

Random Walk Hypothesis and Market Efficiency of Shanghai Stock Exchange

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ABSTRACT

The financial market consists of the money markets and capital markets. The capital market apart from the primary market also includes where securities issued in the past are traded. The secondary market is called the stock market. It deals with stock and equity shares. The efficiency of the financial market depends upon how quickly the market assimilates new information. In a weak form of efficient market current price reflects all the information contained in the past prices. A market is said to be efficient when the stock prices fully reflect all the available information were making abnormal profit is impossible. Any fresh information that helps to alter the prospect of the organization's potential profitability must instantly be displayed in the stock prices without delay. The SSE Composite Index is also known as SSE Index. The study examines the random walk and market efficiency of the Shanghai Composite Stock Exchange. The study considered data based on the daily time series data from the period April 2015 to March 2022. In the study applied various statistical tools and techniques including serial correlation, run test, Augmented Dickey-Fuller (ADF) test, and Phillips-Perron (PP) test. It is observed that the null hypothesis of the daily returns of the indices is rejected and accepted. The main objectives of the paper testing the random walk and market efficiency of the Shanghai Stock Exchange. The results indicate follow the random walk and market efficiency of the Stock Exchange.

Keywords: Random Walk, Efficiency, Stock Exchange, Run test, ADF test and PP test.

I. INTRODUCTION:

The financial market consists of the money markets and capital markets. The capital market apart from the primary market also includes where securities issued in the past are traded. These secondary markets are called stock markets or stock exchanges. It deals with stock and equity

shares. The efficiency of the financial market depends upon how quickly the market assimilates new information. In a weak form of efficient market current price reflects all the information contained in the past prices. A market is said to be efficient when the stock prices fully reflect all the available information where the making of abnormal profit is impossible. Any fresh information that helps to alter the prospect of the organization's potential profitability must instantly be displayed in the stock prices without delay. The Shanghai Composite Stock Exchange is Asia's biggest stock exchange and it is also the world's 3rd largest stock market. The Shanghai Composite Stock Exchanges' first share was listed in June 1866. The Shanghai Composite Stock Exchanges is known as SSE Composite Index and SSE Index is a stock market index. The stock market had developed the conditions conducive to the emergence of international settlement of the stock market such as a joint stock market, several banks, and an interest in diversification among the established trading houses. The Shanghai Stock Exchange is the largest market by market capitalization at US\$7.62 trillion as of July 2021. The Shanghai Stock Exchange (SSE) is China Stock Market. It is one of the three stock exchanges operating independently in mainland China, the others being the Beijing Stock Exchange and the Exchange. The study examines the random walk and market efficiency of the Shanghai Composite Stock Exchange by considering the daily closing index prices.

The remaining of the paper is designed into six sections. The literature Review is described in second section. The third Section deals with data and study period. The fourth Section describes the methodology. The fifth Section analyses the result and finally, the sixth section ends with conclusion.

II. LITERATURE REVIEW:

Butler (1992) examines the market efficiency of thinly traded stock markets in Kuwait and Saudi Arabia by taken into consideration of daily closing prices over the period from 1985 to 1989. The study shows that allocation efficiency plays a vital role in the Saudi stock market. There is a significant autocorrelation is found between the individual stocks. Kuwait has developed a centralized auction-based stock exchange. On the other side, Saudi Arabia grants a brokerage monopoly to twelve banks through the over-the-counter market.

Ford (2003) investigates asymmetric nature of return distribution of thirty publicly traded stocks that has been taken from S & P 500 index by considering 251 daily returns for the year 2002 and the data is collected from the website of yahoo finance. Here, the study uses ordinary least square technique. McAleer et al., (2003) examines the integration and contagion effect of exchange rates of ASEAN regions over a period from 1994 to 2002 by considering 2273 daily observations. Here the ASEAN region consists of Indonesia, Malaysia, the Philippines, Singapore and Thailand. The study uses an econometric equation by incorporating dummy variable in the model. They observe that the establishment of common currency is possible only when the disturbances are in similar nature. Finally, they establish that the degree of association among the ASEAN countries is increased during the financial downturn. Worthington et al., (2003) investigates the weak form of market efficiency of seven Latin American equity markets namely Argentina, Brazil, Chile, Columbia, Mexico, Peru and Venezuela by taken into consideration the daily data from Morgan Stanley Capital International (MSCI) during the period from 31-Dec-1987 and 28-May-2003. The study uses many tools and techniques like serial correlation coefficient, runs tests, Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests and multiple variance ratio (MVR) tests. The study opines that the markets don't follow random walk and informationally inefficient. In the same fashion, Tas et al., (2005) examines the behavior of stock prices of the Istanbul Stock Exchange (ISE 30) index over a period from January 1995 to January 2004 by considering the daily stock returns and the data is obtained from the official website of the respective stock exchange. The study applies various statistical and econometric tools and techniques like D-F test for examining the weak form of market efficiency. The study also applies runs test. It is found that the ISE-30 index is inefficient in its

