



## INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE AND MANAGEMENT

### CONTENTS

| Sr. No. | TITLE & NAME OF THE AUTHOR (S)  | Page No. |
|---------|---|----------|
| 1.      | INTERNATIONALIZATION STRATEGIES FOLLOWED BY THREE MEXICAN PIONEER COMPANIES GRUPO MODELO, GRUPO BIMBO AND CEMEX: ISSUES AND CHALLENGES<br><i>JOSE G. VARGAS-HERNANDEZ &amp; MOHAMMAD REZA NORUZI</i>  | 1        |
| 2.      | DELIVERY OF EFFICIENT AND EFFECTIVE PRIMARY EDUCATION AND HEALTHCARE SERVICES BY LOCAL GOVERNMENTS OF OYO STATE IN NIGERIA<br><i>DR. SAMIHAH KHALIL @ HALIM &amp; DR. SALIHU, ABDULWAHEED ADELABU</i>   | 8        |
| 3.      | THE FOUNDATIONS OF RELATIONSHIP MARKETING<br><i>SYED HABIB ANWAR PASHA, IMRANUL ISLAM SABBIR &amp; SYED OHIDUR RAHMAN</i>   | 13       |
| 4.      | EMPLOYEES RETENTION STRATEGIES: A STUDY OF SELECTED ORGANIZED RETAILER IN LUCKNOW CITY, UTTAR PRADESH<br><i>PRIYA &amp; DR. VIKRAM BISEN</i>  | 21       |
| 5.      | COSTING EMPLOYEE TURNOVER BASED ON EMPLOYEE PERFORMANCE LEVEL - A STUDY ON FIVE STAR HOTELS IN BANGALORE<br><i>PRASANNAKUMAR.J.P &amp; DR. SHAJI THOMAS</i>   | 30       |
| 6.      | ORGANISED RURAL RETAILING IN INDIA THROUGH 'RPSO' (RURAL PROCUREMENT AND SUPPLY OUTLET) MODEL<br><i>DR. N. RAMANJANEYALU &amp; DR. M. S. SUBHAS</i>   | 41       |
| 7.      | SIX SIGMA - ORIENTAL INDIAN MANAGEMENT CONCEPTS: MODERN JAPANESE INDUSTRIAL QUALITY CONTROL STANDARD – (AN INQUIRY THROUGH HISTORICAL & PHILOSOPHICAL PERSPECTIVE)<br><i>DR. S. P. RATH, DR. BISWAJIT DAS, ARCHANA CHAUDHARY &amp; PRIYA PUTHAN</i> | 46       |
| 8.      | A STUDY ON IMPULSIVE BUYING BEHAVIOUR AND SATISFACTION TOWARDS RETAIL OUTLET IN BIG BAZAAR COIMBATORE<br><i>A. PUGHAZHENDI &amp; DR. D. SUDHARANI RAVINDRAN</i>   | 51       |
| 9.      | A STUDY ON BRAND PERCEPTION OF FMCG GOODS<br><i>DR. S. JEEVANANDA</i>   | 55       |
| 10.     | ENVIRONMENTAL MANAGEMENT ACCOUNTING PRACTICES IN SELECT ISO 14001 COMPANIES IN INDIA<br><i>DR. HEENA SUNIL OZA &amp; DR. MINAL CHIRAG PATEL</i>   | 59       |
| 11.     | ORGANIZED RETAILING IN SMALLER CITIES - THE NEXT MOVE<br><i>DR. C. S. DALVI &amp; SAYALI PATASKAR</i>   | 64       |
| 12.     | MANAGERIAL CREATIVITY AND WORK MOTIVATION OF SECONDARY SCHOOL TRIBAL TEACHERS IN RELATION TO THEIR OCCUPATIONAL SELF EFFICACY<br><i>DR PRAKASH CHANDRA JENA</i>   | 67       |
| 13.     | ENHANCING BRAND VALUE THROUGH CSR<br><i>DR. SARITA BAHL</i>   | 72       |
| 14.     | FACTORS EFFECTING PURCHASE DECISION OF BRANDED SPORTS ACCESSORIES WITH SPECIAL REFERENCE TO REEBOK<br><i>DR. PREETI MK. SHARMA &amp; RUBINA PATHAN</i>  | 79       |
| 15.     | ADVERTISING AND CONSUMER BUYING BEHAVIOUR: A STUDY WITH SPECIAL REFERENCE TO NESTLE LTD.<br><i>DR. NAVEEN KUMAR, DR. VIJAY KUMAR GANGAL &amp; KIRTI SINGH</i>   | 83       |
| 16.     | FACTORS INFLUENCING CAREER CHOICE AMONG ADOLESCENTS<br><i>ZARINE IMMANUEL &amp; DR. KALYANI KENNETH</i>   | 88       |
| 17.     | DIVERGENCES BETWEEN INDIAN ACCOUNTING STANDARDS (ASs) AND INTERNATIONAL FINANCIAL REPORTING STANDARDS (IFRSs)<br><i>DR. ATUL VORA &amp; AJEET KUMAR SAHOO</i>   | 92       |
| 18.     | A CRITICAL STUDY OF CONSUMER PREFERENCES TOWARDS ORGANIZED RETAIL IN JAIPUR<br><i>DR. SUSMIT JAIN</i>   | 99       |
| 19.     | A STUDY ON ATTITUDE OF WOMEN TOWARDS FITNESS CENTRE IN RAMANATHAPURAM, TAMILNADU<br><i>DR. A. MARTIN DAVID, R. KALYAN KUMAR &amp; G. DHARAKESWARI</i>   | 116      |
| 20.     | FACTORS AFFECTING EQUITY INVESTORS' BEHAVIOR<br><i>DIVYANG J JOSHI, AGA KHUSHBOO &amp; RAHI DESAI</i>   | 120      |
| 21.     | CELEBRITY ENDORSEMENT: A STUDY OF INDIAN FMCG SECTOR<br><i>SUNILDRO L.S. AKOIJAM</i>  | 127      |
| 22.     | STOCK MARKET BEHAVIOUR: EVIDENCE FROM ASIAN STOCK MARKETS<br><i>DR. SANJEET SHARMA</i>  | 131      |
| 23.     | FINANCIAL INCLUSION - THE QUESTION UNANSWERED<br><i>SMITA RAO &amp; VAISHALI RAHATE</i>   | 136      |
| 24.     | SIGNIFICANCE OF FLEXIBLE WORK TIMING IN WORK-LIFE BALANCE<br><i>PREETHI VIJAIMADHAVAN &amp; DR. D. VENKATRAMA RAJU</i>  | 142      |
| 25.     | QUALITY OF LIFE OF FEMALE PROFESSIONALS: A COMPARATIVE STUDY OF MALE VS. FEMALE<br><i>PRATIBHA BARIK</i>  | 148      |
|         | REQUEST FOR FEEDBACK  | 152      |

