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Empirical Analysis of Selected Factors Import on Cost of Capital Prediction of Productive Companies

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ABSTRACT

The current study considers impact of factors in clouding growth opportunities, profitability, risk, cashing on cost of capital of productive (manufacturer) companies. The statistical sample of this study included 106 industrial companies of 15 type of industries. It was used the multiple regression test synchronously (modularize data)and constants impacts method (pooled and panel data) for analysis. The results show direct and meaningful impact of assets output on cost of capital of market value/book value, financial risk, market risk, capital gain (output) on cost of capital of productive companies by time and periods.
The results of these studies is consistent on studies results of Gebhart Samtaniyan Li, Godo Mohram, Omran & poynton and is disagreed with studies results of Doyzis & John Kaos Kas Liolen, Mehrani.
Key words: Cost of capital, cost of Equity capital pooled and panel data, time series, industry.

INTRODUCTION

One of fundamental challenges that current companies especially productive large companies deal with it, is cheap financial supply. In other word, most important duty that managers undertake in companies is maximizing of shareholders wealth. In this regard, the recognition of various aspects of financial problems and effective factors has considerable importance on financial status and structure of companies and cost of capital is one of most important cases (Afrasiyabi, 2005, 11). "Capital" word in phrase "Cost of Capital" is a wider concept than capital concept in accounting literature and only doesn't include shareholders salary, but includes all of used long-term funds and financial resources including under possession of economic sector holders and others.

The concept of capital from this point of view includes two parts of shareholders salary and long- term debts (Nasirpour, 2001, 9). The evaluation of cost of capital of company is important for managers because four reasons:

1) cost of capital of expected gain rate requested by company investors is for investment. More be gain rate requested by investors of a company for investment, more expensive is the financial supply for company.
2) The cost of capital is a rate that investors use to discount company future pecuniary currents (processes). More(Higher) be cost of capital, less be the current value of company future pecuniary flows. So, the companies with less cost of capital will be more valuable than companies with more cost of capital. Investors evaluate the cost of capital of a company with evaluation of taking risk of pecuniary currents than other opportunities available investment (Sharfman & Fernando, 2008, 570).
3) Managers can evaluate their investment projects and capital funding determination. Because of this, investors desire to evaluate the company activities in related to their expected benefit gain risk evaluation very much (Pagano, 2003, 3)
4) It is use the cost of capital in cases like designing of optimum structure, decision makings about long-term hire, replacement of savings bond, capital management in flow and other cases (Nasirpour, 2000, 17).

In fact, the concept of cost of capital communicates between duties of financial supply decisions and investment decisions (Abbassi, 1382, page 8).

Managers as representatives of share holders should try to arrange company capital structure so that the company cost of capital is minimum and consequently, company value and share holders wealth become maximum (Lotfi, 2004, 8).

"Moren & Polsan" have defined the cost of capital as expected gain rate that justify the investment economically. So, it can be called the cost of capital as required gain. In fact, the cost of capital displays (expresses) the opportunity cost that investor sustains for investment in a company or project (Darren, Nutter worth, 2003, 427).

Regarding to importance of cost of capital, we are seeking to recognize the effective factors in this study.

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Study Background

Gode & Moharam (2001) in a study called "What influence on implied cost of Equity capital of productive companies? " analyzed the effective factors on cost of Equity capital. Since cost of capital is a criterion (scale) for risk calculation, the measurement of cost of equity capital requires considerable attention.

That study was based on ohlson-juettner model that cost of equity capital was calculated based on analysts' predictions about gain (benefit). In that study, factors like share gain flexibility, informative environment, gain flexibility, levers of effective factors on cost of equity capital was mentioned.

The study time range was 1984-1998. The results of that study is following as:

1: There is strong negative relationship between the number of analysts and cost of equity capital.

2: There is strong positive relationship between systematic risk (β) and cost of equity capital even after control of industry type impact.

3: There is positive relationship between benefit standard deviation and cost of equity capital, that is; companies with variable gains have more cost of equity capital.

4: There is a positive relationship between financial leverage and cost of equity capital.

5: There is a strong and positive relationship between cost of equity capital and assets gain and capital gain (Gode, Mohanram, 2001, 3-17).

