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# CALENDAR ANOMALIES: EVIDENCES FROM EAST ASIAN STOCK MARKETS

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## Abstract

*This paper attempts to investigate various calendar anomalies like Day of the week effect, Turn of the month effect, Holiday effect and January effect in the seven East Asian stock markets (China, Japan, India, Hong Kong, Taiwan, Mongolia and Korea) by using index returns and time varying econometric modelling methods. This study further investigates the presence of volatility clustering, symmetric information and leverage effect in these markets. The research paper has applied GARCH-M (1, 1), GJR-GARCH-M (1, 1) and E-GARCH-M (1, 1) models to investigate the aforesaid objectives. The study did not observe sign of Day of the week effect, and January effect but noticed the strong evidence of positive returns during the first four and last two trading days of the month in Indian, Taiwanese and Mongolian Stock Market. It is further observed that the Mongolian stock market shows significant negative returns during the month of August. The presence of Turn of the month for six days does not confirm that which day would give the excess returns in the stock market so, it would be highly difficult to generate excessive returns in these markets. This research also searched out that volatility in clustering, returns are highly volatile, and negative shocks transmits more volatility in the market than the positive shocks. The study also finds the strong evidence for the presence of "leverage effect" in all markets considered for the study. It may be inferred from the study that the absence of calendar anomalies indicates operational efficiency of East Asian Stock Market.*

**Keywords:** Monday effect, Turn of the Month effect, Holiday effect and January effect.

## 1. Introduction

Stock Returns depend upon a certain sets of information which are unpredictable, therefore, the stock prices are unpredictable. This unpredictable behaviour of the stock returns is known as "Random Walk Model". A large number of studies have empirically proven that the stock returns behave differently at different point of time, for example Monday returns are found to be negative and Friday returns are found to be

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greater than other days of the week (Weekend Effect), days before holiday provide higher returns than other days (Holiday Effect), January returns are found to be greater than other months of the year (January effect), and the last and first few trading days provide excess returns in the stock market (Turn of the Month). These systematic patterns in the returns are violation of the random walk model and known as stock market calendar anomalies, in the light of the discussion the study aims to inspect the major calendar anomalies namely Monday effect, holiday effect turn of the month effect and January effect in seven most dominating East Asian markets. If they are persisted, then the patterns in the stock returns may be used by individual and institutional investors as a profit making strategy; buying the stock at low prices and selling during high prices. The continued presence of these phenomena in any market leads to represent the untrue intrinsic value of stock and boom in the stock market. This may also raise the eyebrows of financial regulators of respective country. For the aforesaid objective the rest of the study is organised as Section II reviews the available literature, section III explains the stylized facts of the index returns section IV explains the methodology and section V ends with the conclusions and suggestions.

## 2. Review of Literature

Calendar anomalies are studied all over the world for mostly all kind of money market, commodity market and stock market in numerous studies and being confirmed. It is confirmed in US stock market that Friday's returns are found to be significantly positive and Monday's returns are found to be significantly negative[Kelly (1930), French (1980), Gibbon and Hess (1981), Lakonishokand Levi (1982). The same results are documented for UK, and Canada (Jaffe et. al. (1985). Wong et al. (1992) studied Asian stock markets and found presence of Monday effect for Singapore, Malaysia, and Hong Kong but for Thailand they reported that negative returns are found on Tuesday while all the countries exhibits the significant positive returns on Friday.

Holiday effect is important calendar anomalies and states that a pre-holiday trading day provides excess returns than that of other trading days. The holiday effect is observed in most of the stock markets in world including US, UK, Europe, Australia, Japan, China and Taiwan the studies reported that the returns for the day before the holiday could provide the excess returns up to 12 percent higher than that of any other trading day [Keim (1989), Ariel (1990), Cadsby and Ratnar (1992), Meneu and Pardo (2004)]. In the US market Lucey (2005) suggested that holiday effect is mainly driven by the local investors. However, recent studies around the world on stock markets claimed that holiday effect is either disappeared or it is declining (Wong and Wong (2006), Couts and Sheikh (2000), Keasey and Littler (2005).

Turn of the month affect signifies the returns around the last trading days and first few trading days of the month are found to be higher. Penman (1987) in the US market argued that the companies release information containing good news in the first half of the month which leads to increase in the price in the beginning of the month and same was confirmed by Ariel (1987). Ogden (1990) also provided the robustness of the results in US explained the turn of the month effect connecting it with the cash flow approach. Cadsby, Ratnaret. al (1992) studied the turn of the month effect and confirmed the same in Germany, Switzerland, Australia, UK and Canada. Booth et al. (2000) also supported the results and conclusion of liquidity hypothesis given by Ogden (1990). Moberly and Waggoner (2000) claimed that the turn of the month effect has disappeared from the US stock market because investors started investing in the market directly instead of channels of mutual funds and institutional investors.

