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Determine the Effects of Fundamental Variables and Mass Behaviors in Changes of Stock Price

(Evidence from Iran Stock Exchange)

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Abstract

Previous studies have claimed that new information about market fundamentals provides only a partial explanation of observed price fluctuations. It has been proposed that short-term fluctuations are caused by shifts in market psychology or events that have no direct impact on business prospects or economic conditions. In accordance with the idea that short-term

variability in asset prices could be explained by causes other than fundamentals. We test the probability of the existence of bubbles and herding behaviors, using panel data from 2005 - 2010 in Tehran exchange securities. The present research deals with two major and three minor hypotheses. Price variations are a dependent variable in all these hypotheses. Variations of incomes, variations of debts to the shareholders and variations of monthly price fluctuations form independent variables of the minor hypotheses respectively.

Our results show that there is not significant relation between stock price changes and fundamental hangs. Thus existence of bubble is approved. Also, other findings about herding behaviors indicate that there is significant relation between stock price changes and changes in herding behavior proxies.

Keywords: Fundamental variables, Mass Behaviors, Stock Price

1. Introduction

According to the efficient-market theory, the price of securities reflects instantly all related and available information as a whole. The efficient – market hypothesis introduces simply the effectiveness of pricing process in the stock market. Therefore, the market value of an asset is theoretically equal to the intrinsic or fundamental value of the same asset (the present value of assets future cash flow). In an efficient market, the price of assets changes in response to new information. As information enters randomly to market, therefore prices should follow the notion of random walk.

The theory of random walk is indeed very close to the idea of efficient market. This theory argues that the changes in stock price follow no pattern or trend, thus, the previous trend of prices cannot be used to forecast the future prices. The theory of random walk shall not mean that prices changes irrationally, rather it states that when a huge amount of information is entered into market, all current news are reflected in the ruling price of stocks. The changes in tomorrow's price only reflect the news of tomorrow. As news is random and unpredictable, therefore, changes of price arising out of the dissemination of information must happen randomly and unpredictably (Hirschey, 2003).

Despite the theory of efficient market and notion of random walk, market prices may not always indicate the fundamental values of company, which are regarded as intrinsic values. Some scholars believe that the fluctuation of stock price may be so wide that it cannot be justified by the changes in fundamental values. Although they acknowledge that the long-term changes in stock price depend on the changes in market fundamental values, they also argue that short-term fluctuations shall be analyzed based on market psychology using those events, which are not in direct relation with the business perspective or economic conditions (Harman, 2000).

If price changes cannot reflect the changes in the fundamental value of assets, price fluctuation may be due to the existence of bubbles. Bubble is that part of price, which is not related to the fundamental values of an asset. When the price of a share is equal to the present value of future cash flow of the same share, the bubble part of that price is equal to zero. If the price of an asset is fully different from its fundamental value, the bubble part of its price is more than the intrinsic value (Gonzales, 2004).

The term "speculative bubble" is used to describe the other's evaluation of market following market drop. These bubbles are emerged when assets are evaluated above their intrinsic value. In this condition, markets are vulnerable and relatively bad news may cause a wave of stock sales. Because of such an oversupply, considerable fluctuation may be produced in prices. Such a high fluctuation cause that investors lose their confidence, capital costs increase, stock price decreases, investment projects reduces, and at worst, economic growth slows down. In some cases, this crisis may be transferred to other economic sectors and even to other countries (Gonzales, 2004).

2. Theoretical Framework and Research Literature

The results of a research carried out by Johnson, Lindblom, and Platan in 2002 on the bubbles

of IT companies in 1990s showed that the behavior of market members has been to some extent irrational and the combination of investments had a change because of the existence of speculative bubble. The results of this research show that herd behavior has been an important factor in high prices of stocks and reduction of prices (cited in Fadainezhad & Eshghi, 2006). Shiller and Pound (1989) have provided evidences consistent with the existence of herd behavior in stock market. They studied institutional investors to identify the factors involved in their decisions made for the purchase of special stock. The results show that the encouragement of others (professionals, fund managers, etc) people are deceived to purchase stocks with risen price. Banerjee (1992) has also found that stock market investors ignore their own information, and make their decisions based on the strategies of others. Christie and Huang (1995) found that dispersion increases significantly during the periods of increase in the absolute value of prices. They concluded that these results are consistent with rational pricing and inconsistent with herd behavior, since rational pricing patterns forecast that more increase in the changes of market return is itself a change in dispersion increase.

