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# A STUDY ON THE EFFECT OF BUSINESS RISK ON PRICING MODELS IN PETROCHEMICAL COMPANIES

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### ABSTRACT

The main purpose of this paper is to investigate the effect of business risk on pricing models in petrochemical companies. In this regard, the financial information of the companies that had shares admitted to trading on the Tehran Stock Exchange during 2011-2015, was collected. The research method is descriptive and correlational. The econometric method namely panel data was used for hypothesis test. According to the results of F-Limer and Hausman tests, fixed effects model was chosen as the most efficient econometric technique in this study. The results show that all the research variables namely operational leverage, sales risk, operational risk, firm size, return on asset to capital ratio and future growth opportunities (except financial leverage) had a positive and significant effect on pricing of the companies' stocks. Business risk and types of it made a positive and significant different on stock pricing.

Keywords: Business Risk, Pricing Model, Operational Risk

### **INTRODUCTION**

One of the foremost concerns of investors for investment in financial markets is investment risk. By risk, it means that potential negative fluctuations are future economic returns. That is to say, risk can be expressed as any fluctuations in any income or any phenomenon that can distract the outcome of what investor expect. The concept of risk plays a key role in financial markets, because market participants start asking about its risk level, in their first encounter with any securities. Therefore, it has to be recognized and measured and makes a plan for removing unnecessary risks so as to manage risks associated with opportunities (Sinai et al., 2005).

On the other hand, stock liquidity is important as a factor affecting risk and return level on stock exchange. Due to the nature of risk aversion, investors always seek less risky stocks with high liquidity, so that more financial security can be provided for them. During the process of investment, investors' funds account for one or more assets and preservation of these assets for a time period in the future in the hope of earning return. Investment is a systematic and coherent process and its goals are well-defined as there is a certain strategy for reaching them (Khodamipour and Didekonan, 2012).

Statement of the problem

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In the modern analysis of investment, traditional resources of risk generation are considered to be the factors causing fluctuations in returns and are categorized into two general categories:

- 1. the first category is the factors affecting securities; interest fluctuation risk, inflation risk, exchange rate fluctuation risk, political risk, and market risk are examples of this category. The risk caused by these factors is referred to as systematic or unavoidable risk.
- 2. the second category is the factors that affect one or more special securities; credit risk, business risk, financial risk, liquidity risk, and operational risk are examples of this category, which is known as non-systematic or avoidable risks. Non-systematic risk can be mitigated by proper selection of securities or by means of diversification techniques, e.g. selection of a set of securities and preparation of portfolio. By such a diversification, the total risk of an asset, which is subject to avoidable and unavoidable factors, is as follows:

Total risk of an asset = avoidable (non-systematic) risk + unavoidable (systematic) risk In the same vein, the question is "to what extent do business risks affect stock pricing models in petrochemical companies?"

# Importance and necessity of research



In order to make any investment decision, costs and interests, i.e. returns, associated with it have to be determined at best. It should be noted that there is always a risk that expected returns fail to be met. This situation is seen as under-risk situation. It is not that important to determine a return per se, and we need to identify relevant risk as well. Sales risk and operational risk would affect company's operational liquidity risk. The bulk of sales risk and operational risk is associated with the type of firm's business activity.

# Research objectives

- 1. Investigating the relationship between business risk and stock pricing
- 2. Investigating the relationship between tax leverage and stock pricing in petrochemical companies.
- 3. Investigating the relationship between operational risk of stock changes and stock pricing of petrochemical companies.
- 4. Investigating the relationship between sales risk and stock pricing of petrochemical companies.

# Research hypotheses

# Main hypothesis

1. There is a significant relationship between business risk and stock pricing of petrochemical companies.

# Sub-hypotheses

- 1. There is a significant relationship between tax leverage and stock pricing of petrochemical companies.
- 2. There is a significant relationship between operational risk of stock changes and stock pricing of petrochemical companies.
- 3. There is a significant relationship between sales risk and pricing stock pricing of petrochemical companies.

# Research questions

- 1. Is there a significant relationship between business risk and stock pricing of petrochemical companies?
- 2. Is there a significant relationship between tax leverage and stock pricing of petrochemical companies?
- 3. Is there a significant relationship between operational risk of stock changes and stock pricing of petrochemical companies?
- 4. Is there a significant relationship between sales risk and stock pricing of petrochemical companies?

