
Simultaneous analysis of the selected variables for this research using partial least squares (PLS) method indicated that some variables, i.e. fixed assets to total assets, long-term debts to equity ratio, size of the company, earnings per share, current ratio, age of the company, tax to net profit before tax ratio and first, second and fifth industries have statistically significant correlation with capital cost (dependent variable). Also some variables, i.e. fixed assets to total assets, earnings per share, tax to net profit before tax ratio and size of the company have direct relationship with capital cost (dependent variable), while other variables, i.e. current ratio, age of the company and long-term debts to equity ratio have inverse relationship with profit (dependent variable). And thus it is determined the variable of "type of industry" also has a major impact on cost of capital, and addition to affecting intercept, has also impact on the slope of the regression line. With regard to the first hypothesis, i.e. the relationship between fixed assets to total assets ratio with the cost of capital, the results of the study show that there is significant relationship between the cost of capital and fixed assets to total assets ratio. Fixed assets to total assets ratio reflects the composition of the firm's assets. The higher will be this ratio, the further guarantee against environmental risks will be possible. With such reasoning, capital owners and creditors classify such companies as companies with low perceived risk. According to portfolio theory for investment, their expected return also decreases. Their reduced expected return will reduce the cost of capital. So there is an inverse relationship for fixed assets to total assets ratio. But Omran and Pointon (2004) found hat the higher will be this ratio, the greater security will be provided for business units because fixed assets can be used as collateral for debt payment. Fama and French (2000), Rajan and Zingales (1995), and Wessels and Titman (1988) argued that the fixed assets to total assets ratio should be the important determinant of leverage.

In connection with the second hypothesis, i.e. the relationships between long-term debts to equity with cost of capital, the results show that there is a negative and inverse relationship between cost of capital and long-term debts to equity ratio.

This indicates the amount of resources that the company has provided via borrowing. The high value of this ratio indicates that a high percentage of long-term financial needs are satisfied through borrowing. In other words, additional financial leverage is used in this case. With the increase amount of debt in capital structure, weighted average of cost of capital decreases and those who provide the companies with facilities will not give much attention to the risk of the company. If they wanted to focus of the risk of the company, they would, for the given facilities to the company, determine their expected rate of return based on the company's risk; and if the company's debt would exceed a certain level, the rate of return also would increase proportionally and this would cause that debt would not be an affordable financing source. The results of the study negate the traditional theory of capital, which points that the costs of capital is U-shaped and first decreases and then with increase in debt amount will increase. Gebhard, Swaminathan and Lee, Gode and Moharam, and Omran and Pointon found the positive relationship between leverage and cost of capital. While Mohammad Hassan Kamali found an inverse relationship between debt ratio and cost of capital.

For the fifth hypothesis, i.e. the relationship between the cost of capital and net growth of fixed assets is significant, the results of the study show that the relationship between the cost of capital and net growth of fixed assets is not significant. Omran and Pointon believed in a positive relationship between the cost of capital and net growth of fixed assets, because the higher will be this growth, the higher also will be the cost of capital. The seventh hypothesis assumed a significant relationship between the age of the company and the cost of capital. The research results show that the relationship between the age of the company and the cost of capital is negative and inverse. This seems to be reasonable that a company with a longer history of operations will be more known for investors; investors will have more data regarding that company and more time for analyzing the data. This prior awareness has a direct impact on risk. So, the better would be such prior awareness, the lower will be the cost of capital. Peterson and Rajabin believe in a negative and inverse relationship between the age of the company and leverage, as Easley and Ohara found the same relationship between the age of the company and the cost of capital. This finding is also consistent with the experimental results obtained by Coval and Moskowitz (1999) and Hoierman. They found that investors and stock managers more readily accept those stocks with which they are more familiar. In such cases, local investors may feel that they have more prior awareness regarding stock companies, so they will incur less risk for acquisition of such assets.

For eighth hypothesis, i.e. there is a significant relationship between cost of capital and tax to net profit before tax ratio, the results show that there is a significant relationship for $\dfrac{tax}{net\ profit\ before\ tax}$. But Omran and Pointon and Miller and Modigliani Civil found that this is an inverse and negative relationship, because tax may reduce

investment rate and also the cost of debt may be reduced via tax deductibility. Mali and Helson provided clear evidences of tax impacts and stressed that tax shields should change the company's secondary tax rate so that it can affect the debt to equity ratio. Wessels and Titman (1988), Bradley *et al.* (1984) and March (1982) could not find a significant relationship between taxes and capital structure.

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