International Journal of Management, IT & Engineering
Vol. 8 Issue 4, April 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

A WEAK-FORM EFFICIENCY ANALYSIS OF ASIAN STOCK MARKETS

Dr.Rupinder Katoch*

Abstract

The concept of efficient market hypothesis has remained the focus of the researchers of Finance ever since it has been proposed by Fama in 1965. Many researchers from time to time have analyzed the capital market efficiency of different countries of the world. The present study has analyzed and compared the efficiency of the Asian capital markets. Adjusted Daily closing prices of the most important Asian countries Japan, China, Singapaore, Hongkong, and India for the period ranging between 01/01/2008 to 31/12/2017 have been taken into consideration in order to test the weak form of market efficiency. Descriptive Statistics, ADF test, Auto-Correlation test, BOX-PIERCE TEST (Q), Jarque-Bera Statistic and Runs test have been used in order to reach the results. The results of tests of normality viz, Skewness, Kurtosis, Jarque Bera Statistics reject the null hypothesis that monthly index returns follow a normal distribution for the entire analyzed indexes. The tests for stationarity viz. Augmented Dickey-Fuller test contradict the random walk theory and the tests for independence and randomness viz. Auto-correlation and Runs test fully support randomness in stock price series.The study provides vital indications to stock market players as far as the trading/investing in the capital markets of Asia is concerned.

Keywords:

Auto-correlation Test;

ADF Test;

Runs Test;

Weak-form of efficiency;

Normality;

* **Former Principal,Sant Baba Bhag Singh Post Graduate College,District Jalandhar,Punjab,India**

1. Introduction

1.1. An Overview of Asian Market

In a global economy, plenty of opportunities are available to invest outside of North America and Europe. Asia, in particular, is offering a host of interesting investment opportunities. Also, it is home to robust financial markets representing trillions of dollars. Emerging markets like China and India are fast becoming engines for future growth. Investing in Asia provides access to a significant portion of the world's stock markets in a fast-growing, exciting region. The regions of Asia are divided into developed and developing economies. The highly developed countries include Japan and the four countries often referred to as the Asian Tigers - Hong Kong, Singapore, South Korea and Taiwan. Major players among the other powerhouses include Russia, China, India and Malaysia. These other nations are major economic forces. Historically, Asian Stock markets have been in existence for more than 100 years. But they could rise to prominence until after World War II. Japan set the pace with protectionist policies, and a strong central-government-led development effort that turned the country into an exporting powerhouse. In time, its neighbors soon took notice of the trend. A host of other nations, including Hong Kong, Singapore, South Korea, Taiwan, Vietnam, Thailand, India and China, began a period of rapid industrialization in the early 1960s that continued through the 21st Century. These nations entered the global marketplace by exporting mass-produced products and then, over time, many of them evolved their efforts to enter the high-tech arena. With the injection of large amounts of foreign investment capital, the Asian Tiger economies grew substantially between the late 1980s and early- to mid-1990s. Cross-industry growth continued until 1997 when Asia was struck with the financial crisis. Since the late 1990s, these economies have recovered. Korea is a prime example of a country that emerged from the turmoil to become a dominant player in international markets, as the country has become a technology powerhouse. With a high emphasis on education, South Korea is one of the world leaders in the robotics, biotechnology and aerospace research fields. China and India are following suite, as they work their way through the same development process. At the end of 2010, the Asian economies were still booming. China, South Korea, Thailand, Indonesia and Malaysia are exporting powerhouses. Gross domestic product is rising in these nations and so are the investment opportunities. Double-digit stock market returns have left Western markets in the dust over the past decade, and investors are taking notice. South Korea's Kospi sits at a record; Japan's Nikkei

