**FAMA DECOMPOSITION ANALYSIS OF SELECTED COMPANIES OF BOMBAY STOCK EXCHANGE IN INDIA**

**Dr. Dhanraj Sharma**

**Assistant Professor**

Department of Commerce

Central University of Rajasthan

**ABSTRACT**

This main purpose of the research is to examine the selectivity and diversificationcomponentin generating the superior return for the study period i.e. April 2010 to March 2015. To achieve the major objective of the study, Fama (1972) Decomposition modelis applied on a sample size of 30companies. In the sample size, all the top 30 companies are taken which constitute the S&P BSE Sensex. The research also characterized the results on the basis of risk and return related performance measure. The study confirms that diversification and selection has significant role in providing additional value in the investment within the study period.

***Keywords-****Selectivity, Diversification, Risk and Return, Fama Decomposition Model and BSE.*

**INTRODUCTION**

The Indian stock exchanges are the most prominence exchanges not only in Asia but also at the international phenomena.The Bombay Stock Exchange (BSE) is one of the oldest exchanges across the world, established in 1875 which was earlier known as The Native Share and Stock Brokers’ Association.BSE is a corporatized and demutualised entity, with a broad shareholder-base which includes two leading global exchanges, Deutsche Bourse and Singapore Exchange as strategic partners.BSE is Asia's first & the Fastest Stock Exchange in world with the speed of 6 micro seconds and one of India's leading exchange groups. Over the past 140 years, BSE has facilitated the growth of the Indian corporate sector by providing it an efficient capital-raising platform. BSE provides an efficient and transparent market for trading in equity, debt instruments, derivatives, mutual funds. It also has a platform for trading in equities of small-and-medium enterprises (SME).

World Federation of Exchangesrevealed that BSE is one of the world's leading exchanges for Index options trading. It is also one of the best exchanges in terms of listed members as more than 5500 companies are listed on BSE.

**Chart-1 Movement in S&P BSE Sensex from April 2015 to March 2016**



*Source – Historical database of BSE Ltd.*

The Chart-1 shows the movement of S&P BSE Sensex for the study period i.e. from April 2010 to March 2016. It can be clearly observed that index achieve remarkable growth in the study period. The Compound Annual Growth Rate (CAGR) of S&P BSE Sensex was 7.61 per cent return during the last six years. The index was 29361.5 which was highest figure achieved in February 2015 and lowest figure was 15454.92 in December 2011. It registered a positive annual growth rate in all years except in 2010-11.

This Chart-2represents the shareholding pattern of the major shareholders other than promoters of BSE Ltd. Since BSE Ltd. is a corporatized and demutualised entity, with a broad shareholder-base, Deutsche Bourse and Singapore Exchange are the major shareholders having the equal contribution of 4.91 per cent in the share capital of BSE Ltd. Life insurance Corporation of India is third largest shareholder of BSE Ltd having the share of 4.83 per cent followed by State Bank of India (4.83 per cent), GKFF Ventures (4.73 per cent), Acacia Banyan Partners Limited (3.87 per cent), Atticus Mauritius Ltd (3.87 per cent), Caldwell India Holdings Inc (3.87 per cent), Quantum (M) Limited (3.87 per cent) and Bajaj Holding and Investment limited with a share of 2.90 per cent.

**Chart-2 Shareholding pattern of top 10 shareholders in S&P BSE Sensex**

****

*Source – Annual Report of BSE Ltd as on March 2015.*

The popularity of investment in share market has grown dramatically over the last few decades. The evaluation of the performance of listed companies has the prominent importance for the academicians and investors. A continuous research based on risk and return analysis is needed to find out whether the companies are able to add the value in the investment with respect to risk bear by the investors. The study contributes in providing an analytical framework to assess the different components of return specifically related with the systematic risk, inadequate diversification and selectivity by using the Fama Decomposition model.

This research paper consists of five sections which starts with introduction and followed by brief review of relevant existing studies. The next section provides the methodology followed by empirical result of the research based on models developed by Fama (1972). The final section presents conclusion of the research paper.

