

Mean and Volatility Spillover Effect from Currency Market to Equity Market

By

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**MASTER OF SCIENCE IN MANAGEMENT SCIENCES
(FINANCE)**



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This thesis includes no material which has been already accepted for the award of any other degree or diploma in any university and confirms that to the best of my knowledge the thesis includes no material previously published or written by another person, except where due reference is made in the text of the thesis.

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DEDICATION

*I dedicate my work to my Parents who had been an inspiration
for throughout my life.*

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Table of Contents

CHAPTER #1 INTRODUCTION	1
1.1 Relationship between Currency and Equity market.....	1-3
1.2 Theatrical Background.....	4
1.2.1 Underpinning theory	4
1.2.2 Problem Statement.....	4
1.2.3 Research Questions.....	4
1.2.4 Research Objective	4
1.2.5 Significance of the Study	5
1.2.6 Plan of the Study.....	5
CHAPTER # 2 LITERATURE REVIEW	6-25
CHAPTER # 3 DATA DESCRIPTION AND METHODOLOGY	26-34
3.1 Stock market Indices and Currencies.....	27
3.1.1 Russian Stock Exchange.....	28
3.1.2 Bulgaria Stock Exchange.....	28
3.1.3 Hungary Stock Exchange.....	28
3.1.4 Poland Stock Exchange	28
3.1.5 Greece Stock Exchange	28
3.1.6 Egyptian Stock Exchange	29
3.1.7 South African Stock Exchange	29
3.1.8 Nigerian Stock Exchange.....	29
3.1.9 China Stock Exchange	29
3.1.10 India Stock Exchange	29
3.1.11 Indonesia Stock Exchange	30
3.1.12 South Korea Stock Exchange.....	30
3.1.13 Malaysia Stock Exchange.....	30
3.1.14 Pakistan Stock Exchange	30
3.1.15 Philippines Stock Exchange.....	30
3.1.16 Sri Lankan Stock Exchange	31
3.1.17 Taiwan Stock Exchange.....	31
3.1.18 Thailand Stock Exchange	31
3.1.19 Mexican Stock Exchange.....	31

3.1.20 Argentina Stock Exchange.....	31
3.1.21 Chile Stock Exchange	32
3.1.22 Brazil Stock Exchange.....	32
3.1.23 Bahrain Stock Exchange.....	32
3.1.24 Jordan Stock Exchange.....	32
3.1.25 Turkey Stock Exchange	32
3.1.26 Kuwait Stock Exchange.....	33
3.1.27 Oman Stock Exchange.....	33
3.1.28 Saudi Arabia Stock Exchange.....	33
3.2 Methodology	33
3.3 Variable Description	34
CHAPTER # 4 DATA DESCRIPTION AND METHODOLOGY	36-55
CHAPTER # 5 Conclusion and Recommendations	56
5.1 Conclusion	56-58
5.2 Recommendations.....	58
5.3 Direction of Future Research	58
REFERENCES.....	59-62

List of Tables

Table # 4.1 Descriptive statistics of Currency market and Equity market of Brazil, India, Indonesia and Russia	36
Table # 4.2 Descriptive statistics of currency market and equity market of Turkey, China, Mexico and Chile.	37
Table # 4.3 Descriptive statistics of currency market and equity market of Egypt, Philippines, Saudi Arabia and Argentina.....	38
Table # 4.4 Descriptive statistics of currency market and equity market of Malaysia, Poland, South Africa and Greece	38
Table # 4.5 Descriptive statistics of currency market and equity market Korea, Pakistan, Taiwan and Thailand	39
Table # 4.6 Descriptive statistics of currency market and equity market of Bahrain, Hungary, Nigeria and Sri Lanka	40
Table # 4.7 Descriptive statistics of currency market and equity market of Bulgaria, Oman, Kuwait and Jordan	40
Table # 4.8 Mean and Volatility spillover effect from Currency market to Equity market of EASTERN EUROPE countries	42
Table # 4.9 Mean and Volatility spillover effect from Currency market to Equity market of AFRICAN countries	44
Table # 4.10 Mean and Volatility spillover effect from Currency market to Equity market of ASIAN countries.....	46
Table # 4.11 Mean and Volatility spillover effect from Currency market to Equity market of ASIAN countries.....	48
Table # 4.12 Mean and Volatility spillover effect from Currency market to Equity market AMERICAN countries.....	50
Table # 4.13 Mean and Volatility spillover effect from Currency market to Equity market MIDDLE EAST countries	52
Table # 4.14 Mean and Volatility spillover effect from Currency market to Equity market of MIDDLE EAST countries	54

List of Abbreviation

KSE	Karachi Stock Exchange
RTSI	Russian Trading System Index
BSE	Bombay Stock Exchange
JCI	Jakarta Composite Index
SCI	Shanghai Composite Index
TASI	Tadawul All Shares Index
ATG	Athens General Composite
BAX	Bahrain All Shares
BUX	Budapest Stock Exchange
ARCH	Autoregressive Conditional Heteroskedasticity
GARCH	Generalized Autoregressive Conditional Heteroskedasticity

Abstract

The prime objective of the study is to explore the mean and volatility spillover between the currency market and equity market. The standard methodology of GARCH-M is used to explore the relationship between currency market and equity market of twenty eight emerging countries by using daily data from the period 1st January 2000 to 31st December 2016. Volatility spillover is observed in all the sample countries from currency market to stock market except Nigeria, China and Oman. The positive results indicate that shocks in currency market increase the volatility of stock market. As per statistical results, the mean spillover is observed from currency market to equity market of India, Turkey, China, Mexico, Philippines, Malaysia, Poland, Korea, Taiwan, Thailand, Bahrain, Hungary, Nigeria and Oman. Mean spillover is found insignificant from currency market to equity market of Brazil, Indonesia, Russia, Chile, Egypt, Saudi Arabia, Argentina, South Africa, Greece, Pakistan, Sri Lanka, Bulgaria, Kuwait and Jordan. Mean spillover is observed significant and negative in all sample countries while positive and significant is found in Nigeria only. The study reveals that shocks arising from the appreciation in currency leads to higher stock returns and shocks associated with depreciation in currency market results in reduction in equity market return. Highest influence is observed in Egyptian market. Currency market and equity market are integrated and interdependent with each other and stock markets are very sensitive in the context of volatility.

Keywords: Stock market, foreign currency market, Mean spillover, Volatility spillover, Emerging markets, GARCH-M.

CHAPTER # 1

INTRODUCTION

1.1 Relationship between Currency market and Equity market:

During last decades, many practitioners as well as policy makers has attracted to investigate the relationship between the stock market and foreign exchange market because these are interdependent and interlinked with each other. There is speedy growth in cross border equity investments in last three decades. This growing trend in equity investment leads to increase the demand and supply of currencies. This great demand of foreign currencies and flow of equity creates some interdependence among stock returns and the foreign currency return. When the interdependency increased, it also increased the volatility transmission between equity market and currency market which leads to increase the portfolio risk internationally which is faced by the investors, which further influence the return of portfolio of investor.

Globalization and financial liberalization support the market integration. Over the period, cross border investment have accelerated this process. With the passage of the time, the currency market and stock market has integrated with each other. Generally, this relationship is studied through Co-integration analysis. But this study investigates the relationship through spillover effect captured by ARCH/GARCH of equity of models. There is more focus on spillover effect among stock market but the spillover effect from exchange rate market to stock market has less empirical evidence.

Globalization and Cross-border investment have creates many different information in the market and when new information comes in the market then we see the change in currency market. As, currency market appreciates and depreciates due to different information. We see the effect of currency fluctuations on stock market.

The existing literature is less focused on the emerging market and more focused on the developed market. Kanas (2000) examines the effect of volatility spillover between

foreign exchange market and stock market of six developed and industrial countries include Germany, United States, Japan, Canada, United Kingdom and France. The results reveal that there is a significant volatility spillover from equity market to currency market in all countries except Germany. However, the volatility spillover effect from currency market to equity market is weak.