"Doyzis & John Kaos Kas" (2004) considered the determinative factors of cost of equity capital in countries of eastern and central Europe. They did it by analysis of shares performance in companies level. That study main concentration in order to find the common determinative factors in shares gain was on areas that have related to newfound markets geographically and politically. In that study they found out that the traditional model of CAPM and D-CAPM (Develop capital pricing Asset model) have any explanative power in description of shares performance in spite of their spread use in previous models of Europe newfound markets.

The number of their sample was 112 companies and the sampling period was selected from 1 June 1998 to 31 October 2003 that is 6 years. They were the sample 39 companies of Poland, 34 companies of Czech republic, 20 companies of sloewni and 19 companies of Hungary the considered risk factors were sectioned 3 groups in that study:

1. Traditional group includes standard deviation β in level of total sample, Beta in level of newfound markets and local markets β (Beta).

2. New group includes losing risk of main capital in local market level, losing risk of main capital in newfound market level, losing risk of main capital globally (all samples).

3. Factorial group includes natural logarithm of capital market value, share trades volume closed to capital market value average, times of trade, M/B, P/E and share price speed (historical gains).

Meanwhile, in that study, cash, size, potential growth and market value ratio to book value was considered (analyzed) to explain difference in share gain. The obtained results of that study showed that in newfound markets, the share of small companies act better that share of large companies. Midterm previous gains can explain the future gains. In consideration of price speed impact, value shares had higher gain than growth shares. But that study shows any relationship between cash and share gain (Devyzis & Jankauskas, 2004, 17-46).

Lewellen has considered of financial ratios for prediction of share gain. The time range of this study was 1995-2000. He calculated CAPM model of share gain and analyzed prediction power of gain ratio to price, book value to market value and partitioned gain ratio. The results showed that divided gain ratio can meaningfully predict share gain ratio. But gain ratio to price, book ratio to market ratio have little ability in prediction of share gain (lewellen, 2003, 211-221).

Mohammad Ghasim Osmani (2002) considered many effective factors on cost of capital including company size, closure amount, industry type and debt ratio in a study after identification of cost of capital models and effective factors on cost capital in addition to representation of reliable model for cost of capital calculation.

In that study, 86 shareholder companies were selected as sample for time period of 1996 to 2001 first, costs of capital were done of five model like 1) average model of performed gain ratio, 2) pricing model of capital assets, 3) model of benefit ratio to price, 4) Gordun model 5) accounting evaluation model (EBO), calculation and then it was done meaningful tests of models.

The result of that study showed meaningful difference in calculation of companies cost of capital using of 5 model. Accounting evaluation model had higher partial validity than other models. Pricing model of capital assets had minimum validity. At the same time, company size and industry type were effective on cost of capital (Osmani, 2002, 56-77).

Mehrani (2003) did a study called "relationship between profitability ratios and share gain in Tehran Stock.

It's time range was 2000-2001 and was done by using of ols regression method. Independent variables and function include profitability ratios and calculation share gain respectively and it was considered the relationship between them. The study results showed that some ratios like assets gain, shareholders salary gain have meaningful relationship with share gain. Contrary, criteria like benefit growth and sale growth are not suitable

criteria for prediction of share gain. Also, changes of some variables like shareholders salary gain and assets gain can predict changes of share gain by itself (Mehrani Payiz, 2003, 93-105)

RESEARCH METHOD

Used research method in current study is correlation research method. Because, the goals express desirable financial rations impact on cost of capital. This study is functional about goal.

Because we are seeking to respond developed problems in functional research. Data related to bond exchange was extracted by using of Novin Rahavard software. It was used SPSS software for data analysis and extraction of descriptive statistics and was used Eviews software for referential statistics.

Research Hypotheses

1. Impact of growth opportunities, risk, profitability, cashing, share is meaningful on cost of capital.
2. Impact of growth opportunities, risk, profitability, cashing is meaningful on cost of capital in various industries.