Shiller (1981) has provided a test to determine if prices can reflect fundamental changes. In this test called Variance Bound test, the changes in stock price are compared with the changes in the fundamental values of assets. It supposes that the current fundamental stock price depends on the future dividends of that stock, which have been adjusted with one discount rate. Therefore, ruling price is a predictor (an estimator) of future return. If the market price is consistent with the market fundamental variables, stock price shall be equal to the market fundamental values, and the estimated fluctuation of cash flows (fundamental prices) is less than that of actual cash flows fluctuations (return). Shiller extracted prices and dividends of S&P 500 index to show that the fluctuation of stock price is considerably more than the fluctuation of present value of dividends; therefore, dividends cannot be the reasons of changes in stock price.

Tirole (1985) provided a model, in which the fundamental value of an asset is equal to the present value of the future return of that asset, discounted using a constant rate. Therefore, if the price of an asset is more that the market fundamental value, it is said that there is bubbles. This model is a general equilibrium considering an unlimited sequence of overlapping generations with limited horizons of investment. The researcher shows that as long as the rate of economic growth is greater or equal to the expected return rate of assets, the emergence of bubbles is possible. Allen and Gorton (1988) used a short-term model, in which bubbles were expected to appear. To study the growth of market fundamental variables and stock prices, they tested the time-series reliability of prices and dividends. In case any trend is observed in price or dividends, the series were subtracted. Diba and Grossman (1988) introduced tests based on the reliability of the characteristics of stock prices and dividends. The general idea of this test, called co-integration text, states that it can be evaluated if the changes in stock price are consistent with the changes in fundamental variables by asking if their growth rates are comparable. If market fundamental variables grow slower than the asset price do, it is said that stock price has bubble part (Gonzales, 2000). Diba and Grossman test (1988) is based on the theoretical conclusion that in case there is a bubble, time series obtained from subtracting must have an unreliable mean. Diba and Grossman argue that the actual stock

price and actual dividends co-integrates. They believe that any deviation from fundamental values is the result of the variables having reliable mean. Therefore, they did not reject the hypothesis of the consistence of prices with fundamental variables (Diba & Grossman, 1988).

McQueen and Thorley (1994): this method tests rational speculative bubbles, when investors are informed of the existence of bubbles, but they also think that prices may increase further more. McQueen and Thorley assume that if prices have bubbles, the runs of abnormal positive return will have duration dependence, i.e. any increase in the length of run reduces the probability of ending an abnormal positive return runs (the inverse relation between the probability of a run ending and the length of the same run is called duration dependence) (Fadainezhad and Eshghi, 2006). Chirinko and Schaller (1996) accept based on the data of 1911 until 1987 that there are bubbles, but the actual decisions for investment are made based on fundamental variables. In most tests mentioned above, the null hypothesis states that there are bubbles, and it is tried to reject the nonexistence of bubbles using alternative hypothesis. In these models, the empirical relation between fundamental variables and dividends is tested. O'connell and Zeldes (1998) the difference of their model with Tirole's model is that this model contains asset holders with unlimited planning horizon. Anyhow, bubbles grow exponentially with a rate equal to the expected return rate. This is because speculators keep an expensive asset only when they expect that this asset will be priced higher in the future.