According to the theoretical background, two main views explain the relationship between these two markets; the flow oriented Model and the Stock oriented Model. Flow oriented Model proposed by Dornbusch and Fischer (1980) which tells us that trade balance performance and the current account of the company are considered as two important elements of the determination of exchange rate. On the other hand, Stock Oriented Model suggest by Branson (1983) and Frankel (1983) that suppose demand and supply of financial securities as equities and bonds are helped to determine the exchange rate.

Over the two last decades, the South East Asian countries experiences two main crisis, called the Asian currency crisis in 1997- 1998 and subprime crisis in the 2007- 2008. The first phase is observed as sharp decline of currencies in many countries as Indonesia, Thailand, Philippines, South Korea and Malaysia around 33-74% during the time of 1997 June to 1998 August. Stock market also reached up by 50% in this period within the same era. The subprime crisis that was started in 2007 also added stressed to the equity and currency market in Asian state. However, the Asian region exchange rate has observed to be more durable and have not declined highly during the last crisis in comparison of 1997-1998. Meanwhile, the currencies are more stable and stock market has experienced strong impact of the crisis. During this period, Asian currencies are declined by only 5% and stock market has declined around 17% from this crisis.

The theoretical background of this study is based on Market efficiency proposed by Fama and French (1970 & 1990). The Market efficiency theory argues that price adjusts on the arrival of new information. When information disseminates in one market, it automatically evolves to transmit it into other market, as market are being rapidly

integrated. Thus behavior in one market inclines to others. So, unexpected fluctuations may create volatility in market.

Volatility is the statistical tool that is used to measure the market risk of portfolio or a single instrument. Volatility spillover can be explained as when shocks arising in one market are transmitted to the other variable. The effect of volatility spillover may be seen in two ways as it brings positive change in other series or negative change.

Volatility spillover has an important role to investigate the transmission mechanism of information among financial market. If the markets are properly integrated with each other, then the shocks of one market automatically evolves to transmit into other market. Furthermore, it is claimed that the movement of the shocks have more effect in integrated market than the non-integrated markets. However, the volatility spillover effect becomes higher in financial markets in case of crisis situations.

International financial researcher has a great interest in emerging stock markets due to their well diversification opportunities for many international investors. These emerging markets is more accessible as well as attractive for investment due to increasing financial transparency, decreasing restrictions on transactions and many more things which creates an exclusive landscape for financial analysis and investigation.

Jebran (2014) states that deregulation and liberalization of trade system have created many opportunities for local and foreign investors. Global liberalizations have removed barriers in local country for foreign inflows. By removal of barriers, the good and services has internationalized. However, foreign investors also have an opportunity to invest in common stock through which they can increase their capital by diversifying their portfolio around the world. Before liberalization, investors were not able to invest their wealth in developed and global stock markets.

In the current world, investors are able to get benefits by investing developed and developing equity markets. The process in which an investor diversifies the portfolio by looking around the globe to minimize the risk called portfolio diversification. This theory

developed by Markowitz in 1952 for the very first time. He argues that instead of investing a security in one asset; we need to invest in multiple securities. So he gave the idea of investing the asset in different securities. Later on Sharpe amend the idea of Markowitz by providing the concept of CAPM (Capital Asset Pricing Model).

1.2 Theoretical background

1.2.1 Underpinning Theory

With the passage of time, national market is being integrated with each other due to globalization and cross border investment. When information disseminates in one market then automatically it evolves to transmit into other market (Forex market and Stock market). Both markets are very sensitive in the context of information. These markets have more rapid influence on each other. Market efficiency theory supports the phenomena because price reflects all available information.

1.2.2 Problem Statement

A bird eye view of the financial market revealed that currency and stock market have seen many ups and downs in the last few decades. The relationship between stock and currency market is very unpredictable and inconsistent. Sometime, these provide opportunity for diversification on the other point of time contagious effect flows from one market to another. Therefore, a continuous revisit of the markets is need of time.

1.2.3 Research Questions

- Whether exchange rate behavior influences the return of Stock market?
- Whether exchange rate behavior influences the volatility of equity markets?

1.2.4 Research Objectives

- To provide insight about mean spillover between currency market and equity market.

- To explore the volatility spillover between the currency market and stock market of emerging economies.

1.2.5 Significance of the Study

This study investigates volatility spillover between stock market and foreign exchange market of the selected twenty eight different emerging markets. Exchange rate fluctuations also considered to be important key role while investing in foreign equity markets because it affects the price of the stock. The stock price of the securities change if there is any adverse effect on the exchange rate. As information comes in the market, it starts to reflect in the prices.

Exchange rate variation also effects and reflects the liquidity of the country. As currency depreciates in some country, the foreign investors try not to invest in that country due to increase in exchange rate risk. In case of currency appreciation, the inflow of foreign investors will affect the liquidity that will ultimately translate in share prices.

Therefore, the results of this study are important for investors. Investors may use the information to manage their international portfolio risk and currency risk strategies. This study is also important for portfolio manager, portfolio formation investor, FPI and multinational firms which intend to manage their international investment exposures.

1.2.6 Plan of the Study

This study has been represented in five chapters as detailed below;

Chapter # 1: Introduction

Chapter # 2: Literature Review

Chapter # 3: Data description and Methodology

Chapter # 4: Data analysis and Discussion

Chapter # 5: Conclusion and Recommendation

CHAPTER # 2

LITERATURE REVIEW

The relationship between stock market and exchange rate has attracted academicians as well as practitioners as to play a crucial role in managing risk and diversifying portfolio. Apte (2001) states that globalization and financial liberalizations provides many opportunities for investor to portfolio diversification across different regions. By diversifying portfolio internationally, the exchange rate risk may arise with association of domestic stock market which is important part of the Portfolio risk. So, this phenomenon creates linkage between the currency market and forex market. Such relationship is not only observed in mean returns between these two markets but at the same time in volatility spillover among cross-markets. Against currency fluctuation, stock returns and exchange rate movements are used to hedge portfolio and risk management is helpful to design the appropriate strategies for both these markets.

Arifin & Syahrudin (2011) investigate the relationship between the stock market returns and the exchange rate changes namely Singapore, Thailand, Indonesia, Philippines, and Malaysia of five ASEAN states. The sample era starts from 1997 to April 2010 and then they divide into main three divisions which describe the period called subprime crises, Asian crises and non-crises. The study uses VAR (1) – GARCH (1, 1) model is used through BEKK depiction of Engle and Kroner (1995). Arifin finds the persistence of mean spillover during the analysis of spillover effect between exchange rate and the stock market for Singapore and Malaysia during two main crises. It also finds that these markets significantly influence with each other and volatility spillover is observed in all three periods. Though, in these markets direction of volatility spillover is not same. The study also investigate that fluctuation of currency of ASEAN-5 states in the crises and find a strong effect on the volatility of these stock markets except Singapore in the subprime crises period. The study reports bi-directional volatility spillover in the non-crises period between the stock market and exchange rate in all markets except

Singapore. In nutshell, the study shows that currency fluctuation has strong impact on the stock market volatility in the ASEAN-5 countries.

Francis, Hasan & Hunter (2006) explain the dynamic relationship between the currency and equity market. Precisely, this study tests the bi-directional volatility and means spillover between the foreign equity market, the US stock market and the bilateral exchange rate. German, Canadian, UK and Japanese are taken as foreign equity markets which have currencies as German mark, Canadian Dollar, British pound and Japanese yen respectively. This study also examines the mean and volatility spillover and its link to information spillover and how changes in the currency order flows carries this information. The results are significant and bi-directional between the equity market and currency market and between foreign equity market and US in mean and volatility spillover. In mean, there is the significant spillover is reported from the UK, German, Canadian and Japanese equity market to exchange rate. They also find significant results for changes in the mark, the yen, Canadian dollar and the pound exchange rate and foreign equity returns and the US. The study indicates that foreign equity market significantly influences the US equity market. There is also significant volatility spillover from the foreign equity market and US to currency market and from the currency market to the foreign equity market and US market. From currency to equity market spillover is stronger. The bi-directional volatility spillover is also significant among the equity markets and these periods strengthen the negative shocks of following period in equity market.

