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# An Empirical Study of the Intercorrelation among Various Global Equity Markets to Develop a Diversified Worldwide Equity Index Based Portfolio

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**Abstract:** Financial Market instruments and Indexes generate risk-return trade-offs. However, their performances are not studied in absolute terms but are relative to certain accepted benchmarks at domestic or global level. With the development of multiple indexes as benchmarks, the current study has aimed to develop a diversified worldwide equity index based on the selected countries indices. In the study, fifteen countries arechosen in order to find the optimal portfolio for global investment. The currency adjusted (in USD) monthly holding period returns of the countries' index (one index per country) has been calculated. Based on their annualized returns and risks correlations were generated construct a heat map for analysis. By optimization of the portfolio Sharpe Ratio the optimal weights are identified for the global investment portfolio. The weights so allotted to the select set of countries are then correlated with the weights allotted by the **iShares MSCI ACWI ETF**, which is taken as a benchmark source to see the efficiency of the methodology devised in the paper for an optimal global portfolio generation. The findings indicate that 92.52% of the weights generated by maximizing the Sharpe Ratio are significantly correlated with the iSHARES MSCI ACWI ETF holdings for the selected set of fifteen countries for the given period 2012-2016 indicating the workability of the portfolio generation methodology undertaken in this paper for research.

Keywords: Sharpe Ratio, Optimization, Benchmark, Correlation

## 1. INTRODUCTION

Global Investing is "investing on a worldwide scale, reconciling or taking commercial advantage of global market differences, similarities and opportunities in order to meet global objectives in terms of diversification and generating higher returns."

It is not a progressive move, it is a transformative procedure. While this does not have any significant bearing to all, it applies mostly to those that start as household financial specialists. Global responses in the form of speculations has increased and is clear for roughly almost all parts of shopper's day by day life. Neighbourhood locales or national limits are no more confined to the domestic powers. To be effective in today's globalized economy, it is an absolute necessity for the organizations to be continuously receptive to nearby and additionally worldwide economic situations and fluctuating viewpoints identified with the global investing process.

This is true for Stocks Markets as well. With the global dynamics permitting cross country investment, it becomes essential to understand the global investment opportunities in detail. In India at present, the international investment is through the mutual fund and ETF route. Their returns need to be benchmarked against a global index or Fund and hence the need to understand the essence of a benchmark. Identify or create one to evaluate the fund performance.

The paper aims to develop a Global equity market index from a well-diversified worldwide Equity Index portfolio and correlate it with the *the iShares MSCI ACWI ETF*, which is a globally recognized benchmark. The study is based

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on monthly returns of fifteen countries indices based on market cap and an index is develop based on the same by identifying the weights for individual asset class through the optimization of Sharpe ratio. This is then correlated with the *iShares* **MSCI ACWI ETF** to understand the correlation and effectiveness of the chosen underlying Indexes for the portfolio.

## **REVIEW OF LITERATURE**

Richard O. Michaud, Gary L. Bergstrom, Ronald D. Frashure, & Wolaha (1996) were one of the earliest researchers whodemonstrated that including universal resources builds the mean-variance proficiency of household value portfolios. Their study observed that detached worldwide contribution adds to diminished risk and that dynamic administration may build returns. The study concludes that universal value expansion can and has enhanced riskreturn connections for worldwide financial specialists, with dynamic administration contributing more to higher returns. Agarwal (1997) studied the determinants of outside portfolio speculation (FPI) and its effect on the national economy in six Asian nations. The results of regression demonstrated that the four important determinants of FPI are real exchange rate, index of economic activity and the share of domestic capital market in the world stock market capitalization and inflation rate. The inflation had a negative coefficient while the others had a positive coefficient. With respect to effect of FPI on the national economies, it was found that the index of economic activities and inflation rate had an upward trend; the volatility had not increased over time and the ratio of foreign debt has come down along with the debt servicing to GDP ratio and that Indonesia and India had crossed upper bounds of debt ratios.Goetzmann, Lingfeng, & Rouwenhorst (2005) break down the correlation structure of the worldwide value showcase in the course of the most recent 150 years. The findings revealed that the worldwide connection structure moves significantly after some time and takes note of that the advantages of worldwide broadening that are brought on by the increment in the quantity of business sectors accessible to worldwide speculators and the low normal relationship among the accessible markets.B.S. Bodla, Ashish Kumar (2009) to study FIIs and their connection with financial factors carried out month to month information sets relating to securities exchange capitalization, exchanging volume, FIIs streams and other related factors for a period of 15 years from January 1993 to December 2007. The Granger Causality Test was used to decide the connection of FII investments, deals and investments with securities market capitalization and volume. The study found that investments made in Indian securities exchange directly related to Market Capitalization yet in the event of exchanging volume, FIIs speculation turned as a consequence of exchanging volume and also that sales by FIIs in Indian stock market have a bidirectional causality with market capitalization. Gumus & Kurt (2015) analyzed the relationship between FDI and FII and macroeconomic indicators in Turkey over 2003-2013. The findings reveal a bi-directional relationship between FDI and real exchange rate and FDI and interest rates and a one-directional relationship between FDI and stock market.Mohanasundaram (2015) found that FII inflows are directly related to Exchange Rate, Producer Price Index of USA, Return on S&P 500, Return on Nifty, and Market Capitalization of NSE and have a negative association with Wholesale Price Index of India. Thus, concluding that FII inflows in India are majorly dependent on macroeconomic factors.