Statistical Community and Sample

Accepted companies in Tehran bond exchange were selected as statistical community. Regarding to conditions of sample selection, the companies were select and then were classified 15 classes following as:

Table 1. Accepted companies in Tehran stock

Di	Classified industries group	Di	Classified industries group
D1	Pharmacology	**D9**	Non-metallic ore
D2	Auto and Auto Parts	**D10**	Extraction of metal ores
D3	Chemical products	**D11**	Electrical machinery and apparatus
D4	Food and drinks except sugar	**D12**	Ceramic tiles
D5	Cement	**D13**	Rubber and Plastics
D6	Basic metals	**D14**	Petroleum products, nuclear fuel
D7	Machinery and equipment	**D15**	Computer and related activities
D8	Manufacture of metal products		

Condition of Sample Selection

- Companies were selected in Tehran bond exchange before 2004.
- Companies fiscal year ends to Esfand month end.
- Companies information be available for calculation of research variables in mentioned time period.
- Maximum 3monthes trade delay be in share trades of sample companies.
- It doesn't include mediatory companies, banks, investments and holdings because the nature of their action is different.

Finally, after observation of above conditions and sampling performance of current 426 companies in savings bond exchange to end of 2008 year, 106 companies were selected.

Research Variables

P= share final price in financial period
E= net profit of per share in the end of financial period
e_o= Each share net profit at the first of financial period
d_e= Each share cash profit at the first of financial period
K_e^c= Cost ratio of usual shares.

Table2. Related to dependent and independent variables:

Dependent variable			
Cost of capital	Wacc		$WA_{cc} = \frac{L}{L+R} Kd(1-t) + \frac{L}{L+P} K_e^c$
	K_e^c		$\frac{1}{P/E - \frac{e_o - d_o}{e_o}}$
Independent variable			
Growth oppourtunities	SG	X1	$SG = \frac{S_{it} - S_{it} - 1}{S_{it} - 1}$
	M/B	X2	$\frac{market\ value\ ratio}{book\ value\ of\ share\ holders\ rights}$
Risk	Financial	X3	$\frac{sum\ of\ total\ debts}{book\ value\ of\ share\ holders\ rights}$
	Market	X4	$\frac{price\ average\ of\ 3\ past\ financial\ years}{price\ of\ 3\ past\ financial\ years}$
Profitability	ROA	X5	$\frac{operating\ goin\ it}{average\ of\ assets\ book\ value} = \frac{ol_{it}}{ATA_{it}}$
	ROE	X6	$\frac{operating\ gain\ it}{average\ of\ capital\ book\ value} = \frac{ol_{it}}{AE_{it}}$
Cashing	times	X7	*Share purchase and sale times*

Compound of cross-sectional and periodical data

The variables were considered among different variables in one word and in the other word during periodical term of 2004-2008 years. In such cases, the suggested solution is compound of intra group data and time series together and evaluation of desirable pattern based on modern data. If we put together extracted cross-sectional data of sample companies in various years, we will face with compound data. It is done how to arrange data in this study as two ways. In first way, we put together first company data for T year. Then, this action is repeated for second company and next companies. It is said pooled data this how to arrange data. In second kind, we put together the data of sample companies in each year, so that this process is repeated for next years. How to arrange the data this way is called panel data.

Multiple regression test synchronously:

Sometimes two or more variables have main impact on dependent variable. Mult fold regression measures synchronous and linear impact of two or more variables on dependent variable.

Table 3. correlation test between dependent and independent variables

Test result	meaningfulness	statistic	Standardized coefficients	Non standardized coefficients		model
			Beta	Standard error	B	
	.000	20.896		.007	.140	Constant
Reject	.214	1.244	.050	.005	.006	SG
Support	.001	-3.311	-.145	.003	-.009	M/B
Support	.000	-4.732	-.232	.010	-.048	ROE
Support	.000	8.097	.386	.032	.260	ROA
support	.002	-3.070	-.129	.006	-.018	Financial risk
support	.037	-2.088	-.085	.001	-.001	Market risk
Reject	.334	1.355	.039	.000	3.068	Trade times

B column of non Standardized coefficients in this table is used as coefficient of independent variable for prediction of dependent variable (Y) in regression equation. General formula of mutifold regression equation is following as:

$$Y_i = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \cdots + a_nX_n$$

As meaning fullness value (sig) shows, impacts of 5 independent variable including market value ratio/ book ratio, financial risk, market risk, ROA and ROE has meaningful impact on cost of capital. Impacts of other variables is not meaningful and is not suitable for prediction of dependent variable. And market value ratio/book value, financial risk, market risk and ROE has reverse impact on cost of capital and ROA has direct impact on cost of capital. But about importance and role of independent variables in prediction of regression equation should be from standardized β value. So, it can be judged about partial importance of variables by it.