Choi, Fang & Fu (2014) use EGARCH method to investigate the volatility spillover results between the stock market returns and the exchange rate changes for New Zealand. By including the leverage affect, the study effectively control the down market effect in the stock market of New Zealand in the EGARCH frame. It investigates whether exchange rate changes affects the volatility of spillover. After the crash of 1987 the financial market has become more integrated and the volatility between the stock return market and foreign exchange market becomes significant. The environment of the New Zealand is very different than other market as examined by Kanas (2000). The study

reports that the return of stock market marginally affects the NZ dollar volatility. Volatility spillover between exchange rate market and foreign stock market changes over time in NZ. The spillover between the stock market and the exchange rate before the 1997 crash is significant. However, the spillover fades after the crash. This study provides results that “asset approach” is not fit for the small New Zealand stock market for the determination of exchange rate, whose currency is determined by international factors. On the other side, it reports significant results from foreign currency fluctuation to stock market in NZ in volatility spillover. These results are reliable to the argument that the NZ market is affected by the dollar fluctuation of NZ. When leverage effect is incorporated, the results become significant before and after the crash of 1997 from exchange rate changes to stock market returns in spillover using the EGARCH method in analysis.

Jan & Jebran (2015) explain the volatility spillover effect from G5 equity market to Karachi stock market by using weekly data from 5th January, 2004 to 30th December 2013. By using Co integration analysis of Johansen and Juselius, the study finds long run relation between the G5 stock market and Karachi stock exchange. France, Japan, U.S., Germany and UK countries are included in G5 countries. GARCH (1, 1) method is used to examine the volatility spillover between these two markets. Co integration result shows that there exist a long run relationship between Karachi stock exchange and UK and Germany stock market. There is volatility spillover exist between G5 stock market to Karachi stock market, by investigating the volatility spillover. This study reveals that variation in G5 stock market has effect on Karachi stock market. It further find that France, UK, Japan and Germany stock market increases the volatility of KSE while US market decrease the volatility of KSE. On the basis of empirical results, there is less diversification opportunities for G5 equity market and KSE investors. Based on results, it is not favorable for KSE investors to invest in G5 equity market to diversify their portfolio. Furthermore, the investors of G5 stock market cannot take any favorable benefit by investing in KSE emerging market. Covering only 10 period of years, this study is limited to investigate the economic integration of KSE and equity market of G5

countries. The future direction of the study suggests adding more developed stock market while exploring the integration of KSE.

Jebran & Iqbal (2015) explain the dynamic relationship between stock market of Asian countries and the foreign exchange market named as Japan, India, Pakistan, Sri-Lanka, China and Hong Kong. This study uses daily data from 4th January, 1999 to 1st January, 2014, and applies EGARCH method to study the asymmetric volatility spillover effect between stock market and foreign exchange market of Asian countries. For china, Pakistan, Sri Lanka and Hong Kong; statistically significant bidirectional results are observed regarding volatility spillover between these markets. For India, the analysis reveals unidirectional results between the stock market and foreign exchange market. In case of Japan, the study shows no volatility spillover evidence between them. It further finds that volatility spillover is asymmetric in all markets.

The persistence of volatility in foreign exchange market is greater than the stock market. This study has numerous implications for investors and economic policy marker. Policy makers can better understand how both these markets affect each other and the consequences that may arise by integration of stock market and foreign exchange market. As reported in study the negative effect between these two markets (from foreign exchange market to equity market) may reduce the trade balance, country's competitiveness and international trade which may lead to adverse effect in the country's economic growth.

It is argued that stock market has non favorable effect on foreign currency market. As portfolio balance model shows that rise in local stock prices will raise the investor's demand for local asset, in order to gain more domestic currency investor sell foreign assets which may lead to rise in interest rate which further lead to appreciation of the currency. Therefore, polices be devised and implemented controlling their impact on the volatility of stock market and foreign exchange market. The volatility transmission may provide the benefit to hedger and portfolio manager to predict the behavior of one

market. Investors can plan hedging strategies to manage the fluctuation of foreign currency market which can help them out of financial crises in future.

Yang & Doong (2004) investigate the inter-temporal relation between the stock market and exchange rate changes for G7 countries. EGARCH method is used in this study which is the extension of multivariate GARCH, through which we can capture asymmetric behavior of volatility transmission mechanism. In this case, study explains mean and variance spillover from stock market to exchange rate to find the evidence of asymmetry. It investigates that negative shocks in the stock prices have more impact on the exchange rate in comparison of positive shock. Study reveals that fluctuation in stock prices has more impact in the exchange rate movements but the exchange rate fluctuation has less effect on the stock prices changes. The study shows asymmetric results from equity market to foreign exchange rate for Japan, US, Italy and France and also reports that there is a significant volatility spillover between these two markets. Empirical evidence proposes that these two markets are integrated and information transmission (flow) is exists. The study claims that financial manager may get greater insight to manage their international portfolio, devising diversification and hedging strategies.

Fedorova & Saleem (2009) examine the relationship between stock market and foreign exchange market in Eastern European market by using GARCH method. From Eastern Europe, four major emerging markets are selected Hungary, Russia, Poland and Czech Republic. The sample period starts from January 1995 to December 2008. The study is divided in three main parts. Firstly, it explains the relationship between three emerging stock market of Eastern Europe and Russia, second it analyze the linkage among the exchange rate market of these countries. Lastly, it investigates the interdependency between the stock market and currency market of Russia, Poland, Czech Republic and Hungary. The study uses weekly returns and estimate bivariate GARCH BEKK suggested by Engle and Kroner (1995). First, it finds the dependence of returns on the first lag value on almost all the emerging stock market of Eastern European. It does not find any evidence that Hungarian and the Polish equity market are linked with Russian stock market.

It further finds the significant volatility spillover effect in emerging equity market of Eastern Europe. The empirical results shows that shock on Russian equity market influence the mean returns of Polish, Czech and Hungarian markets. The volatility spillover is bidirectional in Poland, Hungary and Russia while unidirectional results are observed from Russia to Czech, Russia to Polish, Polish to Czech and Hungary to Czech stock markets. Analysis reveals that in almost all the currency market, bidirectional spillover is present. In Poland only, the evidence of volatility spillover from Polish stock market to Czech currency market is observed.

There is a significant relationship between the equity market and currency market in Emerging stock markets of Eastern Europe. The study further investigates the indication of volatility spillover effect from exchange rate market to equity market in all countries. The study finds the integration in emerging stock market of Eastern Europe, which remains consistent with the previous research. The further research can be carried on to investigate the interdependency between stock market and currency market across many different countries.

Kanas (2000) examine the linkage between the stock market returns and exchange rate movements for six countries named Japan, UK, Canada, France, Germany and US. The results are summarized in different parts. (a) Except Germany the study find significant spillover effect from stock market to currency market in all countries. The result indicates that for the exchange rate determination, Asset approach is valid when used for these countries in terms of second moments of exchange rate distribution. (b) The spillover from equity market returns to currency market is symmetric in nature. (c) There is insignificant result of volatility spillover from currency market to stock returns for all countries. (d) For the stock market returns and exchange rate movements of correlation coefficient of EGARCH is negative and also significant for all countries which indicates that there is significant relationship between these two markets. (e) After 1987 crash, the volatility spillover has increased between stock returns and exchange rate changes, because during this period financial market has become more integrated with each other.

Zhou, Zhang & Zhang (2012) examine the regional volatility spillover, direction volatility spillover and total volatility spillover between the Chinese market and world stock market start from February 1996 to December 2009 by using generalized vector autoregressive structure where the forecast-error of variable ordering is invariant of variance decompositions. The study examine the volatility spillover between the eleven world markets, volatility spillover between the major individual stock market like Japan, Taiwan, Hong Kong, US and UK and the Chinese market and among the Asian market and Chinese market. The study finds the evidence that from 1996 to 2009, Chinese market is rarely affected by the world equity market in the context of volatility spillover. Prior to 2005, Chinese market is a little affected. After 2005, Chinese stock market has a greater influence on the other market because this market is matured in these years. The volatility interrelationship is more prominent in Hong Kong, Taiwan and Chinese markets than Western, Asian and Chinese market. The study tells us that spillover among the Japanese, Indian and Chinese market is different than among the US, UK and Chinese stock market which further states that correlation among Asian equity market has more increased in recent years.

