The Role of The Capital Market in The Cost of Capital of Perrochemical Companies Listed in Tehran Stock Exchange (Tse)

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Abstract

The present study investigates the impact of financing though the capital market on the cost of capital of petrochemical companies listed in Tehran Stock Exchange (TSE). Primarily, the relationship between financing through the two methods of capital increase and long-term receivable loans, and the company's cost of capital is explored. Subsequently, the impact of both methods of capital increase and long-term receivable loans on the company's cost of capital has been investigated. The research data has been obtained from 7 petrochemical companies listed in TSE over the 2005-2013 and in order to test the hypotheses, the panel data model has been used. Based on the research data, there is a significant relationship between financing through capital increase (stock) and long-term receivable loans, and cost of capital, and also the results of the study show that the impact of capital increase on the cost of capital is less than the impact of the long-term receivable loans.

Keywords: Capital market, Cost of Capital, Petrochemical Companies

Introduction

Based on the macroeconomic theories, accumulation of physical capital is one of the necessary prerequisites for the national economic growth. In other words, optimal use of the workforce in the production process is greatly dependent on the amount of available capital and accumulation of capital plays a major role in determining the increase in total output and output per capita of the workforce. In the first method, in addition to opening the fields for the increase of production and productivity in the national economy, the level of progress of the society is in accordance and agreement with the amount of investment made (Abdeh Tabrizi, 2004). Therefore,
accumulation of capital, as one of the components of economic growth, is almost as important as the other factors of production such as the workforce, natural resources, technology and management and the process of capital formation can be accelerated by means of financial markets. Financial markets have the role of absorption of the liquidity available in economy in the form of small or large savings and direction of these resources toward investment in the productive sectors of economy. Market capital, as part of the financial markets, has the duty of provision and equipment of financial resources of economic activities. For financing and completion of their activities, business firms require a high volume of capital and it is evident that provision of this amount of capital is not possible within a limited time and it must be provided by other resources; by referring to the capital market, firms can be assured of providing their required financial resources.

When firms need financing, they must meet their financial resources and for provision of their required financial resources, the two resources of internal and external financing are available for them. Internal resources include cash flows resulting from operating activities, sale of assets and retained earnings, and external resources include borrowing from financial markets and equity. As selection of each of these resources has some costs for the firm and the firm is aimed at minimization of these costs, naturally when this is achieved, the profit of the firm is maximized as well; therefore, the firm must select the best capital structure, which is a combination of different financial resources, so that it can minimize the cost of capital.

Developments in the industry of every country require short-term, medium-term and long-term investment programs and through that, a huge fund is achieved in the economy of every country. Investment resources can be met through retained earnings, new share issue, banking facilities or a combination of these sources of supply. As one of the most fundamental industries available in the world which is known as the Mother Industry, the petrochemical industry is not an exception either and for operation and progress and development of its production capacities, it requires investment in this industry and due to the scattered liquidity in the society, capital market, as part of the financial market, has a considerable role to play in absorption and guidance of this liquidity toward the petrochemical industry. Therefore, in this paper, the impact of capital market on financing of the petrochemical industry has been investigated.

**Theoretical Foundations**

Financial markets constitute the main framework of the financial sector. The main participants of these markets are people, families and firms that enter these markets in order to supply their funds and are famous as surplus units; also, the firms and the people that enter these markets with the goal of financing, are fractional units. Financial market draws the surplus unit and the fractional unit nearer and makes transfer of the fund between these two units possible and these transfers of funds provide productive investment. Financial markets can be divided thus based on different views:
1-Based on the type of financial or fixed assets or variability of income, financial markets are divided into debt markets and capital markets.

2-Based on the maturity of financial assets, financial markets can be classified to the short-term or money markets and medium-term and long-term markets.

3-Furthermore, financial markets can be classified into cash markets (markets in which financial assets are immediately traded) and accrued markets (markets in which financial assets are traded in the future).

But in a general and accurate classification, capital markets can be divided into the real markets (goods, work, services) and nominal markets (money and capital) and among these four markets, the market of goods and services and work is related to the real sector of economy and the market of money and capital is related to the financial sector of economy.

1. **Money Market**

The money market is one of the components of financial markets in which the demand maturity is short-term and the Stock Exchange that are traded in this market, have a maturity of less than one year. For this reason, this market has less risk compared with the capital market. In this market, the savers of funds can't directly refer to the applicants of funds; therefore, this relationship is facilitated merely by institutions and financial intermediaries (Barkhordari, 2011).

