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Checking for the Existence of the Random Walk Hypothesis: The Case of Karachi Stock Exchange

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ABSTRACT

Securities market are an important part of any economy when it comes to the distribution of scarce resources as it acts as an intermediary of capital distribution from savers to lenders through the mechanism of price. In an efficient market, there are many participants whose actions decide the price, which is already a representation of the intrinsic value as all the information is already incorporated in the shares prices, and so the prices at any future time would be moving randomly.

In Pakistan, securities market is one with high sensitivity due to political turmoil, expectations and insider information. In such a situation it is important to check the efficiency of the market. This paper examines this relation in the existence of the random walk hypothesis.

The data has been selected over a period of three years from four companies listed on the KSE-100 Index. The total number of observations for the daily stock returns is 2625. The observations have been treated and the statistical tool ANOVA is used to quantify the data.

The results show that the random walk hypothesis holds true for the daily returns. No “day of the week effect” is present. Thus the random walk theory holds true for the Karachi Stock Market, and so it can be termed as an efficient market.

INTRODUCTION:

The primary role of the capital market is allocation of ownership of the economy's capital stock. In general terms, the ideal is a market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions, and investors can choose among the securities that represent ownership of firms' activities under the assumption that security prices at any time "fully reflect" all available information. A market in which prices always "fully reflect" available information is called "efficient". (Fama, 1970) Because new information is randomly favorable or unfavorable relative to expectations, changes in stock prices in an efficient market should be random, resulting in the well-known "random walk" in stock prices. Thus, investors cannot earn abnormally high risk-adjusted returns in an efficient market where prices reflect intrinsic value.(Netter & Jones, 2007) The fact that the market is efficient is important for the public economy when it comes to the distribution of scarce resources as it acts as an intermediary of capital distribution from savers to investors through the mechanism of price. In order for the capital to be allocated to where it makes most use from a public economy point of view, it is important that prices give the right signals, i.e. contain all the important information. Thus, the society needs the market to be efficient (Claesson, 1987).

LITERATURE REVIEW:

A lot of work has been done previously on the topic. The research work that has been selected as the base for this paper has been written by Mr. Haroon Mahmood. In his work, "Market Efficiency: An Empirical Analysis of KSE 100 Index", Mr. Mahmood has picked up eight companies from the KSE-100 Index, four of them have a market capitalization of over one (<1) and the other below one (>1). He has

then used the statistical tool ANOVA in order to analyze whether the mean returns on any particular day, or month was significantly different from the others. His analysis included that the KSE is an efficient market, meaning that the random walk hypothesis holds true in this market.

Other people have also conducted research on similar topics. These include the works by Frimpong and Magnus et.al (2007), B.J.Tabak (2002), H. Fazal (2000), H. Marashdeh (2007), Cheong and Zaidi (2007).

PURPOSE OF THE STUDY:

In the context of Pakistan, securities market has a special significance due to its sensitivity to political turmoil, expectations, prospects of stocks and insider's information. Thus, the Pakistani government increasingly comes to realize the importance of improving the efficiency of the Karachi Stock exchange in particular, and its relevance to private sector development and economic growth (Bashar, 2002). Also, Business Week has over the past years declared KSE as been one of the best performing market in the world. Ever since the past year the market has seen a major downturn with the floor mechanism been in force in the market, negligible trading took place over that period. Ever since the removal of the floor the KSE-100 Index has fallen from a all time high of over 13000 index points to just over 5100 index points (Business Recorder, 2008). In such a scenario, where the once "best" performing market of the world has seen a drastic downturn, it is important to check the efficiency of the market in the light of the existence of the random walk phenomenon.

Thus the purpose of the study is to check that whether the Karachi Stock Exchange is an efficient market or not, i.e. do the share prices follow a specific path or not, which can be used to predict their future prices.

HYPOTHESIS:

The Hypotheses are stated as follows:

"The day of the week effect does not exist in the Karachi stock exchange"

And

"The random walk hypothesis holds true for the Karachi stock exchange"

LIMITATIONS:

The study has limitations in the sense that only data for three years has been used in order to conduct the analysis, also only four companies have been chosen out of the entire KSE-100 Index. In addition to that there is only one method ANOVA that has been used which is relatively simpler to use as compared to the many other complex procedures that could be used to perform the same kind of analysis.

METHOD

Data Collection:

For the purpose of the research, historical stock prices for a period of three years from January 2006, up till September 2008 have been used. The stock prices do not include the data from October 2008, November 2008 and December 2008, as at that time the floor mechanism had been imposed on the Karachi Stock Exchange and so negligible trading took place, also the prices for December are very low and if included would distort the overall data values. For making the analysis more valid the data from these three months has been left out. The total number of observations is 2625. There are four companies that are selected from the KSE-100 Index, in order to minimize biases companies have been selected based on their market

capitalization, with two having capitalization of above one (>1) and the other two less that one (<1). The companies are, Pakistan State Oil, Pakistan Oilfields Ltd., ICI Pakistan and Lucky Cement.

The data is considered reliable as the publishing authority is highly liable for any information that is presented by them, and also as the same data is used by many professionals for their analysis, it is considered reliable. Also as all the data is publicly available so if someone wants to perform the same research then data would be easily available to them.

Sources of Data:

The data used in this research is primarily secondary. The data for the company stock prices have been obtained from the Karachi Stock Exchange website (www.kse.com.pk). The capitalization data for the different companies has also been obtained from the KSE website.