During the subprime crisis, US market is greatly correlated with other stock markets in the context of volatility. Though, other market also very volatile. Shanghai stock market significantly contributes to the other market in terms of volatility from February and July 2007. Chinese market is not really affected with the volatility of other world stock market during the global crisis. They have used stock indices of eleven markets in North America, Asia and Europe. The study has large focus on the Chinese equity market, so the study does not consider the stock market of Australia and South America which is left for future examination. The further future research can be done on the spillover between the macro economy and the financial markets, spillover among many different countries and spillover with the highly frequent data.

Theodossiou (1993) investigates transmission mechanism between equity returns and volatility shocks among the Germany, UK, Japan, Canada and US. This study use weekly data. By using multivariate GARCH-M frame, the study examines conditional volatility

affects expected returns in all these markets. Empirical evidence provides results statistically significant from equity market of US to the Germany, UK and Canada and from the Japan to Germany in mean spillover. The mean spillover of US coefficient is positive which indicates past behavior of US has positive effect on current period. The spillover in these markets explains almost 6% of the return variation in one week but they don't expand beyond that. In all the five markets, the study finds no significant effect of conditional volatility on expected returns.

It further report strong time-varying conditional variance in return series in all markets. In Canada and Germany the volatility of stock market is more persistence and less persistence in UK comparatively to the Japan and US. In US, Germany and Japan significant evidence are present regarding volatility spillover. Cross- volatility spillover results are statistically significant from UK to Canada, from US to the all four equity markets and from the Germany to Japan. In UK stock market cross-volatility of US is stronger and in German equity market is weaker. Similarly, from UK to Canadian equity market volatility spillover exists. From US to German stock market volatility spillover effects and from German stock market to Japanese are weaker. As suggested by hypothesis, correlation structure of the returns is constant in all five stock markets.

Larger co movements in the equity market that is identified after market correction are mainly due to the variation of covariance structure rather than correlation structure as implies by the constant correlation structure. Generally, increased degree of volatility is compensated by the equal size of covariance structure.

Kumar & Kamaiah (2017) investigate the volatility and return spillover among Asian stock market by using wavelet cross-correlation and multiple correlations. For this study, daily data is used from stock markets like Hong Kong Shanghai index, Bombay stock exchange, Korea stock index (KOSPI), Tokyo NKKEI 225 stock exchange, Amman stock index and Singapore stock market starts from 3rd January 2000 to 31st December 2013. The study finds that Asian stock markets in long run are co-integrated. It further finds that significant portion of every market's volatility array can be fundamentally

explained by own shocks at intraweek scale but when the degree of spillover increases, the volatility dynamics changes in long run. For wavelet multiple cross-correlation (WMCC) values, it identifies two established markets, HIS and STI, identifies as the follower or potential leader among group. It finds from the analysis, that volatility spillover among the studied markets is comparatively low at high frequency. This study concludes that in the short run, the opportunities of the diversification for investor exist because the volatility spillover is moderate in short run among markets. However, in long run discrepancies among the markets vanish so it is best for investor to avoid long-term diversification.

Yu & Liao (2017) examine the mean and volatility spillover effect among China's equity market, money market interest and currency market by using GARCH (1, 1)-BEKK of VAR(7) model. The sample period starts from July 2005 to December 2016. The analysis reveals that there is only unidirectional mean spillover exist from foreign exchange market to stock market; Secondly between equity market and money market and the foreign exchange market and money market, there exist bidirectional mean spillover asymmetrically which shows time-varying variance and persistence of the volatility. Thirdly, from equity to money market, the study finds unidirectional variance spillover which is confirmed from money to foreign exchange market.

Liu, Demirer, Gupta & Wohar (2017) explain Volatility estimation has significant influence on derivatives valuation, diversification of the portfolio and managing the risk. However, vast literatures exist for the performance of volatility estimation model for the uses of asset classes and the financial market. This study contributes to the literature, a bivariate Marko switching multi-fractal (MSM) identification to the model and then examine the foreign exchange rate and equity market volatility for the G6 countries (Japan, France, Italy, UK, Canada, Germany) and BRICS countries (South Africa, Brazil, China, Russia, India). The MSM model in this study suggest a par-simonious structure to report the interaction between equity market and exchange market and also address the statistical anomalies includes volatility clustering, changes in the structure of volatility

process and long memory in the volatility dynamics. This study contributes for both perspective of empirical and methodological to the literature.

The analysis reveals that GARCH model offers higher volatility estimation for short horizons, principally for exchange return in innovative markets. On the other side, MSM model offers significant enhancement for longer estimation horizon, constantly among many markets. By comparing bivariate and univariate multi-fractal model, the study states that bivariate model offers higher forecast than the univariate in the G6 countries and results are more consistent for foreign exchange return. However, it has less benefit for emerging markets.

Groboys (2015) examine the effect of volatility spillover between the US stock market and with the three big trading partners of USA with variable exchange rate. Diebold and Yilmaz (2009) propose the model of forecast error of variance decomposition frame of the VAR model. This approach helps to estimate the variance and the monthly volatilities. A volatility spillover relatively is updated each month based on the VAR model optimal lag order for the purpose of currency market. The empirical analysis based on the sample period starts from 1986 to 2014 argues that the degree of volatility spillover influence is high when the time of economic turbulence proceeding. If economy is low, then the impact of volatility spillover is almost non-exist.

Baele (2005) in this paper, this study investigate the integration effect of regional and globalization on the amount by which shocks of regional and global market are conveyed to local stock market. The focus of the study is on Western European stock market because these states are more integrated in terms of economic, monetary and financial aspects. This study examines the scale of volatility spillover and time-variance nature from US and European market to local stock market of European country. This study uses the regime-switching model that allows the intensity of shock spillover changes over time and the main novelty of this model is to use for time-variant integration. It further finds that spillover force in regime switching model is important for both economical and statistical perspective. During the 1980s to 1990s, the US and European the sensitivity of

shock spillover increased although the increase is more prominent in European market. In the period of second half of 1980s and first half of 1990s, shock spillover variations are more strongly increased. The study investigates that increase in development of stock market, integration of trade and low inflation adds to the intensity of European shock spillover.

Hamao, Masulis & Ng, (1990) examines the effect of price variation and price volatility among three main international equity markets named New York, Tokyo and London. By using GARCH (1, 1)-M framework, this study uses daily data from open to close and from close to open returns. It examines the spillover from UK and US equity market to Japanese stock market for conditional variant. On the Japanese stock market the effect of volatility spillover is significant but the effect of spillover on remaining two stock markets is much weaker. It is not confirmed that whether returns converts in single currency or not so this result is not much effective.

Uncertain variation in foreign market index is mainly linked with the effect of significant spillover on conditional mean of local market for close to open and open to close returns. The return of open to close effect suggests informational inefficiencies in the stock market. For close to open return, this effect is consistent on condition mean with financial integration internationally. However, the degree is much lesser of volatility spillover is this case.

Santamaria, Gonzalez, Guarin & Velandia, (2017) investigate the volatility spillover among major global stock market index of the world. This study use DCC-GARCH structure for demonstrating the relationship of multivariate of volatility among the stock market. This study is the extension of Diebold and Yilmaz (2012) who consider the time-varying framework of their covariance mediums who calculate spillover directly from the return series. This study use daily data of Germany, UK, China, Australia, and Canada, Japan and US and the sample period from January 2001 to August 2016. This study finds several kinds of results. First, spillover results provide the extensive variation overtime and when markets are instable it becomes greater. From the period of 2007 to 2007, total

spillover present the increasing trend and it remains higher at the end of 2011 period. The total spillover extent level above 67% during that time period, conforming to the financial crises internationally which is higher than normal average before crisis. However, it reduces from 2011 somehow. This shows that the spillover intensity has risen, even in the non-crisis period.