2. **Capital Market**

One of the other financial markets is capital market and in this market, long-term financial needs (with the maturity of more than one year) of the firms is provided and due to the long-term time due for the demand maturity, the level of risk in this market is more than that of the money market. Although the money and the capital markets complement each other in optimal provision and allocation of financial resources, due to the time-consuming nature of the production activities, the role of capital market in equipment of financial resources of these activities is more considerable compared with the money capital. The main task of the capital market is financing of firms and the real activities of economy; therefore, by means of the liquidity available in the capital market, proper resources can be provided for investment in economic activities. Moreover, financing through the capital market leads to the reduction of financing costs, effective conditions for transfer of funds and facility of risk between the investors and the investees. Therefore, the more effective the capital market is, transfer of funds is conducted more efficiently and the activities of the firms increase and the economy gradually develops and prospers.
Research Background

Colin Mayer, in a series of articles (1988-1989-1990), conducted the first experimental study on the methods of financing. In these articles, Mayer investigated the financial structures of the companies of 8 different countries over the 1970-1985 period and then compared the results. The results obtained from this study are as below:

1-In all countries, the retained earnings are the most important sources of financing.
2-The most important external sources of financing in all countries, specifically in Europe and Japan, are banks.
3-Companies have used the Stock Exchange Market for less financing.
4-Compared with large companies, small and medium companies mostly use external resources for financing and for this purpose, they mostly used commercial banks and used Stock Exchange Market less often.
5-There is a significant and negative relationship between bank credits and use of retained earnings.

Singh & Hamid (1992) and Singh (1995) investigated the methods of financing of 50 companies of 9 developing countries and the results obtained from their study are as below:

1-The companies in developing countries mostly use external resources for financing.
2-In the developing countries, in order to increase their net assets, companies mostly use the new stock issuance.

Seletis & Pinno (2004), in a study, investigated the companies’ methods of financing and investment and the research results show that all the countries under study use internal resources for financing and in countries such as France and Japan financing is mostly carried out through banks and in countries such as the U.S. and Canada financing is mostly carried out through the bonds and shareholders’ equity has little share in financing.

Robb & Robinson (2009), in a study, have investigated the decision-making policy regarding the capital structure of newly established companies; the results indicate that this type of companies use the bank loans seven times more than other methods of financing and the average companies that have used external resources of financing are twice more than average companies that have used internal resources of financing.

Rajabzadeh, Khorshidi, Qolipour (2006), in a study entitled "investigation and analysis of the role of the money market and the capital market in the cost of capital of companies", have investigated the financing of companies in different countries and the research results show:
1-In the developing countries, financing is mostly conducted through external resources and also, the stock market has a large share in financing of these countries.

2-Financing in developed countries is mostly dependent on internal resources and retained earnings and the amount of shares used in these countries varies.

In this study also, by means of the correlation methods and the t-test, the relationship between methods of financing and weighted average of the cost of capital, has been investigated in different industries of Iran and the results obtained indicate a significant difference between methods of financing, money market and capital market.

Abzari, Dastgir & Qolipour (2007), in a study, investigated the methods of financing of the companies listed in the Stock Exchange and the relationship between the financing pattern of the companies and the features of the size of company, fixed assets and profitability.

The results obtained from the study include:

1-There is no significant difference between the uses of the available financing methods.

2-There is no significant relationship between the methods of financing and the variable of profitability.

3-There is a significant relationship between the method of financing and the variables of the size of company and the company's assets.

Jamshidi (2009), in a study, investigated the methods of financing of the cement companies listed in TSE and also the relationship between the method of financing of the companies and the features of the size of company, investment of the companies in the tangible fixed assets and the life of the company. The results of the study are as below:

1-The cement companies under study make use of interest-bearing debts for financing.

2-No significant relationship has been observed between the company's method of financing, which is the use of interest-bearing debts, and the variables of life of company and net sales.

3-There is a significant relationship between the independent variables of investment changes in the tangible fixed assets and total assets and the investment changes in the tangible fixed assets and capital commitments, and the dependent variable of the changes in the interest-bearing debts.

Hasanpour (2012), in a study, has attempted to identify the financing pattern of the companies listed in TSE in different industries. The research results show that most of the companies under study supply more than half of their capital through the current debts. One of the other results of research is that the type of industry is not effective in determining the financing pattern and that also the net sales and the operating profit can be effective in the financing pattern.
Research Hypothesis

The first primary hypothesis: there is a significant relationship between the methods of financing in petrochemical companies.

The second primary hypothesis: the impact of financing through the capital increase (common stock issuance) on the cost of capital of the petrochemical companies is less than the received long-term receivable loans (debts).