**REVIEW AND LITEARTURE**

*International Studies*

**Fama E. F. (1972)** suggested fund performance in terms of excessreturns over expected returns based on premium for total risk.In other words, the excess returns are computed based oncapital market line (CML). He suggested that overall portfolioperformance has two components. First, performance due tostock selection ability (realized return minus expectedportfolio return) of the fund manager and second performance due to expected portfolio risk -return assumed by the fund manager.**Almakrami (2013)** investigated what variables from a firm's financial statement significantly predict an individual firm's vulnerability to a financial crisis? He had applied structural equation modeling (SEM), multivariable fractional polynomials (MFP) algorithm technique in his study. Result provides two useful early warning indicators including financial leverage and a balance between current assets and current liabilities. **Ayentimi, Mensah& Francis (2013)** in their study investigated the weak-form efficiency on the Ghana Stock Exchange (GSE). The result of the study indicated the inefficiency in the GSE. This implies a sizeable amount ofstock prices on the GSE are either undervalued or overvalued as the market is generally inefficient.It also showed that financial stock return series do not follow normal distribution when Normality of the return series and random walk assumptions were tested.**Potocki and Świst (2012)** in their study made attempted to verify the strong-form efficiency of the market on the basis of recommendations issued by 63 financial institutions. The strong form efficiency hypothesis of the Polish capital market was verified with the use of statistical and econometric methods. **Guidi& Gupta (2011)** investigated that whether the selected ASEAN countries are following the Random Walk Hypothesis or not? The result of these test shows that among the selected six ASEAN countries Indonesia, Malaysia, Philippines and Vietnam are not following EMH and the stock market of Singapore and Thailand are weak form efficient.

*Indian Studies*

**Ramachandran (2013)** in his study aimed at examining the efficiency of Indian Stock market by studying stock price and trading volume reaction resultant upon the corporate action information. The result showed that the bonus information release will not influence the stock price. The analysis reveal that the information release of dividend, bonus issue, stock split and merger do not influence the security returns in any significant manner. **Singh (2010)** tried to study whether the capital market reforms has increased the efficiency of stock market. In this study Indian stock market has been examined for the time period of 1991-2002*.*Adjusted closing prices were mainly extracted from the CMIE database Prowess, and supplemented by data from the BSE site. **Mukherjee (2007)** captured the trends, similarities and patterns in the activities andmovements of the Indian Stock Market in comparison to its international counterparts. For the comparative analysis of the different stock exchanges, the period chosen is from 1st January 1995 to 31st July, 2006. The result of the study showed that Indian stock exchange has the governance system and an efficient mechanism in place to be a world class institute. **Varma (2002)**examined the relationship between index futures and index options prices in India. The result shows that some overpricing of deep-in-the-money calls and some inconclusive evidence of violation of put-call-parity. It also shows that the observed prices are rather close to the average of the intrinsic value of the option and its Black-Scholes value (disregarding the smile).

On the basis of above review of earlier studies it can be observe that various studies are conducted on the efficiency of listed companies but very few studies are there which mainly focused on risk and return market performance of these companies. Selectivity and diversification is the untouched part in the various researches specifically in the context of India.

**RESEARCH METHODOLOGY**

*Sample selection and Sources of data*

The study employed the secondary sources of data. The samples of companies are selected on the basis of stock listed in BSE and constituted the S&P BSE Sensex. S&P BSE Sensex is based on free float market capitalization of top 30 companies. All these companies are taken as a sample. For evaluating the market performance of sample companies, the weekly closing value of stock prices is taken into consideration. Therefore,weekly closing values of shares have been used for all the sample companies for the period from April, 2010 to March 31, 2015. The data have been collected from the database of BSE Ltd. In order to have a meaningful evaluation, the stock performance of the companiesis comparing with their respected benchmark portfolios. For this purpose, S&P BSE Sensex is taken as proxy of benchmark index for all the companies. The closing value of respected benchmark indexes is also used to calculate the weekly market return for the above mention period.