Procedure:

As the statistical tool ANOVA would be used so it is to be explained at this point. Using ANOVA, the hypothesis would be true in the situation where the Null Hypothesis, which states:

$$H_0: \text{Mean } 1 = \text{Mean } 2 = \text{Mean } 3 = \text{Mean } 4$$

DOES hold true, i.e. at least one of the mean returns would be significantly different from the others.

The data obtained had to be treated as it was not ready to be analyzed. Firstly, all the stock prices were given numbers according to the corresponding day of the week (i.e. Mon=1, Tue=2…Fri=5). At this point the daily returns for the stock prices were computed as the logarithmic difference between todays and the previous day's stock price, thus providing continuously compounded returns as follows,

Ln (P_t/P_{t-1}) where;

Ln= Logarithm

P_t= stock price in time period t

$P_{(t-1)}$ Stock price in time period t-1

After that all the days had to be separated in to different columns (i.e. one column for Monday, Tuesday and so forth). The respective returns for the days were inserted in to the columns of the respective days. After this the statistical tool ANOVA was applied at a significance level of 5%. It was applied to the data for all the four companies. The stock returns were chosen as the dependants and the respective days as the factors and the test conducted.

RESULTS AND DISCUSSION:

The interpretations for the results obtained from ANOVA are analyzed per guidelines given in the following table:

If	***Then***
test statistic > critical value (i.e. F> F-crit)	*Reject the null hypothesis*
test statistic < critical value (i.e. F< F-crit)	*Accept the null hypothesis*
p value < Significance level	*Reject the null hypothesis*
p value > Significance level	*Accept the null hypothesis*

Source: Qimacros

Firstly as the data has been analyzed with the significance value of 0.05, this means that if the P-value is greater then 0.05 then the Null Hypothesis would hold true.

From data tables (in appendix) we can see that for all the companies the p-value is far greater then the significance level of 0.05, also it is observed that F< F-critical for all the companies. From this we can say that there is insignificant difference between the mean values of the data of the different companies on the Karachi Stock Exchange over the time period for which the data has been taken and so the null hypothesis holds true. As described above in the situation where the null hypothesis holds valid the hypothesis formulated for the research also hold true.

CONCLUSIONS:

From the research it could be concluded that the day of the week effect does not hold true in the Karachi stock exchange, from this we can say that the daily stock returns on any day are not significantly different from any other day, this is compatible with Fama's conclusion on existence of random walk hypothesis. The result indicates that the daily stock returns are independent and can't be used to make judgments about the future stock prices. This means that the stock prices at any time are a true reflection of the intrinsic value and of the judgment of the market participants about the stocks potential.

This conclusion is contrary to many other researchers who believe that the Karachi stock exchange shows signs of the day effect and hence question the efficiency of the market.

SCOPE FOR FURTHER RESEARCH:

Further research is possible in which more complex tests such as Autocorrelation, Q statistic and the Variance ratio tests, in addition to the other many tests, could be used in order to check for the existence of the Random Walk Hypothesis in the Karachi Stock Exchange. Furthermore the monthly as well as the yearly returns

could also be used in addition to the daily stock returns that have been used in this paper.

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Karachi Stock Exchange History Section on [www.kse.com.pk]

Karachi Stock Exchange Market Capitalization Section [www.kse.com.pk]

Pakistan Oilfields Anova

Groups	*Count*	*Sum*	*Average*	*Variance*
Monday	127	-0.56669	-0.00446	0.004759
Tuesday	125	-0.56855	-0.00455	0.00547
Wednesday	129	-0.43917	-0.0034	0.005492
Thursday	129	-0.43447	-0.00337	0.007284
Friday	130	-0.58138	-0.00447	0.00413

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.00019	4	4.74E-05	0.008732	0.999849	2.385963
Within Groups	3.446084	635	0.005427			
Total	3.446274	639				

ICI Pakistan Anova

Groups	*Count*	*Sum*	*Average*	*Variance*
Monday	137	-0.11699	-0.00085	0.003092
Tuesday	134	-0.12917	-0.00096	0.002901
Wednesday	141	-0.10273	-0.00073	0.003182
Thursday	136	-0.10898	-0.0008	0.00283
Friday	135	-0.06992	-0.00052	0.00313

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1.496E-05	4	3.74E-06	0.001235	0.999997	2.38507
Within Groups	2.0533451	678	0.003029			
Total	2.05336	682				

Pakistan State Oil Anova

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Monday	133	-0.40336	-0.00303	0.00237
Tuesday	133	-0.40347	-0.00303	0.002712
Wednesday	135	-0.4138	-0.00307	0.003067
Thursday	133	-0.41722	-0.00314	0.00214
Friday	131	-0.40669	-0.0031	0.001989

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1.1E-06	4	2.76E-07	0.000112	0.999999975	2.38543
Within Groups	1.622891	660	0.002459			
Total	1.622892	664				

Lucky Cement Anova

Groups	*Count*	*Sum*	*Average*	*Variance*
Monday	134	-0.42144	-0.00315	0.004831
Tuesday	131	-0.44888	-0.00343	0.00455
Wednesday	137	-0.43329	-0.00316	0.005066
Thursday	130	-0.47505	-0.00365	0.005256
Friday	130	-0.46205	-0.00355	0.004631

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2.79E-05	4	6.97E-06	0.001431	0.999996	2.385492
Within Groups	3.198424	657	0.004868			
Total	3.198452	661				