Regarding the first primary hypothesis, the two secondary hypotheses are tested as below:

The first secondary hypothesis: there is a significant relationship between financing though the capital increase (common stock issuance) and the cost of capital of the petrochemical companies.

The second secondary hypothesis: there is a significant relationship between financing though long-term receivable loans (debts) and the cost of capital of the petrochemical companies.

Conclusions and Recommendations Data:

The variables used in this study include the capital of the company, long-term receivable loans from the bank system and the interest rates on by the company, the tax rate and the amount of EPS/P (earnings per share/ market value of common stock). The study period in this research is the years between 2005 and 2013. In this study, in order to investigate the impact of the capital market on the financing of petrochemical companies, companies have been selected from among the petrochemical industry that have the following features:

1-The data related to the variables under study in this research are available for that company during the years 2005 and 2013.

2-They have used the methods of financing in the study period.

3-They are members of TSE.

Eventually, only seven petrochemical companies had the features above which have been investigated in this study. In this study, for the model estimate, the Eviews Software has been used.

Introduction of Model

In this study, in order to determine the impact of the level of capital changes and long-term receivable loans on the financing costs, the model below has been used. In this model that has been estimated by means of the panel data model, the levels of $\alpha_1$ and $\alpha_2$ are the level of impact of changes in capital and the company's receivable loans respectively on the company's cost of capital.
\[ RWACC_{it} = \alpha_0 + \alpha_1(RS_{it}) + \alpha_2(RB_{it}) + \epsilon_{it} \]

*RWACC*<sub>it</sub>=Rate of changes in the financing cost

*RS*<sub>it</sub>= Rate of changes in long-term receivable loans

**Model Estimate:**

1. **Unit Root Tests:**

Unit root test is one of the most important tests that are used for estimate of a Regression with reliable coefficients. For this reason, the unit root test of Levin, Lin et al. has been used in order to test the sustainability of the variables.

**TABLE 1. THE RESULTS OBTAINED FORM ESTIMATE THE OF THE UNIT ROOT TEST FOR *RWACC* VARIABLE**

<table>
<thead>
<tr>
<th>Intercept</th>
<th>Intercept and trend</th>
<th>No intercept and trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>Prob</td>
<td>Statistic</td>
</tr>
<tr>
<td>Levin, Lin &amp; Chu t</td>
<td>-11.3436</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

**TABLE 2. THE RESULTS OBTAINED FORM ESTIMATE THE OF THE UNIT ROOT TEST FOR *RS* VARIABLE**

<table>
<thead>
<tr>
<th>Intercept</th>
<th>Intercept and trend</th>
<th>No intercept and trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>Prob</td>
<td>Statistic</td>
</tr>
<tr>
<td>Levin, Lin &amp; Chu t</td>
<td>-6.16743</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

**TABLE 3. THE RESULTS OBTAINED FORM ESTIMATE THE OF THE UNIT ROOT TEST FOR *RB* VARIABLE**

<table>
<thead>
<tr>
<th>Intercept</th>
<th>Intercept and trend</th>
<th>No intercept and trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>Prob</td>
<td>Statistic</td>
</tr>
<tr>
<td>Levin, Lin &amp; Chu t</td>
<td>-6.57504</td>
<td>0.000*</td>
</tr>
</tbody>
</table>
The results of the tables above indicate the sustainability of the variables. So, based on this, there is no problem in estimating the model and there is no need to use the difference of variables in the model.

2. Testing the validity by means of the panel method or F-Limer:

Before starting the discussion on estimate and analysis of the model, firstly the significance of the individual effects must be tested. In other words, it must be investigated whether the results obtained from using the panel data model are reliable for the model estimate or not? Therefore, in terms of the statistical test, we will have:

\[ H_0: \alpha_i = \alpha_2 = \ldots = \alpha_N \]  
\[ i \neq j \]  
\[ H_1: \alpha_i \neq \alpha_j \]

The statistic of this test has the F explanation; as you can see, we are facing the two constrained and unconstrained models and in the constrained model, the intercepts are constant and equal:

\[ F = \frac{(RSS_R - RSS_U) / N - 1}{RSS_U / NT - N - K} \]

RSS_U: Sum of squares of the residuals of the unconstrained model
RSS_R: Sum of squares of the residuals of the constrained model
N: Number of sections
T: Time period
K: Number of explanatory variables of the model
NT: Number of adjusted observations

If intercepts do not vary for different sections, the ordinary OLS method can be easily used; in fact, the constrained model is the same as ordinary OLS and it is as if we have placed the data related to different sections in a row, and that we estimate the model for the K variable with NT.

