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Testing the Evidence on Weak Form EMH at Pakistan Stock Market

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ABSTRACT

Market efficiency has been a hot pursuit of researchers in the area of financial markets. In both developed and developing countries inquiries have been made to test the existence of the three forms of market efficiency. Moreover, the results are different for developing countries as compared to developed countries. For example, in developed countries markers have been consistently found to exhibit weak form of efficiency, however, they have only occasionally been found to exhibit semi-strong form of efficiency, and have hardly been found to exhibit strong form of efficiency. The case of developing is difference as they have only occasionally been found to exhibit Market efficiency weak-form of efficiency only. This study has, therefore, been conducted to test the existence of weak-form of efficiency in Pakistan stock market. For that purpose, statistical tests such as runs, test, auto-correlation test, and the Box-Ljung Statistics were employed. It was found that none of the tests confirmed the existence of weak-form of efficiency in Pakistan stock market.

Keywords: *Market efficiency, Efficient Market Hypothesis, Pakistan Stock Market*

INTRODUCTION

This study was conducted to find out the existence of weak form of Efficient Market Hypothesis (EMH) which may be affecting the prices of stocks listed with Pakistan Stock Market (PSX). The existing research provides for a mixed evidence related to the theory of EMH, therefore, investigating the efficiency of Pakistan Stock Market may be a valuable pursuit. Literature has viewed stock market efficiency as very important for the smooth functioning of financial markets in developing markets such as Pakistan. The objective of this will be achieved by using some advanced statistical tests as described in the methodology. The scope of this study is to test the weak form of market efficiency at Pakistan Stock Exchange. The other forms of EMH are, however, beyond the scope of this study. Moreover, for this study KSE-100 index is used as a proxy for Pakistan stock market.

LITERATURE REVIEW

EFFICIENT MARKETS HYPOTHESIS

Efficient Market Hypothesis (EMH) is connected with the concept of random walk theory which proposes that successive prices are independent, therefore, the prediction of next price change cannot be achieved by the current price change. As there is no observable trend, EMH claims that it not

possible to consistently beat the market by making use of information already known to the market, and if it happens it is only through mere luck (Fama, 1970). EMH is classified into three forms, which are discussed below.

Weak Form EMH:

As the current prices are assumed to incorporate the impact of historical information, therefore, future prices are not driven by such historical information. Consequently, abnormal returns cannot be achieved by employing any investment strategies using historical information. Assets prices offer no consistent trends rather price changes occur randomly based on information which is unexpected (Fama, 1970). There are two set of tests available to find out the existence of the weak form of EMH. The first test involves the statistical tests of independence between the price movements. Other set of tests involve comparing risk and return results for the trading rules to the results from the simple "Buy and Hold Policy" (Reilly & Brown, 2003). The tests of independence are further divided into two types, which are: number one, Autocorrelation Tests of independence; and number two, the Runs Test (Reilly & Brown, 2003). Runs test measures whether or not the returns in an observed series are uniformly distributed (Reilly & Brown, 2003). Majority of the studies using statistical tests of independence, particularly the studies featuring autocorrelation tests, performed for developed stock markets, have consistently supported the weak-form of efficiency (Brown & Reilly, 2003). The trading rule involving small or large filters have not proved to yield returns above the buy and hold policy. Other trading rules such as advanced decline ratios, short selling, specialist activities have generated mixed results (Fama, 1991).

Semi Strong Form EMH:

This Form of EMH claims that prices are adjusted naturally as soon as new information is available, that is, current stock prices will fully incorporate the impact of the public information. The greater implication of the above claim is that both of the investments styles that is, fundamental analysis and technical analysis, are considered unable to achieve abnormal returns on consistent basis. In order to effectively test for market efficiency in Semi Strong Form, the adjustments in the prices, as a result of the arrival of new information, must be reasonable in size, and emerge instantaneously. Results of studies of Semi Strong Form Efficiency are mixed. The tests do not indicate the presence of this form of efficiency in the developing stock markets. The results for Cross Sectional Predictors which include size, P/E ratios and monetary policy rejected the hypothesis and pointed out inefficiencies in the markets. Nevertheless, event studies in developed markets have been providing support for this form of Efficient Market Hypothesis (Fama, 1991).

