

INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, ECONOMICS & MANAGEMENT

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WEAK-FORM OF EFFICIENCY IN CHINESE STOCK MARKET

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ABSTRACT

Stock prices fully reflect all available information in Efficient Market Hypothesis (EMH). The Market here is so rational and random. The historic prices are not useful in predicting the future price movements in the weak form of efficiency. It is difficult to form trading strategy for abnormal returns. China, an emerging market is in the limelight because of her spectacular economic growth in the recent years. It is generally believed that emerging markets are less efficient, though; the empirical evidences are for and against. After 2003 almost all emerging markets witnessed tremendous growth, including returns in the stock market. In this paper an attempt is made to analyze the weak form of efficiency in the emerging market, Chinese stock market. The study involving the time period of January 2004 to February 2012, reveals that the stock returns are independent of each other. This is tested using serial correlation tests for low degree of serial correlation in the market return. Ljung – Box Q (LBQ) Statistics, Augmented Dickey Fuller (ADF) test, Run test and Phillips-Perron (PP) tests are used for checking the serial correlation coefficient and the market is found to be in efficient form. This is in line with some of earlier finding.

KEYWORDS

Auto Correlation, Efficient Market Hypothesis, Random Walk, Serial Correlation, Weak Form of Efficiency.

INTRODUCTION

Stock markets behave in rational way and the stock prices fully reflect all available information, in efficient market hypothesis (EMH). Stock prices adjust to the new information as and when that information is available¹. In weak-form of efficient market, price changes are random and past price changes are not useful in forecasting future price changes after adjusting for transactions costs. In these markets, successive returns are independent of each other and follow a random walk (Fama 1965, 1970)². It is generally believed that emerging markets are less efficient, though, the empirical evidences are for and against this belief. Because of this property, there occurs no anomaly in any form in the market which makes it difficult to form trading strategy for abnormal returns. In emerging market studies, many have tested the efficiency of the markets during various time periods and come out with stating, either a stock market is in the weak form or not. But no one could conclude that a particular market is (in) efficient for its entire life period. After 2003 almost all emerging markets witnessed tremendous growth, including returns in the stock market. China, an emerging market is in the limelight because of her spectacular economic growth in the recent years. In this paper an attempt is made to analyze the weak form of efficiency in the emerging market, Chinese stock market. The basic objective here is to assess whether stock prices in the Chinese stock market move in random, or, the Chinese stock market mechanism is efficient. This is to empirically test whether the weak form of efficient market hypothesis holds good in Chinese stock market.

LITERATURE REVIEW

Weak form of efficiency is found in developing and emerging markets like the Kuala Lumpur Stock Exchange (Branes, 1986), Asian markets (Chan, Gup and Pan, 1992), the Nairobi Stock Exchange (Dickinson and Muragu, 1999), the Latin American countries market (Ojah and Karemera, 1999), seven European emerging stocks markets (Hassan et al. 2006), Botswana (Akinkugbe, 2005), Russia (Abrosimova et al., 2005) and The United Arab Emirates (Moustafa, 2004). Indian stock market exhibits weak form of efficiency over varying time periods (Rao and Mukherjee, 1971; Dhankar, 1991; Mittal, 1995; Mishra, 2009; and Gupta and Basu 2007). weak form of efficiency in Chinese market is claimed by Liu et al. (1997), Laurence et al. (1997), and Lima and Tabak (2004).

At the same time inefficiency in weak-forms are reported across the stock market like Korea and Taiwan (Cheung, Wong and Ho, 1993), 19 emerging markets (Claessens, Dasgupta and Glen, 1995; Harvey, 1994), Saudi Financial market (Nourrrendine Kababa, 1998), the Johannesburg stock Exchange (Roux and Gilbertson, 1978; Poshakwale S, 1996), Bangladesh (Islam & Khaled, 2005) and Turkey (Tas and Dursonoglu, 2005). In India (Chaudhary, 1991; Kulkarni, 1978; Subramanian, 1993) and in china (Mookerjee and Yu, 1999 and Ma, 2004) there are few studies which did not support the weak efficiency hypothesis. In all these studies