January Effects supports that equity returns are found to be more lucrative during the month of January than other trading months. There are numerous studies to explain the January effect. One of the leading explanations in the US market was given proposed tax loss selling hypothesis. It states that an investor sells his security in the ending month of the year i.e. December for taking the benefit of tax setoff. When investors sell their holdings, supply of securities increase and return decreases. On the other hand, investor again starts buying new holdings in January and ultimately returns increase. [Branch (1977), Ritter (1988) Bhardwaj and Brooks (1992) Kramer (1994, Starks et al. (2006)]

For the presence of anomalies, explanations were given by various studies like speed of information flow, availability of high frequency data, shortening the settlement period, reduction in the transaction costs, free flow of capital in the international markets, better liquidity etc. Contrary with the above findings and explanations some of the researches (Sullivan et.al.(2000)) had claimed that most of the findings for day of the week effect, holiday effect, turn of the month effect and January effect are the result of extensive data mining by the researchers. This study has also pointed out that if the appropriate statistical technique is used as per the stylised facts of stock returns, the result for calendar anomalies are very weak. Hudson et.al (2002) argued that the strategy made on the basis of calendar anomalies does not earn abnormal profit. This study extends the contribution to the available literature through including the latest data, modern time series techniques and including most important seven growing nation in East Asian region.

## 3. Stylized facts of Index Returns

This study uses the closing values of major stock indices in the East Asian region. It covers a period of approximately sixteen years starting from January 2000. On the basis of capitalisation and share in the capital market of each country, this study used the prominent stock indices of India, China, Japan, India, Hong Kong, Taiwan, Mongolia and Korea. The closing value of each index is collected from Bloomberg and yahoofinance.com. Some studies had claimed that calendar anomalies in the stock returns is found because of dividend effect [Lakonishok and Smidth (1988), Couts and Mills (1995) and Arsad and Couts (1997)], therefore, this study used the closing index values of each day after adjusting the payment of dividend to minimise the probability of dividend effect on the calendar anomalies as claimed by various researchers. This study is concerned with the stock returns. Therefore, index values are converted into compounded continuous Index Returns which are calculated by using the following expressions.

$$\textit{Daily Index Returns (Rt.)} = \boldsymbol{LogP_1 - LogP_0}$$

Here, $Log\ P_1$ is the natural logarithm of value of index at trading day $T_1$ and $LogP_0$ represents the natural logarithm of value of index at trading day proceeding to $T_1$ and $R_t$. Represents the daily compounded continuously return on index. With an objective to confirm the stylised facts of stock returns and to analyse the preliminary data, this study used the descriptive statistics which are represented in the Descriptive Statistics.

**Table 1: Descriptive Statistics**

| Measures | CHINA | HONG KONG | INDIA | JAPAN | KOREA | MONGOLIA | TAIWAN |
|---|---|---|---|---|---|---|---|
| Observations | 3956 | 3849 | 3869 | 3864 | 3876 | 3666 | 3862 |
| Mean | 0.000216 | 6.29E-05 | 0.000416 | -1.83E-05 | 0.000152 | 0.001068 | -2.29E-05 |
| Median | 0.000656 | 0.000385 | 0.001019 | 0.000295 | 0.000709 | 9.14E-05 | 0.000355 |
| Maximum | 0.094008 | 0.134068 | 0.159900 | 0.132346 | 0.115397 | 0.502325 | 0.065246 |
| Minimum | -0.09256 | -0.13582 | -0.11809 | -0.12111 | -0.12739 | -0.436034 | -0.09936 |
| Std. Dev. | 0.016197 | 0.015439 | 0.015647 | 0.015453 | 0.016687 | 0.045061 | 0.014458 |
| Skewness | -0.26826 | -0.084316 | -0.20291 | -0.43286 | -0.46248 | 0.697442 | -0.25304 |
| Kurtosis | 7.493305 | 10.94295 | 9.869108 | 9.175549 | 8.463634 | 29.33288 | 6.091374 |
| Jarque-Bera | 3375.399 | 10122.68 | 7633.109 | 6260.788 | 4959.158 | 106217.2 | 1579.032 |
| Probability | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| Sum | 0.853424 | 0.242044 | 1.609081 | -0.07055 | 0.588387 | 3.913770 | -0.08837 |
| Sum Sq. Dev. | 1.037619 | 0.917217 | 0.947056 | 0.922483 | 1.079015 | 7.441901 | 0.807119 |