225 index is above a two-decade high; Hong Kong's Hang Seng is around a 10-year peak, while markets in India, Taiwan and Indonesia are among the others scaling fresh heights. Therefore the Asian stock market, more than ever before, is increasingly becoming one of the most popular investments outlets in recent times due to its high returns. The development of Asia and the cross-border flow of capital globally present a host of opportunities for investors. However, Asian financial markets, particularly within developing economies, are still generally less mature and less regulated than markets in America or Europe. The wide variety of financial products is available in developed countries outside Asia. Regulatory reforms in Asian financial markets also lag Western markets, and political factors can play a role, particularly in less developed economies where government intervention can be heavy. The operating differences and regulatory differences all serve as reminders of the need for investors to conduct research and give careful consideration to any investment before adding it to their portfolios. (Smith)

1.2. Efficient Market Hypothesis and Investment implications

The efficiency of stock markets has remained a major area of research for researchers in financial economics. A stock market can win the faith of investors only if it is efficient viz. it can assure investors of fair returns. Capital market efficiency has great implications on the functioning of the capital markets as it affects investors' returns and thus stimulates investor's interest in market activities. A number of econometric techniques of model building have been applied in stock market for forecasting. According to Fama (1965), a stock market where successive price changes in individual securities are independent is by their definition, a random walk market. Therefore the knowledge of the past behaviour of the series of price changes cannot be used to increase expected gains (Aguebor, etal 2010). In an active market made up of knowledgeable investors, securities will be fairly priced to reflect all available information (Fama, 1965). If a market is efficient then the security price, at any given time, will fully incorporate all available information and thus make it impossible for any investor to outperform the market. This study therefore aims to test the weak form of efficient market hypothesis in the Asian capital market with a view to determining whether the Asian capital market is efficient or not; and to determining whether the Asian capital market provides investors with fair returns on their investments or otherwise.The main objective of the study is to test the weak form of the efficient market.

2. Literature Review

Limited literature is available about Asian countries Capital market efficiency. Empirical research on testing the random walk hypothesis in Asian Capital markets has produced mixed results. Various researchers have given different views regarding efficiency of Asian stock markets. The results have given us two different schools of thoughts, the first supporting the presence of weak form market efficiency in some stock markets in Asia and the other denying the same and claiming no evidence of random walk in the Asian stock markets.

2.1. Studies Supporting Weak Form Market Efficiency in Asia

Chan, Gup, and Pan (1992) while analyzing the weak form hypothesis from 1983 to 1987 in Asian Countries like Hong Kong, South Korea, Singapore, Taiwan and Japan found that stock prices in these major Asian markets were efficient in the weak form. Vaidyanathan and Gali(1994) tested for the weak form efficiency on the daily closing prices of ten shares actively traded on the Bombay Stock Exchange checking for randomness using the runs test, serial correlation and filter rule tests based and found evidence from all the three tests supporting the weak form of Efficient Market Hypothesis. Wu (1996) examined efficiency in both Chinese stock markets, Shanghai and Shenzhen stock exchange. They used the serial correlation test for the period from June 1992 to December 1993on eight and twelve individual shares and found that Chinese stock markets to be weak-form efficient. Studies done by Bhaumik (1997), Rao and Shankaraiah (2003), Sharma and Mahendru (2009), who ran various econo-metric tests, found that the returns follow random walk and concluded that the BSE is weak form efficient. Pant and Bishnoi (2002) have also used autocorrelation function, unit root test and variance ratio to examine the random walk hypothesis for Indian stock market. On the basis of the test results, they concluded that Indian stock market follows random walk and thus is efficient in weak form. Li (2003) analyzes weak-form efficient of China's stock markets over the entire history of the Shanghai and Shenzhen Stock Exchanges. Results show that in the initial development stages Shanghai and Shenzhen markets are inefficient, but in the past decade the Chinese stock markets are converging to efficiency. Chung (2006) analyze the Chinese Stock Market using a 15 year period from 1992 to 2006 for the Shanghai A-share, Shanghai B-share, Shanghai Composite and Shenzhen Composite and from October 5, 199 2 to December 30, 2005. Results based on several