Secondly, during sample period net position doesn't change for each country. The net transmitter always is US, Germany, UK and Canada while Japan, Canada and China are the net receivers. However, when the total spillover is considered, their intensities reveal significant time-variation. Transmission initiates in developed stock market. But the strength of transmission is lower within this group of markets than others. Even the Chinese equity market is grown overtime, but still a net receiver of spillover. Among this set of countries, to test volatility spillover is higher during subprime crisis pairwise spillover is revealed on constant term and dummy variable is used for the financial crisis period. The results revealed that all constant is statistically significant and positive. The volatility results in all countries are different from US. The evidence provides us that spillover significantly is increase significantly during the crisis period.

Chiou (2011) this study captures the relationship of lead-lag by using return volatility variable among three major equity markets named Tokyo, New York and London. The sample period starts from 1997 to 2007. The evidence indicates that these three markets are strongly significantly interdependent with each other. Tokyo leads to London and New York; London effects Tokyo plus New York; and New York effects to London as well as Tokyo. However, London and New York effect is stronger. The results are mostly consistent with previous studies. This study has some significant implications for Portfolio management, trading strategies, option markets and policy marking. By observing the other market, an investor may make some profitable investment in one market due to their interdependency and close relation. Second, regulars should also capture the foreign market not only the local market and must be ready to deal the adverse conditions according to that. Thirdly, due to high correlation between stock market vs. international market it is difficult to achieve the diversification level

internationally. Finally, like domestic stock market, local option market is also interdependent. Generally, this study extends the prevailing literature in integrated market to check how the stock market affects each other by mean of return volatility. The evidence confirms that the relation between New York, Tokyo and London is of high degree.

Li & Giles (2015) in comparison of the developed stock market, emerging markets are more affected via their own past behavior for both the long and short horizon. The degree of own shock effect is probably same for US market but between Japanese stock market and emerging equity market, the own shock impact became smaller since the 1990s to recent 5 years. If we include 'bad news' the finding becomes change. The study provides US equity market has highly negative shock effect between all stock market for both the short and long run period. Results clarify that emerging markets are more affected through 'good news'. In whatever market we examine, negative shocks are much strongly effect than overall effects. The own past effect of volatility is greatly significant in all cases, and persistency is observed at highest level in the US stock market when full sample period is examined. However, for US market the past effect of volatility became the lowest one and Asian emerging stock market has the high value from this effect.

This study also finds the volatility spillover and shocks among different markets. The US equity market has unidirectional (shock) spillover to the emerging as well as Japanese market and the transmission of shock spillover for both the short and long run. The degree of shock spillover in emerging market from US stock market is higher than the Japanese market over recent 5 years. When negative shocks are considered, in short run unidirectional spillover is observed but not in long horizon. Meanwhile, in recent 5 years shock spillover are bidirectional and significantly influence the emerging and Japanese stock market that are not found in past literature. In the shock spillover effect, there is significant result of volatility spillover from USA to other market but only during financial crisis period and past volatility effect of emerging counties are transmitted to US stock market at same time. Though, in long run the study do not find shock effect from Japan to Asian market but volatility spillover is significant between both these

markets in short as well as long run. The relation between Asian developing market and Japanese market becomes stronger during recent 5 years.

Qayyum & Kemal (2006) finds the relationship between the equity market and currency market for Pakistan. For this investigation Engle Granger two step methods is used and returns are demonstrated by EGARCH bivariate method. The co integration results show that there is no relationship in long run among these markets. The behavior of currency market and stock exchange market is interdependent and interlinked. One's market returns is largely affected by the instability of other market. Meanwhile, the returns of equity market are sensitive to the volatility of currency market as well as the returns of stock market. On the other side, exchange rate market is greatly affected by the returns of the stock market and the return of currency market is mean reverting. The evidence provides strong linkage between volatility of stock market returns and volatility of currency market. The study further finds the volatility spillover effect between these two markets in Pakistan.

Wu (2005) this study examines the relationship between the currency market and stock exchange market. This study uses EGARCH method and the EGARCH-X method which explains the dynamic relationship between these two markets in short run also preserve the equilibrium in long run relationship not only for conditional mean but also in conditional volatility. This study takes data among some global economies and has more focus on regional market of Asian countries and also adds during and after impact of Asian crises in 1997. This study investigates the transmission of volatility among seven Asian countries between currency and stock exchange market. The analysis reveal that there is no significant condition mean relation between these market but volatility linkage exist between exchange rate changes and equity returns in the recovery period for all economy except South Korea.

Meanwhile, the correlation is measured by the coefficient between standardized residuals of equity returns and the currency variation are significant and also negative for all states except Indonesia in the crisis period. It further reports statistically significant linkage in

between the currency and stock market. It further reports that volatility spillover has increased in the recovery period which shows that transmission of Asian market increases after the financial crisis of Asia; when we compare the transmission of volatility during the crisis and recovery periods. The results also reveal that interaction between the two markets of Asian countries affected by Asian crisis and for Philippines, Indonesia, Thailand and Japan the impact is higher. Thailand is more vulnerable in financial crisis. The further future research can be carried out on the terrorist incidents, September earthquake, the linkage of equity and currency market and political party changes.

Am & Azzam (2012) this study empirically investigates the stock market behavior for an Asian emerging stock market during the financial crisis from the period of 1992 to 2009. The researcher identifies the behavior of equity market return during the episode of significant price decline in Crashes. This paper uses GARCH-M method for the purpose to study the time-variant volatility effect and investigate how stock market responds to crisis. In order to investigate this study, three scenarios have been used; the first scenario is to determine the impact of 2008 crisis only, second scenario is to study the impact of the financial crisis that arise 35% or more drop in equity prices which involves the crashes of 2005 and 2008 and third scenario is to include all crisis which caused to decline in the stock prices 20% more than that. The sample period starts from 1992 to 2009 and study uses daily, weekly and monthly closing data for weighted price index of Amman stock exchange (AME) general. This study also takes the data from different sectors mostly insurance, industrial sectors and banks. The analysis of GARCH-M model reveals that crisis has negative effect on stock returns and this effect is higher in the period of 2008 crisis and even greater that caused 20% or more drop in the stock prices. The estimated risk retains its monotonic linkage with stock returns and is significantly positive.

This study is important for policy makers as well as practitioners. It approves that correlation among the emerging and developed market have a tendency to decline the market. Markets are interacting with each other by interrelated transactions or by general investor's sentiments. ASE is the emerging and well developed market to the level that it

is interconnect to stock market globally and it is largely affected by events of negative or positive which affect the financial market globally.

Beer & Hebein (2011) investigates the dynamic relationship between two group of markets; Developed market and Emerging market by using EGARCH framework for nine countries. The developed countries are UK, US, Japan and Canada and Asian emerging markets are South Korea, Philippines, Hong Kong, India and Singapore. There is positively significant price spillover exist from currency market to the equity market for US, Canada, South Korea, India and Japan. Currency depreciation indicates to decay in stock prices in these countries as depreciation leads to higher inflation in future then investor becomes skeptical about company of their future performance.

For developed countries, the study does not find any evidence of persistence of volatility between currency market and stock return market. For the emerging countries, the results are opposite than developed in which volatility is more persistence and enduring. This provides the evidence of asymmetric parameters that are significant and positive for Hong Kong equity market, currency and stock market of Korea and Philippines currency market. The positive results reveal that positive shocks raise volatility of an equal scale than the negative shocks. Normally, developed countries show a negative asymmetric constraint. However, this could be due to the market frictions, market inefficiency or it could be due to distributional feature of revenues of these markets. Meanwhile, there are significant results between stock market and currency market for all Asian countries and from developed market only for US exchange rate market is significant in terms of the impact of the extent of innovation.

Adjasi, Harvey & Agyapong (2008) explores the effect of currency market volatility on equity market of Ghana plus the other macroeconomic variable's effect on equity market volatility for sample period from 1995 to 2005. This provides evidence that there is an inverse relation between the currency market fluctuation and equity market return. According to the study, volatility shocks exist from currency market to equity returns on Ghana equity market. The analysis reveals statistically significant results between equity

market and macroeconomic variable. Moreover, persistence of volatility exists in many of macroeconomic variables; present behavior effects on future rate on forecast variance. Rise in trade deficit and estimation about future rising leads to decrease the volatility of stock market as per analysis also consumer price indices has good relationship with equity market volatility that's mean raise in consumer price leads to increase in volatility of stock market. Stock market volatility and TB rate has negative linkage. This indicates raise in TB rate leads to decrease in equity market volatility.

