

# A COMPARATIVE STUDY OF RISK, RETURN AND MARKET EFFICIENCY OF WORLD STOCK MARKETS

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## ABSTRACT

The analysis of risk and return is very important before investing so that investor can trade off between risk and return. The present study has been conducted to examine the risk, return and market efficiency level of five emerging and five developed stock markets for the period April 01, 2001 to March 31, 2011. The study found that emerging stock markets performed better than the developed stock markets during the period of study. The study also found that emerging and developed stock markets were efficient in weak form of market efficiency on the basis of serial correlation test and run test.

**Keywords:** Capital Market, Risk; Return, Volatility, Efficient Market Hypothesis (EMH).

## 1. Introduction

The capital market is the market for securities, where companies and governments can raise long term funds. Broadly markets can be classified as emerging markets and developed markets. The term Emerging Markets is used to describe a nation's social or business activity in the process of rapid growth and industrialization. Currently these are approximately 28 emerging markets in the world. The developed markets are those countries that are thought to be the most developed and therefore, are less risky. Risk and return are two main issues in investment decisions. The level of return generally depends on the level of risk. More specifically, most investors are conscious about the variation between actual outcome and the expected outcome.

The efficient market hypothesis (EMH) states that if new information is released about a firm how quickly it will be incorporated into the share prices. EMH claims that a market cannot be out performed because all available information is already built into all stock prices. In an efficient market no trader will be presented with an opportunity for making a return on a share that is greater than a fair return for the risk associated with it. In other words, stock market efficiency means that the current prices are an unbiased estimate of its true economic value based on the information revealed in the major stock markets of the world. There are three levels of market efficiency namely Weak form of market efficiency, semi strong form of market efficiency and Strong form of market efficiency.

## 2. Review of Literature

Keeping in view the specific objectives for which the present study have conducted, the review of the earlier studies have been done pertaining to the field of return, risk and market efficiency in world stock markets.

Fama's (1965) study is considered to be one of the most definitive studies of the random walk model ever conducted. It studied the daily proportionate price change of 30 stocks in the Dow Jones Industrial Average (DJIA) for five years ending June 1962. On the basis of serial correlation test and runs test the study concluded that there is little evidence, either from the serial correlations or from the various runs test of any large degree of dependence in the daily, four day, nine day and sixteen day price changes and concludes that there exists strong and voluminous evidence in favour of random walk hypothesis. Fama and Blume (1966) have further extended the study on filter rules and stock market trading. It observed and concluded that there appears to be both positive and negative dependence in price changes. The order of magnitude of dependence was so small which add further to the evidence that for practical purpose random walk model was an adequate description of price behaviour. Granger and Morgenstern (1970) worked on random walk theory of stock prices for several time periods with differing sampling intervals. The study concluded that the random walk model explained the short term prices changes and it was not considered so efficient to explain long term trends in prices. Thus, results of this study confirm the random walk hypothesis. Gupta (1985) worked on the weak form of efficient market hypothesis to examine the proposition that share price movements over the short periods (*viz.*, a day, a week, a month) were independent of each other. In some cases, the first order serial correlation coefficients were significantly different from zero. Run test in the pre dividend restriction period has yielded a significant (at 5 per cent) value for the Z variate in respect of only four stocks. Thus the empirical results pertaining to both serial correlation and runs analysis found that markets were efficient in weak form.

French and Roll (1986) Examined the volatility of equity returns during exchange trading and non trading hours for all common stocks listed on the New York and American stock exchanges between 1963 to 1982. The study found that trading hours are more volatile than non trading hours. Among non trading hours, weekends have lower volatility than normal holidays and holiday weekends have the lowest volatility of all. Jones and Wilson (1989) worked whether stock price volatility has increased, and whether it is currently above or below historical level. The study found that it cannot be concluded that volatility has increased in the 1980's. it is not clear that current volatility differs substantially from past volatility. Compared with two decades following world war second, *i.e.* 1950's and 1960's, volatility in the 1980's is high, compared with the 1930's, however, current volatility is quite mild.

Schwert (1989) analyzed the relation of stock volatility with real and nominal macroeconomic volatility, economic activity,

financial leverage and stock trading activity. The study found that volatility was unusually high from 1929 to 1939 (great depression) for many economic series and stock market volatility is related to the general health of the economy. Stock market volatility is higher during recession and "operating leverage" increase during recession. Chaudhuri (1991) investigates the behaviour of ex post return on industrial share price indices and the volatility of returns and inter temporal stability. The inter temporal stability of volatility has been tested by applying multiple rank correlation technique and by computing Kendall's coefficient of concordance and its significance is assessed by chi square test. It is found that aluminium, electricity generation and supply and shipping industries are consistently volatile.