The above table 1 represents the descriptive statistics of Index Returns after reducing all the public holiday in each year for every country. So it represents the characteristics of Index Returns for all trading days since last sixteen years starting from April2000 and ending on 31st August 2015. The above table shows that over the sample period daily Index Returns have increased for China, Hong Kong, India, Korea and Magnolia as they show positive mean value while Japan and Taiwan have shown a negative growth rate during the period of study which shows a decline in the daily returns. Median of every country is different from their mean and no modal value is given which shows that distribution of the Index Returns is non-normal. A high value of Standard Deviation and difference in minimum and maximum values shows higher uncertainty or high rate of unconditional volatility in the Index Returns. Skewness and Kurtosis are the measures of theoretical distribution of Index Returns as it can be observed from the table that all the countries are having a negative value of Skewness except Mongolia and positive value are there for Kurtosis. The negative values of Skewness indicate that the negative returns take place more often than the positive returns. The positive values of Kurtosis in all the countries represent that the theoretical probability distribution of the returns is highly peaked and fat tailed. In brief, on the basis of above statistic it can be asserted that large changes are followed by large changes and small changes are followed by small changes in both the direction. Several studies claimed that the stock returns are not found to be normally distributed as the null hypothesis of normality can be rejected at all level of significance as the JB statistics with the corresponding p-value of 0.0000 in case of all countries at all level of significance and this result is the verification of the results of non-normality and is supported by mean, median, standard deviation, Skewness and Kurtosis. In brief, on the basis of given characteristics of return it can be viewed that returns are highly volatile (uncertain) and non- normally distributed [Mandelbrot (1968), Bollerslev (1992), Brock and Lima (1995), Campbell and McKinlay (1997), Maddala and Rao (1997)].

## 4. Research Methodology

It is found that the distribution of returns are around the mean and extreme negative and positive secondly it is observed that the volatility is a positive function of its own past patterns (Volatility Pooling), it is also observed that the index returns respond more to the fall of market than that of rise in the index returns (leverage effect). The study uses ARCH-GARCH (1, 1), E-GARCH (1, 1), and GJR-GARCH (1, 1)models proposed by Engle (1982), Bollerslev (1986) andNelson (1991) and Gloston, Jangannathan and Runkle (1993) to capture the above stated and non-linear behaviour of Index Returns to estimate various calendar anomalies and volatility. A brief description of the models used is as follows.

The simplest form of an ARCH model can be written as following.

$$\sigma_t^2 = E\,[\varepsilon^2_t/I_{t-1}] = \mu + \gamma\,\varepsilon^2_{t-1} \qquad 1$$

The above equations states that conditional variance or volatility at time 't' is a functions of variance of time 't-1', variance itself is square of distance of any variable from its mean that cannot be negative, so, the constant ($\mu$) and coefficient of lagged error term ($\gamma$) must be non-negative. From the equation it can be observed that the conditional volatility is dependent on immediate past volatility. It represents the persistent of volatility and also the presence of volatility clustering.

The equation 1 may be further extended for P number of lags by adding the impact of previous volatility

$$\sigma_t^2 = E\,[\varepsilon^2_t/I_{t-1}] = \mu + \gamma_1\,\varepsilon^2_{t-1} + \gamma_2\,\varepsilon^2_{t-2} + \gamma_3\,\varepsilon^2_{t-3} + \gamma_4\,\varepsilon^2_{t-4} + \ldots + \gamma_p\,\varepsilon^2_{t-p} \qquad 2$$

Equation2 represents the volatility till period P which has significant impact on the current variance, but, the shocks before time period P do not influence the current conditional variance. The fastest transmission of information by information and communication technology, current prices reflect all the past information and shocks. Bollerslev and Taylor (1986) claimed that in place of using large number of lags in the conditional variance, it is justified to use only immediate past variance itself and residuals. This model is also known as GARCH (1, 1) model. In a compact form it can be written as:

$$\sigma_t^2 = E\,[\varepsilon^2_t/I_{t-1}] = \mu + \gamma\,\varepsilon^2_{t-1} + \omega\,\sigma^2_{t-1} \qquad 3$$

In equation3, $\omega$ is the extent of immediate past volatility on current variance and rest of the variables are same as in the ARCH model presented above. GARCH (1, 1) suggested byBollerslev (1986), can be extended up to P and Q lags of residuals and variance respectively which may be written as follows:

$$\sigma_t^2 = E\,[\varepsilon^2_t/I_{t-1}] = \mu + \gamma_1\,\varepsilon^2_{t-1} + \ldots + \gamma_p\,\varepsilon^2_{t-p} + \omega_1\,\sigma^2_{t-1} + \ldots + \omega_q\,\sigma_{t-q}^2 \qquad 4$$