# **RESEARCH THEORETICAL FOUNDATIONS**

### Domestic studies

Khodamipour and Didekonan (2012), in a study entitled "assessment of the effect of exports earnings on stock prices of companies listed on the Tehran Stock Exchange", conducted a comparative study into the effect of export earnings on stock prices of different companies with one another. The results of hypothesis test showed that there is a positive but incomplete correlation between average export earnings and average company stock price, though this correlation was not significant. The results also showed higher prices of exporting companies' stocks compared to the those of non-exporting companies (Khodamipour and Didekonan, 2012).

Qalibaf Asl and Karimi, (2011), in a research entitled "a study on premium pricing, liquidity, size, value and market risk on the Tehran Stock Exchange", explored the relationship between market surplus return, firm size, book-to market value ratio, liquidity and stock return on the Tehran Stock Exchange, drawing on Fama-French three-factor model. As a result, this research achieved the following results in line with its research objectives;

- 1. There is a direct and significant relationship between market risk and stock returns of companies listed on the Tehran Stock Exchange.
- 2. There is a significant relationship between firm size and stock returns of companies listed on the Tehran Stock Exchange, in that small firm's return and firm size was positively related and large firms' return and firm size was negatively related.
- 3. There is a significant relationship between extra return on portfolio and company's bookto-market value ratio (value premium).
- 4. There is a significant relationship between extra return on portfolio and company' stock trading turnover (liquidity premium) (Qalibaf Asl and Karimi, 2011).

Mojtahed Zadeh and Ghodrati (2011), in a research on the effect of irregularity of accruals on corporate pricing, studied the effect of accrual irregularity on stock pricing in companies listed on the Tehran Stock Exchange. The results of hypothesis test showed that each sum of years besides the impact of market risk premium variables namely firm size and book-to-market value ratio on stock returns are significantly and negatively related to stock returns. This result is consistent with those of Sloan (1996), Hirschliffer and Ho Vetou (2010), Kang, et al., (2010), Clint et al. Given the literature, irregularity of accruals was taken as a factor affecting company's incorrect pricing by market. The general results indicated that investors should pay attention to accruals as well as cash part of profit. Companies with lower rates of accruals are riskier than those with higher accurals, so they can earn higher returns (Mojtahed Zadeh and Ghodrati, 2011).



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## Foreign Studies

Ahmed and Duellman (2008) showed that firms with more conservative action will have higher future profitability indicators such as gross profit margin and cash flows as well as lower specific costs. In interpretation of their findings, they stated that firms that are more conservative also make investment more efficiently (Ahmad & Duellman, 2008).

Biddle and Hillary (2011) in their study have found that accounting quality increase by reduction of information asymmetries between managers, creditors and investors lowers the risk of moral danger and incorrect choices and eventually reduces company's risks and financial costs. In this case, the liklihood of investment inefficiency (investment less or greater than needed) decreases.

Using panel data, Morgado and Pindadou (2014) showed that there is an optimal level of investment, in that projects are conducted with positive net present value. Companies making investment above are in the process of over-investment, so that conflicts of interest arise between shareholders and managers in the context of information asymmetry. In contrast, companies whose investment is less than optimal level are underinvestment due to information asymmetry and high costs of financing. In this case, a conflict of interest arises between current and future shareholders and creditors. Likewise, they showed that companies with valuable investment opportunities have an optimal investment level higher than that of companies without such opportunities (Morgado & Pindand, 2014).



# Research conceptual model

Given the theoretical foundations, domestic and foreign studies and professors' comments, the conceptual model of the research is as follows;



Figure 1: Research conceptual model

**RESEARCH METHOD** 

#### A. ALLAHYARI et al.,

The aim of choosing a research method is to determine what method can help researcher find the answer to research question stricter, easier, and quicker. The present research is an applied study by purpose, as the results of it can be used by managers, investors and in general users. By research method, it is correlation, as it addresses the effect of business risk on pricing models in petrochemical companies listed on the Tehran Stock Exchange.