Broca (1992) studied weak form of market efficiency specifically the day of week effect. The data comprises daily values of Bombay Stock Exchange (BSE) Sensex, National Index of equity prices published by the Bombay Stock Exchange for a period, April 1984 December 1989. It has been observed that the mean daily returns were lowest on Wednesday rising to peak on Friday. The standard deviation was also discovered to be highest on Monday. The skewness coefficient for all days was found to be close to zero indicating a high degree of symmetry in stock returns. The mean daily returns for each of the five week days over the sample period appeared to have fluctuated considerably.

Choe and Shin (1993) examined the stock return volatility by analyzing inter day and intra day Korea stock exchange (KSE) price data. The study found that open to open return volatility is consistently greater than close to close return volatility. The study further documented that open to open return volatility is greater than inter day return volatility measured at any other time of the day and opening price after the lunch break is as volatile as the opening price of the day.

Ho and Cheung (1994) analyzed the seasonal variation pattern in return volatility. The data for the study consist of the daily stock price index of the eight Asian markets including Hong Kong, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand. Using the Levene test, it is found that there exists day of the week variation in volatility in most of the emerging Asian stock market. Monday returns have the highest volatility for all the emerging Asian markets with the exception of Korea (it is Tuesday in case of Korea).

Roy and Karmaker (1995) worked on the measurement of the average level of volatility in the Indian stock market and whether it has increased in the current period. Volatility has been measured by standard deviation of rates of return. Their sample data consist of two sets of index numbers. The first set comprises of the capital stock and share index compiled and published by the capital magazine on a monthly basis for the period January 1935 to December 1960. The second set is composed of economic time's index number of ordinary share prices compiled and published by the economic times on a daily basis for the period 1961 to 1992. It is concluded in the study that stock market volatility has increased in the current period.

Belgaumi (1995) studied the weak form of market efficiency with the help of 70 companies listed in the A category on the Bombay Stock Exchange and also listed and traded in Calcutta, Madras and Ahmedabad Exchanges for a period, April, 1990 March 1992. The serial correlation coefficients did not depict statistically significant relationship except for Standard Industries whose coefficient was greater than three times the standard error. On the basis of results of correlation coefficients and runs tests, it can be concluded that the Indian stock markets were efficient in weak form.

Mittal (1995) examined the differences in the level of market efficiency of the five major stock exchanges in India by using serial correlation test and run test. It has been noted that the first order serial correlation coefficients were insignificant. On the basis of runs test, It has been found that only in the case of only two industries, the standardised z value was found significant at 5 per cent and 1 per cent levels. The runs test accepted random behaviour in 14 cases out of 16 stocks. But in case of serial correlation test, it was found that 9 stocks behave randomly. The study validated the weak form of market efficiency.

Karmakar (1997) studied the share price volatility and efficient market hypothesis. The study attempts to test all these by using the simple efficient market model and variance inequalities developed by Robert Shiller. The study clearly pointed out that share price volatility over the period 1968-1991 appeared to be far too high to be explained by the subsequent changes in the information about future real dividend.

Arumugam (1999) studied weak form of Market Efficiency specifically the day of the week effects in stock returns pertained to the daily closing stocks prices comprising BSE Sensex for 18 years period from April 4, 1979 to March 31, 1997. The study revealed that the bull phase witness's significant negative returns and the bear phase witnessed significant positive returns for Mondays. It also noted significant positive Friday returns at 1 per cent level for the entire study period.

Malik (2000) studied weak form of market efficiency to test the validity of random walk hypothesis in the Indian capital market over a very short period of time. The study was based on the stock price data of 133 companies consisting of 48 companies from the specified group and 85 companies from the non specified group for period, April 1996 March 1997. In nutshell, it concluded that the runs test generally follows random walk model for the successive price changes in respect of most of the series. Taking an overall view on the basis of serial correlation test and runs analysis test, it can be concluded that share prices in general followed a random behaviour and were efficient in a weak form of market efficiency.