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## STOCK MARKET BEHAVIOUR: EVIDENCE FROM ASIAN STOCK MARKETS

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### ABSTRACT

*The present study has been undertaken to examine the stock return behavior of selected Asian stock markets. The study is based on daily data for stock indices of the Hong-Kong, Japan, India, Singapore and Taiwan for the period of 2<sup>nd</sup> January 2001 to 30<sup>th</sup> June 2011. The stock return behavior of selected Asian stock markets has been examined using Jarque-Bera, Run test, Kolmogorov-Smirnov (K-S) test and GARCH model. The analysis of the share price behavior indicated that all test used in present study reject the hypothesis of random walk for all selected Asian stock markets except the Run test which supports the hypothesis of random walk for Hong- Kong and Taiwan. The results seem to go against the recent efforts towards improving the functioning and transparency of the stock markets. The reform process and opening up of Stock Markets as a result of liberalization measures taken by Governments in the past decade have not been able to bring more discipline in these stock markets. It seems that certain anomalies still exist in these stock markets which may be making these stock markets inefficient. It provides market players the opportunity to predict future prices and bring the possibility of earning higher than expected returns and investors can earn excess profits using past stock prices as their source of information.*

### KEYWORDS

Stock Market efficiency, Friday Effect, Efficient Market Hypothesis, share price behavior

### INTRODUCTION

In finance, the efficient market hypothesis indicates that one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis, given the information publicly available at the time the investment is made. There are three major versions of the hypothesis: "weak", "semi-strong", and "strong". Weak form efficient market hypothesis claims that prices on traded assets already reflect all past publicly available information. Semi-strong efficient market hypothesis claims both that prices reflect all publicly available information and that prices instantly change to reflect new public information. Strong efficient market hypothesis additionally claims that prices instantly reflect even hidden or "insider" information. The weak form of efficient Market hypothesis (EMH) (Which is used synonymously with random walk theory) holds that prices have no memory and yesterday has nothing to do with tomorrow. It states that stock prices reflect all available information so that prices are near their intrinsic values. In an efficient market information is freely available. The price of a share approximates to its intrinsic value. Market efficiency has an influence on the investment of an investor because, if the market is efficient, past information will provide no information about the future prices and trying to pick up winners will be a waste of time. Given their risk in an efficient market, there will be no under valued stock offering higher than expected returns. On the other hand, if markets are not efficient games can be played in stock markets and excess returns can be made by correctly picking the winners.

