

# The Relation between Macroeconomic Variables and the Firm Risk Forecasting (Case Study of Tehran Stock Exchange)

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## ABSTRACT

One of the most important economic sectors, is the capital market that no secret on nobody. Capital markets are closely related of the economic structure of the country and Strengths and weaknesses that can be indicative of the country's economic situation. Development of capital markets can play an important role in the growth of national income and general welfare of community. In this research, were analyzed the usefulness of macroeconomic variables (Currency rates, inflation rates, interest rates and relative price changes oil) in predicting companies risk in the years 2005-2012 and ratio of book value to market value(BV/MV), was selected for alternative measures of companies risk. Results show that the relative changes in macroeconomic variables are significantly positively correlated with changes in firm risk measures. Although the relative changes in Tehran Stock Exchange measures are significant negatively correlate with changes in firm risk measures.

**KEYWORD:** macroeconomic variables, risk of the company, book value to market value

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## 1. INTRODUCTION

In the past decades, several models for the pricing of capital assets are presented. Risk factors are most important factors to be considered in these models. One of the Investment models is Capital Asset Pricing Model (CAPM) that, it is shown systematic risk of each asset factor ( $\beta$ ) (Chen, 2003). Capital asset pricing model is a basic paradigm in the field financial (Rai and Talngy, 2005). This model considers only systematic risk factor, therefore, is a single-factor model. However, for multi-factor asset pricing models are created. The most famous multi-factor model is the Arbitrage pricing model. Arbitrage pricing theory, is a new and different approach in determining asset prices and tries identify out the market factors which affecting on to the securities. One of the advantages this theory is that the strong assumptions used in the capital asset pricing theory does not require (Elton et al, 2003). Unlike the Capital Asset Pricing (CAPM) which many limits for prioritization and returns divide considers, Arbitrage pricing model describe the expected return on assets only according to weak assumption and where there are no arbitrage opportunities (Gilles, R. & Leroy, 1991). Securities risk (regardless of type) can be caused by two factors. Group of these factors are related to the company itself, this is avoidable factors and therefore, creates risk, is called non-systematic risk. Another group of factors is related to market risk caused by these factors is called systematic risk. In this study, is evaluated the effect of macroeconomic variables on the systematic risk of the listed companies in Tehran Stock Exchange. This thread is based on the concepts of arbitrage pricing theory and Fama and French three-factor pricing model (Fama, E. F., & K. R French 1992).

## 2. Background research

Achsani and Strohe (2002) studied Small regional markets such as Norway and Indonesia markets. They found that stock returns are negatively correlated with changes in interest rate, and with changes in oil prices and real economic activity are positive correlation. Rao & Radjeswari (2000) studied the effect of macroeconomic factors on stock prices Indian. Their research results indicated that macroeconomic variables affect the return on assets. Baker & Wurgler (2002) for measurement fluctuations in the market value used of the ratio of market value to book value. Their research shows that the ratio of book value to market value is alternative to risk companies. Christopher Gan et al (2006) examined Two-way interactions between stock index and macroeconomic variables (Currency, GDP, inflation rate, money supply, interest rates long-term and short-term and retail prices of local petroleum). The results showed that there are between New Zealand price index and the economic variables examined long-term relationship. Al -Sharks (2004) and Chou & Rhee & Wang (2007) Confirmed between stock prices and macroeconomic variables (oil price, interest rate and inflation rate) There are significant relationship. Wigren & Wilhelmsson (2007) by doing research, Concluded that effect huge policies on economic growth short-term and small amount of long-term economic growth. Henriques & Sadorsky(2008) in the theirs study showed that, there are inverse relationship to between book value to market