Strong Form EMH:

The efficiency in this form is not possible to exist if there are legal barriers which will prevent private information to become public i.e. existence of trading laws. To test the market in its Strong Form Efficiency the market is required to behave in a manner where market participants are not able to earn abnormal returns over an extended period of time. Strong Form Efficiency is not said to be refuted even if some investment professionals and money managers are found to consistently outperform the market because the presence of millions of investment managers across the world will produce a normal distribution of returns even in the presence of a few dozen "superior"

performers (Fama, 1970). Regarding the tests for strong-form efficiency, the major studies have examined insider trading, performance of professional money managers, security analysts and the activities of exchange trading specialists. The evidence on the tests of strong form EMH is generally mixed. The results have shown that corporate insiders and stock exchange market-makers or specialists have monopolistic access to the information thus the results for these both types of investors do not support the hypothesis. In general, there is not much support for this form of EMH in both developed and developing stock markets (Fama, 1991).

SOME CONTRASTING VIEWS

The efficient market hypothesis has been tested, with consistent results previously, in a range of markets including stock markets, bonds markets, commodity markets, and others. However, there have been several studies where the results produced are inconsistent with the theory. Jensen (1978) argued that the post-announcement risk adjusted abnormal returns were systematically non-zero in the period subsequent to earnings announcements which is suggestive of market efficiency. He tested for both market efficiency and the adequacy of the asset pricing model, and concluded that the abnormality in the returns was because of market inefficiencies, and not because of deficiencies in asset pricing model. Similarly, Thompson (1978) found that a very simple trading rule could earn an abnormal return of approximately 4%, uniformly per year during the period of 1940-1971. Although, Thompson was not able to find the reason of the abnormal returns, however, he argued that the abnormal returns were primarily due to inappropriateness of the asset and not because of market inefficiency (Jensen, 1978). Galai (1978) in testing for market efficiency investigated whether call options and their underlying stocks behaved in a synchronized manner or a trading rule could be applied to earn arbitrage profits. He found that these two markets did not behave in a synchronized manner. Moreover, he found out that positive profits could have been attributed to a trading rule. A comprehensive survey was conducted based on the opinion of finance professors about the efficiency of US stock markets. It was argued that while the respondents thought that the US market was inefficient, they, however, passively invested suggesting that their actions were in conflict with their opinion about the efficiency of the market. (Doran, Peterson & Wright, 2007). As the research has progressed in the arena of market efficiency, more definite results have poured in as compared to previous research. Moreover, the tests covering efficiency have increasingly shown a tendency to be moving towards testing inefficiency rather than efficiency. A significant characteristic of the conventional studies, however, is that these tests were generally conducted on homogeneous markets. As markets are segmented in terms of specific institutional and investor preferences, therefore, a theoretical model that appropriately considers these preferences is required, and appropriate tests of segmented market efficiency are needed. The significance of discussing whether the existence of segmented market efficiency is that it indicates whether it would be possible to earn excess returns from trading on developing markets (Bechev & Gechev, 2007).

EARLIER EVIDENCES ON MARKET EFFICIENCY

Chakraborty (2006) attempted to examine the weak form efficiency for Pakistan stock market through tests such as variance ratio, runs, and auto-correlation. All of these tests rejected the random walk hypothesis. Mustafa & Nishat (2000) argued that high volume trading of stock is associated