In emerging and developed countries, exchange rate fluctuation has attracted much consideration due to its proper implication in financial economy, specially the stock market. This study finds different observations between currency market volatility and equity market returns. If local currency depreciate of some country leads to raise the stock prices in long run but it decreases stock return in case of short run. Empirical studies suggest that currency depreciation is great for stock market particularly for those stock markets which are operate in largely export driven state.

This implies that macroeconomic data can be used by the investors to forecast volatility of stock market. It is recommended to investors for good stock market performance, that policy makers must invest their measures in stable macroeconomic atmosphere because any uncertainty may affect the equity market's performance. So, we must have to have a stable currency market system to attract investors. A fluctuation in exchange rate market leads to have managerial issues because it creates risk of losses or gains. This result may generate uncertainty for investors as they should invest or not invest in market.

Andreou, Matsi & Savvides (2013) this paper explores the mean and volatility spillover relationship between the equity market and currency market of twelve emerging countries. VAR- GARCH model is used in this study to see the relationship. The model also includes spillover from the regional as well as global stock market with addition to emerging stock and currency market. This analysis reveals for all emerging countries, there is evidence of bi-directional connection in variance among the currency market and stock market except Colombia. In volatility spillover, global stock market and regional

market also significantly contributes. There is a significant effect of Asian crisis on the transmission of volatility mechanism among the currency market and emerging equity market in both directions. However, the flexibility in currency market system is associated with greater volatility spillover among the stock market and the currency market for most of the emerging countries.

Mishra, Swain & Malhotra (2007) investigates the relationship of volatility spillover between Indian stock market and currency market by using ARCH models as EGARCH (1, 1) and GARCH (1, 1) to study the spillover effect between stock and currency returns. This study finds in volatility that both these markets are having persistency and predictability on the context of past behavior. The effect of this past behavior is asymmetric. This study also finds the evidence of volatility spillover among equity market and currency market is bidirectional except stock indices as S&P CNX 500 and the S&P CNX NIFTY. The study provides result that both these markets move in same direction and having long run relationship. In nutshell, this study suggests that both these markets are highly integrated with each other and significant results of bidirectional volatility spillover provides the result that information flow is exist between these two markets. So, the investor may forecast the behavior of one market by utilizing the information of other. Long run relationship among these markets suggests that between two variables unidirectional causality is there.

Bhar & Nikolova (2007) explores the integration level of BRIC states on the Global and regional basis by using daily returns of equity index. This study provides the evidence among BRIC countries, there is high level of integration exists and their regions respectively and the rest of the equity world, there is lesser extent of integration. This study finds greater effect of regional trends on the stock returns of these countries in comparison of world trends. The US stock market returns and world index returns have significantly influence on the variance returns among Brazil, China, Russia and India. There is negative relationship exist for China in volatility spillover in the regional and global context. The study suggests many diversification opportunities for investors. High

level of integration in BRIC countries suggests the need for stock selection strategies for Portfolio at the same time investment within these countries in particular growth areas.

Taşdemir & Yalama (2014) this study is about volatility spillover effect between two major emerging equity markets as BOVESPA and ISE which have financial interaction and insubstantial trade and located in different states. By applying Cross- correlation causality test in variance, this study examines the direction of volatility flow and their existence between these two countries before and after the period of three major crisis. Multivariate approach permits us to control the spillover effect within region and the financial center. There is direct linkage between two equity markets as per evidence. BOVESOA and ISE are affected by the financial crisis in case of the volatility transmission as per finding. In all sub period, the volatility spillover effect from Brazil to Turkey but from Turkey to Brazil, the volatility spillover effect is only Post crisis period.

Fang & Miller (2002) this study explores the linkage between depreciation of the currency and returns of the stock market by using bivariate model of GARCH-M. This study examines the volatility effect across the Korean stock and currency market over the Asian crisis during 1997 to 2000. This study includes three main elements. First, data covered the Asian financial crisis period. Second, in variance process this study incorporates structural shift dummies for the stock and currency market due to Asian financial crisis. Third, by taking into account adjustment dynamics, this study estimates the lagged effect of equity market returns to exchange rate depreciation. Currency depreciation has significant influence on the returns of stock market in all three channels. First, degree of currency depreciation has negatively effect on the equity market returns. Second, currency depreciation positively influence on the returns of stock market. Third, the volatility of stock market returns reacts to the volatility of currency depreciation. In summarize form; exchange rate depreciation modifies the decision of stock market investment.

Chiang, Yang & Wang (2000) this study analyzes the behavior of the Asian stock markets by using multivariate conditional variance and co-variance frame. Information is

derived in this study by local, regional and the world factors to understand the national stock returns. Firstly, by using lagged returns of national stock as local factor, the result indicates that most of the markets exhibit significant autoregressive process, hypothesis is in rejecting random. In the regional and the world factor, US and Japanese stock returns influence a positive impact on the Asian equity returns though lag length differs from country to country. Next phase, analysis provides the evidence that returns of the national stock and national currency have a positive relation and higher stock returns leads to the appreciation of domestic currency.

Finally, the result are estimated in the basis of GARCH (1, 1) bivariate. As per evidence, both variance and co-variance is time varying in this study. This study argued that while pricing of the assets internationally, the process of variance co-variance needs to build into model more clearly in order to incorporate the time-varying risk.

Jebran (2014) this study explores the dynamic relationship between the Pakistani stock market and the stock markets of Asian countries include India, Malaysia, Sri Lanka, Indonesia, and China. This study uses the monthly data of stock prices index from November, 2003 to November, 2013. The evidence provides integration of Indonesia and India stock market by applying the Correlation matrix for the purpose of finding linkage among stock market. This study finds all variables stationary at 1st difference in unit root test application. The Co-integration approach of Johansen and Juselius is applied to examine the long run relationship between variables which reveals only one equation of co-integration. Sri Lankan stock market is granger caused by Malaysia, India and Indonesia stock market by applying Granger Causality test. As per statistical results, there is unidirectional causality from Indonesia, India and Malaysia to stock market of Sri Lanka. This study finds no long run association among stock market of Pakistan and any other stock market. The results of variance decomposition states that variances in Pakistani stock market and India is because of their own market innovation and other's stock market have no influence to them.

CHAPTER # 3

DATA DESCRIPTION AND METHODOLOGY

Data Description

The current study aims to explore mean and volatility spillover from currency market to equity market of twenty eight emerging markets for the sample period of 16 years from 2000 to 2016. Emerging countries are divided into different regions as Eastern Europe market, African market, Asian market, American market, Middle East market. The five Emerging Eastern Europe markets including in our study are Russia, Bulgaria, Hungary, Poland and Greece. Egypt, South Africa and Nigeria are including in African market. The Asian Emerging markets are China, India, Indonesia, South Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan and Thailand. We have taken Mexico, Argentina, Chile and Brazil from American state. The seven countries includes in Middle East markets are Bahrain Jordan, Turkey, Kuwait, Oman and Saudi Arabia.

This study use daily data instead of weekly because stock and foreign exchange market trading occurs on daily basis. The reason behind selection of daily data is to capture more information as in case of weekly and monthly data sharp changes are averaged out.

The sample consists of emerging markets as these markets attract the interest if academicians as well as practitioners due to high return offered. Investment more rapidly grows in emerging markets due to better risk and return tradeoff. These markets also influence the demand and supply of foreign currencies.

Table 3.1 below provides the details of the stock market and currencies studies. The representative index of the respective market is taken as proxy of the market behavior.

