Phenomenon of Random Walk on Tehran Stock Exchange

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Abstract

Stock exchange as the heart of the capital market is essential to economic progression for which certain conditions are necessary; efficiency is a requirement. Proper stock pricing and allocation of capital follow efficiency. The main goal of this study is to check out a phenomenon called random walk, which is one of the most important features of market in weak form of efficiency, and to study the effects of week days on stock price at Tehran Stock Exchange. The results show that solely Tuesdays have positive effects on stocks price. Also old prices have effects on the current prices of the stock exchange that is the old prices can predict the future prices and thus Tehran Stock Exchange does not comply with random walk hypothesis and it is not in a weak form of efficiency.

Keywords: random walk, week days, efficient market, Tehran Stock Exchange

Introduction

Capital market is an institution to make long-term provisions. In other words, capital market is composed of stock exchange with stable income and shares with maturity for over a year. The heart of a capital market of a community is its stock exchange. Stock exchange has an important role to play in a nation's economical development and this market is like a financial mediatory which many investors invest in. A great number of companies and institutes, which require financial sources for financial provision, refer to this market and in case of inefficiencies; the savings in most cases will be poured into financial provisions of projects with low productivity. However, if the stock exchange, which is the most capital market, be efficient, capitals properly will be allocated, the saver more satisfied with a bet-ter productivity, economic plans better made provisions for, and the prices of stock exchanges fairly determined. Efficiency of stock exchange is one of the important factors of economic development.

In the 1930s, a number of researches were launched to study random behaviors of prices and to answer the question that why prices do not act accordingly. The results soon became part of a strong thinking and theoretical movement in economy and investment. That's how the theory of random behavior of prices was born. After doing a number of experimental tests, the school of random walk showed that constant changes to prices in short term periods of time like a day, a week or a month are independent of one another. With the 1960s past, the researches with their statistical researches on price behaviors were taken over by the problem of economical features of stock market, which are known to be the cause of random alterations. This problem caused a new theory to emerge in connection with efficient market.

Fama (1965) defined an efficient market in the simplest but sufficient way: efficiency of capital market is achieved if the information were clear to the market in the set period of time of pricing (Salimi far,shirzour,2011).

Ntim *et al.* (2011) studied a weak form of efficiency in African Stock Exchange. To this end, they conducted a variance ratio test and concluded that such markets are not in a weak form of efficiency. Jarrett (2010) studied the minor stock markets of Singapore, Malaysia, Korea, and Indonesia in terms of weak forms of efficiency. Jarret studied changes incurred by week days to the daily enclosing stock prices and showed that a weak form of efficiency did not exist in the their markets. Asiri (2008) studied the price behavior of stocks in the stock markets of Bahrain for 40 admitted companies into this market from 1990 to 2000 and showed that this market is at the level of a week form of efficiency. Lim (2008)

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studied the stock market of Malaysia and the effect of Asian, financial crises in 1997 on the market. Lim also studied the daily closing prices for the years from 1994 to 2006. The results showed that during the above period of time the Malaysian market did not experience a weak form of efficiency and that the market had been affected by financial crisis. Jarrett (2008) studied Hong Kong's Stock Exchange and the daily closing prices for 601 companies in 2002 for almost 300 days. The results showed that the Hong Kong's Stock Exchange did not comply with random walk theory and that this stock exchange was not in a weak form of efficiency. Jain *et al.* (2013) studied the phenomenon of random walk in the Indian Stock Exchange for the period of global financial crises from 2005 to 2010. The research conducted parametric tests and non-parametric tests and the results showed that the Indian Stock Exchange for the above years was not in a weak form of efficiency that is the investors might not procure abnormal interests through old prices. Jarrett and Kyper (2005) examined and confirmed the previous studies on the American Stock Exchange and daily pattern of time series of stock exchange in the American Stock Exchange markets. Laopodis (2003) studied the Athenian Stock Exchange for a weak form of efficiency and the results showed that the Athenian Stock Exchange for the above time did not comply with the random walk phenomenon. Thus in case of a random walk, the investors may not acquire abnormal returns.