**Table-1 List of Top 30 companies constituted the S&P BSE SENSEX**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Company Name** | **Code** |
| 1 | Asian Paints | A1 |
| 2 | Axis Bank | A2 |
| 3 | Bajaj Auto | A3 |
| 4 | Bharat Petroleum | A4 |
| 5 | BhartiAirtel | A5 |
| 6 | Bosch | A6 |
| 7 | HCL Technologies | A7 |
| 8 | HDFC Bank | A8 |
| 9 | Hindustan Unilever | A9 |
| 10 | Hindustan Zinc | A10 |
| 11 | HDFC | A11 |
| 12 | ICICI Bank | A12 |
| 13 | Indian Oil | A13 |
| 14 | Infosys | A14 |
| 15 | ITC | A15 |
| 16 | Kotak Mahindra Bank | A16 |
| 17 | Larsen &Tubro | A17 |
| 18 | Lupin | A18 |
| 19 | Mahindra and Mahindra | A19 |
| 20 | Maruti Suzuki India | A20 |
| 21 | NTPC | A21 |
| 22 | ONGC | A22 |
| 23 | Power Grid Corporation Of India | A23 |
| 24 | Reliance Industries | A24 |
| 25 | SBI | A25 |
| 26 | Sun Pharmaceutical | A26 |
| 27 | Tata Consultancy & Services | A27 |
| 28 | Tata Motors | A28 |
| 29 | Ultra Tech Cement | A29 |
| 30 | Wipro | A30 |

*Source- Database of BSE*

The weekly change in the stock prices was observed for the sample companies, market index and 91 days T- bills for the study period. There has been a controversy as to what constitutes risk free assets. Generally treasury bills of different durations have been used as a surrogate for risk free assets in earlier studies conducted. In this study, the weekly yields on 91-day U.S. treasury bills (T- bills) have been used to surrogate for risk free rate of return as has been done by most of the researchers.

*Objectives of the study*

This study is carried out to achieve the following objectives-

* To evaluate the risk and return relationship of the selected sample companies the S&P BSE Sensex during the study period.
* To examine the role of selectivityand diversification in the value creationof investment.

*Hypothesis of the study*

* Selected sample stocks of the companies are not able to beat the benchmark index.
* Selectivity and diversification do not have any significant role in the value creation of investment.

Following are the statistical tools and techniques used in evaluation of market performance of the sample companies:

*Return*

The average return on the shares of sample companies has been worked out using the weekly return series by the following.

*Return= (Closing Value of Share t -Closing Value of Sharet-1)/ Closing Value of Share t-1*

Similarly, the weekly returns for the benchmark index have been computed. For the benchmark index, the return of S&P BSE Sensex is calculated as:

*Return= (Indext-Indext-1)/ Indext-1*

The weekly yield on 91 days US treasury bills are already in the return form which is converted into weekly return.

*Risk*

The risk is calculated on the basis of weekly-end stock return. The following measures of risks associated with mutual funds have been for the study:

*Standard Deviation-* The total risk is measured by the standard deviation of the weekly returns which was calculated using the following formula:

*σ =*$\sqrt{\frac{1}{n-1}\sum\_{t=1}^{n}(R\_{t}}-\overbar{R)}^{2}$

where,

σ = Standard Deviation, n= number of weekly returns

Rt = weekly returns of the stock $\overbar{R}$ = mean return of the stock.

*Beta*

 Beta estimate the systematic risk, is the fund’s volatility as regard market index measuring the extent of co movement of fund with that of the benchmark index.

*β =* $\frac{Covariance between mutual fund return and market return}{Varianceofmarketreturn}$

Higher the values of beta indicate a high sensitivity of fund returns against market return and the lower the value indicate lower sensitivity.

*Fama measures*

Risk adjusted performance measures discussed earlier primarily judge the overall performance of a fund. However it is useful to breakdown the performance into the different components of performance. Thus, in addition to using the explicit risk- return trade off measures for performance evaluation of mutual funds, It may also evaluate the portfolio on the basis of decomposition of portfolio performance by using components of investment performance such as proposed by Eugene F. Fama.

*Fama(1972)* measures breaks down the observed return into four components:

1. Risk free return Rf
2. Compensation for systematicrisk β(Rm – Rf**)**
3. Compensation for inadequate diversification (Rm – Rf**)**{(σt/ σm**)-**β)}
4. Net superior returns due to selectivity (Rt – Rf**)-**{(σt/ σm**)(**Rm – Rf)}

Fama argues that the difference between return on an active bet and return on a passive bet which is obtained from the security market line may arise due to selectivity skills of the fund manager. This difference is analogous to the alpha of Jensen measure. However Fama goes a step further and decomposes selectivity into diversification return and net diversifiable risk to which active bet is exposed of the fund manager. It may be noted that positive net selectivity and selectivity are not likely to be significantly different from each other. Thus, in sum it is advisable to test either selectivity or net selectivity for performance evaluation in case of well diversified portfolios since both measures would provide the same result. However, Net selectivity is a more appropriate measure in case of diversified portfolio.