Table # 3.1 Stock Market Indices and Currencies

Country's Name	Index	Currency
Brazil	IBOVESPA	Brazilian real
India	S&P BSE SENSEX	Indian rupee
Indonesia	JAKARTA COMPOSITE INDEX	Indonesian Rupiah
Russia	RTSI	Ruble
Turkey	BIST 100	Turkish lira
China	SHANGHAI COMPOSITE INDEX	Renminbi
Mexico	IPC	Mexican peso
Chile	IPSA SANTIAGO DE CHILE	Chilean peso
Egypt	EGX30	Egyptian pound
Philippines	PSEI.PS	Philippine peso
Saudi Arabia	TADAWUL ALL SHARES INDEX	Saudi riyal
Argentina	MERVAL	Argentine peso, Dollar sign
Malaysia	FTSE KLCI MALAYSIA	Malaysian ringgit
Poland	WIG20	Polish zloty
South Africa	FTSE SOUTH AFRICA	South African Rand
Greece	ATHENS GENERAL COMPOSITE	Euro
Korea	KOSPI COMPOSITE INDEX	South Korean won
Pakistan	KSE index	Pakistani rupee
Taiwan	TSEC WEIGHTED INDEX	New Taiwan dollar
Thailand	SET INDEX	Thai baht
Bahrain	BAHRAIN ALL SHARES	Bahraini dinar
Hungry	BUDAPEST STOCK EXCHANGE	Hungarian forint
Sri Lanka	COOMBO IND ALL SHS	Sri Lankan rupee
Bulgaria	BULGARIA STOCK EXCHANGE	Bulgarian lev
Nigeria	NSE30	Nigerian naira
Kuwait	KUWAIT MAIN MARKET	Kuwaiti dinar
Oman	MSM30	Omani rial
Jordan	AMMAN SE GENERAL	Jordanian dinar

3.1.1 Russian Stock Exchange

Russian Trading system is the leading stock exchange located in Moscow which is established in 1995. The indices of Russian market are RTS and MOEX Russian Index. The market capitalization it has \$ 635 billion till December 2016. The listed companies of Russian trading system in Moscow are about 245.

3.1.2 Bulgaria Stock Exchange

Bulgarian stock exchange is located in Sofia, the representative of Bulgaria that is founded in 10th October 1991. The market capitalization of Bulgaria Stock exchange is \$ 8.5 billion. The indices in Bulgaria include SOFIX, BG40, BGTR30, and BGREIT.

3.1.3 Hungary Stock Exchange

Budapest stock exchange is the leading stock exchange in Hungary and Budapest is the Capital of this country. This stock market is established in 18 January 1864. The market capitalization of BSE is about \$ 26.2 billion till May 2017. The number of listed companies is 61. The indices include BUX, BUMIX, and CETOP.

3.1.4 Poland Stock Exchange

Warsaw stock exchange is the most representative stock exchange in Warsaw, Poland which is established in 12th April, 1991. This stock market has \$ 149.62 billion market capitalization. The indices of Poland are WIG, WIG20 and WIG30.

3.1.5 Greece Stock Exchange

The Athens stock exchange is the capital of Greece located in Athens. The number of listed companies is 221. Market capitalization it has 36.61 billion till 11th May 2017.

3.1.6 Egyptian Stock Exchange

Egyptian stock exchange comprises with two stock markets, Alexandria and the Cairo exchange which is run by the same board of director. Alexandria stock exchange is founded in 1883 and then Cairo in 1903. The number of listed companies comprises in 373. The market capitalization of this stock exchange has 417 billion. The indices include EGX 30 Index EGX 70 Index EGX 100 Index Dow Jones Egypt Titans 20 Index.

3.1.7 South African Stock Exchange

Johannesburg Stock Exchange is the leading and oldest stock exchange in Africa. The market capitalization of JSE is around \$ 1007 billion till 31st December 2013. It is located in Johannesburg, South African and established in 8 November 1887. The indices are FTSE and JSE.

3.1.8 Nigerian Stock Exchange

The stock exchange of Nigeria is established in 1960 as Lagos stock exchange. Later on, its name changes from Lagos to Nigerian stock exchange. It has 176 listed companies. The market capitalization is around N8.5 trillion in 2017.

3.1.9 China Stock Exchange

Shanghai stock exchange is the leading stock exchange located in Shanghai, China. The number of listed companies is 1041 till may 2015. The market capitalization is probably \$ 3.5 billion till February 2016.

3.1.10 India Stock Exchange

Bombay stock exchange is founded in 1875 as SENSEX. The market capitalization of BSE is around \$ 1482 billion. It has 5749 market capitalization. The stock indices are BSE SENSEX, BSE 500, and BSE small and mid-capitalization.

3.1.11 Indonesia Stock Exchange

Indonesian stock exchange is the stock exchange market located in Jakarta, Indonesia. It is established in 1912. It has 532 listed companies. The stock exchange has market capitalization IDR 5.226 trillion. The indices are IDX Composite, Jakarta Islamic Index and LQ-45.

3.1.12 South Korea Stock Exchange

The Korea exchange is created by the integration of the South Korea. The Korea exchange is located in Busan & Seoul, South Korea. Number of listed companies are 2030 as of January 2015. The indices are KOSPI, KOSDAQ, and KRX 100.

3.1.13 Malaysia Stock Exchange

Kuala Lumpur stock exchange (KLSE) is the main stock exchange in Bursa, Malaysia. It is founded in 1964. The market capitalization this stock exchange has \$ 380 billion. The indices are KLSE and FTSE Bursa Malaysia index.

3.1.14 Pakistan Stock Exchange

The three main stock exchanges exist in Pakistan named as Karachi, Lahore and Islamabad stock exchange. KSE is leading stock exchange in Pakistan. It is placed in Karachi and incorporated in 1949. LSE is established in 1970 and ISE established in 1989. After integration of these three markets, it has 559 listed companies presently. Its market capitalization is \$ 75.1 billion till 2015. The indices as KSE-all share index, KSE-100, KSI-30 index, KSE-30 index.

3.1.15 Philippines Stock Exchange

It is a national stock market in Philippines which is founded in 1927. The market capitalization of this stock exchange is \$ 238 billion. The indices are PSE all shares index, PSE mining and oil index, PSE composite index and PSE financial index.

3.1.16 Sri Lanka Stock Exchange

Colombo stock exchange is the representative stock exchange in Sri Lanka. It is founded in 1985. It gives an automated trading platform. It comprises of 294 listed companies. Market capitalization is about \$ 21 billion. The stock indices are COOMBO IND ALL SHS, S&P Sri Lanka 20 Index (S&P SL20), all share price index (ASPI).

3.1.17 Taiwan Stock Exchange

Taiwan stock exchange (TWSE) is the financial institution places in Taipei, Taiwan. This stock market is established in 1961. The listed companies of this stock market are 898. Taiwan Weighted index (TAIEX) is the main indices.

3.1.18 Thailand Stock Exchange

Thailand is the leading stock exchange located in Bangkok, Thailand. It is founded in 30 April 1975. Its market capitalization is \$ 460 billion. The listed companies are 584. The indices are SET Index, SET 100 Index and SET50 Index.

3.1.19 Mexican Stock Exchange

Mexican stock market is the only stock market in Mexico also known as Mexican Bolsa, BMV and Mexbol. It is founded in 5th September 1933. The market capitalization is \$ 402.99 billion in 2016. The numbers of listed companies are 140. Indices are IPC, IRT ComMx, INMEX RT, IRT Large Cap.

3.1.20 Argentina Stock Exchange

Buenos Aires stock exchange is the financial institution whose operations located in Buenos Aires, Argentina. This stock exchange established in 1854. Its market capitalization is \$ 1.125T in June 2015. Merval is the indices of this stock exchange.

3.5.3 Chile Stock Exchange

Santiago stock exchange is the third largest stock market in Latin America that is started in 27 November, 1893. This stock exchange is located in Santiago, Chile. The indices include IPSA.

3.1.21 Brazil Stock Exchange

BM&F BOVESPA is the stock market responsible for the stock market operations in Sao Paulo, Brazil. It is formed in 23 August 1890. It has R 2.21 trillion market capitalization till 31st December, 2015. It is the 13th largest stock exchange in the whole world. The indices are IBOVESPA.

