Estimating the Stock Market as a Barometer of the Transition Economy: Evidence from Pakistan

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ABSTRACT
In 2004-2005, the Pakistani stock market has shown an unprecedented rise of 65% and a sharp decline of 32.7% in a week's time, which resulted in a loss of more than Rs.750 billion. The government and the critics have differently claimed the rise and fall of the stock market; according to the government officials, the rise is because of their effective economic management, and the critics claim it is organized corruption. The objective of this research is to check the truthfulness of the Karachi Stock Exchange (KSE) and verify its role as a "barometer of the economy." The results obtained through established and validated models suggested that the Karachi Stock Exchange (KSE) is informationally inefficient, supporting the critics' views regarding foul play by large investors in favor of government officials; therefore, the conclusion that "KSE is not a true barometer of the Pakistani economy" is reached despite the presence of regulatory measures and bodies such as the Securities and Exchange Commission of Pakistan, the Ministry of Finance, and the State Bank of Pakistan.

Introduction
The miraculous images of the stock exchanges for the economic health of a country make it possible for the investors to understand the flow of information from the firm to its listed prices and from prices to the economic condition of the country. The knowledge and understanding about the firm's performance in the past and in the future and its consequences on the economy as a whole are truly and only reflected through an efficient market. That is why the assumption prevails that "the stock index is a public barometer of expectations about an economy that is free for all of us to see." A stock index normally reveals the information about the firm's financial data, solvency and creditworthiness of companies, government policies and regulations, linkages with other local and global industries and markets, IPOs, stock splits, exchange rate fluctuation, and other macroeconomic indicators. The bottom line is that an efficient stock index reflects the overall health of the economy. However, an inefficient stock index is not verified to be a true representative of the economy, and this was proved mostly in the developing economies, where the regulatory outs create opportunities for the aware investors to beat the markets.
In 2004-2005, the Pakistani stock market saw an unprecedented rise of 65% and a sharp

decline of 32.7% in a week's time, which resulted in a loss of more than Rs. 750 billion. The government and critics have made differing claims about the reasons for the rise and fall of the stock market; government officials attribute the rise to their effective economic management, while critics argue that it resulted from organized corruption, where stocks were artificially inflated and then sold off to small investors. According to Inayat, Mangla, Jamshid, & Uppal (2007), the market rise was associated with good economic management of the government, which included the increased liquidity in the market, low interest rate, IPOs, floatation of mutual funds, acceleration in the privatization programs, and profitable public sector, which boosted the positive sentiments among investors and built their confidence in KSE. However, Managla and Uppal (2007) associate the fall of the market with Carry over Transaction (CoT, locally called BADLA Finance), which is open to a small number of investors and was provided for the short term. The rates on CoT were very high as compared to the open market, which ranged from 18% to 100% during 2004. In the task force report (2005), the strong nexus of lenders and brokers boosts the sentiments in the market through rumors and pumps the stocks for small investors. According to the report, the State Bank of Pakistan had reduced the borrowing rates to 5%, which was even lower than the 4 percent inflation rate at that time. As a result of the low interest rate, Rs. 1100 billion was directed to speculative activities instead of trade and industry. Now, considering both the views of supporters and critics, it is necessary to assess the authenticity of the Pakistan market at the point where an economic boost is indicated.

Literature Review
The tag "stock index as a barometer of the economy" manifests itself around an assumption of the strong relationship between stock index and economic indicators. The relationship between the real economic activities and the stock market is also confirmed by Giannellis, Nikolaos, Angelos Kanas and Athanasios P. Papadopoulos (2010). According to the authors the UK and US markets are strongly related to the real sector activities. The empirical evidence is extracted by using the EGARCH volatility model and the volatility spillover between the two sectors, interdependencies and asymmetric behavior of stock indices were concluded, showing the strong relationship between the economy and stock market indices. In the study of António Portugal, João Sousa and Adelaide Duarte (2010), the authors narrated how the exchange rate, monetary system and the economy is associated with stock indices and how the spillover effect in the form of a volatility move across different sectors. The authors concluded that the small and open economies in transition should consider the Portuguese integration process as an example. The spillover effect from one economic activity to another can also extend from one economy to another economy. The methodology of measuring such an effect is co-integration, which checks the long term relationship between and among different economic activities across different economies. This test is also used for the long term relationship of different stock and macro-economic indices. According to Jose Soares and Da Fonseca (2008), the European and non-European international indices are co-integrated.