Gamini Premaratne, Lakshmi Balasubramanyan (2003) observed that understanding of volatility in stock markets is important for determining the cost of capital and for assessing investment and leverage decisions as volatility is synonymous

with risk. The study was based on (i) Univariate GARCH, (ii) Vector Auto regression and (iii) a Multivariate and Asymmetric Multivariate GARCH model with GJR extensions. The empirical results indicate that there is a high degree of volatility co movement between Singapore stock market and that of Hong Kong, US, Japan and UK. Results support small but significant volatility spill over from Singapore into Hong Kong, Japan and US markets despite the latter three being dominant markets.

Gabaix Xavier, Gopikrishnan Parameswaran and Plerou Vasiliki (2005) propounded a theory of excess stock market volatility, in which market movements are due to trades by very large institutional investors in relatively illiquid markets. Such trades generate significant spikes in returns and volume; even in the absence of important news about fundamentals. The study observed that the optimal trading behaviour of these investors provide a unified explanation for apparently disconnected empirical regularities in returns, trading volume and investor size.

Rajni Mala and Mahendera Reddy (2007) worked on Volatility of returns in financial markets in small developing economies. The generalized ARCH model was used to find out the presence of the stock market volatility on Fiji's stock market for the period 2001-2005. The study found out that seven out of the sixteen firms listed on Fiji's stock market is volatile. The volatility of stock return then regressed against the interest rate and found that the interest rate changes have a significant effect on stock market volatility.

### 3. Objectives of the Study

- i. To compute the return and risk in the emerging and developed stock markets.
- ii. To examine the weak form of market efficiency in the emerging and developed stock markets.

### 4. Research Methodology

#### 4.1 Sample Size

The study is based on secondary data. The ten years weekly data from April 01, 2001 to March 31, 2011 of five emerging and five developed markets namely India, Japan, Hong Kong, China, Taiwan, Indonesia, Singapore, Canada and Israel have been collected from [www.ecostat.com](http://www.ecostat.com) on the basis of their capitalisation.

#### 4.2 Statistical Tools

In the present study, the returns on different emerging and developed markets have been computed by using the Geometric Mean.

$$\text{Geometric Mean} = \sqrt[n]{x_1 \times x_2 \times x_3 \dots x_n}$$

To measure the risk level in different markets, the standard deviation has been used.

$$\text{Standard Deviation} = \sqrt{\frac{1}{n} \sum (x - \bar{x})^2}$$

To measure the market efficiency the serial correlation test and run test has been used.

$$\text{The serial correlation coefficient } (r_k) = \frac{C_k}{C_o}$$

Wherein,

$$C_k = \frac{1}{n} \sum_{t=1}^{n-k} (X_t - \bar{X})(X_{t+k} - \bar{X}),$$

$k = 0, 1, 2, 3, \dots, n,$

$$\bar{X} = \frac{1}{n} \sum_{t=1}^m X_t \text{ is mean of the whole series,}$$

$C_o$  = the variance of  $X_t$ ,

$n$  = number of observation.

Statistical testing of the serial correlation coefficients requires the standard error of estimated coefficients. It is obtained as:

$$Z = r_k \sqrt{n - k}$$

In the study under consideration, the expected number of runs of all types can be computed by using the method suggested by Brownlee (1965) as:

$$M = \frac{2(n_1n_2 + n_1n_3 + n_2n_3)}{n_1 + n_2 + n_3} + 1$$

Wherein,

$M$  = Expected number of runs

$n_1$  = Number of Positive Signs

$n_2$  = Number of Negative Signs

$n_3$  = Number of Zeros (no change in share price)

The standard error of the expected number of runs of all signs may be obtained as follows:

$$\sigma = \left[ \frac{[2(n_1n_2 + n_1n_3 + n_2n_3)]}{(n_1 + n_2 + n_3)^2 - (n_1 + n_2 + n_3 - 1)} - \frac{2(n_1n_2 + n_1n_3 + n_2n_3 + 6n_1n_2n_3)}{(n_1 + n_2 + n_3)(n_1 + n_2 + n_3 - 1)} \right]^{1/2}$$

For large samples, the sampling distribution of  $M$  is normally distributed with mean  $M$  and standard error  $\sigma_m$ . The difference between actual and expected number of runs can be expressed by a standard variate  $Z$  as under:

$$Z = \frac{(R + 0.5 - M)}{\sigma_m}$$

Wherein,

$R$  = Observed number of runs of all signs

$0.5$  = Continuity adjustment

$M$  =  $s_m$

To measure the investor's perception regarding risk and return, the frequencies and percentage method have been used.