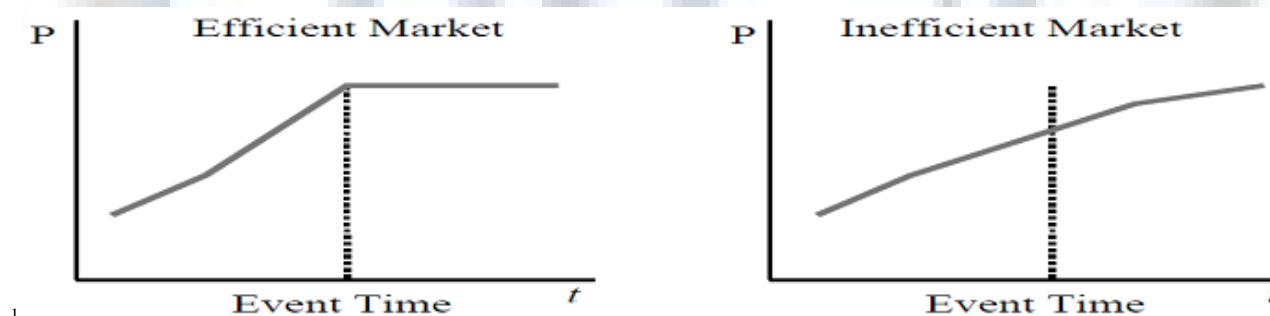


FIG. 1: MARKET REACTION TO AN EVENT

The Above figures shows the situation of market, in case of an event, if the market is efficient, stock prices immediately reflect effect of new event, but it will take some time for the prices to adjust for new information, if the market is not efficient.

² Fama (1970) defined efficient market as a market as a market with large numbers of rational profit maximizing individuals actively competing with each other and doing attempts to predict future market values of individual securities, and where all important relevant information is almost freely available to all investors.

whether the stock market is in the weak form or not is being analyzed for a specific time frame. For the recent period, the stock market mechanism of China is being tested for efficiency in this study to add further literature in this direction.

METHODOLOGY

To test the weak form of efficiency in the Chinese stock market, the monthly market index sse-50, which is a weight adjusted composite price index, considering 50 largest stocks of good liquidity and representativeness by scientific and objective method, is considered. This reflects the complete picture of good quality large enterprises, which are most influential in Shanghai security market. These data are obtained from the Shanghai stock exchange's official website for the period January 2004 to Feb 2012, since the index was introduced in December 2003. The objective of the study is to identify observable interdependence and non-randomness in the market return. This could be tested for low degree of serial correlation in the market return.

This low degree of serial correlation in index returns suggest that stock index prices in the markets violates weak form of efficient market hypothesis (EMH). The computation of index return is done by calculating the percentage value of log variation in stock index.

Autocorrelation, otherwise called serial correlation test is the tool for checking randomness. It is a measure for testing the dependence between the members of series of observation in time order. This is widely used to notice any perceptible trend in index price movements. Serial correlation test measures whether the correlation coefficient between a series of returns and lagged returns in the same series, are significantly different from zero. A serial correlation of zero implies that price changes in consecutive time periods are not correlated and future price changes cannot be predicted from the past data. A significant positive serial correlation could be viewed as evidence of price momentum in markets. Serial correlation coefficients provide a measure of relationship between value of random variable 'X', in time 't' and its value k-periods earlier.

Both parametric and non parametric tests could be used calculate the Serial correlation coefficient. Ljung – Box Q (LBQ) Statistics, Augmented Dickey Fuller (ADF) test are some of the parametric methods of calculating the serial correlation coefficient. Run test and Phillips-Perron (PP) tests are non parametric tests used for the calculation of serial correlation coefficient. LBQ Statistics measures correlation between index changes in consecutive time period. LBQ is more powerful in small sample properties with a chi-square distribution of m degree of freedom. If the Q statistic is significant, then the series can be identified as random in nature. The LBQ is calculated as,

$$Q = n(n+2) \sum_{k=1}^h \frac{\hat{\rho}_k^2}{n-k} \dots\dots\dots(1)$$

The Runs Test for Randomness is a non parametric test which does not require returns to be normally distributed. A 'run' is defined as "a succession of identical symbols which are followed or preceded by different symbols or no symbol at all". When the expected number of run is significantly different from the observed number of runs, there is no randomness the series. The expected number of runs is represented by:

$$E(r) = \frac{n + 2n_a n_b}{n} \dots\dots\dots(2)$$

Where n represents the number of observations, n_a and n_b respectively represent observations above and below the sample mean (or median), and r represents the observed number of runs.

The random walk nature of stock prices can also be tested by Unit Root Test³. A series with unit root is said to be non-stationary indicating nonrandom walk. The most commonly used test to examine the existence of a unit root is Augmented Dickey-Fuller (ADF) test which includes additional lagged difference terms. ADF is a modified Dickey-Fuller (DF) test with a parametric correction for higher order correlation to take care of possible serial correlation in the error terms. In ADF the following regression equation is estimated with u_t as pure white noise error term.