Harman (2000) tested price bubbles and mass behaviors of investors in the stock market of the United States of America, when rational bubbles and collective behaviors of investors were observed notwithstanding positive or negative return in market. Konadu et al (2005) have tested the existence of rational bubbles in the stock index of NASDAQ for the duration beginning form 1994 to 2003 using interest present value model. For this purpose, they applied a new test based on fractional integration test, and concluded that although co-integration and unit root tests do not reject the existence of bubbles, the fractional integration test carried out on the data excluding monthly data rejects the existence of bubbles in the market (cited in Alipour, 2007).

Nasrollahi (1998) concluded that the fast growth of Tehran's stock exchange index in 1995 and the first season of the year 1996, as well as the reduction of this index in the fall and winter of that year caused some investors and even expert to think of a false increase in prices. In theory, the false increase of price is a price bubble, which should be regarded as the second part of the price of an asset. Hazhir Kiani and Mirshamsi (1999) studied the monthly data of 17 companies accepted in the stock exchange of Tehran during the period from 1988 to 1997 using reliability test, the ratio of price to profit, and the co-integration test of price and profit of each share. They provided several reasons proving that the existence of rational bubbles in price cannot be rejected in at least 15 companies from the total seventeen companies studied in their research.

Ma'delat, Kourosh (2002) studied price bubble in an economic research carried out in the stock exchange of Tehran using the data of 1991 to 2001. For this, he used state-space method composed of state equations and differential equations. Godari (2006) studied rational bubbles in his master dissertation titled "A Study of Price Bubbles in the Stock

Exchange of Tehran during the Recent Years (2004 – 2005). Godari took a sample consisting of 22 companies in the stock exchange to show that there has been bubble in the price of the shares in the stock exchange of Tehran in 2004 and 2005, while most experts believe that bubble is blown up after the drop of prices and break of most companies' P/E. Asadi, Hamidizadeh, and Soltani (2006) studied the existence of price bubble in the stock exchange of Tehran based on the size of seventy companies and industries during the fiscal years beginning from 1991 ending to 2005, and showed that 57 percent of the companies at the confidence coefficient of 95 percent, and 43 percent at the confidence coefficient of 90 percent had price bubble. The analysis of statistical tests show that firstly there is statistically a significant relation between stock price bubbles and size of the company at the confidence coefficient of 95 percent; secondly, there is statistically no significant relation between stock price bubbles and industry type of the company.

Alipour (2007) studied in his master's dissertation titled "the Study of Rational Price Bubbles in the stock Exchange of Tehran", the existence of price bubbles in the stock exchange of Tehran during the period from 2000 to the first season of 2007. The main hypothesis of this research states that, "there is rational price bubble in the stock exchange of Tehran". To study this issue, three different tests including unit root test, co-integration test, and fractional integration test were carried out. The results of unit root and co-integration test confirmed the existence of bubble in the stock exchange of Tehran. In contrast, the results of fractional integration test show that the data were able to recourse to mean value.

Eslami Bidgoli and Shahriari (2007), in this research, the mass behavior of the participants of the stock exchange of Tehran during the period from 2001 to 2005 has been studied and tested. The primary evidence indicate that the investors of the stock exchange use rarely quantitative method to determine stock value, and their judgments is mostly based on their mental images, nonscientific information, rumors, and blind obedience to those persons called prominent participants in capital market. Therefore, two models have been used to study this behavior in the stock exchange of Tehran. For this purpose, the return deviation of the companies' stocks from market return has been studied in a daily, weekly, and monthly manner and during the increasing or decreasing fluctuation periods. The findings of this research indicate that according to the daily data on return there is no mass behavior during market growth, and in contrast, there are evidence proving the existence of such a mass behavior during market depression. Ezzatollah Abbasian, Vahid Mahmoudi, Elham Farzanegan (2010) carried out a research to identify price bubbles in the common stock of the stock exchange of Tehran using present value model, and found that financial markets specially capital market are the most important means of allocating financial resources. Considering the strategic financial and economic importance of this market, in case of any big deviation in this market, the allocation of financial resources of the whole country may face a great challenge. One of the factors that may cause problem is price bubble. In general, when the price of a stock is different from the price expected in the future, the issue of bubble in the market is put in limelight. This paper aims to study the credit of present value model with time variable expectation using M-TAR momentum threshold co-integration, and it tries to answer if there is any asymmetric adjustment between stock prices and cash return on

stock in the stock exchange of Tehran during the long term from 2000 to November 2008. The results showed that there is no long-term co-integration relation between stock price and cash return to indicate that there is a rational bubble.