statistical tests provide evidence of the presence of the day-of-the-week effect in Chinese stock markets. A day-of-the-week effect exists on the Shanghai stock exchange, but not on the Shenzhen stock exchange during the full sample period. Mahmood et al. (2010) tried to examine the impact of recent financial crisis on the efficiency of Chinese stock market by dividing the stock price data from Shanghai and Shenzhen stock market for the period of six years, starting from January 2004 to December 2009, into two sub-periods, i.e. be-fore crisis and during crisis period. The sample data was analyzed by applying Runs test, Variance Ratio test, Durbin-Watson test and Unit Root (ADF) test and it was concluded that the Chinese stock market was weak form efficient and global financial crisis has no significant impact on the efficiency of Chinese stock market. Mall, Pradhan, and Mishra (2011) use daily data from June 2000 to May 2011 and found that the Indian capital market is weak form efficient. Cheung and Coutts (2001) supported a pattern of random walk in Hong Kong market.

2.2. Studies Not Supporting Weak Form Market Efficiency in Asia

Ko and Lee (1991), analyzing the Japanese market found that daily stock returns were not normally distributed and that weak form market efficiency did not hold. Ryoo and Smith (2002) analyzed the Korean Stock Exchange, using daily data from March 1988 to December 1998 found that price limits had influenced the equity prices not to follow a random walk process. Fuss (2005), based on data from December 1980 to December 1996, analyzed market efficiency using India BSE National Price Index, Jakarta SE Composite Price Index, Korea SE Composite Price Index, Kuala Lumpur Composite Price Index, Philippines SE Composite Price Index, Taiwan SE Weighted Price Index and,Bangkok S.E.T. Price Index. He used weekly stock price data and found that stock prices in major Asian emerging markets did not follow a random walk before the liberalization period, but after the liberalization period the weak-form efficient hypothesis is not rejected at the 5% level, with the exception of Indonesia and Thailand. Bui (2006) analyzes the Vietnamese stock market, using data from 2000 to 2004.Results show that it is not compatible with the weak-form market efficiency hypothesis. Cooray and Wickremasinghe (2007) focused on India, Sri Lanka and Pakistan to test weak form market efficiency, based on data from January 1996 to January 2005. They found evidences that weak-form efficient was supported by the classical unit root tests. Gupta and Basu (2007) analyzed Indian stock market and described that it is not efficient. Islam et al., (2007) examined Thailand Stock market with

data from 1975 to2001 and found that the market was not efficient. Niblock and Sloan (2007) investigated daily data of the Shanghai A, Shanghai B,Shenzhen A, Shenzhen B, Hang Seng, and Dow Jones Industrial Average indices from 2002 to 2005 and found that China's stock markets were still not weak form efficient. Jarret (2008) examined the Hong Kong stock market, from 1992 to 2002, and found that the weak form of efficient markets hypothesis did not hold good. Malafeyey, Awasthi, & Kambekar(2017) tested for market efficiency by studying the impact of global financial crisis of 2008 and the recent Chinese crisis of 2015 on stock market efficiency in emerging stock markets of China and India. The data for last 20 years was collected from both Bombay Stock Exchange (BSE200) and the Shanghai Stock Exchange Composite Index and divided into four sub-periods, i.e. before financial crisis period (period-I), during recession (period-II), after recession and before Chinese Crisis (period-III) and from the start of Chinese crisis till date (period- IV). Daily returns for the SSE and BSE were examined and tested for randomness using a combination of auto correlation tests, runs tests and unit root tests (Augmented Dickey-Fuller) for the entire sample period and the four sub-periods The evidence from all these tests supported that both the Indian and Chinese stock markets do not exhibit weak form of market efficiency. They do not follow random walk overall and in the first three periods (1996 till the 2015) implying that recession did not impact the markets to a great extent, although the efficiency in percentage terms seems to be increasing after the global financial crisis of 2008.

3. Research Methodology

3.1. Objectives of the Study

To provide an insight into the stock markets of Asia.

To test the weak form of Market efficiency of the stock markets of Asia.

3.2. Hypothesis

H0: The Stock Markets of Asia are efficient in weak form and follow the theory of random walk.