weak form and it is also evident from runs test. The study also reports about rejection of random walk hypothesis. They also suggest that the past stock prices may be helpful to predict the future prices and also abnormal gain is possible. John et al., (2007) examines the unit roots in macroeconomic time series which now a day's received a great amount of attention both in theoretical and applied research. In this study, Nelson and Plosser (1982) methods are used and considered 14 macroeconomic variables from the United States of America over the period from 1909 to 1970. The study also applies standard ADF test. The study applies various endogenous tests to examine the structural break in the time series data which is also examined by Lee and Strazicich (2003), Nelson and Plosser's (1982) and Lumsdaine and Papell (1997). It is found that there is no strong rule to apply an appropriate methodology for performing unit root tests or no consensus about the empirical results of unit root tests has emerged from this survey. The development of testing for unit roots with structural breaks in the univariate framework raises a question of incorporation of breaks in the co-integration framework. Torun et al., (2008) examines the market efficiency of the stock markets by considering eleven countries from European Union over a period from January 1999 to December 2006. The study uses various statistical tools and techniques like Panel unit root tests, co-integration and causality analysis. The study reports that few countries are not informationally efficient in their semi-strong forms. The study also observes uni-directional causality relationship between purchasing power of Euro and inflation rates to stock exchange returns and stock exchange returns to unemployment rates. Khan, A.Q., et al., (2011) examines the weak-form efficiency of the Indian Capital market based on the two major stock exchanges of India such as NSE and BSE. In the study, data considers from the respective websites of NSE and BSE and also taken from the publications of the Reserve Bank of India (RBI) that is the Monthly Bulletin and the Handbook of Statistics. The Data consists of daily closing prices of two major stock indices of India which are the BSE Sensex and S&P CNX Nifty for the period from 1st April 2000 to 31st March 2010. The study uses various tests and techniques such as non-parametric tests (run tests). The study found that both NSE and BSE reject the random walk and support the market is not weak-form market efficiency. The study suggests to investors can't determine the movement of the present stock prices or anticipate future movements in price and volume. Also, suggest the investors cannot make a

profit relying on this model. Afego, P., (2012) examines weak-form efficient markets hypothesis for the Nigerian stock market. In the study data considers the monthly index returns, the index use is in local currency and the data consists of 305 observations spanning the period from February 1984 to June 2009. The study applies various tools and techniques such as the Kolmogorov-Smirnov (K-S) goodness of fit test and nonparametric test (Run test) and Normality Tests. The study found that in general, contradicts the weak-form of the efficient markets hypothesis. The study results that stock price changes on the NSE are not random and that exploitable patterns exist, making it possible for arbitrage portfolios to be constructed based on trading rules. This observation contradicts the weak form of the EMH. The study suggestions that establishing the profitability of trading rules on the NSE, after accounting for trading costs, opens up a potentially interesting area. Ali et al., (2013) analyses the random walk and weak form of market efficiency of SAARC countries namely Pakistan, India, Srilanka and Bangladesh. Therefore, they consider daily, weekly as well as monthly time series data which are obtained from the official websites of the respective stock markets over a period from January 2005 to December 2010. The study applies Autocorrelation test, Ljung-Box Q-Statistic, Run test, Unit root test, variable ratio test and J-B test statistics. It is observed that the time series data follow normal distribution based on J-B test. They also observe that the time series data have unit root problem meaning based on ADF and P-P tests meaning that null hypothesis is accepted here or in other words stock market doesn't follow random walk. Finally, they also suggest that abnormal gain is possible from these markets. Senthilnathan (2015) examines the market efficiency of the Asia and Pacific regions countries. The study considers that efficient market hypothesis may be considered as model and the countries may devise strategies to make their markets efficient. This study also indicates that the countries having efficient markets pay attention on monitoring and evaluation to keep the market efficient in line with the dynamic changes in the environment. This study also supports the existence of a weak-form of market efficiency, since the market efficiency depends on various factors, including knowledge and actions of investors.