Gilmore and McManus (2003) studied the weak form of efficiency in three markets of Poland, Hungary, and the Czech Republic and showed that in none of the above a weak form of efficiency was experienced; thus random walk hypothesis was not confirmed. Omran and Farrar (2006) studied weak forms of efficiency in the new markets of Middle East. They studied the random walk phenomenon and chronological effects; they refuted random walk hypothesis for the above capital markets. The main goal of this research is to study a phenomenon called random walk, which is one of the most important features of market in weak form of efficiency, and

to study the effects of week days on stock price at Tehran Stock Exchange.

Methodology

All companies have qualified by Tehran Stock Exchange for the period of time starting from 2009 to 2012 constituted the statistic population and the hypotheses were following:

Primary hypothesis: the time series of stock price of Tehran Stock Exchange comply with the random walk phenomenon.

First secondary hypothesis: week days have no effects on stock prices of Tehran Stock Exchange

Second secondary hypothesis: future stock prices of Tehran Stock Exchange are unpredictable

Since the week days were considered as the qualitative independent variable in this study it need a dummy variable entered into the model. The study model is as follows:

$$Y_t = a + b_1 Y_{t-1} + b_2 Y_2 + b_3 Y_3 + b_4 Y_4 + b_5 Y_5 + e$$

Y_t: the dependent variable (stock price at day t),
a: y-intercept,
e: mean-zero error,
Y_{t-1}: the quantitative independent variable (price in day t-1),
X_2: the dummy variable for Saturday (if Saturday 1 and if not 0),
X_3: the dummy variable for Monday (if Monday 1 and if not 0),
X_4: the dummy variable for Tuesday (if Tuesday 1 and if not 0), and
X_5: the dummy variable for Wednesday (if Wednesday 1 and if not 0).

Unit root test

Prior to model estimation, data must be tested for reliability. In order to analyze the stationary of variables, The Phillips-Perron test is used as a unit root test, the results are in the table 1:

Table 1. Results of Unit Root Test

Variable	Test	Statistic	Prob.	Observation
closing daily prices	Fisher- Phillips perron	27.2107	0.0072	7290

Source: research computations

As it has been clarified from the above table(1), the variable is stationary and the result is meaningful at level 0.05 of significance.

Poolability test (Chow test)

Chow test is conducted to say whether the model is a pooling model or a panel. The table (2) shows

the results of Chow test, as it is clear, the probability is (0.0030) which is below 0.05. Thus the hypothesis which states that the model is pooling is rejected and therefore, the panel hypothesis would be accepted.

Table 2. Result of Chow Test

Test	Statistic	d.f	Prob.
Cross-section	3.592554	(5,8755)	0.0030
Cross-section Chi-Square	17.966914	5	0.0030

Source: research computations

Hausman test

One of the most important parts of panel model estimation is to determine the effect type of the explanatory variables that is to determine whether the research model complies with the fixed effect model or with the random effect model. To answer the above, it's used Hausman test and the result is shown in Table 3.

Table 3. The results of Hausman Test

Test	Chi Sq. Statistic	Chi Sq. df	Prob.
Cross-Section Random	17.835268	5	0.0032

Source: research computations

The result shows that the estimated model complies with the picturesque model with stationary effects. (If probability is less than 0.05, the stationary effects are acceptable).

Heteroscedasticity

In a panel model it is probable that the between-levels variances be heteroscedastical. To test the heteroscedasticity between levels, it's used Laspeyres Test (LM) and Generalized Least Squares (GLS) method for cases with heteroscedasticity of variances between levels.

$$LM = \frac{T}{2\sum i(S_i^2 / S^2 -1)^2} \sim X_n^2$$

T is for the number of years of time series and S^2 stands for total variance achieved from the total estimation of the model.

The static is 63.862, which is higher than the table value. Thus, the variance is heteroscedastic.

To solve the problem of heteroscedasticity of the variance it's used GLS method and the results are displayed in Table 4.