## 2. RESEARCH METHODOLOGY

#### 2.1. OBJECTIVES:

a) Construction of an optimum global portfolio by maximizing the portfolio Sharpe Ratio using the solver function.

b) To calculate and analyze the heat map correlation matrix for the sample size on the basis of their monthly index holding period return for the given period.

#### 2.2. HYPOTHESIS:

H0: There is no significant correlation between the weights generated in the study taken and the iSHARES MSCI ACWI ETF holdings for the selected set of fifteen countries.

H1: H0: There is significant correlation between the weights generated in the study taken and the iSHARES MSCI ACWI ETF holdings for the selected set of fifteen countries.

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## 2.3. VARIABLES OBSERVED:

- 1. The monthly returns for each of the selected set of fifteen countries' index for the given period of sixty months: January, 2012- December, 2016.
- 2. The monthly returns for the U.S Securities 10Y Bond for the given period of sixty months: January, 2012-December, 2016.
- 3. The monthly exchange rate for each of the selected set of fifteen countries for the given period of sixty months: January, 2012- December, 2016.

## 2.4. RESEARCH DESIGN:

The study is an observational study where the performance of fifteen countries taken as sample was observed and compared over a given period. The data collected, in relation to this observation, the monthly index returns for the selected set of fifteen countries from January, 2012- December, 2016, is linear. Therefore, this is a descriptive (observational type) longitudinal (linear data) study.

#### 2.5. SAMPLING:

Indexes sampled are:

- The United States of America New York Stock Exchange
- The United Kingdom London Stock Exchange
- Japan Japanese Exchange Group Nikkei 400
- China Shanghai Stock Exchange
- Canada Toronto Stock Exchange
- Germany Deutsche Borse
- India Bombay Stock Exchange
- Australia Australia Securities Exchange
- South Korea Korea Exchange
- Sweden OMX Nordic Exchange
- South Africa Johannesburg Stock Exchange
- Spain BolsasyMercadosEspanoles Spanish Exchange
- Taiwan Taiwan Weighted Index
- Brazil BM&F Bo Vespa Stock Exchange

The period of study is of sixty months from January, 2012-December, 2016 based on secondary sources. The sample of the study consists of fifteen countries with their corresponding index has been selected based on the highest market capitalization as on December 2015 Monthly Reports, from the World Federation of Exchanges.

#### (Source:en.wikipedia.org)

The monthly index returns collected for the sample size indices has been adjusted for the monthly exchange rate respectively prevailing, for the given period.

(Source: investing.com , in.finance.yahoo.com ,ofx.com)

## 3. DATA ANALYSIS

The following steps/process was undertaken to evaluate the data

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3.1. SIMPLE AVERAGE

Average=  $(\sum x/N)$  where, x– Monthly Index Return; N– Number of total months

3.2.STANDARD DEVIATION

$$S.D = \sqrt{\frac{1}{N}} \sum_{i=1}^{N} (xi - \mu)$$

3.3.PEARSON'S CORRELATION

It is a linear measure of relationship between two sets of data. It ranges from (-1 - +1). A number closer to +1 denotes a more positive.