Being large of β value shows partial importance and their role in prediction of dependent variable. Here it can be judged that ROA variable has more share in prediction of dependent variable in comparison with other variables. Because 1 unit of change in its standard deviation cause to change standard deviation of dependent variable to amount of 1386.

$$Y_i = .140 - .009X_1 - .048X_2 + .260X_3 - .018X_4 - .001X_5$$

Table 4. correlation coefficient between dependent and in dependent variables

Watson camera	Standard error	Modified determination coefficient	Determination coefficient	Correlation coefficient	sample
1.785	0.79252	.384	.395	.406[a]	1

Correlation coefficient between dependent and independent variables shows the relationship of more than 40% among them. It can be explained 0.384 of dividend gain charges in accepted productive companies in Tehran bond exchange. Of course, the support of trades times and sale growth has not been meaningful.

Table 5. ANOVA test

model	Squared sum	Degree of freedom	Arithmetic average	F test	Meaningfulness
.000a	34.557	.071	9	.635	Regression
		.006	513	3.222	Residual
			522	3.857	total

Table ANOVA shows regression meaningfulness and linear relationship among variables, too, and obtained meaningfulness supports it's being meaningful in %99 level. Main results of regression has been showed in table 5.

Second hypothesis:

Impact of growth opportunities, risk, profitability, cashing has meaningful difference on cost of capital in various industries. The growth opportunities including (sale growth, market value ratio/ book value), risk including (flexibility of share price, sum of total debts/ book value), profitability including (operating profit) average of assets book value, operating profit/ average of capital book value) and cashing including (trade times) have meaningful impact on cost of capital in different industries. Panel data provide very suitable condition for expansion of evaluation methods and theoretical results and researchers able to use cross-sectional data and time series for consideration of these problems. Of course, there is no possibility of their study in only cross-sectional environments or only time series. Panel data method is a method for integration of cross-sectional data and time series synchronously (Baltagi B.H, 2005,8).

Regression pattern as panel data method is following as:

$$Y_{it} = a_{it} + \sum_{k=2}^{k} \beta_{kit} X_{it} + \mu_i + v_{it}$$

In this pattern, including v_{it} disorder has normal distribution and instead of it, all is and t_s are independent of x_{it}. So, first it must be considered whether there is differences in industry? If there is differences, it is used panel data method and otherwise, it is used ordinary least square method (OLB) for model evaluation. μ_{is} also show individual impacts or differences in industry. They are expressed in random effect frame or fixed effect, and in comparsion with ordinary least square method (OLS), they are evaluated in following hypothesis form:

$$H: \mu_1 = \mu_2 = \cdots = \mu_N = 0$$

At least, one of μ_i is against zero ($\mu_i \neq 0$)= H_1

In order to test above hypotheses, it is used F_{leamer} statistic following as:

$$F = \frac{RRSS - URSS/(N-1)}{URSS/NT - N - K} \sim F_{(N-1).(NT-N-K+1)}$$

Which in that, RRSS is Restrict Residual sum squares (panel data), SRSS is unrestricted Residual sum square (peeled data), N is total industries, T is the number of time observations and K is the number of evaluated parameters. If in above relationship, calculated F be larger than table F with degree of freedoms N-1, NT-N-K in critical area α, He hypothesis is rejected and so panel data model is correct, that is differences or industry effect are observable. But if calculated F be smaller than related F in table, so it cannot be rejected the H_0 hypothesis. Therefore, it can be concluded that there is no difference or industry effect, and regression model must be evaluated by ordinary least square (OLS) method. After it is choose to use panel data method instead of OLS regression, it must be determined that panel data pattern is used with fixed or random effect. It is used Housman test to choose among models of fixed effect and random effect that this test is following as:

$$w = (b_s\beta_s)'(M_1 - M_0)^{-1}(b_s - \beta_s)$$

So that in that w has normal distribution x^2 with degree of freedom R. M_1 is variance- covariance matrix for model coefficients of fixed effect b_s , and M_0 is coefficient covariance matrix of random effect model β_s. if M_1 and M_0 are correlation, so b_s, β_s can be different meaningfully and it is expected that this is reflected in test. In Hausman test, the support of H_0 hypothesis shows choice of random effect method and it's rejection shows choice of fixed effects method.