Equation 4, represents GARCH (p, q) modelling, the variance cannot be negative in this case also, all the coefficients should be non-negative i.e. $\mu$, $\gamma$, $\omega$ should be greater than zero.Limitations of GARCH (1, 1) model can be seen from the equation 4 that it gives equal importance to the positive and negative shocks. But in reality the negative shocks bring more volatility in the market than that of positive shocks,i.e leverage effect, so the study used GJR-GARCH model suggested by Gloston, Jangannathan and Runkle (1993) model to capture the impact of negative and positive news generally known as "leverage effect" which can be represented given below in equation 5 and 6.

$$h_{t-1} = \delta + \alpha_1\varepsilon^2_{t-1} + \gamma d_{t-1}\varepsilon^2_{t-1} + \beta_1 h_{t-1} \qquad 5$$

$$\boldsymbol{dt} = \begin{cases} \mathbf{1}, & \varepsilon t < 0\ (Good\ news) \\ \mathbf{0}, & \boldsymbol{\varepsilon}\mathbf{t} \geq \mathbf{0}\ \ (\boldsymbol{Bad\ news}) \end{cases} \quad 6$$

Applying restrictions on the signs of different coefficients make the study more of mathematical than that of Financial nature so the study used E-GARCH method suggested byNelson(1991) that may be represented below given in the equation 7. This model is superior to the above cited models in various ways like it does not put any artificial restriction on the sign of coefficients.

$$\text{Log}\ (\sigma_t^{2)} = \omega_1 + \beta \text{Log}\ (\sigma^2{}_{t\text{-}1}) + \gamma \left| \frac{\mathbf{Ut-1}}{\sqrt{\boldsymbol{\sigma}\mathbf{2t-1}}} \right| + \boldsymbol{\alpha} [\frac{|\mathbf{Ut-1}|}{\sqrt{\boldsymbol{\sigma}\mathbf{2t-1}}} - \sqrt{\frac{\mathbf{2}}{\boldsymbol{\pi}}}] \quad 7$$

E-GARCH model given in the equation 7 represents the special features of asymmetric information and negative sign of $\gamma$ represents the negative relation between volatility and returns. In the light of above discussion it can be seen that ARCH-GARCH modelling is used to capture the variance of the residuals, so, the whole model can be divided into two categories as mean and variance. Here, the OLS model may be used as the mean modelling while GARCH (1, 1) may be used as the conditional variance equation. So, the whole econometrics framework can be designed as follows:

Model 1 (Day of the Week Effect)

Conditional Mean Equation for Day of the week effect

$$Returns = \sum_{i=Monday}^{Friday} \beta\text{iDi} + Et$$

Conditional Variance Equation for Monday Effect

$$\sigma_t^2 = \text{E}\ [\varepsilon^2{}_t / \text{I}_{t\text{-}1}] = \mu_{\text{DOW}} + \gamma_{\text{DOW}}\ \varepsilon^2{}_{t\text{-}1} + \omega_{\text{DOW}}\ \sigma^2{}_{t\text{-}1} + \sum_{i=Monday}^{Friday} \beta\text{iDi} + Et$$

Model 2 Holiday Effect and Turn of the Month Effect

Conditional Mean Equation for holiday and turn of the month effect

$$Returns = \sum_{i=Holiday}^{TOM} \beta\text{iDi} + Et$$

Conditional Variance Equation

$$\sigma_t^2 = \text{E}\ [\varepsilon^2{}_t / \text{I}_{t\text{-}1}] = \mu_{\text{TOM}} + \gamma_{\text{TOM}}\varepsilon^2{}_{t\text{-}1} + \omega_{\text{TOM}}\sigma^2{}_{t\text{-}1} + \sum_{i=Holiday}^{TOM} \beta\text{iDi} + Et$$

Model 3 JanuaryEffect

$$Returns = \sum_{i=January}^{December} \beta iDi + Et$$

Conditional Variance Equation for January effect

$\sigma_t^2 = E[\varepsilon_t^2 / I_{t-1}] = \mu_{JAN} + \gamma_{JAN}\,\varepsilon^2_{t-1} + \omega_{JAN}\,\sigma^2_{t-1} + \sum_{i=January}^{December} \beta iDi + Et$

GJR-GARCH model

Conditional Mean Equation for Day of the week effect

$$Returns = \sum_{n=Monday}^{Friday} \beta iDi + Et$$

Conditional Variance Equation for Monday Effect

$h_{t-1} = \delta + \alpha\varepsilon^2_{t-1} + \gamma d_{t-1}\varepsilon^2_{t-1} + \beta_1 h_{t-1} + \sum_{n=Monday}^{Friday} \beta iDi + Et$

$$dt = \begin{cases} 1, & \varepsilon t < 0 \ (Good\ news) \\ 0, & \varepsilon t \geq 0 \quad (Bad\ news) \end{cases}$$