*Ft= Portfolio Return – Risk free return – Returns due to all risks*

*= (Rt – Rf****)-****{(σt/ σm****)(****Rm – Rf)}*

A positive value for Ft indicates that the fund earned returns higher than expected returns and lies above CML and a negative value indicates that the fund earned return less than expected returns and lies below CML.

**EMPIRICAL ANALYSIS**

Empirical analysis is mainly divided into two parts. First section deals with the risk and return analysis and test the statement whether selected sample stock of the companies are able to beat the benchmark index.

**Table-2 Risk and Return analysis of sample companies**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Code** | **Rt** | **σt** | **Rm** | **σm** | ***Β*** | **Rf** |
| A1 | 0.60826 | 3.34621 | 0.20589 | 2.28796 | 0.1530 | 0.00540 |
| A2 | 0.45561 | 4.87486 | 0.20589 | 2.28796 | 0.1360 | 0.00540 |
| A3 | 0.34746 | 3.56936 | 0.20589 | 2.28796 | -0.7000 | 0.00540 |
| A4 | 0.55672 | 4.78110 | 0.20589 | 2.28796 | 0.1510 | 0.00540 |
| A5 | 0.20471 | 4.19927 | 0.20589 | 2.28796 | 0.0280 | 0.00540 |
| A6 | 0.69558 | 3.18597 | 0.20589 | 2.28796 | 0.0830 | 0.00540 |
| A7 | 0.72442 | 3.87962 | 0.20589 | 2.28796 | -0.8000 | 0.00540 |
| A8 | 0.42808 | 3.17105 | 0.20589 | 2.28796 | -0.0500 | 0.00540 |
| A9 | 0.59544 | 3.58193 | 0.20589 | 2.28796 | 0.1310 | 0.00540 |
| A10 | 0.21398 | 4.17057 | 0.20589 | 2.28796 | 0.0170 | 0.00540 |
| A11 | 0.11845 | 9.04763 | 0.20589 | 2.28796 | 0.5510 | 0.00540 |
| A12 | 0.28826 | 4.33463 | 0.20589 | 2.28796 | -0.1460 | 0.00540 |
| A13 | 0.18898 | 4.56217 | 0.20589 | 2.28796 | 0.0760 | 0.00540 |
| A14 | 0.07417 | 4.82121 | 0.20589 | 2.28796 | -0.2710 | 0.00540 |
| A15 | 0.41467 | 3.05657 | 0.20589 | 2.28796 | -0.0200 | 0.00540 |
| A16 | 0.39439 | 4.94443 | 0.20589 | 2.28796 | -0.4600 | 0.00540 |
| A17 | 0.27967 | 4.47368 | 0.20589 | 2.28796 | -0.1560 | 0.00540 |
| A18 | 0.73844 | 3.07424 | 0.20589 | 2.28796 | -0.0850 | 0.00540 |
| A19 | 0.41531 | 4.01389 | 0.20589 | 2.28796 | -0.2280 | 0.00540 |
| A20 | 0.44936 | 3.99535 | 0.20589 | 2.28796 | 0.2540 | 0.00540 |
| A21 | -0.04785 | 3.56110 | 0.20589 | 2.28796 | 0.0780 | 0.00540 |
| A22 | 0.12680 | 4.04984 | 0.20589 | 2.28796 | -0.0390 | 0.00540 |
| A23 | 0.18043 | 2.93448 | 0.20589 | 2.28796 | -0.1860 | 0.00540 |
| A24 | -0.01248 | 3.48658 | 0.20589 | 2.28796 | -0.0020 | 0.00540 |
| A25 | 0.22503 | 4.66474 | 0.20589 | 2.28796 | -0.4730 | 0.00540 |
| A26 | 0.75894 | 3.48267 | 0.20589 | 2.28796 | 0.366 | 0.00540 |
| A27 | 0.51934 | 3.44098 | 0.20589 | 2.28796 | -0.1800 | 0.00540 |
| A28 | 0.62162 | 5.03034 | 0.20589 | 2.28796 | -0.5800 | 0.00540 |
| A29 | 0.43443 | 3.76228 | 0.20589 | 2.28796 | 0.0060 | 0.00540 |
| A30 | 0.24613 | 3.49471 | 0.20589 | 2.28796 | -0.1200 | 0.00540 |
| **Average** | 0.37481 | 4.09972 | 0.20589 | 2.28796 | -0.0822 | 0.00540 |
| **Standard Deviation** | 0.22550 | 1.12544 | 0.00000 | 0.00000 | 0.2975 | 0.00000 |
| **Maximum** | 0.75894 | 9.04763 | 0.20589 | 2.28796 | 0.5510 | 0.00540 |
| **Minimum** | -0.04785 | 2.93448 | 0.20589 | 2.28796 | -0.8000 | 0.00540 |