#### Research Model, variables and how to measure them

In this study, given the theoretical foundations, domestic and foreign studies and professors' comments, the following model is used for examining hypotheses;

$$\begin{split} \text{PS}_{it} &= \beta_0 + \beta_1 \text{ OL}_{it} + \beta_2 \text{ RS}_{it} + \beta_3 \text{ ORCS}_{it} + \beta_4 \text{SIZE}_{it} + \beta_5 \text{Lev}_{it} + \beta_6 \text{ROA}_{it} \\ &+ \beta_7 \text{Growth}_{it} + \epsilon_{it} \end{split}$$

Where in the above model: Dependent variable: SP: stock pricing Independent variables: OL: operational leverage RS: risk of sale ORSC: operational risk of stock change Control variables: Size: firm size (natural logarithm of company sale) LEV: financial leverage (total debts-to-total assets ratio) ROA: return on asset ratio

Growth: future growth opportunities (book-to-market value ratio per share) Stock pricing:

Gordon proposed the following model for stock pricing, and it is used in this study.

$$P_0 = \frac{E_0(1-b)}{k-br}$$

Where:

Po (price per share in the beginning of year zero), Eo (earning per share by the end of year zero) b (% of retained earnings), K (the expected rate of return on shareholders' equity)

r (rate of investment return) and br (rate of earnings growth per share and dividend) Operational leverage:

As a matter of fact, it is the ratio of operational liquidity change to the number of change in sold units. To simplify it, we assume that all goods produced were sold out during the same period (Sajadi et al., 2009),

Thus:

OL= <u>% of operational liquidity change</u> % of sold goods change

Risk of sale:



(1)

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Depending on economic conditions and competitors' action, price may vary in sale number (of both) according to former expectations. This situation is called "risk of sale". In this study, it is obtained by the difference between the number of sale and the number of expected sale.

## Study population and sample

The study population consists of all companies that had shares admitted to trading on the Tehran Stock Exchange during 2011-2015 on the Tehran Stock Exchange. It is evident that it is difficult to study the whole population, if the population in question is large and size and number of subjects are too much. Thus, for convenience and time, energy and fund saving, we can use sampling method and generalize its results to the population. To this end, systematic exclusion sampling method was used. Given the limitations, a number of 9 firms were chosen as sample.

## Data collection method

Data collection of this study was conducted in two phases; in the first phase, reading materials and library references including books, weekly magazines and monthly magazines and journals, publications of research centers, theses and dissertations were used for main data of the research method including background, characteristics and other items; in the second phase, data needed for calculation of research variables were obtained from data banks e.g. Rahavar-e Novin, official website of Tehran Stock Exchange, and official statistics published by Tehran Stock Exchange by using a library method.

# Data analysis method and hypotheses test

At this point, information and data were developed and completed using Excel spreadsheet software. After this, Eviews software was used to analyze the statistical information. Statistical analysis was carried out in descriptive and inferential statistics. In the descriptive statistics, mean, median, minimum, maximum and standard deviations of each variable were presented. Inferential statistics included test of variable reliability (by methods like Fisher test, Pesaran and Shin, Philips, Levine, Brietung, and Hadry test), F-limer test, Hausman test, and significance test of regression coefficient. Given that series data of companies listed on the Tehran Stock Exchange and time series were used in this study, our data is kind of panel data.

### Table 1: Descriptive statistics

#### GROWTH SIZE LEV ROA ORCS RS OL PS Variables -17/94 -19/77 -19/44 -0/.1 -٣/٢٣ -0/98 - 7 . / 3 1 -77/41 Levin-Lin Chut statistic ./... ./... ./...٧ ./...١ ./...1 ./... ./... ./... Significance level \_7/97 -7/07 LY/V2 -۲/۸۷ -11/44 -9/19 -1./1. -0/5. Pesaran and Shin statistic •/•••• •/••• ./...1 ./.. ۵۷ ./.... ./...١ •/••• ./... Significance level

### Descriptive Statistics

For better understanding of the nature of populations used in research and further knowledge of the research variables, it is necessary to describe these data before analyzing the statistical data. Moreover, the statistical description of data is a step in identifying the model governing them and a basis for explaining the relationships between the variables used in the research. Therefore, before examining the research hypotheses, the research variables are briefly examined in Table 1. This table contains indicators for describing research variables.