This aspect of market efficiency has, however, become more interesting when the analysis is carried out in the context of International stock markets in the era when Globalization has brought financial integration among the nations. The gradual lifting of restrictions on capital flows and relaxation of exchange control in many countries have accelerated integration among the world's capital. However, in the present situation global markets have tended to become more integrated as a result of common practice towards liberalization and deregulation in the capital markets of both developed as well as emerging countries. These basic changes lead to increase the correlations among the stock prices of various national markets all over the world that would ensure the reduction in the potential benefits from international portfolios diversification. Thus, the present study is being contemplated with the objective of examining random walk hypothesis for some Asian stock markets.

The paper is organized as follows: Section I is related to introduction. Section II provides a brief review of literature. Section III explains research methodology used in study. Section IV presents empirical results. Finally, concluding remarks are given in Section V.

### REVIEW OF LITERATURE

Weak form efficiency has been tested by many researchers in many stock exchanges of the world. The early studies on testing weak form efficiency started in the developed market. Empirical evidence on the weak form efficiency indicates mixed results.

Sharma and Kennedy (1977) conducted a comparative study of stock price behaviour on the Bombay, London, and New York stock exchanges. The results of their study shown that stocks on the Bombay Stock Exchange follow a random walk and is equivalent in this sense to the behaviour of stock prices in the markets of advanced countries. Sunil Poshakwale (1996) in their study provided evidence of day of the week effect and supports the viewpoint that stock market is not weak form efficient. Alam et al. (1999) in their study tested the random walk hypothesis for Bangladesh, Hong Kong, Sri Lanka and Taiwan. They found that all the stock indices except the Sri Lankan stock index follow a random walk.

Grieb and Reyes (1999) employed variance ratio test on weekly stock returns to reexamine the Brazilian and Mexican stock markets. Their findings indicated nonrandom behavior in the Mexican market while the Brazilian market indicated evidence in favor of the random walk. Magnusson and Wydick (2000) tested the random walk hypothesis for a group of African countries and found that there is greater support for the African stock markets than for other emerging stock markets.

Nath and Dalvi (2005) examined the day of the week effect anomaly during 1999 to 2003 for Nifty. They found that market inefficiency exists. According to Dhankar and Chankraborty (2005) variance ratio test suggests dependency of the Sensex series, which violates the assumption of the random walk hypothesis. Using the ARIMA process they have developed a model for forecasting future returns to the Sensex.

Chawla, Mohanty and Bhardwaj (2006) made an attempt to test for the random walk hypothesis among the Indian market vis-à-vis the developed economies such as the US, UK, Australia and Canada. The results of study suggested the existence of random walk hypothesis in these markets. Anokhi Parikh (2008) attempted to test for the month-of-the- year effect in India using monthly returns of the Nifty index for the period 1999-2008. The results of the study revealed that December is a month of truly anomalous returns in the Indian stock market. Bepari and Mollik (2009) in their study investigated the existence of seasonality in return series of Dhaka Stock Exchange (DSE) of Bangladesh. The study uses the monthly return data of the DSE all share price index (DSE All Index) for the period from 1993 to 2006 for the analysis. The results confirmed the existence of seasonality in stock returns.

K. Mittal and Sonal Jain (2009) examined three types of anomalies namely Monday Effect, Friday effect and day of the week effect. The findings of the study brought out that none of the above anomalies exist in the Indian stock market. Further, results of serial correlation and runs tests also supported the Random Walk Theory and market efficiency hypothesis. Srinivasan (2010) attempted to examine the random walk hypothesis by using Augmented Dicky-Fuller test and the Phillips-Perron test. The results of the study revealed that Indian Stock Market did not show characteristics of random walk.