Model 2 Holiday Effect and Turn of the Month Effect

Conditional Mean Equation for holiday and turn of the month effect

$$Returns = \sum_{n=Holiday}^{TOM} \beta iDi + Et$$

Conditional Variance Equation

$h_{t-1} = \delta + \alpha_1\varepsilon^2_{t-1} + \gamma d_{t-1}\varepsilon^2_{t-1} + \beta_1 h_{t-1} + \sum_{n=Holiday}^{TOM} \beta iDi + Et$

$$dt = \begin{cases} 1, & \varepsilon t < 0 \ (Good\ news) \\ 0, & \varepsilon t \geq 0 \quad (Bad\ news) \end{cases}$$

Model 3 January Effect

$$Returns = \sum_{n=January}^{December} \beta iDi + Et$$

Conditional Variance Equation for January effect

$h_{t-1} = \delta + \alpha_1\varepsilon^2_{t-1} + \gamma d_{t-1}\varepsilon^2_{t-1} + \beta_1 h_{t-1} + \sum_{n=January}^{December} \beta iDi + Et$

$$dt = \begin{cases} 1, & \varepsilon t < 0 \ (Good\ news) \\ 0, & \varepsilon t \geq 0 \quad (Bad\ news) \end{cases}$$

E- GARCH Model 1 (Day of the Week Effect)

Conditional Mean Equation for Day of the week effect

$$Returns = \sum_{n=Monday}^{Friday} \beta iDi + Et$$

Conditional Variance Equation for Monday Effect

$$\text{Log}\ (\sigma_t^{2)} = \omega_1 + \beta \text{Log}\ (\sigma^2{}_{t\text{-}1}) + \gamma \left| \frac{\text{Ut}-1}{\sqrt{\sigma 2\text{t}-1}} \right| + \alpha \left[ \frac{|\text{Ut}-1|}{\sqrt{\sigma 2\text{t}-1}} - \sqrt{\frac{2}{\pi}} \right] + \sum_{n=Monday}^{Friday} \beta iDi + Et$$

Model 2 Holiday Effect and Turn of the Month Effect

Conditional Mean Equation for holiday and turn of the month effect

$$Returns = \sum_{n=Holiday}^{TOM} \beta iDi + Et$$

Conditional Variance Equation

$$\text{Log}\ (\sigma_t^2) = \omega_1 + \beta \text{Log}\ (\sigma^2{}_{t\text{-}1}) + \gamma \left| \frac{\text{Ut}-1}{\sqrt{\sigma 2\text{t}-1}} \right| + \alpha \left[ \frac{|\text{Ut}-1|}{\sqrt{\sigma 2\text{t}-1}} - \sqrt{\frac{2}{\pi}} \right] + \sum_{n=Holiday}^{TOM} \beta iDi + Et$$

Model 3 JanuaryEffect

$$Returns = \sum_{n=January}^{December} \beta iDi + Et$$

Conditional Variance Equation for January effect

$$\text{Log}\ (\sigma_t^2) = \omega_1 + \beta \text{Log}\ (\sigma^2{}_{t\text{-}1}) + \gamma \left| \frac{\text{Ut}-1}{\sqrt{\sigma 2\text{t}-1}} \right| + \alpha \left[ \frac{|\text{Ut}-1|}{\sqrt{\sigma 2\text{t}-1}} - \sqrt{\frac{2}{\pi}} \right] + \sum_{n=January}^{December} \beta iDi + Et$$

All the equations developed earlier in the 'Econometrics modelling of calendar anomalies' section represent the application of time varying volatility model in finance. The results derived from these above stated equations are presented in the table 2, table 3 and table 4 below.