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i Y_{t-i} + u_t \dots\dots\dots(3)$$

Phillips-Perron (PP) test is an AR(1) process which takes care of the serial correlation in the error terms in the nonparametric statistical method (Gujarati, 1988). As a condition for a random walk, the ADF and PP unit root tests if fails to reject the presence of unit roots, then there is no evidence against weak form of efficiency.

EMPIRICAL ANALYSIS

The descriptive analysis shows that the return on stock index price of sse-50, ranges between +3.26 to -4.14 with a mean and standard deviation of 0.08 and 1.30 respectively (Fig.2). The stock index prices are ranging between 4627 and 731 with a mean of 1822. From the Box-Ljung test, (Table. 1) except for the first lag, the LBQ statistics are significant. From 10th lag onwards significant negative serial correlation is present and as lag length increases, the significance level also increases. This indicates that the future prices are not dependent on historic prices and they are in random. So the market is in the weak form of efficiency.

³ A random walk is a special case of a unit root process.

FIG. 2: DESCRIPTIVE STATISTICS

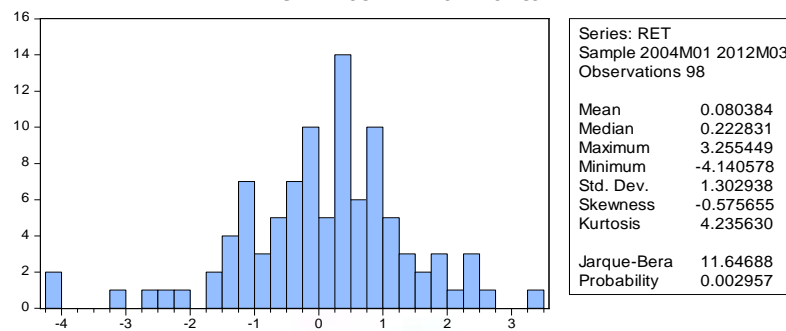


TABLE 1: AUTOCORRELATIONS - SERIES:RET

Lag	Autocorrelation	Box-Ljung Statistic	Sig.
1	.128	1.658	Not sig.
2	.189	5.286	***
3	.131	7.069	***
4	.307	16.871	*
5	.088	17.679	*
6	.000	17.679	*
7	.098	18.710	*
8	.032	18.818	**
9	.009	18.826	**
10	-.032	18.942	**
11	-.037	19.095	***
12	-.142	21.389	**
13	-.229	27.422	**
14	-.285	36.891	*
15	.027	36.979	*
16	-.082	37.780	*

*, **, *** are significance at 1%, 5% and 10% respectively

The *t* values are significant at level and at difference in the ADF test and PP test (Table. 2). From the run test the number of runs is significantly different from observed number of runs (Table.3). So the return series is in random, which is in line with the LBQ test. The market is in the weak form of efficiency.

TABLE 2: AUGMENTED DICKEY-FULLER & PHILLIPS-PERRON TEST STATISTIC

	Augmented Dickey-Fuller test		Phillips-Perron test	
	t-Statistic	Prob.	t-Statistic	Prob.
Level	-2.900102	0.0491**	-8.825684	0.0000*
Difference	-10.98603	0.0000*	-55.23802	0.0001*

*, **, *** are significance at 1%, 5% and 10% respectively

TABLE 3: RUNS TEST

Particulars	
Test Value (Median)	.2228
Cases < Test Value	49
Cases >= Test Value	49
Total Cases	98
Number of Runs	38
Z	-2.437
Asymp. Sig. (2-tailed)	.015
	**

*, **, *** are significance at 1%, 5% and 10% respectively

CONCLUSION

Weak form of efficient market which behaves in rational way usually has its market return in random. This is because the information is fully reflected in the stock prices and the successive stock returns are independent of each other. Depending on the time frame the market may be either in the weak form of efficiency or not. During late 1990's and early 2000's studies claim the Chinese stock market to be in the weak form of efficiency and some to be not in the weak form. But majority of the studies claim the market to be efficient. In the present study which involves the time period of January 2004 to February 2012 reveals that the stock returns are independent of each other. This is tested using serial correlation tests. So the market is in efficient form. This is in line with the other earlier finding of Liu *et al.* (1997), Laurence *et al.* (1997) and Lima and Tabak (2004). The price discovery mechanism is fully efficient. The investors could not formulate any investment strategy for abnormal returns in the market. The historic prices are not useful in predicting the future price movements. This could be tested for seasonal anomaly in the market return. Further study could be done on the calendar anomaly in the Chinese market so as to reconfirm that the

market is in the weak form of efficiency. Also the time periods of study includes the financial crisis period of 2008. The impact of this crisis is felt all over the globe. Its impact on the efficiency front is not discussed in this paper. Elaborate study could be done on the changes in the efficiency of the market because of the crisis.

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