value and stock returns of companies active in the oil and gas industry. Based on the research results of Yang & et al (2009), macroeconomic conditions may affect the relationship between stocks and bonds. Researches Chou et al (2007) and Mabrouk Walid(2009), showed that are firm size and the ratio of book value to market value of the effect on average yields risk. Previous research emphasized on the relationship between oil prices, stock prices and efficiency. But according to industry type, intensity and direction of the relationship is different. Results of this studies show that between oil prices and stock returns of companies active in the oil and gas industry, there is a significant positive relationship, while in other industries, is negative for the relationship. Also, in the oil and gas exporting countries, market reaction than the higher oil prices is positive, while this reaction is negative in importing countries (Nandha&Faff, 2008; Mohanty et al., 2010; Lu & Chen, 2010). Virk (2011) was studied the possibility of using macro-economic variables, as one of the determinants of systematic risk, in the country of Finland.

**3. Statistical population and Research hypotheses**

Statistical population of this study, are all companies listed in Tehran Stock Exchange for the period 2005-2012. According to the availability of daily stock prices during this period, between 120 companies were available 80 companies were selected.

The main research question is that, do ratio changes in the macroeconomic variables can explain changes in stock risk? For answer this question, was set this hypothesis:

- H1. Between currency rate and the changes of risk in stock companies there are a significant relationship
- H2. Between oil price changes and changes of risk in stock companies there are a significant relationship
- H3. Between inflation rate changes and changes of risk in stock companies there are a significant relationship
- H4. Between the interest rate changes and the changes of risk in stock companies there are a significant relationship
- H5. Between the changes in the stock price index of Tehran Stock Exchange and changes of risk in stock companies there are a significant relationship

**4. METHODOLOGY**

Variables introduced in this study are considered differs from the two aspects: on the one side, among the different enterprises and on the other, during the years 2005-2012. For this purpose, the data was used combined (Gujarati, 1995). For determine the effect of research variables on corporate risk, were used multiple regression techniques. Empirical model as follows:

$$\Delta \left( \frac{BV}{MV} \right)_{i,t} = \alpha i + \beta i. R \text{ currency}_t + \beta i. R \text{ oil}_t + \beta i. R \text{ INFLATION}_t + \beta i. R \text{ TEPIX}_{t-1} + \beta i. R \text{ INTEREST}_t + e_i \quad i = 1,2, \dots, 7 \quad t = 1,2, \dots, 7$$

i: represents the company, t: represents time, R: represents rate of charge, BV / MV, represents the book value to market value of assets,  $\alpha$  : represents constant factor model,  $\beta_i$ : represents variable risk i,  $\text{TEPIX}_{t-1}$ : The price index of Tehran Stock Exchange and  $e_i$ : Random variable or operating errors.

**5. Results**

H1 between currency rate and the changes of risk in stock companies, there are a significant relationship

**Table 1** summarizes the results of the first hypothesis test.

Systematic risk index	Independent Variable	Coefficient of variable	Standard error(SE)	t-test	Possibility Amount	coefficient of determination (R2)	Adjusted Coefficient of determination	Durbin-Watson statistic
BV/MV	R.CURRENCY <sub>t</sub>	0.95	0.23	4.036	0.0001	0.0224	0.0225	1.046

Currency rate changes can lead to changes in inflation rate and interest rates and by changes in interest rates, may affect the risk. The results of first hypothesis test show that, between currency rate and the changes of risk in stock companies there is a positive weak significant relationship.

H<sub>2</sub> Between oil price changes and changes of risk in stock companies, there are a significant relationship

**Table 2** summarizes the results of the second hypothesis test.

Systematic risk index	Independent Variable	Coefficient of variable	Standard error(SE)	t-test	Possibility Amount	coefficient of determination (R2)	Adjusted Coefficient of determination	Durbin-Watson statistic
BV/MV	R.OIL <sub>t</sub>	0.596	0.13	4.50	0.0000	0.029	0.028	1.036

The results of second hypothesis test show that, between oil price changes and changes of risk in stock companies, there is a positive weak significant relationship.