with both high volatility and high positive returns implying that non-informational trade affect prices significantly, and that trading activity also has the ability to explain price changes. A hot pursuit of research in finance is the exploration for the existence of patterns in returns. A pattern which can predict prices is a strong evidence of market inefficiency. A widely acknowledged pattern is the weekday's effect which argue against the normality of returns through the week. U.S. stock markets, for example, exhibit stock returns on Mondays on the negative side while returns on Fridays are found to be positive. Several researchers such as Cross (1973), French (1980), Gibbons and Hess (1981), Keim and Stambagh (1984) as well as some others frequently found out very low returns on Mondays, which they described as the 'Monday effect' (Hussain, 2000). Hussain (2000) investigated into the weekday's effect for the Pakistani stock market found out that stock returns were not significantly different along the week in Pakistan. Moreover, it was found that the returns were the lowest on the first day, which, however, tended to disappear once the participation of the foreign investors began. Hussain (1997) investigated the presence of Random Walk in Pakistani stock through Serial Correlation Test and argued that the Random Walk theory may be ineffective for Pakistan stock market as was the case with other developing markets. This provided for a strong evidence of the slow absorption of new information to the prices. The market efficiency may be even more important for developing markets since the level of portfolio investments channeled through these markets continues to grow because of introduction of more investment friendly regulations. Although, there is strong evidence of the existence of both market efficiency and low weekdays effect anomaly in the developed markets; yet, because of the existence of several contextual factors the same may not be valid in the case of emerging stock markets. A research specific to Indian stock market provided for strong evidence of weak form efficiency based on the presence of low weekday's effect for Bombay Stock Exchange across the period of 1987-1994 using tests ranging from runs test, to serial correlation coefficient tests, and to Goodness of Fit Test (Poshakwale, 1996).

DATA AND METHODOLOGY

The sample size for the research will include KSE-100 index. For this study, data set constitutes the daily, weekly and monthly closing values of the KSE-100 Index from January 2014 to August 2019. This provides for 1385 daily data points, 174 weekly data points, and 68 monthly data points. The returns for this study were determined using the following simple formulae: RIt = Loge [It/It-1] * 100. The researcher states following hypothesis for the study:

Ho: The returns are independent over time and follow random walk

Ha: The returns are not independent over times and don't follow random walk

For this study tests Auto-correlation tests of independence" and "Runs Test" were used. The Box-Ljung Statistics is also used to find out the combined empirical results for autocorrelations. For the Autocorrelation test the researcher uses 18 lags for daily returns data and 4 lags each for weekly and monthly data to find autocorrelations within the series. The hypothesis for autocorrelation test of independence can be described as follows:

Ho: Autocorrelations are not present in returns over time (Pa,b=0)

Ha: Autocorrelations are present over time (Pa,b not equal to 0)

EMPIRICAL FINDINGS AND ANALYSIS

This section provides for an investigation and analysis of the results of autocorrelation tests of independence, box-ljung statistics used to achieve the objectives of this study.

Auto-Correlation Test:

Table 1 shows that the results of the Autocorrelation test of independence and the Box-Ljung statistic. It is apparent from the given table that that the Autocorrelation is not 0 for any of the Lags although certain negative correlations exist implying that the returns are sometimes negatively autocorrelated in between lags but nevertheless they are not independent. When the box-Ljung statistic is analyzed it is again evident that the Sig. figure is greater than the Values in all 18 Lags. If as an example the first Lags value is taken then, (1.075) is greater than sig (.300), so it means returns are not independent and our results are statistical significant and thus null hypothesis is rejected that daily returns are independent over time. Therefore, Ha: Autocorrelations are present over time, is not to be rejected. In the auto correlation test carried out on the monthly returns of the KSE-100 index it is seen that the autocorrelation is also positive and negative sometimes but never zero. This shows that the returns are not independent and this can be further proved by the results of the Box-Ljung Statistic. The Box-Ljung statistic shows test values to be significant for all lags except lag 1 which might be due to any irregularity in the data.