H1: The Stock Markets of Asia are inefficient in weak form and don't follow the theory of random walk

3.3. Data Sources

The study has heavily relied on academic journals, books and research papers for obtaining the relevant data. For the purpose of analysis and testing the weak form efficiency of the stock markets of Asia, MonthlyAdjusted Close prices of S&P BSE 200(Index, India), Shanghai Stock Exchange Composite Index (Index China), FTSE Straits Times Singapore (STI, Index Singapore), HANG SENG INDEX(Index Hongkong) and Nikkei 225(Index Japan) have been obtained for the period starting from 01/01/2008 up to 31/12/2017 from the websites of Yahoo Finance and Investing.Com India. Since the data collected were the adjusted closing prices of the stocks, they were converted to returns using the following equation:

$$Rt = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Where:

P_t= price of the asset at time t

P_{t-1}= price of the asset at time t-1

The following methods are used to test Normality, Independence and Randomness of the data. The computations in the present study are aided by XLSTAT:

Market Efficiency Tests

Tests	**Methods**
Normality Test	Descriptive Statistics and Jarque-Bara Statistic
Random Walk Tests	
Test for Independence	Auto-correlation
Test for randomness	Runs test
Test for Stationarity(unit root test)	Augmented Dickey-Fuller test.

4. Analysis and Discussion

4.1. Normality Test

Table I: Results of Descriptive Statistics and Jarque Bera Statistic

Statistic	S&P BSE 200	**Shanghai Stock Exchange Composite Index**	**FTSE Straits Times Singapore**	**HANG SENG INDEX**	Nikkei 225
Nbr. of observations	117	117	117	117	117
Median	0.931	0.639	0.938	0.473	0.970
Mean	1.173	0.092	0.260	0.369	0.622
Variance (n-1)	402.597	63.048	27.462	38.055	35.377
Standard deviation (n-1)	20.065	7.940	5.240	6.169	5.948
Skewness (Pearson)	5.482	-0.534	-0.373	-0.389	-0.738
Kurtosis (Pearson)	53.807	1.348	5.242	1.439	1.479
Jarque-Bera(Value)	14700.015	14.419	136.682	13.041	21.283
Jarque-Bera(p-value)	< 0.0001	0.001	< 0.0001	0.001	< 0.0001

Skewness and kurtosis Interpretation:

An important property of a normal distribution is that the skewness and kurtosis must be equal to 0 and 3 respectively. A look at Table 1 reveals that both the distributions are not normal.

Jarque-Bera Test interpretation:

H0: The variable from which the sample was extracted follows a Normal distribution.

Ha: The variable from which the sample was extracted does not follow a Normal distribution.

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.Therefore as per **Descriptive statistics and Jarque Bera Statistic**, none of the five stock markets Indices follow the theory of random walk as the distributions are not normal.

4.2. Test for Randomness

4.2.1. Runs Test

Table II: Results of Runs Test

	R	E(R)	p-value (Two-tailed)	alpha	Results
S&P BSE 200	68.000	59.393	0.131	0.05	Randomness
Shanghai Stock Exchange Composite Index	55.000	59.291	0.480	0.05	Randomness
FTSE Straits Times Singapore	65.000	59.291	0.331	0.05	Randomness
HANG SENG INDEX	56.000	59.462	0.583	0.05	Randomness
Nikkei 225	59.000	59.462	0.995	0.05	Randomness

Runs Test interpretation

H0: Data are randomly distributed

Ha: Data are not randomly distributed

As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

4.2.2. Auto-correlation Test

To analyze the result, three limits of correlation co –efficient have been taken. These limits are

– 0.25 to 0.25 (low correlation),

– 0.25 to – 0.75 or 0.25 to 0.75 (moderate correlation) and

– 0.75 to – 1 or 0.75 to 1 (high correlation).

The Serial Correlation is calculated for monthly returns of five Asian Indices from January 2008 to December, 2017. In serial correlation test, lag t is compared with lag t +1, lag t +2, lag t +3 and so on.