Correlation number (r) =  $\frac{n(\Sigma(xy) - \Sigma(x)\Sigma(y))}{\sqrt{[n\Sigma(x^2) - (\Sigma x)^2] [n\Sigma(y^2) - (\Sigma y)^2]}}$ 

X, y – two variables

**3.4. COVARIANCE** 

It is a linear measure of relationship between the variances of two sets of data. A negative number indicates opposite movement between the two sets of data and vice-versa.

Covariance (1, 2) = S.D (1) x S.D (2) x r (1, 2)

Bordered covariance (1, 2) = (W1\*W2\*Covariance (C1, C2)

3.5.SHARPE'S RATIO:

William Sharpe (1966) developed the reward-to-risk ratio that measures the excess returns (risk premium) in a risk free investment over a risky one, per unit of volatility. It is used to evaluate portfolio performance.

#### Sharpe Ratio = $(R_m - R_f)/\sigma_m$

 $R_m$ - The average returns from the riskier asset(s);  $R_f$ - The average returns from the risk free asset(s); $\sigma_m$  - The standard deviation of the returns from the riskier asset(s).

3.6.CONSTRUCTION OF AN OPTIMUM GLOBAL PORTFOLIO BY MAXIMIZING THE PORTFOLIO SHARPE RATIO USING THE SOLVER FUNCTION

To calculate annualized average (return) and annualized standard deviation (risk) for the sample size and U.S Securities 10Y Bond for the given period.

Table 1:

COUNTRIES	RETURN	RISK
NYSE(U.S)	0.0757	0.1056
LSE(U.K)	0.0013	0.5504
JPX(NIKKIE 400(JAPAN)	-0.1957	0.3522
SSE(CHINA)	0.0785	0.2672
ENX100-PARIS	0.0523	0.1266
TMX(CANADA)	0.0755	0.2298
DAX30(GERMANY)	0.0878	0.1532
BSE(INDIA)	0.0471	0.1762
ASX 200(AUSTRALIA)	0.0004	0.1626
KRX(KOREA)	-0.0019	0.1405
OMX NORDIC EX (SWEDEN)	0.0270	0.1371
JSE MI (S.AFRICA)	-0.1333	0.5049
BME (SPAIN)	0.0563	0.2652
TWII (TAIWAN)	-0.1552	0.4424
BM&F (BRAZIL)	0.0467	0.3742

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**Table 1** depicts the annualized average and annualized standard deviation for the monthly holding period returns for the index selected for each corresponding country in the set of fifteen countries selected. They were calculated as:

Annualized Average = Average x 12, Annualized Standard deviation = Standard deviation x  $\sqrt{12}$ 

#### Bordered covariance matrix for the sample size.

Table 2:

	W 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
W 2	BORDERE D VARIANCE	NYSE(U .S)	LSE( U.K)	JPX(NIKKIE 400(JAPAN)	SSE(CH INA)	ENX10 0- PARIS	TMX(CAN ADA)	DAX30(G ERMANY)	BSE	ASX 200(AUSTR ALIA)	KRX(KO REA)	OMX NORDI C EX	JSE MI (MKT)(S. AFRICA)	BME (SPAIN)	TWII (TAIWA N)	BM&F(BR AZIL)
0.07	NYSE	5E-05	7E- 05	-1E-04	4E-05	5E-05	3E-05	5E-05	5E-05	5E-05	4E-05	5E-05	3E-05	6E-05	7E-05	8E-05
0.07	LSE(UK)	7E-05	1E- 03	-2E-04	1E-06	1E-04	-4E-05	1E-04	8E-05	6E-05	5E-05	9E-05	-3E-05	2E-04	2E-05	-8E-06
0.07	JPX(NIKKIE 400(JAPAN )	-1E-04	-2E- 04	6E-04	-2E-04	-1E-04	-7E-05	-2E-04	-2E-04	-2E-04	-1E-04	-2E-04	-1E-04	-2E-04	-2E-04	-3E-04
0.07	SSE(CHINA )	4E-05	1E- 06	-2E-04	3E-04	3E-05	3E-05	6E-05	3E-05	5E-05	7E-05	4E-05	2E-04	5E-05	1E-04	1E-04
0.07	ENX100- PARIS	5E-05	1E- 04	-1E-04	3E-05	7E-05	2E-05	8E-05	6E-05	6E-05	5E-05	7E-05	3E-05	1E-04	7E-05	6E-05
0.07	TMX(CANA DA)	3E-05	-4E- 05	-7E-05	3E-05	2E-05	2E-04	2E-05	1E-05	4E-05	4E-05	2E-05	1E-04	2E-05	5E-05	2E-04
0.07	DAX30	5E-05	1E- 04	-2E-04	6E-05	8E-05	2E-05	1E-04	7E-05	7E-05	6E-05	8E-05	6E-05	1E-04	8E-05	8E-05
0.07	BSE	5E-05	8E- 05	-2E-04	3E-05	6E-05	1E-05	7E-05	1E-04	7E-05	5E-05	6E-05	2E-05	8E-05	8E-05	1E-04
0.07	ASX 200	5E-05	6E- 05	-2E-04	5E-05	6E-05	4E-05	7E-05	7E-05	1E-04	6E-05	7E-05	4E-05	1E-04	8E-05	1E-04
0.07	KRX	4E-05	5E- 05	-1E-04	7E-05	5E-05	4E-05	6E-05	5E-05	6E-05	9E-05	5E-05	1E-04	6E-05	9E-05	1E-04
0.07	OMX NORDIC EX	5E-05	9E- 05	-2E-04	4E-05	7E-05	2E-05	8E-05	6E-05	7E-05	5E-05	8E-05	2E-05	9E-05	5E-05	6E-05
0.07	JSE MI (MKT)	3E-05	-3E- 05	-1E-04	2E-04	3E-05	1E-04	6E-05	2E-05	4E-05	1E-04	2E-05	1E-03	3E-05	1E-04	2E-04
0.07	вме (SPAIN)	6E-05	2E- 04	-2E-04	5E-05	1E-04	2E-05	1E-04	8E-05	1E-04	6E-05	9E-05	3E-05	3E-04	1E-05	7E-05
0.07	TAIWAN	7E-05	2E- 05	-2E-04	1E-04	7E-05	5E-05	8E-05	8E-05	8E-05	9E-05	5E-05	1E-04	1E-05	9E-04	2E-04
0.07	вм&ғ (BRAZIL)	8E-05	-8E- 06	-3E-04	1E-04	6E-05	2E-04	8E-05	1E-04	1E-04	1E-04	6E-05	2E-04	7E-05	2E-04	6E-04
1.00	TOTAL	6E-04	2E- 03	-2E-03	1E-03	7E-04	7E-04	9E-04	8E-04	8E-04	8E-04	7E-04	2E-03	1E-03	2E-03	2E-03

**Table 2** depicts the bordered covariance for each of the fifteen countries with each country being allotted equalweights.Where: C1- Country 1, C2- Country 2; S.D1- Annualized Standard Deviation of C1, S.D2- Annualized StandardDeviation of C2

Portfolio return and portfolio risk for the sample size and bordered covariance.

Table3:

Portfolio Standard deviation	0.1167
Portfolio Return	0.0042

**Table 3** depicts the portfolio return and the portfolio standard deviation.

They have been calculated as:

Portfolio standard deviation =  $\sqrt{\sum \{Bordered \ covariance \ of \ a \ country \ with \ all \ the \ 15 \ countries \ (inclusive \ of \ itself)\}}$ 

Portfolio return =  $[\sum {Annualized average of the monthly holding period returns of country*Weight of the country}]$ 

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To calculate and maximize the Portfolio Sharpe Ratio using the solver function to allot weights to each of the country indices.

#### Table 4:

Portfolio Sharpe Ratio(before maximization)	-0.2556
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**Table 4** depicts the Sharpe ratio before it was maximized using the solver function.

Using the Solver function:

(i) The subject to constraints is set. The weights have to be allotted such that the weights for each country in the portfolio are less than or equal to 1 but greater than or equal to 0.

(ii) The total of all the country weights should come to 1 i.e. the portfolio should show a 100% investment using the selected set of fifteen countries.

(iii) The Sharpe Ratio is to set at maximum as it has to be maximized. The portfolio will thus allot weights to the countries in such a way that the Sharpe ratio is maximized.

#### Table 5:

After using the Solver function	
Portfolio Standard deviation	0.1075
Portfolio Return	0.0785
Maximized Portfolio Sharpe Ratio	0.4143

**Table 5** depicts the portfolio return and the portfolio risk after maximizing the Sharpe Ratio (also shown in Table 5) and allotting the weights to the fifteen countries for an optimum portfolio.