Sanjeet Sharma (2011) examined whether day of week effect exist in Indian Stock Market or not, and to analyses whether anomalies exist in India the data has been taken for the period from January 2008 to December 2009 for two indices: Sensex and Nifty. The results of this study showed that the day of the week effect did not exist in the Indian Stock Market and this market can be considered as informationally efficient. Monday Effect and Friday Effect were also found insignificant while comparing Friday and Monday returns with other days mean returns. The present study attempts to contribute to the existing literature on the market efficiency by examining the selected Asian equity markets.

## METHODOLOGY

The present study is based on the secondary data related to daily closing figures of various stock indices of various Asian stock markets over the period from 2<sup>nd</sup> January 2001 to 30<sup>th</sup> June 2011. The various stock markets considered in this study include four emerging economies (India, Taiwan, Hong Kong and Singapore) and one developed market (Japan). While the sample countries (Taiwan, Hong Kong and Singapore) have been selected randomly from the list of Asian countries considered for the construction of MSCI index of emerging markets, Japan, being a developed market, has been selected deliberately so as to make the analysis more fruitful. Table 1 shows country –wise indices considered for present study. The data is taken from Yahoo Finance. The returns using the closing prices of these indices are computed using the first differences of natural logs of prices.

TABLE 1: STOCK EXCHANGE AND STOCK INDICES UNDER STUDY

| S. No. | Country   | Index           | Symbol |
|--------|-----------|-----------------|--------|
| 1      | India     | BSE 30          | BSE    |
| 2      | Japan     | Nikkei 225      | nikkei |
| 3      | Hong-Kong | Hang-Sang       | HS     |
| 4      | Singapore | Straits Times   | ST     |
| 5      | Taiwan    | Taiwan Weighted | TAIWAN |

Several tests for establishing statistical independence in a stock price time series are available. The following tests, namely Jarque-Bera, Run test, Kolmogorov-Smirnov (K-S) test and GARCH model are used.

### JARQUE-BERA TEST

In statistics, the Jarque-Bera test is a goodness-of-fit measure of departure from normality, based on the sample kurtosis and skewness. The test is named after Carlos Jarque and Anil K. Bera. The test statistic JB is defined as:

$$JB = \frac{n}{6} \left( S^2 + \frac{1}{4} K^2 \right)$$

where n is the number of observations (or degrees of freedom in general); S is the sample skewness, and K is the sample kurtosis:

$$S = \frac{\hat{\mu}_3}{\hat{\sigma}^3} = \frac{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^3}{\left( \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 \right)^{3/2}}$$

$$K = \frac{\hat{\mu}_4}{\hat{\sigma}^4} - 3 = \frac{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^4}{\left( \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 \right)^2} - 3,$$

where  $\hat{\mu}_3$  and  $\hat{\mu}_4$  are the estimates of third and fourth central moments, respectively,  $\bar{x}$  is the sample mean, and  $\hat{\sigma}^2$  is the estimate of the second central moment, the variance.

### GARCH MODEL

Uncertainty is measured by looking at volatility in individual series. The volatility of individual series is tested by applying GARCH model (Generalized ARCH), introduced by Bollerslev (1986). In the standard GARCH (1,1) specification

$$\hat{\sigma}_{it}^2 = \delta + \beta \hat{\sigma}_{it-1}^2 + \gamma \sigma_{t-1}^2 + \epsilon_t$$

Where residual series are generated by regressing  $x_t$  and  $y_t$  on constant,  $\sigma^2$  is the one period ahead forecast variance based on past information called the conditional variance. The coefficient  $\beta$  is defined as ARCH (1) and  $\gamma$  as GARCH (1). If both the coefficients are individually significant and their sum is close to one then the series is said to be volatile.

### NON-PARAMETRIC TESTS

**RUN TEST:** Test is to detect statistical dependencies (randomness) which may not be detected by the autocorrelation test. The null hypothesis is that the observed series use random variable. The number of runs is computed as a sequence of the price changes of the same sign (such as; +, -, 00). When the expected number of runs is significantly different from the observed number of runs, the test rejects the null hypothesis. A lower than expected number of runs indicates the market's over-reaction to information, subsequently reversed, while higher numbers of runs reflect a lagged response to information. Either situation would suggest an opportunity to make excess returns.

Under the null hypothesis that successive outcomes are independent, and assuming that  $N_1 > 10$  and  $N_2 > 10$ . The number of runs is asymptotically normally distributed with

$$\text{Mean: } E(R) = \frac{2N_1N_2 + 1}{N}$$

$$\text{Variance: } = \frac{2N_1N_2(2N_1N_2 - N)}{(N)^2(N-1)}$$

Where N = total number of observations

N1 = number of '+' symbols

N2 = number of '-' symbols

R2 = number of runs

The run test converts the total number of runs into a Z statistic. For large samples the Z statistic gives the probability of difference between the actual and expected number of runs. If the Z value is greater than or equal to  $\pm 1.96$ , the null hypothesis is rejected at 5 percent level of significance.