The random walk hypothesis and the efficient market hypothesis are the close virtual and many authors used the random behavior of indices to confirm for the market efficiency e.g. Nikola Gradojević, Vladimir Djaković and Goran Andjelić (2010) applied the Lo & Mckinley variance ratio test on Euro / Serbian exchange rate returns and rejected the random behavior of the index. Upon the results the authors concluded the inefficiency and imperfection in the small economy such as Serbia. There are different reasons of market inefficiency which include the investor psyche, seasons & customs, thin trading, high

volatility, weak microstructure and illiquidity Živković, Boško and Jelena Minović (2010). However the authors considered the illiquidity is one of the major reasons of market inefficiency and it was evidenced from the Serbian stock market, where the liquidity was low and volatile which result stock market inefficiency.

Stock market efficiency got its importance in financial literature, when Eugene Fama documented his seminal work "The Behavior of Stock prices" in 1965 and in 1970 "Efficient Capital Market a Review of Theory and Empirical Work". The concept was also traced back to the beginning of the previous century in Bachelier's dissertation. The concept of efficient stock market is based on the assumption of competing freely with each other by estimating the future value of individual stocks, so it is necessary that all the investment community would know all those new information which are affecting the value of stocks. Therefore, any news / data affecting the prices of some stocks should be available to all investors, roughly in the same form. Hence, the market is said to be efficient, if market considered all the factors (information) that change stock prices and incorporates all those factors into stock prices and represent the best value of that stock at that specific moment. The faster the market adjusted to the new prices the greater will be the market efficiency. Therefore, no one can predict stock future prices on the basis of historical data or by using any sort of technical and fundamental analysis. Therefore, it is impossible to beat efficient market in the long run to earn an abnormal return. According to Fama (1976), in an efficient stock market, expected value of stocks is equal to stock intrinsic value and this value is the same what market evaluates for that specific stock. Hence, Fama (1965) annulled the possibility of any manipulation of stock values in an efficient market to earn an abnormal return.

Fama (1970) classified market efficiency in three categories namely, weak form, semi-strong form, and strong form. In the weak form of efficiency, stock prices reflect the past prices and previous trading history. The random walk model is used to document weak form of market efficiency. The random walk hypothesis is based on the assumption of independently and identically distribution of stock prices. Mathematically, we can express the random walk model as under;

$$P_t = P_{t-1} + \Delta P_t + \varepsilon_t \text{------------------------ (A)}$$

Therefore, from the equation 'A' we can interpret that today's price 'Pt' is dependent on the previous day's price 'Pt-1'; the value of 'ΔPt' represents the expected return on that stock, plus a random component 'εt' is also occurring over the interval. In the semi-strong form of market efficiency, the prices of stocks reflect not only the company-specific information but also the public information (stock splits, dividend announcements, etc.). In other words, if a market is efficient in its weak form, then one can check its semi-strong form, but in case of inefficiency in weak form, then there is no need to check the semi-strong form of market efficiency. In the strong form of market efficiency, the investors not only possess company-specific and public information but also monopolistic information (private information), provided there are no legal barriers to private information becoming public, for example, insider trading laws. According to Seyhun (1986, 1998), the strong form of market efficiency did not hold for any of the world stock markets with an uneven playing field. It means that the strong form of market efficiency is impossible, except in the case where the laws are universally ignored. In the strong form of market efficiency, it is assumed that no investor can earn abnormal returns for a longer horizon, and even inside information cannot provide the investors an edge to earn an abnormal return.

The theory of efficiency and performance is not only limited to the stock market, but it

also covers the banking and real sectors. According to Saadet, Kasman, and Adnan Kasman (2011), there is a strong relationship between the performance measure and banks' specific variables of efficiency. The authors concluded that changes in performance measures of banking variables have a positive and significant impact on stock returns.

Methodology
The Variance Ratio Test
According to Lo and McKinley (1988), the Variance Ratio test is derived with an assumption that, if the natural logarithm of a time series P_t is a pure random walk then the variance of its qth difference variable would be q times the variance of its first difference. In other words, the variance of its, q^{th} difference grows proportionally with the difference q.

Therefore, if we obtain n+1 observations P_o, P_1, P_2… P_n at equally spaced intervals then 1/q of the variance of P_t, P_{t-q} is expected to be the same as the variance of $P_t - P_{t-1}$.