# Table 2: Results of GARCH (1,1) Model

| | | | GARCH(1,1) | | | | |
|---|---|---|---|---|---|---|---|
| Variables | China | Japan | India | Hong Kong | Taiwan | Mongolia | Korea |
| M | 0.00000294*** | 0.00000442*** | 0.00000423*** | 0.00000169*** | 0.00000112*** | 0.00000136*** | 9.39*** |
| Γ | 0.075329*** | 0.106124*** | 0.111168*** | 0.064636*** | 0.065422*** | 0.066869*** | 0.06943*** |
| Ω | 0.915229*** | 0.877475*** | 0.872765*** | 0.927104*** | 0.93051*** | 0.941986*** | 0.92874*** |
| Monday | 0.00035ns | 0.000581ns | 0.000894** | 0.000661* | -0.00022ns | -0.001711** | -6.17E-0ns |
| Tuesday | 0.00128** | 0.001566** | 0.000635ns | 0.0000678ns | 0.000203ns | -0.000973* | 0.00078* |
| Wednesday | -0.00046ns | 0.000478ns | 0.001006** | 0.000330ns | 0.000958ns | -1.02E-05ns | 0.00100ns |
| Thursday | 0.00022ns | -0.00026ns | 0.000939** | 0.000530ns | 0.000439ns | -0.001409** | 0.00063ns |
| Friday | -0.00013ns | -6.97E-06ns | 0.001238** | 0.000666ns | 0.000711ns | 0.000396ns | 0.00027ns |
| Holiday | 0.001815ns | 0.000233ns | 0.00161ns | 0.001349ns | 0.000665ns | 0.000484ns | 0.001864* |
| TOM | 0.000865ns | 0.000134ns | 0.002072*** | 0.001272** | 0.001342*** | 0.000569ns | 0.000328ns |
| January | -0.000263ns | -0.000304ns | 0.000232ns | 0.000412ns | 0.00041ns | -0.00047ns | -0.00032ns |
| February | 0.000836ns | 0.001903** | 0.000399(ns | 0.000495ns | 0.000838ns | 0.000934ns | 0.001113ns |
| March | 0.000858ns | 0.000983ns | 0.000424ns | -0.001368ns | 0.000231ns | -0.000655ns | 0.000684ns |
| April | -0.000217ns | -0.000869ns | -0.000306ns | 0.001291ns | 0.000158ns | -0.002125ns | 0.000813ns |
| May | 6.27E-05ns | -0.000107ns | 0.001137* | -0.000242ns | 0.000425ns | -0.002265** | 0.000386ns |
| June | 0.000527ns | 0.000775ns | 0.001513** | 9.50E-05ns | 5.13E-05ns | -0.000524ns | -0.00033ns |
| July | 0.000226ns | -0.000381ns | 0.000421ns | 0.001533** | 1.30E-05ns | -0.000538ns | 0.001255* |
| August | -0.001267ns | 8.50E-05ns | 0.000698ns | 0.0001ns | -0.000362ns | -0.002993*** | 0.000141ns |
| September | 0.00166** | 0.000965ns | 0.002133** | 0.001092ns | 0.000751ns | 0.001629* | 0.001017ns |
| October | -0.000192ns | -0.000753ns | 0.001098ns | 0.00103ns | -8.95E-05ns | -0.001169ns | -0.00036ns |
| November | 0.000207ns | 0.001845** | 0.002331** | 0.000999** | 0.000773ns | -0.001742ns | 0.000998ns |
| December | 0.000619ns | 0.00049ns 8 | 0.000887ns | 0.000121ns | 0.001607ns | 0.001817** | 0.000968ns |

# Table: 3 Results of GJR-GARCH (1,1)

| GJR-GARCH (1,1) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coefficients | China | Japan | India | Hong Kong | Taiwan | Mongolia | Korea |
| Δ | 3.07E-06*** | 5.44E-06*** | 5.01E-06*** | 2.43E-06*** | 1.38E-06*** | 1.49E-06*** | 1.42E-06*** |
| Α | 0.060113*** | 0.04825*** | 0.047602*** | 0.022284*** | 0.025741*** | 0.092176*** | 0.027689*** |
| Γ | 0.02972*** | 0.102499*** | 0.115766*** | 0.076007*** | 0.070065*** | -0.05585*** | 0.081893*** |
| Β | 0.914652*** | 0.875978*** | 0.871572*** | 0.925274*** | 0.931399*** | 0.941397*** | 0.925368*** |
| Monday | 0.000233ns | 0.000177ns | 0.000624ns | 0.000368ns | -0.00042ns | -0.00107* | -0.00023ns |
| Tuesday | 0.001171ns | 0.001135ns | 0.000321ns | -0.0002ns | -3.80E-05ns | -0.0006ns | 0.000573ns |
| Wednesday | -0.00056ns | 0.000286ns | 0.00077* | 8.40E-05ns | 0.000813* | 0.000445ns | 0.000755** |
| Thursday | 0.000124ns | -0.00056ns | 0.000588ns | 0.000213ns | 0.000162ns | -0.00077ns | 0.000263ns |
| Friday | -0.00029ns | -0.00023ns | 0.000864** | 0.000513ns | 0.000496ns | 0.000785ns | 4.85E-05ns |
| Holiday | 0.001867ns | -0.00018ns | 0.001446ns | 0.001529ns | 0.000918ns | 9.91E-05ns | 0.001929ns |
| TOM | 0.000786** | -0.0002ns | 0.001736*** | 0.001015** | 0.001043** | 0.001082** | 0.000111ns |
| January | -0.00045ns | -0.00089ns | -7.30E-05ns | -2.04E-05ns | 0.00027ns | 0.00044ns | -0.00053ns |
| February | 0.000689ns | 0.001725** | 0.000301ns | 5.31E-05ns | 0.000651ns | 0.001275* | 0.000818ns |
| March | 0.000695ns | 0.000737ns | 8.64E-05ns | -0.00144** | 1.16E-05ns | 5.69E-05ns | 0.000119ns |
| April | -0.00037ns | -0.00068ns | -0.00043ns | 0.001105* | 5.78E-05ns | -0.00147* | 0.000786ns |
| May | - | - | 0.001104 | - | 5.00E- | - | 0.00016n |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0.00013ns | 0.00085ns | ** | 0.00068ns | 05ns | 0.00199** | s |
| June | 0.000318ns | 0.000311ns | 0.000888ns | -0.00018ns | -0.00013ns | -0.00025ns | -0.00062ns |
| July | 0.00018ns | -0.00066ns | -2.74E-05ns | 0.001271** | 0.00022ns | -3.36E-05ns | 0.001114ns |
| August | -0.00128ns | -0.00024ns | 0.000415ns | -2.75E-05ns | -0.00064ns | -0.00232*** | -0.0001ns |
| September | 0.00146ns | 0.000776ns | 0.002102** | 0.00098* | 0.000482ns | 0.001818** | 0.001249* |
| October | -0.00021ns | -0.00092ns | 0.00052ns | 0.00094ns | -0.00035ns | -0.00058ns | -0.00068ns |
| November | 0.000196ns | 0.00135ns | 0.001755ns | 0.000635ns | 0.000287ns | -0.00144ns | 0.000426ns |
| December | 0.000652ns | 0.000439ns | 0.000512ns | -0.00039ns | 0.001359ns | 0.00253** | 0.000461ns |