**KOLMOGOROV-SMIRNOV (K-S) TEST**

The K-S test was originally proposed in the 1930s [Kanji 1999]. K-S is one of the best known and most widely used goodness-of-fit tests. It is based on the empirical distribution function and converges uniformly to the population cumulative distribution function with probability measure one. The one sample K-S test procedure compares the observed cumulative distribution function for a variable with a specified the theoretical distribution which may be normal, uniform, Poisson or exponential. The K-S Z is computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test checks whether the observations could reasonable have come from the specified distribution.

**EMPIRICAL ANALYSIS**

The empirical results are presented as below.

**DESCRIPTIVE STATISTICS AND TEST FOR NORMALITY**

To test the distribution of series the descriptive statistics for the return series of all the five Asian stock markets has been presented in Table 2. It is seen that the frequency distributions of Hong-Kong, Japan, India, Singapore and Taiwan are not normal for the period of study. The skewness coefficient, in excess of unity is taken to be fairly extreme. High or low kurtosis value indicates extreme leptokurtic or extreme platykurtic. Generally values for zero skewness and kurtosis at 3 represents that the observed distribution is normally distributed. Table 2 makes it clear that Hong-Kong, Japan, India, Singapore and Taiwan stock market return series distribution are not normal. Further, Jarque-Bera test also rejects the null hypothesis of normal distribution for all the series and clearly indicate that all return series under study significantly deviate from normality.

**TABLE 2: DESCRIPTIVE STATISTICS**

|             | Hong-Kong | Japan     | India     | Singapore | Taiwan    |
|-------------|-----------|-----------|-----------|-----------|-----------|
| Mean        | 0.000188  | -0.000129 | 0.000590  | 0.000182  | 0.000236  |
| Median      | 0.000400  | 0.000300  | 0.001200  | 0.000450  | 0.000550  |
| Maximum     | 0.134100  | 0.132300  | 0.159900  | 0.075300  | 0.065200  |
| Minimum     | -0.135800 | -0.121100 | -0.118100 | -0.092200 | -0.069100 |
| Std. Dev.   | 0.016146  | 0.016318  | 0.016723  | 0.012774  | 0.014857  |
| Skewness    | 0.023808  | -0.396105 | -0.124653 | -0.326172 | -0.169806 |
| Kurtosis    | 11.89227  | 9.809124  | 10.09401  | 8.799341  | 5.098846  |
| Mean        | 0.000188  | -0.000129 | 0.000590  | 0.000182  | 0.000236  |
| Jarque-Bera | 8474.173* | 5035.951* | 5399.815* | 3649.872* | 484.4462* |
| Probability | 0.000000  | 0.000000  | 0.000000  | 0.000000  | 0.000000  |

\* Significant at 1 percent level of significance

\*\* Significant at 5 percent level of significance

\*\*\* Significant at 10 percent level of significance

**RUN TEST:** The results of the run test are presented in Table 3. It is evident from the table that the Z-statistics, which have been computed to test the significance of the difference between the number of actual runs and the expected runs, are found significant in case of India, Japan and Singapore. It makes clear that these stock markets are not efficient in weak form. Further, for the stock markets of Hong-Kong and Taiwan difference between the number of actual runs and the expected runs, has not been found significant, which shows that random walk theory persist in these stock markets.

**TABLE 3: ESTIMATES OF RUN TEST**

| Variable  | Runs | Z- test | Assy Sig(2-Tailed) |
|-----------|------|---------|--------------------|
| India     | 1215 | -3.388* | .001               |
| Japan     | 1339 | 2.051** | .040               |
| Hong-Kong | 1332 | .861    | .389               |
| Singapore | 1381 | 2.104** | .035               |
| Taiwan    | 1270 | -1.021  | .307               |

\* Significant at 1 percent level of significance

\*\* Significant at 5 percent level of significance

\*\*\* Significant at 10 percent level of significance

**KOLMOGOROV-SMIRNOV TEST**

The K-S Z-statistics has been used to test that the normality of frequency distribution of the underlying series. The results are presented in Table 7. Thus, the K-S test confirms that the frequency distribution of the return series of all the five Asian stock markets does not fit the normal distribution. Thus, the findings of the K-S Z-statistics makes further clear that selected Asian stock markets are not follow random walk model as basic assumption of random walk model is that return series should be normal.