### 5. Risk-Return Analysis

The section dealt with the risk, return and market efficiency of world stock markets. Investor's analyse risk and return from investing in different stock markets so that he can trade off between risk and return and can allocate investible funds in different stock markets. Table 4.1 given below exhibits the risk, return of one year holding period in emerging stock markets.

Table 1 shows that the years 2001-02 & 2001-03 were not good for Indian stock market as the returns were negative during this period. The investors who invested only for short period suffered losses. The year 2003-04, 2005-06, 2007-08 and 2009-10 were extremely good and the return was higher than 20 per cent. The year 2008-09 was extremely bad and investors suffered who invested in thirty stocks which are included in Sensex by 48.81 per cent. The year 2004-05, 2006-07 and 2010-11 were normal year. The year 2001-02, 2003-04, 2007-08, 2008-

**Table 1: Annual return on emerging stock markets**

Year	India		SSE		Taiwan		Jakarta		Telave	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk	Return	Risk
2001-02	-3.09	30.08	-25.81	22.85	17.68	35.77	31.42	22.88	4.60	22.64
2002-03	-10.76	17.19	-4.62	20.33	-32.03	27.81	-17.50	24.40	-10.03	20.06
2003-04	57.36	20.08	14.62	17.48	30.99	21.56	55.66	21.34	45.03	22.67
2004-05	15.30	19.67	-36.26	19.48	-2.52	21.46	44.51	18.07	15.86	14.60
2005-06	54.95	16.66	12.63	20.37	8.49	13.44	16.82	19.73	26.88	13.61
2006-07	14.75	23.71	93.73	26.78	20.14	14.68	32.49	21.16	13.13	16.19
2007-08	22.51	28.97	5.82	32.42	6.61	23.43	30.25	29.62	-0.33	20.60
2008-09	-48.81	41.52	-39.57	42.73	-54.19	33.37	-52.70	39.56	-39.15	34.22
2009-10	56.30	26.40	25.21	24.67	39.52	21.95	65.40	24.72	55.41	17.50
2010-11	6.42	18.01	2.71	21.37	15.54	15.57	24.86	20.31	3.94	15.14

09 were quite risky as the volatility in return was more than 20 per cent. The year 2005-06 and 2010-11 were less volatile.

The Chinese stock market performed very badly in the year 2001-02, 2004-05, and 2008-09 as the negative return was more than 20.00 per cent. But the year 2006-07 and year 2009-10 were good and the return was more than 20 per cent. The remaining years were normal. The years except 2003-04 were highly volatile as the volatility in the returns was more than 20.00 per cent. Taiwan stock market was extremely bad for the year 2002-03 and 2008-09 as the negative return was more than 20.00 per cent. The years 2003-04, 2006-07 and 2009-10 were extremely good as the return was more than 20 per cent. The remaining years were normal. The years 2001-02 and 2008-09 were extremely volatile, the year 2005-06 and 2006-07 were low volatile and the remaining years were moderately volatile.

The years 2001-02, 2003-04, 2004-05, 2006-07, 2007-08 and 2009-10 were extremely good and the return was more than 30 per cent for Indonesia stock market. The year 2008-09 was extremely bad as the return was -52.69 per cent. As a whole, the Indonesia stock was found highly volatile as most of cases the volatility in returns was more than 20.00 per cent. In the Israel stock market, the years 2003-04, 2005-06 and 2009-10 were extremely good as the return was more than 20 per cent. The year 2008-09 was extremely bad. As a whole the Indonesia stock market found moderate volatile. Equity investments are suitable for those investors who invest for long period. The rate of returns in various emerging stock markets for five year holding period is given in Table 2.

Table 2 depicts that Indian stock markets performed very well during different holding periods of 5 years. In all five year holding period the return was positive and more than 10.00 per cent annually. The period 2003-08 was extremely good and the return was 33.05 per cent annually. The Chinese stock market have negative return for the period 2001-06 and in remaining block of five years have positive but was lower than Indian stock market. The Taiwan stock market also not performed well during different blocks of five year holding period. In the period 2003-08 the return was 12.68 per cent but

in remaining block of five years period hovering around 4.5 per cent. Even in the period 2004-09 it was found negative even the other emerging stock markets have positive rate of return.