The variance ratio, VR (q), is defined as

$$\text{VR} \quad (q) \quad = \frac{\sigma_q^2}{\sigma_1^2}$$

or

$$\frac{1}{q}\frac{Var(P_t - P_{t-q})}{Var(P_t - P_{t-1})} = 1$$

Where σ_q^2 is the unbiased estimator of 1/q of the variance of q_{th} difference of the logged stock return (P_t-P_{t-q}) and σ_1^2 is an unbiased estimator of the variance of the logged return (P_t-P_{t-1}). The computation of estimators σ_q^2 and σ_1^2 is given below:

$$\sigma_q^2 = \frac{1}{m}\sum_{t=q}^{n}(P_t - P_{t-q} - qu)^2$$

$$\sigma_1^2 = \frac{1}{n-1}\sum_{t=1}^{n}(P_t - P_{t-1} - u)^2$$

Where

$$m = q(nq - q + 1)(1 - \frac{q}{nq})$$

and

$$u = \frac{1}{nq}(P_{nq} - P_o)$$

P_o and P_{nq} are the first and last observation of the time series and 'n' is the sample size.

Z (q) test statistics under the assumption of homoscedasticity (equal variances) with asymptotic variance of the VR statistic $\phi(q)$ will be debelow and defined as under:

$$\phi(q) = \frac{2(2q-1)(q-1)}{3q(nq)}$$

And

$$Z(q) = \frac{VR(q)-1}{\sqrt{\phi(q)}} \rightarrow N(0,1)$$

There is a growing consensus among the finance empiricists that volatility is time varying and as documented by several researchers that variances of stock returns are conditionally hetroscedastic with respect to time. As a result, a linear relationship does not exist over the observation intervals. To overcome the difficulty of hetroscedasticity, Lo and McKinley (1988) derived the hetroscedasticity consistent variance estimator $\phi^*(q)$, which is given below:

$$^*(q) = \sum_{j=1}^{q}[\frac{2(q-j)}{q}]^2 \delta^\wedge(j)$$

Where

$$\delta^\wedge(J) = \frac{\sum_{t=j+1}^{q-1}(P_t - P_{t-1} - u)^2(P_{t-j} - P_{t-j-1} - \hat{u})^2}{[\sum_{t=1}^{nq}(P_t - P_{t-1} - \hat{u})^2]^2}$$

And finally VR statistic can be standardized asymptotically to a standard normal test statistic i.e. $Z^*(q)$ which is reported by Lo and McKinley (1988) and computed as under:

$$Z^*(q) = \frac{VR(q)-1}{\sqrt{\phi^*(q)}}.... \rightarrow N(0,1)$$

Returns Calculation
The daily closing values of the KSE index will be used for the approximate computation of the daily return with the assumption of trading done at the closing values. The natural logarithm of relative of daily index values is thus the measure of daily returns, which will be used in this study. Following is the formula:

$$R_t = Ln\left[\frac{I_t}{I_{t-1}}\right]$$

Where: R_t = daily return on day 't'
I_t = index closing value on day 't'
I_{t-1} = index closing value on day 't-1'
And   Ln= natural log

Descriptive Characteristics of the KSE Returns
The statistical theory, of normal distribution suggested that "A distribution of data is normal, if sample skewness and kurtosis are normal with zero skewness and kurtosis with a value of 3 and variance of statistics are equal to 6/T and 24/T, where T denoted the sample size. Moreover, Hildebrand (1986) suggested that absolute values above 0.2

indicated great skewness. Hopkins and weeks (1990) suggested that skewed distributions were always leptokurtic.

The descriptive statistics of KSE index returns are presented in Table no. 1. The visual inspection of the figures suggested that the average returns are positive, the distributions of stock returns were skewed and leptokurtic and hence complied with the study of Hopkins and Weeks (1990). Hence, the skewness and kurtosis of the index returns suggested, that the KSE index returns are not confirming with null hypothesis of symmetric (zero skewness) and normal distribution (excess Kurtosis is equal to zero). Jarque-Bera (JB) statistics has also confirmed the skewed and leptokurtic (non-normal) distribution of the KSE stock returns and rejected the null hypotheses of zero skewness and normal distribution of KSE index returns.

The Weak Form of Market Efficiency
The researchers have substantiated on the higher power of the Lo and McKinley variance ratio (VR) test as compared with its close counterpart the unit root test and auto-correlation method. Lo and McKinley (1989), used the Monte Carlo experiment and verified through empirical evidences that VR is more efficient, reliable and powerful tool than Dickey Fuller, and Box-Pierce Q tests. According to Pant & Bishnoi (2002), the non-random behaviour arose on the account of mean reverting property of stock indices, autocorrelation and hetroscedasticity would not be blamed alone for the non-random behaviour. Pant & Bishnoi (2002) had also emphasized on the high power of the variance ratio test instead of any standard unit root test.