The constrained N-1 degree of freedom has one intercept. If the intercept varies for different sections, use of the panel method is required.
The results of the table show that intercepts vary for different sections; in this state, use of OLS is unreliable and won't have efficiency either. Based on this, the present study is investigated in the panel method.

3. **Hausman Test (The Selection between Fixed and Random Effects)**

For decision-making regarding selection between the two methods of random effects or fixed effects, the Hausman test is used so that it is determined whether fixed or random effects exist. The statistic of this test is calculated as below.

\[ w = x^2(\kappa) = [\hat{\beta} - \hat{\beta}] S^{-1} [\hat{b} - \hat{b}] \]

In which:

\[ \text{Var}[b - \hat{b}] = \text{Var}[b] - \text{Var}[\hat{b}] = \sum \]

In the relation above, we have:

- **K**: Number of estimating parameters;
- **B**: The model coefficients estimated by the method of random effects;
- \( \hat{\beta} \): The model coefficients estimated by the method of fixed effects;
- \( \sum^{-1} \): Variance matrix-model covariance;

\[ H_0 : \hat{\beta} = \hat{b} \]
\[ H_1 : \hat{\beta} \neq \hat{b} \]

The \( H_0 \) hypothesis indicates that the coefficients of the two models are not different. If the calculated test statistic is larger than \( \chi^2_k \) of the table, the \( H_0 \) hypothesis is rejected meaning that the difference in the intercept of different sections is not random; so, the method of random effects is not proper and therefore, the approach of fixed effects must be used.
TABLE 5. THE RESULTS OBTAINED FORM THE HAUSMAN TEST

(SELECTIOIN OF MODEL ESTIMATION METHOD)

<table>
<thead>
<tr>
<th>RE or FE</th>
<th>prob</th>
<th>Chi-Sq. d.f.</th>
<th>Chi-Sq Statistic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FE</td>
<td>0.000</td>
<td>2</td>
<td>25.257466</td>
<td>Hausman Test</td>
</tr>
</tbody>
</table>

Based on the results of the table, prob is less than 10% (one tenth); therefore, the H₀ hypothesis is rejected and this shows that the difference in the intersection of different sections is not random; therefore, the method of random effects is not proper for model estimation and the model of fixed effects must be used for the model estimation.

Model Estimation and Analysis of Results:

The results obtained from the model estimation are presented in the table below by means of the panel data model.

TABLE 6. RESULTS OF THE MODEL ESTIMATION

<table>
<thead>
<tr>
<th>variable</th>
<th>coefficient</th>
<th>t-statistic</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>33.205</td>
<td>16.63510</td>
<td>0.000</td>
</tr>
<tr>
<td>RS</td>
<td>0.109</td>
<td>2.980056</td>
<td>0.0043</td>
</tr>
<tr>
<td>RB</td>
<td>0.2771</td>
<td>24.10156</td>
<td>0.000</td>
</tr>
</tbody>
</table>

R-squared = 0.93
Durbin-Watson stat = 2.14
prob(F-statistic) = 0/000
Adjusted R-squared = 0/92

Resource: research findings

According to the table of PROB and t-statistic, all variables indicate significance of the variables in the model; also, the impact sign of explanatory variables on the dependent variable is in accordance with economic theories. The impact factor of the rate of capital changes on the rate of changes in the cost of capital equals 0.109 which shows that for every percent of increase in the capital (one unit of increase in the rate of the capital changes has been considered equal to one percent of change in the capital); it is expected that under the conditions when other factors are fixed, cost of capital increases by 0.109 percent. The impact factor of the rate of changes in long-term receivable loans on the rate of changes in the cost of capital equals 0.2771 which
indicates that for every percent of increase in long-term receivable loans (one unit of increase in the rate of changes in long-term receivable loans is considered to equal one percent of change in long-term receivable loans); under conditions when other factors are fixed, the cost of capital is expected to increase by 0.2771%.

Conclusions and Recommendations

In this study, the impact of financing, through the capital market, on the cost of capital of petrochemical companies listed in TSE, was investigated and the research results indicate:

1-There is a significant relationship between the methods of financing, capital increase and long-term receivable loans, and cost of capital. For this reason, petrochemical companies must be able to select the best capital structure and the most appropriate combination of financial resources so that they can minimize the cost of capital.

2-The impact of capital increase on the cost of capital is less than the impact of long-term receivable loans; in other words, financing through common stock is less costly than financing through long-term receivable loans; therefore, it is suggested that petrochemical companies mostly use capital increase (stock) for financing.

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