Indonesian stock market performed very well in all blocks of 5 year holding periods were observed positive rate of return. During the period 2003-08, it was found 35.72 per cent annually. The Israel stock market performed moderately. The return during the study period was between 3 to 20.00 per cent. During the period 2003-08, the return was highest and during the period 2004-09, it was minimum. For the Indian stock market the period 2005-10 and 2006-11 were highly volatile, Chinese stock market was more volatile than Indian stock market. Taiwan, Indonesia and Israel stock markets were less volatile than Indian stock market. Ten year holding period returns of different emerging stock markets are given in the Table 3.

Table shows that Indonesia stock market performed well during the period 2001-11 as the return was 22.88 per annum during this period. The Indian stock market was as 2<sup>nd</sup> number and the return was 16.60 per cent per annum. China stock market, Taiwan and Israel stock market did not perform well as the return was between 5-12 per cent per annum. It was all interesting to note that Indian stock market was more volatile among emerging markets except China. The rate of return and volatility of different developed stock markets for one year holding period are given below:

Table 4 shows that the Japanese stock market did not performed well during this period. In majority of year the return was negative or very low. Only in the year 2005-6 and 2009-10 the return was positive. The year 2008-09 was extremely volatile. The Hong Kong stock market also not performed well but better than Japan stock market. The year 2008-09 was extremely bad and the return was -61.15 per cent and this year was also highly volatile. In Singapore stock market the return was also highly fluctuating and it was -55 to 50.97 per cent.

Canada stock market did not perform well during 2002-03 and 2008-09. The American stock market performance was very negative during the period 2009-10. The return and volatility

**Table 2: Annualised return of (five years holding period) on emerging stock markets**

Year	India		SSE		Taiwan		Jakarta		Telave	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk	Return	Risk
2001-06	22.98	21.45	7.82	20.18	4.23	24.98	25.79	21.49	16.42	19.14
2002-07	26.43	19.80	15.38	21.71	4.76	20.53	26.13	21.17	18.00	17.84
2003-08	33.06	22.19	17.40	24.52	12.69	19.19	35.72	22.25	19.98	17.91
2004-09	11.90	27.69	6.51	30.19	4.14	22.47	14.28	27.05	3.25	21.29
2005-10	20.07	28.78	18.91	30.74	4.17	22.69	18.45	28.18	11.22	21.92
2006-11	10.23	28.96	15.54	30.73	5.52	23.05	20.06	28.29	6.75	22.04

**Table 3: Annualised return (ten years holding period) on emerging stock markets**

Year	India		SSE		Taiwan		Jakarta		Telave	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk	Return	Risk
2001-11	16.60	25.48	4.08	26.12	4.87	24.02	22.89	25.14	11.55	20.64

of 5 years holding period of developed stock market are given in Table 5.

Table 5 shows that the Japanese stock market performed very badly during the period i.e. 2004-09, 2005-10, 2006-11 as the return was negative for the holding period of five years. During the period 2001-06, 2002-07 and 2003-08, the return was below 10.00 per cent per annum. The volatility in the return during this period was between around 18 to 27 per cent per annum. Hong Kong also not performed well as the return was below 5 per cent during 2001-06, 2004-09, 2005-10 and 2006-11. The volatility in return was between around 16 to 26 per cent per annum. The Singapore stock market performed better as the return was positive in all block of five years holding period and was more than 5.00 per cent except 2004-09 and volatility in the return was around 15 to 24 per cent per annum. The performance of Canada stock market and American stock market was also not well and in all stocks of 5 years holding period, it was below 10.00 per cent per annum.

The risk and return analyses of ten years holding period of developed stock market in given below in Table 6.

Table 6 depicts that the return for Japanese stock market was -3.38 per cent per annum during the period 2001-11. The Hong

Kong and Singapore stock market performed moderately during this period as the return was above 5 per cent per annum. The return in Canada stock market and American stock market was below 5 per cent per annum. This seems that developed stock market did not perform well during this period. On the basis of return of emerging and developed stock markets, it may be concluded that emerging stock markets performed better than the developed stock market.