#### Table 6:

Countries	Weights generated
NYSE(U.S)	0.6407
LSE(U.K)	0.0000
JPX(NIKKIE 400(JAPAN)	0.0000
SSE(CHINA)	0.0393
ENX100 (PARIS)	0.0000
TMX(CANADA)	0.0918
DAX30(GERMANY)	0.2282
BSE (INDIA)	0.0000
ASX 200(AUSTRALIA)	0.0000
KRX(KOREA)	0.0000
OMX NORDIC EX (SWEDEN)	0.0000
JSE MI (S.AFRICA)	0.0000
BME (SPAIN)	0.0000
TWII (TAIWAN)	0.0000
BM&F (BRAZIL)	0.0000

Table 6 shows the optimum allocation of weights to the selected set of fifteen countries for an optimum portfolio.

To calculate and analyze the heat map correlation matrix for the selected set of fifteen countries on the basis of their monthly index holding period return for the given period of sixty months: January, 2012- December, 2016.

**Table 7** below shows the correlation matrix of all the fifteen countries. The heat map thus generated depicts:

(i) The greener a cell (closer to +1), the higher are the two countries making that cell correlated positively.

(ii) The redder a cell (closer to -1), the higher are the two countries making that cell correlated negatively.

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Table 7:

	U.S	U.K	JAPAN	CHINA	FRANCE	CANADA	GERMANY	INDIA	ISTRAL	S.KOREA	SWEDEN	S.AFRICA	SPAIN	TAIWAN	BRAZIL
CORRELATION															
U.S	1.00	0.25	-0.80	0.30	0.77	0.29	0.73	0.59	0.68	0.56	0.72	0.15	0.52	0.35	0.48
U,K	0.25	1.00	-0.18	0.00	0.39	-0.06	0.31	0.19	0.15	0.14	0.26	-0.02	0.33	0.02	-0.01
JAPAN	-0.80	-0.18	1.00	-0.36	-0.67	-0.20	-0.66	-0.55	-0.87	-0.61	-0.73	-0.18	-0.53	-0.29	-0.54
CHINA	0.30	0.00	-0.36	1.00	0.19	0.09	0.31	0.15	0.27	0.43	0.22	0.38	0.17	0.19	0.27
FRANCE	0.77	0.39	-0.67	0.19	1.00	0.13	0.89	0.56	0.64	0.61	0.86	0.09	0.64	0.27	0.29
CANADA	0.29	-0.06	-0.20	0.09	0.13	1.00	0.16	0.05	0.26	0.30	0.11	0.22	0.06	0.11	0.47
GERMANY	0.73	0.31	-0.66	0.31	0.89	0.16	1.00	0.61	0.61	0.66	0.81	0.16	0.60	0.26	0.32
INDIA	0.59	0.19	-0.55	0.15	0.56	0.05	0.61	1.00	0.55	0.49	0.52	0.04	0.40	0.23	0.47
AUSTRALIA	0.68	0.15	-0.87	0.27	0.64	0.26	0.61	0.55	1.00	0.58	0.67	0.11	0.54	0.24	0.55
S.KOREA	0.56	0.14	-0.61	0.43	0.61	0.30	0.66	0.49	0.58	1.00	0.61	0.33	0.38	0.33	0.57
SWEDEN	0.72	0.26	-0.73	0.22	0.86	0.11	0.81	0.52	0.67	0.61	1.00	0.07	0.59	0.18	0.28
S.AFRICA	0.15	-0.02	-0.18	0.38	0.09	0.22	0.16	0.04	0.11	0.33	0.07	1.00	0.06	0.12	0.24
SPAIN	0.52	0.33	-0.53	0.17	0.64	0.06	0.60	0.40	0.54	0.38	0.59	0.06	1.00	0.02	0.16
TAIWAN	0.52	0.02	-0.29	0.19	0.27	0.11	0.26	0.23	0.24	0.33	0.18	0.12	0.02	1.00	0.30
BRAZIL	0.52	-0.01	-0.54	0.27	0.29	0.47	0.32	0.47	0.55	0.57	0.28	0.24	0.16	0.30	1.00

**ysis:** The green cells that execute a correlation of more than or equal to +0.7, therefore can be termed as "highly positively correlated". Therefore, investing in only one of the countries making up that cell would be logical as investing in both the countries would most realistically mean investing twice in somewhat similar market conditions. Similarly, the red cells that execute a correlation of equal to or less than -0.7, therefore can be termed as "highly negatively correlated". Therefore, investing in both the countries would hedge the investment as investing in somewhat opposite market conditions would safeguard the investment on either ends.