III. DATA & STUDY PERIOD:

The study is based on secondary data. Data considers daily closing value of the Shanghai

Composite Stock Exchanges. The daily data is obtained from the official website of SSE Composite Index. Data are collected over a period from April 2015 to March 2022

IV. METHODOLOGY:

In the study the measures to test the efficiency and random walk hypothesis applied various econometrics tools and techniques including serial correlation, run test, Augmented Dickey-Fuller (ADF) test, and Phillips-Perron (PP) test.

Serial Correlation

Autocorrelation is also called Serial Correlation. It is calculate the correlation coefficient between lagged returns and returns of series the same series. The relational ship of a significant positive autocorrelation leads to believe that exists in the trend. Autocorrelation has been the most commonly used test for the measurement of randomness.

Runs Test

Runs test is a non-parametric statistical test, in which the number is calculated and compared against its sampling distribution under the random walk hypothesis. It is a sequence of successive alteration of the logarithmic rate of returns with positive or negative signs (+ or -) and a state of affairs when the change is zero. Fama (1965), among other indicators, used run tests to test the RWH of stock price movements.

$$ER = \frac{U(U-1) - \sum_{i=1}^3 s_i^2}{U}$$

Unit Root Test

Unit root test has been employed to test that time series is non-stationarity, a condition for a random walk that supports weak form efficiency for the given market. This particular methodology was put forwarded by Dicky and Fuller (1981) to examine the stationarity of financial time series. A series will be said in a stationary state if the auto covariance and the mean value do not depend on time. In addition to the above, series with a unit root is indicating a nonrandom walk because unit root indicates no stationary implies that if the data points move away from the past mean for long time periods. The most commonly employed tests to examine the unit root are

- (i) Augmented Dickey-Fuller test and
- (ii) Phillips-Perron test.

Augmented Dickey-Fuller (ADF) test

The Augmented Dickey-Fuller (ADF) test finds out the possibility or existence of unit root by employing an autoregressive (AR) model.

$$\Delta \ln R_{SSE,t} = \alpha_0 + \beta_{i,t-1} \sum_{i=1}^q \Delta \ln R_{SSE,t-1} + e_t$$

Phillips-Perron (PP) test

The Phillips-Perron (PP) test also applies to check out the stationarity of the time series. The Phillips-Perron (PP) test is considered a less strict test than of ADF test and it works under the assumption that the error terms are heterogeneously distributed.

$$\Delta \ln R_{SSE,t} = \alpha_0 + \alpha_{1t} + \beta_0 \ln R_{SSE,t-1} + \lambda_i \sum_{i=1}^q \Delta \ln R_{SSE,t-1} + e_t$$

V. Result & Analysis:

Graphical presentation

Figure 1 that the daily returns of the SSE indices over the period from April 2015 to March 2022.



Figure: 1. Shanghai Composite Stock Exchange (SSE)

Table.1: Descriptive Statistics

Index	OB	Mean	Median	Max.	Min.	Standard Deviation	Skewness	Kurtosis	J-B	P-Value
SSE	1703	3.5046	3.5034	3.7131	3.3917	0.0499	0.7444	4.7812	382.4185	0.0000

The results relating to descriptive statistic show that Shanghai Composite Stock Exchanges is negative skewed with very low mean and variance suggesting lower expected returns and risk. The measure of kurtosis suggests that the daily index return series in Shanghai Composite Stock

Exchanges has fatter tails than the normal distribution over the period. This is termed as Lepto-kurtosis, or simply fat tails Jarque-Bera (JB) statistic with significant p value indicates that the return series are not normal.

Table 2 Unit Root Tests

Index	ADF Test				PP Test			
	Level		1 st Difference		Level		1 st Difference	
	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.	t-stat.	Prob.
InSSE	-2.7258	0.0698	-39.1874	0.0000	-2.8310	0.0542	-39.1641	0.0000

*significant at 5% level

Source: Authors' own calculation

The outcome of unit root test based on two approaches is presented in table 2. It is observed that the test statistic based on ADF and PP tests is insignificant in level form in both the logarithmic

rate of return series of the indices that means the series are non-stationary. But they become stationary when difference operator is taken and therefore, null hypothesis of unit root is rejected

meaning that daily logarithmic rate of return series of the indices is stationary and don't follow random walk and market efficient and thus the markets is inefficient at their weak forms.

VI. CONCLUSION:

The study has examined the market efficiency and random walk of the Shanghai Composite Stock exchange over a period from 2015 to 2022. It has been observed from the study that the stock exchange follows weak form of market efficiency during the study period. Finally, it may be opined that the Shanghai Composite index is not efficient in its strong form but the result is acceptable although. Here, the result is insightful for the financial planner, policymakers and investors for the investment point of view. Moreover, the researchers may conduct further studies by considering other financial markets.

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