**Market Efficiency**

This section attempts to examine the weak form of market efficiency in different emerging and developed stock markets. The weak form of market efficiency claims that current stock prices already fully reflect all the information contained in the historical prices. The weak form of market efficiency can be examined by testing independence and randomness of stock prices. Serial correlation test has been used to examine the independence of stock prices and run test has been used to examine the randomness of stock prices. Table 7 shows the serial correlation coefficients in different stock markets:

Table 7 reflects serial correlation coefficients computed the lags 1 to 16 by using the weekly data of ten world stock market

**Table 4: Annual return on developed stock markets**

Year	Japan		Hang Sang		Strit Times		Dow Jones		Nasdaq	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk	Return	Risk
2001-02	-19.77	23.03	-11.80	28.09	7.81	27.56	6.19	23.55	7.15	38.30
2002-03	-28.63	22.38	-21.90	17.62	-31.31	17.22	-24.47	22.55	-29.82	27.11
2003-04	35.17	19.91	34.25	17.76	32.63	17.41	22.62	10.10	35.84	18.03
2004-05	-0.08	14.66	8.55	15.41	16.34	10.75	2.23	10.78	1.57	17.04
2005-06	36.49	16.11	14.76	11.89	16.03	8.63	6.07	10.64	15.84	12.41
2006-07	1.33	16.26	22.54	15.06	24.33	15.20	10.62	11.05	3.44	15.49
2007-08	-29.89	20.69	16.21	28.78	-0.70	22.31	-1.12	15.80	-6.86	17.26
2008-09	-39.62	42.81	-61.16	40.06	-55.21	35.79	-45.17	35.66	-34.07	38.77
2009-10	24.27	21.62	39.24	25.52	50.97	23.26	33.31	15.47	43.83	17.53
2010-11	-14.25	21.24	-10.65	21.01	5.51	13.83	11.89	15.33	13.56	19.68

**Table 5: Annual return (five years holding period) on developed stock markets**

Year	Japan		Hang Sang		Strit Times		Dow Jones		Nasdaq	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk	Return	Risk
2001-06	4.28	19.68	4.87	18.93	8.33	17.64	2.53	16.66	6.15	24.27
2002-07	8.96	18.26	11.65	15.78	11.62	14.49	3.42	13.92	5.41	18.75
2003-08	8.71	17.88	19.24	18.58	17.86	15.50	8.07	11.82	9.99	16.16
2004-09	-6.19	24.57	2.94	23.83	0.23	21.15	-5.43	19.38	-4.74	22.24
2005-10	-1.34	25.61	1.47	25.62	7.18	23.23	0.76	20.11	3.68	22.48
2006-11	-11.63	26.23	1.69	20.34	5.02	23.75	1.91	20.74	3.18	23.50

**Table 6: Annual return (ten years holding period) on developed stock markets**

Year	Japan		Hang Sang		Strit Times		Dow Jones		Nasdaq	
	Return	Risk	Return	Risk	Return	Risk	Return	Risk	Return	Risk
2001-11	3.39	23.20	6.40	23.44	6.69	20.89	2.22	18.79	4.67	23.87

**Table 7: Serial correlation coefficient in different stock market indices**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sensex	0.010	0.166**	-0.032	0.037	-0.014	0.051	-0.047	0.088	0.044	-0.063	-0.061	-0.035	0.087	0.066	0.094	0.021
Dow Jones	-0.048	0.070	-0.118	-0.006	0.027	0.068	-0.091*	-0.011	-0.065	0.038	0.047	-0.018	0.013	-0.015	0.081	0.035
Hang Sang	-0.038	0.093	0.006	0.051	0.042	0.065	-0.013	-0.036	-0.010	0.027	-0.058	-0.055	0.060	0.060	-0.029	0.009
Jakarta	-0.028	0.071	0.083	0.050	0.118*	0.006	0.005	0.049	-0.060	0.038	-0.039	0.075	0.006	0.088	0.038	-0.038
Nikkei	-0.027	0.071	-0.033	0.001	-0.013	0.055	0.012	0.012	-0.011	-0.011	-0.025	0.028	0.080	0.026	0.008	-0.015
Nasdaq	-0.006	0.039	-0.018	-0.024	0.073	0.084	-0.055	0.004	-0.055	0.030	0.016	-0.036	0.004	0.024	0.017	0.013
SSE	0.052	0.071	0.059	0.018	0.039	0.044	-0.034	0.124*	0.054	0.060	-0.112*	0.037	0.011	-0.029	0.023	0.068
Strit Times	0.028	0.048	-0.022	0.033	0.067	0.065	0.056	0.029	0.000	0.020	-0.052	0.009	0.049	0.033	0.027	0.034
Taiwan	-0.007	0.057	0.103*	0.037	0.029	-0.002	0.063	0.012	0.027	0.040	0.024	0.056	-0.016	0.062	0.000	-0.091*
TelAve	-0.042	0.078	0.121*	-0.010	0.093*	-0.012	0.015	0.010	0.041	0.013	0.040	-0.055	-0.019	0.063	-0.054	0.044

Note : \*Significant at 5 per cent level.  
 \*\*Significant at 1 per cent level.