## Table 4: Results of E-GARCH (1,1)

| Variables | China | Japan | India | Hong Kong | Taiwan | Mongolia | Korea |
|---|---|---|---|---|---|---|---|
| ω1 | -0.24407*** | -0.45321*** | -0.43172*** | -0.23501*** | -0.21492*** | -0.08786*** | -0.21429*** |
| Β | 0.169195*** | 0.197772*** | 0.21779*** | 0.126989*** | 0.134227*** | 0.146758*** | 0.148919*** |
| Γ | -0.02479*** | -0.08616*** | -0.08445*** | -0.0576*** | -0.06553*** | 0.055416*** | -0.06733*** |
| Α | 0.986025*** | 0.965135*** | 0.969483*** | 0.984291*** | 0.987218*** | 1.000994*** | 0.988324*** |
| Monday | 0.000158ns | 0.000126ns | 0.000441ns | 0.000451ns | -0.00039ns | -0.00222*** | -0.00043ns |
| Tuesday | 0.001256** | 0.00094** | 0.000344ns | -0.0002ns | -1.94E-05ns | -0.00066ns | 0.000406ns |
| Wednesday | -0.00067ns | 0.000152ns | 0.000888** | 0.000221ns | 0.000737** | -0.00032ns | 0.000769** |
| Thursday | 2.12E-05ns | -0.0006ns | 0.000352ns | 0.000243 | 8.23E-05ns | -0.00233*** | 0.000169ns |
| Friday | 4.19E-05ns | -0.00021ns | 0.000787** | 0.000507ns | 0.00044ns | 0.000883ns | -0.00012ns |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Holiday | -8.28E-05ns | -8.28E-05ns | 0.001668ns | 0.001366ns | 0.000982ns | 0.002971*** | 0.001718* |
| TOM | -0.00026ns | -0.00026ns | 0.001602*** | 0.001024** | 0.000927** | 0.001365** | 5.93E-05ns |
| January | -0.0002ns | -0.00117ns | -2.67E-05ns | 0.000108ns | 0.000374ns | 0.00061ns | -0.0006ns |
| February | 0.000705ns | 0.001786** | 0.000216ns | 7.37E-05ns | 0.000697ns | 0.000267ns | 0.000656ns |
| March | 0.000559ns | 0.000553ns | 4.21E-05ns | -0.0011ns | -8.85E-07ns | -8.40E-05ns | 0.000119ns |
| April | -0.00027ns | -0.0003ns | -0.00018ns | 0.001064* | 9.94E-05ns | -0.00139** | 0.000886* |
| May | -0.00016ns | -0.00089ns | 0.001119** | -0.00076ns | 9.52E-05ns | -0.00209** | 8.35E-05ns |
| June | 0.000268ns | 0.000285ns | 0.000696ns | -0.0002ns | 3.65E-05ns | -0.00117** | -0.00085ns |
| July | 0.000155ns | -0.00073ns | -0.00019ns | 0.001348ns | 0.000142ns | -0.00062ns | 0.000747ns |
| August | -0.00143** | -0.00036ns | 0.000349ns | -1.89E-05ns | -0.00066ns | -0.00331*** | 4.07E-05ns |
| September | 0.001388** | 0.000886ns | 0.00232*** | 0.001075** | 0.0002ns | 0.001429* | 0.001089* |
| October | -9.43E-05ns | -0.00109ns | 0.000315ns | 0.001093* | -0.00047ns | -0.00106* | -0.00082ns |
| November | 0.000493ns | 0.001325* | 0.001452** | 0.000617ns | 0.000354ns | -0.00328*** | 0.00038ns |
| December | 0.000735ns | 0.00012ns | 0.000147ns | -0.00052ns | 0.001192* | 0.002654*** | 0.000304ns |