*Source- Compiled by Author*

Table-2 shows the average risk and return of various sample companies and benchmark index. In terms of average return, share ofSun Pharmaceutical (Sample No. 26) gave the highest return and the NTPC (Sample No.21)gave the lowest return in all the samples. HDFC (Sample No. 11) is the most risky and Power Grid Corporation of India (Sample No.23)is the less risky in the entire sample. Table also shows that average return of 8 samples companiesis greater than the average of benchmark index and average return of 22 sample companies is less than the average return of benchmark index. The cross sectional average return of sample companies is 0.0.37481, more than average return of benchmark index which is 0.20589. Risk free rate is 0.00540 which is taken from average weekly yield of 91 days Treasury bills. The result shows that out of 30 sample companies, 22 companies (73 per cent) are able to beat the benchmark index which means these companies providedthe better return as compare to S&P BSE Sensex and 8 (27 per cent) companies are not able to beat the benchmark.

This section mainly deals with the test of second hypothesis of this research i.e. Selectivity and diversification do not have any significant role in the value creation of investment. For testing of statement, Fama decomposition model is used to examine the selectivity and diversification skills. Result of this model is discussed as below:

**Table-3 Result of Fama Decomposition Model**

|  |  |
| --- | --- |
| **Code** | **Fama Measure** |
| **Rf** | **Rβ** | **Rid** | **Ft** |
| A1 | 0.0054 | 0.0305 | 0.2628 | 0.3096 |
| A2 | 0.0054 | 0.0271 | 0.4001 | 0.023 |
| A3 | 0.0054 | -0.0141 | 0.3268 | 0.0293 |
| A4 | 0.0054 | 0.0301 | 0.3888 | 0.1324 |
| A5 | 0.0054 | 0.0055 | 0.3625 | -0.1687 |
| A6 | 0.0054 | 0.0166 | 0.2626 | 0.411 |
| A7 | 0.0054 | -0.0159 | 0.3559 | 0.3791 |
| A8 | 0.0054 | -0.01 | 0.2879 | 0.1448 |
| A9 | 0.0054 | 0.0262 | 0.2877 | 0.2762 |
| A10 | 0.0054 | 0.0033 | 0.3621 | -0.1569 |
| A11 | 0.0054 | 0.11 | 0.6829 | -0.6798 |
| A12 | 0.0054 | -0.0293 | 0.4091 | -0.097 |
| A13 | 0.0054 | 0.0153 | 0.3845 | -0.2162 |
| A14 | 0.0054 | -0.0011 | 0.4236 | -0.3537 |
| A15 | 0.0054 | 0.0086 | 0.2593 | 0.1414 |
| A16 | 0.0054 | -0.0058 | 0.4391 | -0.0443 |
| A17 | 0.0054 | 0.0312 | 0.3608 | -0.1178 |
| A18 | 0.0054 | 0.0022 | 0.2672 | 0.4636 |
| A19 | 0.0054 | -0.001 | 0.3527 | 0.0582 |
| A20 | 0.0054 | 0.0594 | 0.2907 | 0.0939 |
| A21 | 0.0054 | 0.015 | 0.2971 | -0.3653 |
| A22 | 0.0054 | -0.0068 | 0.3616 | -0.2335 |
| A23 | 0.0054 | -0.0092 | 0.2663 | -0.0821 |
| A24 | 0.0054 | 0.0116 | 0.2939 | -0.3234 |
| A25 | 0.0054 | 0.0152 | 0.3936 | -0.1891 |
| A26 | 0.0054 | 0.0166 | 0.2886 | 0.4484 |
| A27 | 0.0054 | -0.0146 | 0.3161 | 0.2124 |
| A28 | 0.0054 | -0.0333 | 0.4741 | 0.1754 |
| A29 | 0.0054 | 0.0232 | 0.3065 | 0.0993 |
| A30 | 0.0054 | -0.0061 | 0.3124 | -0.0655 |
| **Average** | 0.0054 | 0.01 | 0.3492 | 0.0102 |
| **Standard Deviation** | 0.0054 | 0.0274 | 0.0859 | 0.2696 |
| **Maximum** | 0 | 0.11 | 0.6829 | 0.4636 |
| **Minimum** | 0.0054 | -0.0333 | 0.2593 | -0.6798 |