## 4. HYPOTHESIS TESTING

 $H_0$ : There is no significant correlation between the weights generated in the study taken and the iSHARES MSCI ACWI ETF holdings for the selected set of fifteen countries for the given period.

Correlation (W,M) =< 0

 $H_1$ : There is a significant correlation weights generated in the study taken and the iSHARES MSCI ACWI ETF holdings for the selected set of fifteen countries for the given period.

Correlation (W, M) > 0, where, W – Weights generated as per the Sharpe Ratio and

S-Weights as per the iSHARES MSCI ACWI ETF

Further, Pearson's correlation=0.9252 based on n = 10  $\alpha$  = 0.05 (Sig. %) T<sub>tab</sub>= 1.83

4.1 CALCULATION:

 $T_{cal} = 0.9252 / [((1-0.9252^2) / (15-2))^{0.5}] = 8.7924$ 

4.2 INFERENCE:

 $T_{cal} > T_{tab} = 8.7924 > 1.83$ 

Since,  $T_{calculated}$  is more than  $T_{tabulated}$ , we reject null hypothesis (H<sub>0</sub>) and accept alternate hypothesis (H<sub>1</sub>). Therefore, Correlation (W, M) > 0

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#### 4.3 DECISION:

The weights generated for portfolio by maximizing the Sharpe Ratio are significantly correlated with the iSHARES MSCI ACWI ETF holdings for the selected set of fifteen countries for the given period. Therefore the methodology devised in this study has credibility as the portfolio generated in this study has significant correlation with one of the top indices for global investment.

We can, therefore, with 95% level of confidence, say that the portfolio generation methodology devised in the study taken upis correlated at approximately 92.5% with one of the top-most credible funds, the iSHARES MSCI ACWI ETF, for the given period of sixty months: January, 2012- December, 2016.

#### 5. CONCLUSION

To conclude, we can say that the methodology followed to construct an optimum global portfolio for the selected set of fifteen countries based on the holding period returns of the fifteen indices where one index was taken per country, was found to be positively correlated at a significant 92.5% (approximately) showing that the weights generated by maximizing the Sharpe Ratio and the benchmark, the iSHARES MSCI ACWI ETF holdings, are significantly correlated when it comes to investing in the stock market of these countries.

The paper therefore concludes that the independent methodology followed to construct the optimum global portfolio for the selected set of fifteen countries is highly correlated with the iSHARES MSCI ACWI ETF holdings for the given period.

#### 6. LIMITATIONS

- Only the Morgan Stanley Capital International All Country World Index (MSCI ACWI) index has been used as a benchmark.
- > The limitations of the tools used and that of the range of data taken are applied to the study.

#### REFERENCES

- Agarwal, R. N. (1997). Foreign Portfolio Investment In Some Developing Countries: A Study Of Determinants and Macroeconomic Impact. New Delhi: Institute of Economic Growth.
- B.S. Bodla, Ashish Kumar. (2009). Foreign Institutional Investors and Macroeconomic Variables In India: A Study of Causal Relation. New Delhi: Paradigm.
- Goetzmann, W. N., Lingfeng, & Rouwenhorst., K. G. (January 2005). *Long-Term Global Market Correlations.* Journal Of Business.
- Gumus, & Kurt, G. (2015). THE RELATIONSHIP BETWEEN FOREIGN INVESTMENT AND MACROECONOMIC INDICATORS: X
- Mohanasundaram, T. K. (2015). MACROECONOMIC DYNAMICS OF FOREIGN INSTITUTIONAL INVESTMENTS IN INDIA. *International Journal of Management Research and Reviews*, 10.
- Muhammad Sarfraz Anwer, Rajan K Sampath. (1999). *Investment And Economic Growth.* Place of publication St. Louis: Federal Reserve Bank of St Louis.
- Richard O. Michaud, Gary L. Bergstrom, Ronald D. Frashure, & Wolaha, B. K. (1996). *Twenty Years of International Equity Investing.* Journal Of Portfolio Management.
- Schill, M. J. (2006). New Perspectives on Investing in Emerging Markets. The Research Foundation of.
- **WEBSITES:**www.en.wikipedia.org/wiki/List\_of\_stock\_exchanges, www.etf.com/ACWI, www.investing.com. www.infinance.yahoo.com, www.ofx.com