Table 4. The results of GLS Method

Dependent variable= Y Method: Panel EGLS (cross-section weights)				
Variable	Coefficient	Std. Error	t-statistic	Prob
C	36.33121	7.986838	4.548885	0.0000
x_2	0.188352	1.983006	0.094983	0.9243
x_3	2.518390	1.972884	1.276502	0.2018
x_4	4.300293	1.975964	2.176302	0.0296
x_5	2.111302	1.986653	10.062743	0.2879
Y(-1)	0.994482	0.001160	857.4524	0.0000
R-Squared= 0.997146 Durbin-Watson stat= 1.990839		F-Statistic= 305842.8 Prob. (F-Statistic)= 0.0000001		

Source: research computations

The final estimation of the model

Through the study of variable coefficients in table 4 shows that the variables X_2, X_3, and X_5 aren't statistically meaningful. So they were admitted from the model and final model was re_ estimated. The result of final estimation is shown in table 5.

Results and discussion

The main goal of this study was to study random walk hypothesis , which is one of the most important features of a market in a weak form of efficiency, and the effects of week days on the prices of stocks in Tehran Stock Exchange. In recent years, researches have

been conducted to check the effects of week days on stock price and random walk hypothesis in capital market of Iran and other countries . The findings has been got from some researches on Tehran stock exchange is same with this study. Other researches also shows inef-ficiency of the market in weak form, but methods and tests are different with present study. In other words, it hasn't been studied Iran's capital market in this way that considered the effects of week days on stock price and random walk hypothesis with such methods and tests.

Table 5: Model estimation results

Dependent variable: Y Method: Panel EGLS(cross-section weight)				
Variable	Coefficient	Std. Error	t-statistic	Prob
C	37.57703	7.996055	4.699446	0.0000
X4	3.589963	1.770471	2.027688	0.0426
Y(-1)	0.994414	0.001166	852.8497	0.0000
R-Squared= 0.997143 Durbin- Watson Stat= 1.985825			F-statistic= 436666.1 Prob (F-statistic)= 0.000000	

Source: research computations

First of all, data were tasted in term of stationary that results were shown in table 1. In Chow test, results in table 2 showed probability of the variables is below 0.05. So it stated the Panel hypothesis would be accepted.

The Hausman Test was used to determine whether the model is Random effects or Fixed effects. Because probability was 0.05, the Fixed effects hypothesis would be accepted. Results were shown in table 3.

According to existence of Heteroscedasticity of variance in base model, the Generalized Least Squares (GLS) method was used to remove this problem. The results are in table 4.

Variable coefficient in table 4 showed that variables X_2, X_3, X_5 aren't significant, so we removed them and estimated final model with X_4, Y_{t-1} again, which results show in table 5.

As the final model shows that X_4 (the dummy variable for Tuesday) and Y_{t-1} (the old stock price) has a direct relation with Y_t. Among the week days from Saturday to Wednesday during which interactions take place only Tuesday is effective on stock prices. Hence, the first secondary hypothesis saying that the week days have no effect on stock price is refuted. Also the effect of Y_{t-1} on Y_t signify that the price for previous series had effects on current prices. Therefore, old prices can be used to predict future prices and prices are predictable enabling certain stockers with access to information to procure abnormal interests from this market. Thus the second secondary hypothesis saying that future stock prices are unpredictable is refuted as well. Stock prices of Tehran Stock Exchange are predictable.

As both secondary hypotheses are refuted, it's concluded that time series of stock prices of Tehran Stock Exchange do not comply with the phenomenon of random walk. The primary hypothesis of this study is saying time series of stock prices of Tehran Stock Exchange comply with the phenomenon of random walk is refuted. The market is not in a weak form of efficiency.

Conclusion

Iran is a developing country and one of the important factors for economic development is stock exchange, but to reach this goal there must be certain conditions for effective outcomes. The main goal of this study was to study random walk, which is one of the most important features of a market in a weak form of efficiency, and the effects of week days on the prices of stocks in Tehran Stock Exchange. Theresults showed that for the last years despite improvements in stock exchanges the market had not been in a weak form of efficiency.

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