3. Research Hypothesis

The hypotheses of this research consist of two main and three auxiliary hypotheses as follows:

3.1 Main Hypotheses

1- Change in fundamental variables is effective in the changes of stock price.

2- Change in the signs of mass behavior is effective in the changes of stock price.

3.2 Auxiliary Hypotheses

1- Change in earning is effective in the changes of stock price.

2- Change in the ratio of debt to shareholder's equity is effective in the changes of stock price.

3- Change in price fluctuation is effective in the changes of stock price.

4. Research Method

This research uses an applied method for performance evaluation. The samples are taken using random method, and the results are generalized to the statistical population by induction. For this purpose, inductive – descriptive method has been used. As this method uses the previous operational data, it is an ex-post facto research.

4.1 Statistical Population and Sample

The statistical population of this research is composed of the manufacturing companies of the stock exchange of Tehran during the period from 2005 to the fiscal year 2010 ending to March 19.

In this research, simple random sampling method has been applied. To determine the volume of statistical sample of this research, a pilot random sample of ten companies has been selected. Thereafter, S2 (variance) has been calculated in these sampled companies for the dependent variable, and finally 65 companies were selected using an appropriate formula.

4.2 Data Analysis Method

To describe the skew and kurtosis of data, mean and median of standard deviation have been used. To analyze the results, the tests of variable distribution normality, linear independence of independent variables, residue distribution normality were applied. Variance stability has been also used as the presupposition of a multiple linear regression. To evaluate the relation between variables, Fisher, correlation, linearity, and independent tests have been applied.

4.3 Research Models

The model of the first and second hypotheses has been defined in general as follows:

$y = f(x_1, x_2)$

y = dependent variable (price changes in comparison to the previous year)

x_1= first independent variable (changes in earnings in comparison to the previous year)

x_2= second independent variable (changes in the ratio of debt to shareholder's equity)

The mathematic relation between dependent variable (price change) and independent variables is determined using f: multiple linear regression equation as follows:

$y = \alpha + \beta_1 x_1 + \beta_2 x_2$

The model of the third auxiliary hypothesis has been presented in the following form:

$y = f(x)$

y = dependent variable (price changes in comparison to the previous year)

x= independent variable (changes in price fluctuation in comparison to the previous month)

The mathematic relation between dependent variable (changes in price) and independent variable is determined using panel data as follows:

$y = \alpha + \beta x$

β ،α are parameters of panel data regression equation, and are calculated using panel data estimations based on the performance of companies in stock exchange for each month of a six-year period beginning from 2005 ending to 2010.

5. Research Findings

In the following tables, central indices including mean, median, and dispersion indices including standard deviation, kurtosis, and skewness were calculated for different variables. As the mean is greater than the median, it is proved that there are big points in the data. (Table 1 & 2)

The variable distribution normality test shows that the distribution of variables has not been normal at the level of five percent. Therefore, the logarithm of variables has been used to evaluate the relation among the variables.

To evaluate the linear independence among independent variables, Pearson correlation analysis has been used. As the significance level is 0.214, and greater than 0.05, therefore, the null hypothesis is confirmed. This means that there is a significant relation between two independent variables. The correlation between them is equal to 0.06, which shows a partial and positive correlation.