**TABLE 7: ESTIMATES OF KOLMOGOROV- SMIRNOV TEST**

|                        | India  | Japan  | Hong-Kong | Singapore | Taiwan |
|------------------------|--------|--------|-----------|-----------|--------|
| Absolute               | .071   | .064   | .085      | .073      | .071   |
| Positive               | .066   | .049   | .073      | .067      | .053   |
| Negative               | -.071  | -.064  | -.085     | -.073     | -.071  |
| Kolmogorov-Smirnov Z   | 3.611* | 3.245* | 4.338*    | 3.737*    | 3.616* |
| Asymp. Sig. (2-tailed) | .000   | .000   | .000      | .000      | .000   |

**Note:** The null hypotheses of normal distribution of the underlying variables are rejected at 1 percent level of significance.

**GARCH RESULTS**

The GARCH estimates, as shown in Table 5, are highly significant for all selected Asian stock markets under study. It is observed from the table that the sum of ARCH (I) and GARCH (I) coefficients are close to unity. This implies that all the series are highly volatile. The highly significant values of the sum of ARCH (I) and GARCH (I) coefficients rejects the null hypothesis of a random walk of stock indices. Further, it makes clear that return series in the all the selected Asian stock markets are highly volatile and this increases the likelihood of continuously earning extra returns by forecasting the security prices. It is important to mention that the results based of GARCH model supports the earlier findings based on non-parametric tests and only the Run test supports the hypothesis of random walk for Hong- Kong and Taiwan whereas all other tests used in the study reject the hypothesis of random walk for all selected Asian stock markets under study.



TABLE 5: GARCH ESTIMATES

| Variable  | Coefficients | Coefficient | Std. Error | z-Statistic      | Prob.  |
|-----------|--------------|-------------|------------|------------------|--------|
| India     | ARCH(1)      | 0.133123    | 0.010181   | <b>13.07511*</b> | 0.0000 |
|           | GARCH(1)     | 0.845599    | 0.011264   | <b>75.06887*</b> | 0.0000 |
| Japan     | ARCH(1)      | 0.113063    | 0.009077   | <b>12.45549*</b> | 0.0000 |
|           | GARCH(1)     | 0.875769    | 0.010693   | <b>81.90179*</b> | 0.0000 |
| Hong Kong | ARCH(1)      | 0.068075    | 0.006785   | <b>10.03334*</b> | 0.0000 |
|           | GARCH(1)     | 0.925154    | 0.007672   | <b>120.5892*</b> | 0.0000 |
| Singapore | ARCH(1)      | 0.098080    | 0.007265   | <b>13.50107*</b> | 0.0000 |
|           | GARCH(1)     | 0.896842    | 0.006753   | <b>132.8162*</b> | 0.0000 |
| Taiwan    | ARCH(1)      | 0.064851    | 0.006289   | <b>10.31183*</b> | 0.0000 |
|           | GARCH(1)     | 0.926937    | 0.007041   | <b>131.6529*</b> | 0.0000 |

\* Significant at 1 percent level of significance

\*\* Significant at 5 percent level of significance

\*\*\* Significant at 10 percent level of significance

## CONCLUSION

The present study has been undertaken to examine the stock return behavior of selected Asian stock markets. The study is based on daily data for stock indices of the Hong-Kong, Japan, India, Singapore and Taiwan for the period of 2<sup>nd</sup> January 2001 to 30<sup>th</sup> June 2011. The stock return behavior of selected Asian stock markets has been examined using Jarque-Bera, Run test, Kolmogorov-Smirnov (K-S) test and GARCH model. The analysis of the share price behavior indicated that all test used in present study reject the hypothesis of random walk for all selected Asian stock markets except the Run test which supports the hypothesis of random walk for Hong- Kong and Taiwan. The results seem to go against the recent efforts towards improving the functioning and transparency of the stock markets. The reform process and opening up of Stock Markets as a result of liberalization measures taken by Governments in the past decade have not been able to bring more discipline in these stock markets. It seems that certain anomalies still exist in these stock markets which may be making these stock markets inefficient. It provides market players the opportunity to predict future prices and bring the possibility of earning higher than expected returns and investors can earn excess profits using past stock prices as their source of information.

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