The results indicated that KSE is not following a Random walk and hence the KSE is not informational efficient in the observed data set. This also led to the initial assumption made for the study i.e. inefficient market is not a true representative of the economy. The results are consistent with early studies of Kamal & Rehman (2006), Abass (2004) and Hussein (1996).

Conclusion
The strict intervention policies of the international donors have restricted the fiscal and monetary freedom of the developing countries. Essential development of specific sectors is not possible in the presence of such policies. The Stock market is one of the substitute sources of funds available to the developing countries. That is why the researchers are investigating the behaviour of stock prices as they know the importance of the capital market in the economic progress of any country.

A dynamic private sector and an efficient capital market will play a vital role in the economic growth of any country provided the stock market represents a true picture of the economy. The Capital markets mobilize the economic resources from savings to production activities. The production activities of the companies have a significant impact on the stock market, provided it shows the informational efficiency. Hence, a dynamic and vibrant private sector is required to fulfil the resource requirements of the country and to diminish the role of the international donors in the Pakistani economy. For the effective role of capital market, the government of Pakistan has to take measures to promote the private sector as well as to make the stock market efficient. Any regulation or legislation thereof must increase the efficiency of the Pakistani capital market.

The results of the study regarding stock index as a barometer of the economy and the level of market efficiency are concluded as;

The Upward Trend, Trueness and Stock Market Efficiency

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The bullish trend in KSE in were associated with the privatization of government firms and businesses, entry of the Financial Institutional Investors (FII's) into KSE, Foreign exchange were received through banks instead of other channels which somehow solve the foreign reserve and liquidity problem of the country and the credit rating of Pakistan were increased due to which the confidence of the foreign investors were built to invest in Pakistan.. Moreover, due to investor friendly policies of the State Bank of Pakistan (SBP) the interest rates and inflation rates were kept controlled due to which saving of the small investors were raised, which had been diverted to investment activities rather in spending activities, which triggered the sentiments of the KSE in positive notes. Moreover, Pakistan went through financial sector reforms during the last two decades; these include the major events of the opening of the Pakistani stock market for foreign investors and the adaptation of flexible exchange rate system. Both of these events has brought a sharp increase in the inflows of portfolio investment, which further help to rise the invest-able funds and it also produce highest trading activities in Pakistani markets. This is what this research concluded for that upward trend in KSE in 2004 and 2005.

However, the trueness of the index reveal the other story, as it was known that the rejection of the random walk is associated with the existence of positive serial correlation in successive returns, which also indicate the dependency of stock returns and the rejection of random walk provided evidence to reject the weak form of market efficiency and the possibility of future returns prediction is arises and the trueness of the market evaporated. Hence after applying the variance ratio test, we reject the random walk and the weak form of market efficiency in the KSE. The rejection hinted about the KSE-100 index is not a true barometer of the Pakistani economy. The understanding developing from this study indicates the flow of private and public money to speculative activities only in the stock market and the very important listed firms production activities were least considered. As a result the stock market grows without showing its impact on economic activities and economic growth. The possible reasons of this market inefficiency are thin trading, low regulatory framework, weak microstructure, low level of investors' knowledge, concentrated in BADLA finance, mutual structure and fragmented market are the major reasons.

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APPENDICES

Table 1
Descriptive Statistics
KSE 100 index Returns

Statistics	KSE Returns
Mean	0.0017
Median	0.0026
Maximum	0.0851
Minimum	-0.0774
Std. Dev.	0.0161
Skew ness	-0.4158
Kurtosis	5.47
Variance	0.0003
Jarque-Bera	322
Probability	0.000
Observations	1140

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Table no 2
Variance Ratio Statistics KSE

Number of observations	Horizon q	VRq	test stat Zq	sign-level	test stat Zq*	Sign-level
1139	2	0.547	-15.28	0.000	-10.097	0.000
1139	4	0.266	-13.23	0.000	-8.971	0.000
1139	8	0.129	-9.933	0.000	-7.072	0.000
1139	12	0.088	-8.208	0.000	-6.054	0.000
1139	16	0.064	-7.174	0.000	-5.400	0.000
1139	20	0.052	-6.437	0.000	-4.929	0.000
1139	24	0.048	-5.866	0.000	-4.558	0.000
1139	28	0.038	-5.459	0.000	-4.298	0.000
1139	32	0.032	-5.121	0.000	-4.082	0.000
1139	36	0.029	-4.832	0.000	-3.896	0.000
1139	40	0.027	-4.584	0.000	-3.735	0.000