In H_1 hypothesis test, we analyzed impact of independent variables on cost of capital in level of all accepted productive companies in bond exchange, but it is putted on H_2 hypothesis test for consideration of impact of these variables on cost of capital in 15 various industries. Because of this for industry effect exertion (qualitive variable), it is added by using of panel data method in multiple regression model.

Table 6. limer F test

Meaning fullness	Degree of freedom	static	Effect test
0.0000	(1451)	35/375702	Cross- section F
0.0000	14	177/845183	Cross- section chi- square

Since meaningfulness of limer F fixed effect test is less than /.1, so application of pooled data method is better than pooled data method. It was used Hausman test for recognition of fixed or random effect that in this hypothesis test, zero shows use of random effect method and other hypothesis expresses the use of fixed effect method. Regarding to table 7, it's meaningfulness is less than 0/1.
So, test shows that the effect is fixing.

Table 7. Hausman test

Test summary	X statistics test	Degree of freedom	meaningfulness
Cross-section random	21.499811	9	0.0106

Table 8. Evaluation of pool OLS model

meaningfulness	T statistic	Standard error	coefficient	variable
0.0000	7.355452	0.010690	0.078631	C
0.6042	-0.521545	0.009073	-0.004732	X1
0.5771	0.561188	0.005048	0.002833	X2
0.0012	3.435574	0.013565	0.046605	X3
0.0653	1.884094	0.042607	0.080275	X4
0.9909	0.011442	0.009515	0.000109	X5
0.0509	1.999650	0.000758	0.001515	X6
0.3751	0.894828	1.43E-10	1.28E-10	X7
86.48874		Statistic F	0.975003	Determination coefficient $(R)^2$
0.000000		Meaningfulness	0.963730	Modified determination coefficient (Ad R^2)
2.206346		Watson camera		

Regarding to done test and evaluation performance (financial risk) with meaningfulness (.0012) of less than .1 is meaningfulness. And also meaningfulness of market risk and ROE variables is (.653) and (.509) perspectively and is meaningful.

Amount of positive and strong correlation among variables shows suitable explanation power of model. Obtained R^2 shows that 97% of changes of dependent variable is explained by 5 independent variable. And value of Watson camera statistic is simply 21206 by table 8. This value supports the lack of successive correlation of residual values of regression pattern.

Conclusion

As it was seen through 3 various steps, desired hypotheses were analyzed. In first step, it was putted on consideration of relationship between research independent variables and cost of capital by using of multiple regression method synchronously in level of all accepted companies and it was identified that the variables of market value ratio to book value, financial risk, market risk, share holders salary gain (ROE) and assets gain (ROA) have meaningful relationship with cost of capital. This relationship is direct and positive for variable of assets gain (ROA) and is reverse and meaningful for variables of market value ratio to book value, financial risk, market risk, shareholders salary gain (ROE). In second step, it was done a multiple regression for consideration of industry impact on companies cost of capital as panel data. It was used limer F test for recognition of pool and panel and was used Hausman test for recognition of fixed or random effect. And it was choosed fixed effect finally in third step for synchronous consideration of selected variables of this study, it was determined by using of evaluation method (OLS) that the variables of financial risk, market ristk, ROE and share trades volume has meaningful impact on cost of capital. In relation to growth opportunities including (sale growth, market value ratio to book value), the study results show that there is no meaningful relationship between sale growth and market value ratio to book value with cost of capital omran poyenton belives that there is positive and direct relationship between cost of capital and market value ratio/book value.

In relation to risk includes (market risk and financial risk). The study results show that there is meaningful and direct impact between financial. This ratio is representative of leverage and higher be company risk, cost of capital will be higher.

Gebhaurt samtaniyan Li, Gude Morham, omran and poyenton found out positive relationship between financial lever and cost of capital. In relation to profitability that include assets gain and capital gain. The study results show that there is no meaningful and direct relationship between assets gain and cost of capital. But there is meaningful and direct impact between capital gain and cost of capital. Gude and Moraham supported the positive and strong relationship between cost of capital and assets gain and capital gain.

In relation to cashing that was evaluated by trade times, the study results show that there is no meaningful and direct relationship between cost of capital and trade times. Devyzis and Jankauskas did find any relationship between cashing and share gain.

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