5.1 First Model Estimation

In the following table, the results of regression analysis have been presented: (Table 3)

The probability value of F is equal to 0.353, which is greater than 0.05. Therefore, the null hypothesis is not rejected at the confidence level of 95 percent. This means that there is not significant relation at the confidence level of 95 percent. (Table 4)

The correlation coefficient is equal to 0.047 and the determination coefficient is only equal to 0.002. This means that only about zero percent of the changes of dependent variable is explained by the independent variable. The value of Durbin-Watson statistic is not very different from 2 and is equal to 2.11. The value that is close to 2 indicates that there is no self-correlation among residues, which is another assumption of regression.

The value of t statistic for delta R is equal to 0.93, which is significant and positive at the confidence level of 95 percent. Moreover, the t statistic for intercept elevation is – 4.02, which rejects the null hypothesis at the confidence level of 95 percent. This indicates that constant is significant. Therefore, the model is in form of a constant line. $\Delta P_i = -0.106$

5.2 Second Model

In the table 5, the results of regression analysis has been provided:

The probability value of F is equal to 0.98, which is considerably greater than 0.05. Therefore, the null hypothesis is not rejected at the confidence level of 95 percent. This means that there is not significant relation at the confidence level of 95 percent. (Table 6)

The correlation coefficient is equal to 0.001 and the determination coefficient is only equal to 0.000. This means that only about zero percent of the changes of dependent variable is explained by the independent variable. The value of Durbin-Watson statistic is not very different from 2 and is equal to 2.11. (Table 7)

As the above table shows, the value of t statistic for delta E is equal to - 0.025, which is significant and positive at the confidence level of 95 percent. Moreover, the t statistic for intercept elevation is – 3.92, which rejects the null hypothesis at the confidence level of 95 percent. This means that the constant is significant. Therefore, the model is in form of a constant line. $\Delta P_i = -0.106$

5.3 Third Model

In the table 8, the result of regression analysis has been provided:

The probability value of F is equal to 0.000, which is less than 0.05. Therefore, the null hypothesis is rejected at the confidence level of 95 percent. This means that there is a significant relation at the confidence level of 95 percent. (Table 9)

The correlation coefficient is equal to 0.14 and the determination coefficient is only equal to 0.02. This means that only about 2 percent of the changes of dependent variable are explained by the independent variable. This value is in practice very low, and shows the relation intensity among variables. The value of Durbin-Watson statistic is not very different from 2

and is equal to 2.02. The value that is close to 2 indicates that there is no self-correlation among residues, which is another assumption of regression.

The value of t statistic for delta P is equal to 9.24, which is significant and positive at the confidence level of 95 percent. Moreover, the t statistic for intercept elevation is 12.12, which rejects the null hypothesis at the confidence level of 95 percent. This means that the constant is significant. Therefore, the model is in form of the following: $\Delta IV_i = 0.749 + 1.44\Delta P$

5.3 The Relation of Variables

Considering that the determination coefficient in the linear regression equation has not approached zero, and the hypotheses of this research have been based on the relation among variables, independent test with chi-square criterion has been applied.

5.3.1 The Relation between delta P and delta R

Chi-square is equal to 4.61, which is less that the critical amount i.e. $\chi^2_{4,0.95} = 9.49$

Therefore, the null hypothesis is not rejected. This means that these two variables are independent.

5.3.2 The Relation between delta P and delta E

Chi-square is equal to 1.29, which is less that the critical amount i.e. $\chi^2_{4,0.95} = 9.49$

Therefore, the null hypothesis is not rejected. This means that these two variables are independent.

5.3.3 The Relation between delta IV and delta P

Chi-square is equal to 488.41, which is greater that the critical amount i.e. $\chi^2_{4,0.95} = 9.49$

Therefore, the null hypothesis is rejected. This means that there is a relation between these two variables.

6. Research in Brief, and Conclusion

In general, the findings of the fundamental model indicate that there is no relation between stock price changes and changes in the fundamental variables. Therefore, the first hypothesis of the research stating that there is a significant relation between fundamental variables and changes in stock price is rejected.

On the other hand, we know that lack of significant relation between these two variables proves the existence of bubble (since in an efficient market changes in the price of assets must be related to the changes in the fundamental value of assets).