Table III: Results of Auto-correlation Test

Lag	S&P BSE 200	Shanghai Stock Exchange Composite Index series	FTSE Straits Times Singapore	HANG SENG INDEX	Nikkei 225
1	-0.248	0.101	0.207	0.098	0.147
2	-0.015	0.068	0.097	0.036	-0.035
3	0.071	0.078	0.091	0.113	0.083
4	-0.007	0.110	0.130	-0.027	0.052
5	0.014	-0.003	-0.061	0.004	-0.032
6	-0.070	-0.096	-0.121	-0.117	-0.183
7	0.027	-0.024	-0.203	-0.167	-0.005
8	0.031	-0.017	-0.134	-0.068	-0.017
9	-0.036	-0.188	-0.101	-0.120	-0.041
10	0.031	-0.038	-0.134	-0.020	-0.024
11	-0.030	-0.066	-0.070	-0.034	-0.007
12	-0.044	-0.108	-0.002	-0.099	0.020
13	0.051	-0.196	-0.073	-0.060	-0.006
14	-0.063	-0.060	-0.063	-0.132	-0.062
15	0.044	0.058	0.150	0.184	0.009
16	0.037	-0.033	0.028	0.056	-0.012
17	-0.024	-0.017	-0.137	-0.030	-0.110
18	-0.011	0.023	-0.024	0.022	-0.004
19	-0.019	0.166	0.064	0.098	0.133
20	-0.026	-0.035	-0.030	-0.043	-0.032
21	-0.014	-0.049	-0.085	-0.039	0.019

All the Indices show low auto-correlation. It shows that the price changes are independent of past prices and the past prices are of no use in predicting future prices. Hence, the serial correlation result confirms that the Asian Stock Markets efficient in the weak form.

4.2.3. Test for significance of the serial correlation coefficients (Box-Pierce test)

In addition to the above, the Box-Pierce test was used to test for significance of the serial correlation coefficients. On the basis of the series of tests conducted, the research inferences were made.

Ho1: Successive changes in the prices of shares traded on the floor of the Asian Stock Exchange are independent.

Ha1: Successive changes in the prices of shares traded on the floor of the Asian Stock Exchange are not independent.

Table IV: Results of the Box Pierce Q statistic

Statistic	DF	p-value				
		S&P BSE 200	Shanghai Stock Exchange Composite Index series	FTSE Straits Times Singapore	HANG SENG INDEX	Nikkei 225
Box-Pierce	6	0.210	0.553	0.082	0.615	0.249
Ljung-Box	6	0.194	0.524	0.069	0.586	0.219
Box-Pierce	12	0.686	0.512	0.037	0.506	0.769
Ljung-Box	12	0.656	0.436	0.024	0.434	0.733

Results of the Box Pierce Q statistic indicate that the changes in the prices of shares traded on the floor of the Asian Stock Exchanges are independent. The Box- Pierce statistic indicates that none of the the autocorrelation coefficientof indices is significant since all of the probabilities was less than 0.05, the assumed level of significance. Consequently, we accept the null hypothesis (H01). To this end, we may conclude at the ninety five percent (95%) confidence level that successive price changes for shares traded on the floor of the Asian Stock Markets are independent

4.2.4. Test for Stationarity (unit root test)

Table V: Results of Augmented Dickey-Fuller test

	S&P BSE 200	Shanghai Stock Exchange Composite Index	FTSE Straits Times Singapore	HANG SENG INDEX	Nikkei 225
Tau (Observed value)	-4.832	-4.189	-4.215	-4.337	-4.524
Tau (Critical value)	-3.412	-3.412	-3.412	-3.412	-3.412
p-value (one-tailed)	0.001	0.005	0.005	0.004	0.002
alpha	0.05	0.05	0.05	0.05	0.05

Test interpretation:

H0: There is a unit root for the series.

Ha: There is no unit root for the series. The series is stationary.

As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha. Therefore the series is stationary.

Summary of tests

Test results for indexes with using data from Table 1 to Table V are summarized in Table VI. A minus (–) is assigned when the test contradict randomness and a plus (+) is used when the test results support randomness.