# Table 2. Testing variable reliability hypothesis

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Variables	Stock pricing	Operational leverage	Risk of sale	Operational risk	Return on asset ratio	Financial leverage	Future growth opportunity	Firm size
Mean	0.155147	0.185243	0.495714	0.107669	0.666034	0.612737	1.352210	0.154965
Median	0.126492	0.175242	0.458724	0.055913	0.639231	0.524128	2.291054	0.126428
Max	0.608439	0.690477	1.587421	0.658386	2.077506	0.725314	3.647691	1.608439
Min	0.000142	0.024287	~0.128247	0.000518	0.089110	0.096415	0.130019	0.000142
Standard Deviation	0.125130	0.098254	0.498745	0.154282	0.226298	0.227679	1.387754	0.125097

# Test of variable reliability

Before estimating the effect of business risk on pricing models in petrochemical companies listed on the Tehran stock exchange, it is necessary to test the reliability of all the variables used in the estimation, because variable unreliability causes false regression estimation.

In this study, Levin Lin Chou and Pesaran and Shin tests were used to test variable reliability hypothesis. If test level is lower than 0.05, and then it is reliable. As shown in Table 2, the significance level of Levine Lin and Chou and Pesaran and Shin tests is less than 0.05 for every single variable in the research, and then all the research variables are reliable.

# Research experimental results

As stated, this research aims at investigating the effect of business risk on pricing models in petrochemical companies listed on the Tehran Stock Exchange. To this end, one main hypothesis and three special hypotheses were developed, and in what follows we examine goodness of fit and estimation of these hypotheses. Model 1 was developed to estimate the hypotheses. Hypotheses can be shown statistically as follows;

$$\begin{cases} H_0: \widehat{\beta_S} = b_S \\ H_1: \widehat{\beta_S} \neq b_s \end{cases}$$

As a matter of fact, null hypothesis suggests that none of independent variables is significant in regression model and opposite hypothesis implies that at least one of independent variables is significant in the regression model. In what follows, the results of the first hypothesis test are presented and analyzed.

# F-Limer Test

As stated in chapter 3, if F value obtained from F table is greater or its probability is smaller than 0.05, panel data method should be used; otherwise, pooled data is used instead. According to Table 3, it is seen that the probability of F-Limer test is less than 0.0001, i.e. less than 0.05, so panel data method is used. In what follows, using Hausman test we determined that the suitable analysis method is a random effect or fixed effect method.

Table 5. Results of Tallifer lest			
probability	Test statistic	F Limon	
0.000	4.91	F~Limer	

# Table 3 Possilte of Filimon test

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At this point, Hausman test was conducted to determine whether fixed effect or random effect can be used. According to the results of Table 4, it is observed that the calculated probability is less than 0.0001, so fixed effect method is used. The results of F-Limer and Hausman tests show that the research model can be estimated by fixed effect-panel data method.

Table 4. Results of Hausman lest			
probability	Test statistic	Hausman test	
•.•••	۲۲.۳۴		

# Table 4. Results of Hausman test

# Results of model estimation

A. calculated regression equation of this hypothesis includes:

 $PS_{it} = -6.11 + 0.104 \text{ OL}_{it} + 0.284 \text{ RS}_{it} + 0.092 \text{ ORCS}_{it} + 0.103 \text{ SIZE}_{it} - 0.003 \text{ Lev}_{it} + 0.031 \text{ ROA}_{it} + 0.131 \text{ Growth}_{it}$ 

B. "Coefficient of determination" represents rate of variability (deviation) in the dependent variable (stock pricing), which is explained by regression. This value is equal to 57%.

C. As seen in Table 5, the probability value of F statistic is 0.000. Since this value is less than standard error level, i.e. 0.05, the null hypothesis about the significance of the relationship between stock pricing and its independent variables is rejected. Thus, it can be said that the estimated model is significant at 5% error level.



D. Value of Durbin-Watson statistic is 1.78. As this value is in the range of 1.5 to 2.5, it suggests the lack of autocorrelation in the model; that is, there is no relationship between error statements in the evidence (companies).

method	Fixed effect—panel data method			
variable	coefficient	t statistic	probability	
y-intercept (c)	-9/11.107	-• 7/472442	•/•••	
Operational leverage	•/1•4770	٧/۵٢١٢١٠	•/•••	
Operational risk of stock change	•/٢٨۴١٨٨	2/422.27	•/••٩٢	
Risk of sale	./.97776	2/.98860	•/•491	
Firm size	./1.7.90	1/9977.7	•/•٣?•	
Total debt-to-total asset ratio	-•/••٣٧٣۶	-•/194474	•/٨۴۵٩	
Return on asset ratio	•/•٣١٣٧٦	1/149161	•/•95٣	
Future growth opportunity	./١٣١.۴٨	1/977699	./.410	
R~squared (R <sup>2</sup> )		•/899		
Durbin-Watson	۲۸/۱			
F	ŶΛ			
Prob. F	•/•••			

### Table 5. Results of model estimation

# Results of first hypothesis

Hypothesis 1: there is a significant relationship between operational leverage and stock pricing of petrochemical companies.