The test of the second hypothesis on the existence of the mass behavior of the investors in the stock exchange of Tehran shows that the changes in mass behavior affect the changes in stock

prices. This proves the existence of mass behavior.

6.1 Practical Recommendations

- Investors are encouraged to transact by analytical study of information and future conditions. Any investment notwithstanding the conditions governing transactions leads to loss.

- Short selling may be a factor preventing the emergence of bubble. In short selling, professional investors who decide more rationally than other shareholders can prevent bubbles. By short selling, they increase the supply of assets, and prevent any increase in the price of assets.

- At present, the best method for predicting price in the stock exchange of Tehran for investors and those persons expecting short-term yield, is to pay attention to the previous changes in prices.

- The correlation among the sequential prices in the stock exchange of Tehran indicates that the stock exchange is inefficient. Therefore it is suggested to pay more attention to the dissemination of correct and exact information, which is one of the most important factors of efficiency.

6.2 Recommendations for the Future Researches

- Study the relation among fundamental variables (including dividends, amortization, output money used for the purchase of fixed assets) with the changes in stock price

- Study the existence of bubbles in other markets including housing, gold, and foreign currency markets.

- Study the effects of mass behavior on the stock price in short-term periods (weekly)

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Table 1 & 2. Descriptive Statistics of the Variables

	N		mean	median	Std. Deviation	Skewness	kurtosis
	valid	missing					
deltaE	390	0	.02849	-.09335	.573305	1.888	5.265
Ln(deltaP)	390	0	-.1062	-.0980	.52289	-.159	.561
deltaR	390	0	.01762	.01026	1.980346	.455	5.395
deltaE	390	0	.11300	02569	.569257	1.696	5.345

	N		mean	median	Std. Deviation	Skewness	kurtosis
	valid	missing					
deltaIV	4443	237	.65397	-.03872	4.063151	9.868	116.775
Ln(deltaIV)	4443	237	1.4376	1.3766	.35868	2.365	19.586
deltaP	4342	338	-.06578	-.00693	.392737	2.066	29.988

Table 3. Analysis of variance (ANOVA) Test for Simple Linear Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.236	1	.236	.864	.353(a)
	Residual	106.121	388	.274		
	Total	106.357	389			

Table 4. Multiple Correlation Coefficient, Determination Coefficient, Adjusted Determination Coefficient, and Durbin – Watson Statistic

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.047(a)	.002	.000	.52298	2.111

a. Predictors: (Constant), deltaR

b. Dependent Variable: Ln (deltaP)

Table 5. Analysis of variance (ANOVA) Test for Simple Linear Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.000	1	.000	.001	.980(a)
	Residual	106.357	388	.274		
	Total	106.357	389			

a. Predictors: (Constant), deltaE

b. Dependent Variable: Ln (deltaP)

Table 6. Multiple Correlation Coefficient, Determination Coefficient, Adjusted Determination Coefficient, and Durbin – Watson Statistic

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.001(a)	.000	-.003	.52356	2.112

a. Predictors: (Constant), deltaE

b. Dependent Variable: Ln (deltaP)

Table 7. Estimation and Test of the Parameters of the Model (Intercept Elevation and Gradient of Independent Variables)

Model 1		Un standardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
	(constant)	-.106	.027		-3.923	.000
	deltaE	-.001	.047	-.001	-.025	.980

a. Dependent Variable: Ln (deltaP)

Table 8. Analysis of variance (ANOVA) Test for Simple Linear Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1363.756	1	1363.756	85.471	.000(a)
	Residual	68322.328	4282	15.956		
	Total	69686.084	4283			

a. Predictors: (Constant), deltaP

b. Dependent Variable: Ln(deltaIV)

Table 9. Multiple Correlation Coefficient, Determination Coefficient Adjusted Determination Coefficient, and Durbin – Watson Statistic

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.140(a)	.020	.019	3.994459	2.021

a. Predictors: (Constant), deltaP

b. Dependent Variable: Ln (deltaIV)