**Table 8: Result of runs test for different stock market indexes**

Name of index	Number of cases	Mean		Median	
		Runs	Z value	Runs	Z value
Sensex	520	240	-1.663	246	-1.317
Dow Jones	520	257	-0.158	263	0.176
Hang Sang	416	209	0.012	209	0.000
Jakarta	513	259	0.326	266	0.751
Nikkei	520	245	-1.221	252	-0.790
Nasdaq	520	245	-1.221	252	-0.790
SSE	483	217	-2.319*	219	-2.141*
Strit Times	518	260	0.123	256	-0.352
Taiwan	504	248	-0.244	248	-0.446
Tel ave	516	253	-0.395	255	-0.353

Note: \*Significant at 5 per cent level.

indexes to examine the weak form of market efficiency. The table depicts that out of 160 correlation coefficients, 9 (about 5.6 per cent) were found significant, out of which 8 correlation coefficients (5 per cent) were found significant at 5% level of significance. Only one correlation coefficient (about 0.6 per cent) was found significant at 1% level of significance. The table also represents that 52 correlation coefficients (32.5 per cent) were found negative and 108 correlation coefficients (67.5 per cent) were found positive. There was no correlation coefficient which has zero value. In first lag correlation coefficient there was not any correlation coefficient was significant. In second lag one correlation coefficient was found significant at one per cent level of significance. In third lag

correlation coefficients, three correlation coefficients were found significant at 5% level of significance. In 4<sup>th</sup> lag, 6<sup>th</sup> lag, 9<sup>th</sup> lag, 10<sup>th</sup> lag, 12<sup>th</sup> lag, 13<sup>th</sup> lag, 14<sup>th</sup> lag, 15<sup>th</sup> lag, no correlation coefficient was found significant.

The incidence of market efficiency in relation to different stock market indexes were found interesting, in case of Sensex, the 2<sup>nd</sup> lag correlation coefficient was found significant at 1 per cent level of significance but in case of Dow Jones, the 7<sup>th</sup> lag correlation coefficient was found significant at 1 per cent level of significance. In case of Jakarta, the fifth lag correlation coefficient was found significant, in SSE, the 8<sup>th</sup> and 11<sup>th</sup> lag were found significant at 1% level of significance, in Taiwan,

the 3<sup>rd</sup> and 16<sup>th</sup> lags were found significant at 1% level of significance. In case of Hen Sang, Nikkie, Nusdaq and Strit Time, no serial correlation coefficient values were found significant. In considering the number of correlation coefficient values significance and their pattern, it may be concluded that emerging and developed markets were found efficient.

The randomness of prices can be examined with the help of runs test. Some times share price changes may behave randomly but may be serially correlated for different periods of time. Randomness of stock prices implies the stock price behaviour is identical to that of random numbers. The randomness of stock prices is marked by an absence of any trend of significance. The results of runs tests are reported in Table 8.

The information inputs on the runs analysis reported in the table VIII reveals that z values were significant at 5 per cent level only in 1 case when the runs were obtained from the mean of the stock market index level change during the study period. The identical results were obtained through the mechanism of median. The runs test were found significant in case of SSE composite only in remaining stock market indexes, the numbers of runs were found insignificant. On the basis of runs test and serial correlation test, it may be concluded that emerging stock markets and developed stock markets were found efficient in weak form of market efficiency.

#### Conclusion :

Investor's analyse risk and return before investing so that he can trade off between risk and return. On the basis of return for holding periods one year, five year and ten years the study found that emerging stock markets performed better than the developed stock markets during the period of study (April 2001 to March 2011). The results of serial correlation test found only 9 (5.6 percent) correlation coefficient values significant out of 160 coefficient values. On the basis of number of correlation values significant and their pattern. It may be concluded that stock prices in emerging and developed stock market were independent of their historical prices. The run analysis found Z values significant only in one case which strongly recommended that prices in emerging and developed stock markets behave randomly.

The study may be concluded that emerging stock markets performed better than the developed stock markets, and emerging and developed stock markets were found efficient in weak form of market efficiency during the period of study.

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