**Note: All the results in Table 2, Table 3, and Table 4 are derivded using Eviews software by author.**

Note: $^{***, **, *}$ represents the statistical significance at 1%, 5% and 10%level respectively and ns represents not significant level respectively.

This part of the paper is concerned with the designing and testing the hypothesis for the testing various calendar anomalies stated above using maximum likelihood estimation under GARCH, GJR-GARCH and GED estimation under E-GARCH method. The study had presented the results along with the level of significance in table 2, 3 and 4. These results are presented for Day of the week effect, Holiday effect and turn of the month effect, and January effect separately. The coefficients of GARCH, GJR-GARCH and E-GARCH models are highly statistically significant at one percent level of significance. It means that all the East Asian Countries included in the study shows strong evidence that the stock returns are affected by the shocks which are measured with the help of error term. The impact of any shock is long lasting and takes time to vanish it out. The previous day's returns is very important factor in deciding the current returns shown by the significance of GARCH coefficients. The fall in the stock market affect the stock market more than the rise in the stock market, depicted by the significance of E-GARCH coefficients. There leverage effect is confirmed in all the countries in the study and may be inferred that uncertainty in the prices increases more when price falls as compare to the uncertainty because of price increase.

Above results clearly indicate the absence of Monday effect and holiday effect for all the seven East Asian countries. The results represent that last two and first four working days are very significant for India, Taiwan and Mongolia. These three markets advocate the strong presence of turn of the month effect. The study has taken the first four and last two working day into consideration that are significant and provide the excess positive returns. It is very difficult to infer that which day out of these six day would going to provide excess returns to the investor. Furthermore it is also observed that Mongolian Stock market exhibits negative excess returns in the month of August. When the study considered the impact of information and removed the artificial assumption for the signs of various coefficients and used E-GARCH (Mean) model the study advocates the negative Monday effect for the Mongolian stock market at one percent of level of significance. The study shows various anomalies in these Asian markets but they are not statistically significant, due to the accuracy and consistency of the results the study had considered the one percent level of significance. The study rejected the findings of five percent level of significance and ten percent level of significance. At one percent level of significance it is clear that the East Asian Stock markets are efficient and the probability of getting excess returns on the basis of days of the week, festival, start and end of the month and months in the year is not possible. [Jaffe et al. (1989, Abraham&Ikenberry (1994), Dubois&Louvet (1996), Brusa, Liu and Schulman (2003, 2005)]

## 5. Conclusion

The basic objective of this study was to examine the various calendar anomalies in the stock returns of various economies in the East Asian region. The study selected the fastest growing economies, dominating, and least researched countries in East Asian region. For achieving these objectives study collected daily closing prices adjusted after dividend for all major stock indices in each seven East Asian nations for last fifteen years starting from January 2000. The prices were converted into continuous compounded rate of returns and with the help of descriptive statistics and theoretical distribution of returns, study explained various stylised facts of the stock market returns. With a view to test the calendar anomalies, study used dummy variable technique. To consider the time varying variance and returns ARCH-GARCH family of models were used. The results and findings of the study indicate that the stock returns are highly volatile, non-normally distributed and leptokurtic i.e. the returns are found to be more clustered around mean and fat tailed towards both extremes for all the countries. The results of the study are mixed for the presence and absence of calendar anomalies. It may be inferred that the absence of calendar anomalies indicates operational efficiency of East Asian Stock Market[Ogden (2003), Mehdian& Perry (2000)]. The period may be daily, before public holiday, near the end and beginning of the month, or a particular month and make higher profit. However, an investor may not get enough profit to take the advantage of calendar anomalies because of the presence of transaction costs in every country. There might be some announcement related to firm or market as a whole (inflation, interest rates, financial statement) which may not create excess returns based on this sample [Holden et al. (2005].As all the researches are suffered from various limitations so, this study is also of the same category causes for the absence of calendar anomalies, using only single index, small sample of data, using only seven countries, not using more advanced (GMM) econometrics tools and ignorance of time value of money are some of the limitations of this study that opens the doors of future scope of this area.

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