Table VI: Summarized results

Test	S&P BSE 200	Shanghai Stock Exchange Composite Index	FTSE Straits Times Singapore	HANG SENG INDEX	Nikkei 225
Tests for Normality					
Skewness	-	-	-	-	-
Kurtosis	-	-	-	-	-
Jarque-Bara Statistic	-	-	-	-	-
Tests for Stationarity					
Augmented Dickey-Fuller test.	-	-	-	-	-
Test for independence					
Auto-correlation	+	+	+	+	+
BOX-PIERCE TEST	+	+	+	+	+
Runs test	+	+	+	+	+

5. Conclusion

This paper has analyzed whether the most important Stock Markets of Asia are efficient in weak form. To test the normality of the stock index returns, Descriptive Statistics and a Jarque-Bera test has been used. The results reject the null hypothesis that daily index returns follow a normal distribution for the entire analyzed indexes. Random walk tests viz.Autocorrelation test (ACF); runs tests; unit root tests (Augmented Dickey-Fuller (ADF) test show mixed results. The auto correlation coefficient has been computed for the market index return changes, and shows a non-significant autocorrelation at different lags for the whole sample period. It shows that there exists

independence between the returns. Using the runs test, we find that series return is following the assumption of independent relationship of random walk model. We also use the Augmented Dickey-Fuller (ADF) unit root test to investigate the random walk theory. The results reject the null hypothesis of a unit root. The results of all the performed tests provide mixed evidence that the analyzed markets are weak-form efficient. The information is important to all the players of security markets in Asia.

6. References

- Bhat, I. A., Mir, S. Q., & Nazir, F. (2014). A Comparative Analysis of the Efficiency of the Stock Markets of India and Pakistan. *Global Journal of Finance and Management* , 117-124.
- Chan K., a. G. (1992). An Empirical Analysis of Stock Prices in Major Asian Markets and The United States. *The Financial Review , Vol. 27*, 289-307.
- Cheung K., a. C. (2001). A Note on Weak-Form Market Efficiency in Security Prices: Evidence from the Hong Kong Stock Exchange. *Applied Econometrics Letters , Vol. 8*, 407-410.
- Cooray A., a. W. (2007). Efficiency of Emerging Stock Markets: Some Empirical Evidence from the South Asian Region. *Journal of Developing Areas , 41*, 171-184.
- Gupta R., a. B. (2007). Weak-Form Efficient In Indian Stock Market. *International Business and Economic Research* , 57-64.
- Islam S., W. S. (2007). Islam S., Watanapalachaikul Some Tests of the Efficiency of the Emerging Financial Markets: An Analysis of the Thai Stock Market. *Journal of Emerging Market Finance* , 291-302.
- J., J. (2008). Random Walk, Capital Market Efficiency and Predicting Stock Returns for Hong Kong Exchange and Clearing Limited. *Management Research News , 31*, 142-148.
- Ko K., a. L. (1991). A Comparative Analysis of the Daily Behavior of Stock Returns:Japan, The U.S and The Asian NICS . *Journal of Business Finance & Accounting , 18*, 219-234.
- Malafeyev, O., Awasthi, A., & Kambekar, K. S. (2017). *Random walks and market efficiency in Chinese and Indian equity markets.* arxiv.org.

- Niblock S., a. S. (2007). Are Chinese Stock Markets Weak form Efficient? *FINISIA Conference Australia.* Melbourne.
- R., F. (2005). Financial Liberalization and Stock Price Behaviour in Asian Emerging Markets. *Economic Change and Restructuring , 38*, 37-62.
- Ryoo H., a. S. (2002). Korean Stock Prices Under Price Limits:Variance Ratio Test of Random Walks. *Applied Financial Economics* , 545-553.
- Smith, L. (n.d.). *Introduction To Asian Financial Markets.* Retrieved January 11, 2017, from www.investopedia.com: https://www.investopedia.com/articles/stocks/10/introduction-asian-financial-markets.asp
- VIEITO, J. P. (2013, January-June). THE EFFICIENCY OF ASIAN STOCK MARKETS:A WEAK-FORM EFFICIENCY ANALYSIS. *IJER* , pp. 117-136.
- X., L. (2003). Time-Varying Informational Efficiency in China's A-Share and B-Share Markets. *Journal of Chinese Economic and Business Studies , 1*, 33-56.