*Source- Compiled by Author.*

Table 1.3 gives the information pertaining to Fama measure for the sample companies constituted the S&P BSE Sensex. The component wise result of Fama Decomposition model are discussed below-

**Performance of Risk**

Performance of the risk assesses the return being generated due to their decision to take the risk. They assume risk in the hope of generating the extra returns on their stock. An examination of the Fama measure result shows that except for 12 stocks, the other 18 stock return exhibit positive performance on account of risk bearing activity of investor. The HDFC (0.1100) has the highest positive performance and the lowestis of Tata Motors(-0.0333) among the sample companies.

**Performance of Diversification**

Performance can be attributed to diversification and net selectivity. The diversification measures the additional returns that compensate the investors for bearing diversifiable risk. Therefore an attempt has been made to examine investment performance on diversification. Table 1.3 showed that all the sample mutual fund schemes were earned positive return for its diversification activities. Again the stock of HDFC has the highest positive performance among the sample companies. The majority of positive incidence of return on risk premium and diversification imply that return of sample stock return was more than the risk free rate during the study period.

**Performance of Net Selectivity**

After accounting for diversification, the residual return performance on selectivity is attributed to net selectivity. A positive net selectivity value will indicate superior performance and in case of negative value implies that investor have taken diversifiable risk that has not been compensated by extra returns. Table 1.3 exhibited, on the total net selectivity front 14 stock (46.66%) have shown negative return and the rest 16stock (53.34%) have reported positive net selectivity indicating superior stock selection. The average net selectivity is negative for all sample mutual fund schemes (0.0102), this would imply that stock of 16companies were able to get some additional compensation for their diversification activities.

**CONCLUSION**

This study tried to attempt the investment performance of selected listed companies of Bombay Stock Exchange in India. All those companies which constituted the S&P BSE Sensex are taken as a sample of the study. To analyze the investment performance, risk, return, standard deviation, Beta and Fama Decomposition model is used for the study period of five years i.e. April 2010 to March 2015. The data is collected from the database of BSE website and inference is drawn on weekly basis secondary data. S&P BSE Sensex is taken as a proxy variable of benchmark index. It is found that average return of selected sample companies is superior to benchmark return and investment in these companies is also risky in nature as compare to benchmark. Only 8 Companies are not able to beat the benchmark index. The results of the Fama Decomposition model showed that majority of selected companies have reported positive net selectivity indicating superior stock selection. This would imply that these companieswere able to get some additional compensation for their diversification and selectivity activities.

**REFERENCE**

Almakrami M.Y.(2013).The Use of Financial Statements to Predict the Stock Market Effects of Systemic Crises*.Claremont Graduate University Thesis and Dissertations.*United States.

AyentimiD.T., Mensah A.E. & Francis N.I.(2013).Stock Market Efficiency of Ghana Stock Exchange: An Objective Analysis. *International Journal of Management, Economics and Social Sciences, 2(2)*, 54 –75.

Fama, E. F. (1972). Components of Investment Performance.*Journal of Finance,27*, 551- 567.

Guidi F. & Gupta R.(2011).Are ASEAN Stock Market Efficient? Evidence FromUnivariate and Multivariate Variance Ratio Test, *Griffith Business School*, Discussion paper finance.

Mukherjee D. (2007).Comparative Analysis of Indian Stock Market with International Markets.*Great LakesHerald,1(*1)*,* 39-71.

Potocki T., Swist T. (2012). Empirical Test of the Strong Form Efficiency of the Warsaw Stock Exchange: The Analysis of WIG 20 Index Shares.*South-Eastern Europe Journal of Economics,2*, 155-172.

Ramachandran R. (2013). A Study on Semi-Strong Efficiency of Indian Stock Market.*International Journal of Scientific and Research Publications, 3*(9), 1-3.

Singh R. (2010). Globalization and Capital Market Reforms: Impact on Efficiency of the Indian Stock Market. *Decision, 37*(2), 22-37.

Varma R. Jayanth. (2002). Mispricing of Volatility in the Indian Index Options Market.*IIMA*Working Paper No. 2002-04-01.