Ho:: there is no significant relationship between operational leverage and stock pricing of petrochemical companies.

H<sub>1</sub>: there is a significant relationship between operational leverage and stock pricing of petrochemical companies.

The results of table 4.5 show that operational leverage variable is significant and has a positive coefficient of 0.10. This result show that stock pricing increases by 0.10, as operational leverage increases by 1%.

# Results of second hypothesis

Second hypothesis: there is a significant relationship between operational risk of stock change and stock pricing of petrochemical companies.

 $H_{0:}$  there is no significant relationship between operational risk of stock change and stock pricing of petrochemical companies.

H<sub>1</sub>: there is a significant relationship between operational risk of stock change and stock pricing of petrochemical companies.

The results of Table 4.5 show that risk of sale variable is significant and positive in line with theoretical expectations. That is, as risk of sale increases by 1%, stock pricing increases by 0.28%.

# Results of third hypothesis

Third hypothesis: there is a significant relationship between risk of sale and stock pricing of petrochemical companies.

H<sub>0</sub>: there is no significant relationship between risk of sale and stock pricing of petrochemical companies.

H<sub>1</sub>: there is a significant relationship between operational risk of stock change and stock pricing of petrochemical companies.

The results of Table 4.5 show that risk of sale variable has a positive and significant coefficient. That is, as operational risk increases by 1%, stock pricing increases by 0.09.

# Results of control variables

The control variable, financial leverage is not significant, due to its significant level which is more than 0.5 and 0.10.

Firm size is also significant and has a positive coefficient, which indicates that as firm size increases by 1%, stock pricing increases by 0.10.

Return on asset ratio is significant at 0.10 level and has a positive coefficient of 0.03. This result shows that as return on asset ratio by 1%, stock pricing increases by 0.03.

Future growth opportunity is also significant and has a positive coefficient, which suggests stock pricing increases by 0.14, as future growth opportunities increases by 1%.

# **Research Finding**

Given the results obtained in chapter 4, the significance level of each three variables (operational leverage, risk of sale and operational risk) is less than 0.05. Thus, the special hypotheses are confirmed, and the main hypothesis of the research is also confirmed as these three variables are measures of business risk.

Table of research findings is summarized as follows;

# **RESEARCH FINDINGS**

Result	Hypothesis title
Hypothesis is confirmed	First sub-hypothesis: there is a significant relationship between financial leverage and stock pricing of petrochemical companies



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Hypothesis is confirmed	Second sub-hypothesis: there is a significant relationship between operational risk and stock pricing of petrochemical companies
Hypothesis is confirmed	Third sub-hypothesis: there is a significant relationship between risk of sale and stock pricing of petrochemical companies
Hypothesis is confirmed	Main hypothesis: there is a significant relationship between business risk and stock pricing of petrochemical companies

# CONCLUSION AND DISCUSSION

According to the results of regression model estimation, all dependent and control variables except financial leverage are significantly and positively related to the dependent variable. The results show that business risk and its variety have a positive and significant effect on stock pricing. Business risk is referred to as risk of operational liquidity. Uncertainty of operational liquidity can increase stock pricing, because of uncertainty of its constructs namely earnings and costs.

# Research suggestions

When making decision on maximizing owners' prosperity, financial managers should pay as much attention to effects of investment and financial decisions on owners' risks as needed.

• Given the positive and significant effect of independent and control variables on stock pricing in the present study, it is suggested that companies, investors, banks, etc., take account of these results in their decision makings.



# Research limitations

- limitation on theoretical framework: there were some issues with library studies and essential references.
- limitation on measurement instruments: measurement tool of this study was Eviews software, about which there was little knowledge.
- financial limitation: huge fees for getting master's thesis as well as fees on library studies, travel from city to university, etc.

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