Table 4.1: Auto-Correlations & Box-Ljung Statistics for KSE-100 Index

Daily Returns				**Weekly Returns**			
Lag	Auto-Correlation	Box-Ljung Statistic		Lag	Auto-Correlation	Box-Ljung Statistic	
		Value	Sig.			Value	Sig.
1	-0.225	70.142	0	1	-0.018	0.058	0.81
2	-0.046	73.103	0	2	0.171	5.215	0.074
3	0.189	122.853	0	3	-0.09	6.659	0.084
4	-0.096	135.705	0	4	-0.005	6.664	0.155
5	-0.019	136.214	0				
6	-0.029	137.385	0				
7	0.04	139.645	0				
8	-0.031	141.004	0				
9	0.025	141.861	0				
10	0.032	143.334	0				
11	-0.023	144.078	0				
12	0.015	144.397	0	**Monthly Returns**			
13	0.046	147.362	0	Lag	Auto-Correlation	Box-Ljung Statistic	
14	-0.01	147.505	0			Value	Sig.
15	-0.011	147.681	0	1	0.142	1.422	0.233
16	0.03	148.915	0	2	-0.026	1.47	0.48
17	0.011	149.096	0	3	-0.033	1.547	0.671
18	0.026	150.032	0	4	-0.068	1.889	0.756

Runs Test:

Table 4.2: Runs Test Results for KSE-100 Index			
KSE-100 Returns	**Daily**	**Weekly**	**Monthly**
Test Value (Mean)	0.1171	0.8525	2.3866
Total Cases	1385	173	67
Number of Runs	669	74	27
Z Statistics	-1.14	-1.737	-1.834
Asymp. Sig (2-tailed)	0.254	0.082	0.067

Table 2 contains the results of runs test for return series of KSE-100 index to supplement the empirical findings provided by auto-correlation test. These given Z statistics values are insignificant leading to the conclusion that independence between the consequent prices does not exist. Thus, this drives us to the conclusion that the null hypothesis, if judged solely on the basis of the results of the Runs test, needs to be rejected while the alternative hypothesis, Ha: "The returns are not independent over time", is accepted. The Runs test on the monthly returns of the KSE-100 index reveals that the Z value (-1.834) lies outside the two-tailed distribution. This shows that the null hypothesis is not true for this series. However, daily series of KSE-100 shows irregular results that null hypothesis is not to be rejected based on runs test but overall the returns showed dependence over time. The Z-statistic is negative throughout which implies that the actual runs are not suggestive of randomness, thereby indicating the existence of positive auto-correlation in the observed price data.

Overall Analysis of the KSE-100 Index:

Other than the odd irregularities it is proved that for this series the returns are not independent and the null hypothesis can be rejected. Thus, Ha: The returns are not independent over time and Ha: Autocorrelations are present over time stands true.

CONCLUSION

This study investigates into the evidence of weak form of market efficiency observed in Pakistan Stock Market (KSE). Several sophisticated tests such as serial correlation test, runs test, and Box-Ljung Statistics were used on historical prices of the KSE-100 Index, KSE-30 Index for the period of January 1, 2014 to August 28, 2019. The contemporary research provides for a mixed evidence on the theory of EMH for developing countries, therefore, testing EMH for the Pakistan Stock Market should be a worthwhile contribution. Although, there are some studies related to the examination of Pakistani stock market for the presence of weak-form efficiency, however, these studies used data limited time series of data to conduct only the runs test. Thus, examining the market efficiency at Pakistan Stock Exchange with a robust methodology should be a worthwhile experience. Indeed, market efficiency is a critical element of stock markets which allow them to contribute towards the smooth functioning of the entire financial system, which is much needed in emerging economies such as Pakistan. In case of KSE-100, auto-correlation coefficients were found to be significant at all lags for each of daily, weekly and monthly series. This was confirmed by the values of Box-Ljung Statistics which were above significant value. On the basis of runs test, which produced a negative value of Z-statistic, it may be claimed that there is a positive auto-correlation in the price data.

Moreover, both autocorrelation and runs tests clearly concluded for KSE-30 the non-existence of weak form efficiency.

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