H3 between inflation rate changes and changes of risk in stock companies, there are a significant relationship

**Table 3** summarizes the results of the third hypothesis test.

Systematic risk index	Independent Variable	Coefficient of variable	Standard error(SE)	t-test	Possibility Amount	coefficient of determination (R2)	Adjusted Coefficient of determination	Durbin-Watson statistic
BV/MV	R.INFLATION <sub>t</sub>	0.605	0.085	7.11	0.0000	0.070	0.069	1.203

The results of third hypothesis test show that, between inflation rate changes and changes of risk in stock companies, there is a positive weak significant relationship.

H4 Between the interest rate changes and the changes of risk in stock companies there are a significant relationship

**Table 4** summarizes the results of the Fourth hypothesis test.

Systematic risk index	Independent Variable	Coefficient of variable	Standard error(SE)	t-test	Possibility Amount	coefficient of determination (R2)	Adjusted Coefficient of determination	Durbin-Watson statistic
BV/MV	R.INTEREST <sub>t</sub>	1.31	0.427	3.081	0.0021	0.0141	0.0126	1.0032

The results of Fourth hypothesis test show that, between the interest rate changes and the changes of risk in stock companies, there is a positive weak significant relationship.

H5 Between the changes in the stock price index of Tehran Stock Exchange and changes of risk in stock companies there are a significant relationship

**Table 5** summarizes the results of the Fifth hypothesis test.

Systematic risk index	Independent Variable	Coefficient of variable	Standard error(SE)	t-test	Possibility Amount	coefficient of determination (R2)	Adjusted Coefficient of determination	Durbin-Watson statistic
BV/MV	R.TEPIX <sub>t-1</sub>	- 0.36	0.053	-6.91	0.0000	0.067	0.065	1.211

The results of Fifth hypothesis test show that, between the changes in the stock price index of Tehran Stock Exchange and changes of risk in stock companies, there is a negative weak significant relationship. **Table 6** and **7** summarizes are shown the results related to the coefficients of β in multiple regressions. General form of the model is as follows:

$$\Delta \left( \frac{BV}{MV} \right)_{i,t} = 0.605 + 0.412.R \text{ currency}_t + 0.515.R \text{ oil}_t + 0.706.R \text{ INFLATION}_t + 0.240.R \text{ TEPIX}_{t-1} + 2.556.R \text{ INTEREST}_t + e_i \quad i = 1,2, \dots, 7 \quad t = 1,2, \dots, 7$$

**Table 6** summarizes the results of the multiple regressions.

Independent variables	Coefficient of variable	Standard error(SE)	t-test	Possibility Amount
R. CURRENCY <sub>t</sub>	0/412529	0/314582	1/311355	0/1902
R.OIL <sub>t</sub>	0/515519	0/195523	2/636610	0/0086
R.INFLATION <sub>t</sub>	0/706713	0/095788	7/377899	0/0000
R.TEPIX <sub>t</sub>	-0/240187	0/061979	-3/875298	0/0001
R.INTEREST <sub>t</sub>	2/556689	0/406626	6/287575	0/0000
c	0/605722	0/090513	0/747263	0/4552

**Table 7** summarizes the results of the multiple regressions.

Durbin-Watson statistic	Adjusted Coefficient of determination	coefficient of determination (R2)
1/359857	0/187874	0/193999

## 6. Conclusions

In this research, was investigated the usefulness of macroeconomic variables in predicting risk of Listed Companies in Tehran Stock Exchange. Research results shows that between ratios Currency rate changes, inflation rate, interest rate and oil price changes and Risk index changes companies, there are a weak significant positive relations. However between stock price index Tehran Stock Exchange rate changes and risk index changes companies, there is a weak significant negative relation. In developed markets, ratio of book value to market value has the impact in defining returns. But in Iran's capital market, these variables in defining returns

play a weaker role. Hence, can be claimed that maybe one of reasons for the significance of the relationship is very weak, the result is the same applies.

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