3.1.22 Bahrain Stock Exchange

Bahrain stock exchange is started in 1987 with the 29 listed companies. In 2015, the number of listed companies of BSE is around 50. The exchange functions from Sunday to Thursday. The indices are Bahrain All Share Index, the Estirad Index and Dow Jones Bahrain Index.

3.1.23 Jordan Stock Exchange

Amman stock exchange (ASE) is the main stock exchange in Jordan which is a private financial institution. This stock market is established in 1999 which is located in Amman, Jordan. The name Amman is decided by looking the country's capital city. It has 237 listed companies till 2014 with the market capitalization of JOD 18.1 billion.

3.1.24 Turkey Stock Exchange

The Borsa İstanbul (BIST) is the stock exchange entity of Turkey. It is established as an incorporated company with a founding capital approximately US\$240 million on April 3, 2013. It is started in 1866. It has 371 listed companies with the market capitalization of \$ 220.620 billion. The indices are BIST 30, BIST 100, and BIST 50.

3.1.25 Kuwait Stock Exchange

Kuwait stock exchange is the national stock exchange in Kuwait.

3.1.26 Oman Stock Exchange

The Muscat stock market is the only stock exchange in Oman. It is started by the Royal Greece on 21st June 1988. The listed companies are 116 till 2011 with the market capitalization of \$ 20,239.74 billion as of 2010.

3.1.27 Saudi Arabia Stock Exchange

Saudi Stock Exchange or Tadawul is the only stock exchange in Saudi Arabia. The location of Tadawul stock exchange is Riyadh, Saudi Arabia. It is supervised by the Capital Market Authority. It is founded in March 19, 2007. Its listed companies are 171. The index of this stock market is Tadawul All Shares (TASI).

3.2 Methodology

This study uses two stages GARCH in mean model.

In the first stage, the return series of currency market are modeled:

$$r_{k,t} = \varphi_0 + \varphi_1 r_{k,t-1} + \varphi_2 V_{k,t} + \varepsilon_{k,t}, \varepsilon_{k,t} \sim N(\mathbf{0}, V_{k,t}) \quad (1)$$

$$V_{k,t} = \alpha_0 + \alpha_1 V_{k,t-1} + \alpha_2 \varepsilon_{k,t-1}^2 \quad (2)$$

Where $r_{k,t}$ refer to the daily return of currency market at time t, φ_i are beta co-efficient whereas $\varepsilon_{k,t}$ is the residual which is normally distributed with mean zero and time conditional variance $V_{k,t}$.

The ARMA structure in the model is to adjust for possible serial correlation in the data. In the next stage, mean return and volatility spillover effects across the countries are estimated.

Th0e effects are then substituted in the mean and volatility equations of stock markets as:

$$r_{j,t} = \varphi_0 + \varphi_{j,1}r_{j,t-1} + \varphi_{j,2}V_{j,t} + \lambda_j\varepsilon_{k,t} + \varepsilon_{j,t}, \varepsilon_{j,t} \sim N(\mathbf{0}, V_{k,t}) \quad (3)$$

$$V_{j,t} = \alpha_{j,0} + \alpha_{j,1}V_{j,t-1} + \alpha_{j,2}\varepsilon_{j,t-1}^2 + \gamma_j e_{k,t}^2 \quad (4)$$

$r_{j,t}$ refers to the daily returns of the stock market at time t, where $e_{k,t}$ is the standardized residual series for the currency market and in capturing the mean return spillover effects from these sources. $\varepsilon_{j,t}, \varepsilon_{j,t}$ refers to the error term which captures the unobserved shocks or unexpected behavior.

In order to examine the volatility spillover, the exogenous variable $e_{k,t}^2$ the square of the standardized residual series is included in the conditional volatility equation and is defined as $e_{k,t} = \frac{\varepsilon_{k,t}}{\sqrt{V_{k,t}}}$. The subscript j in each (3) and (4) equations referred to return of the equity market of the emerging countries.

3.3 Variable Description

There are two variables in this study exchange rate and market returns.

- Market returns are calculated by using:

$$R_{j,k} = \ln(I_{j,t}/I_{j,t-1})$$

- Return of Currency market are calculated by using:

$$R_{k,t} = \ln(ER_{k,t}/ER_{k,t-1})$$

J represents stock market and k represents currency market. It is further clarified that exchange rate is taken as domestic currency per unit of \$.

CHAPTER # 4

DATA ANALYSIS AND DISCUSSION

Descriptive Statistics

Table 4.1 reports the value of mean, standard deviation, kurtosis, skewness, minimum and maximum from exchange rate market to equity market of Brazil, India, Indonesia and Russia.

	BRAZIL		INDIA		INDONESIA		RUSSIA	
	BRL	BVSP	INR	BSE	IDR	JKSE	RUB	RTSI
Mean	0.0001	0.0003	0.0001	0.0004	0.0001	0.0005	0.0001	0.0003
Standard Deviation	0.0108	0.0177	0.0042	0.0148	0.0062	0.0135	0.0052	0.0185
Kurtosis	7.5705	3.9126	8.9005	7.6923	27.4845	7.0532	39.6606	13.2294
Skewness	0.0932	-0.0570	0.1467	-0.1989	-0.2050	-0.6908	-0.2195	-0.4548
Minimum	-0.1050	-0.1210	-0.0355	-0.1181	-0.0894	-0.1095	-0.0894	-0.2120
Maximum	0.0830	0.1368	0.0369	0.1599	0.0762	0.0762	0.0762	0.2020

Average daily return of Brazilian currency market is 0.013% and stock market is 0.03%. The maximum return earned in a day by Brazilian currency market is 8.3% and 13.68% by stock market. The maximum loss incurred is 10.5% by currency market and 12.10% by stock market. The average risk is 1%. Currency market is positively skewed whereas stock market is negatively skewed. The return of stock as well as currency market is found peaked. The data is negatively skewed for the rest of the countries except Indian currency.

In case of India, the daily average returns for currency and stock market are 0.01% and 0.04%. The average risk is 0.42% for Indian currency and 1.48% for Indian equity market. The maximum return earned in a day in 3.69% and 15.9% for currency and stock market. The loss incurred is 3.55% by currency and 11.81% in stock market. Same interpretation applies to India, Indonesia and Russia.

Table 4.2 present the value of mean, median, standard deviation, kurtosis, skewness, minimum and maximum from currency market to equity market of Turkey, China, Mexico and Chile.

	TURKEY		CHINA		MEXICO		CHILE	
	TRY	BIST100	CNY	HIS	MXN	MXX	CLP	IPSA
Mean	0.0002	0.0004	0.0000	0.0000	0.0002	0.0004	0.0000	0.0003
Standard Deviation	0.0085	0.0164	0.0009	0.0125	0.0074	0.0130	0.0064	0.0096
Kurtosis	18.0838	7.6712	98.9710	12.9515	18.8173	5.3635	3.5090	10.4914
Skewness	0.4793	0.0062	-0.4744	-0.0959	1.0793	0.0245	0.2885	0.0047
Minimum	-0.1104	-0.1334	-0.0203	-0.1358	-0.0710	-0.0827	-0.0360	-0.0724
Maximum	0.0868	0.1269	0.0184	0.1341	0.0970	0.1044	0.0466	0.1180

The average daily return of Turkish currency market is 0.022% and 0.038% of stock market. The average risk is 0.84% of currency and 1.63% of stock market. The data is positively skewed in all markets except Chinese currency and stock market. The maximum return earned in a day is 8.67% of currency market and 12.68% of stock market. The maximum loss incurred by Turkish market is 11% and 13%.The return of currency market as well as stock market is found peaked.

The Chinese daily average returns are 0.0028% for currency and 0.0038% for stock market. The risk for both markets is 0.086% and 1.25%. The maximum loss faced by Chinese currency and equity market is 2% and 13.5%. The maximum return earned per day is 18.3% and stock market is 13.40%. Same explanation applies to other markets as well.

Table 4.3 shows the mean, median, standard deviation, kurtosis, skewness, minimum and maximum values from currency market to stock market of Egypt, Philippines, Saudi Arabia and Argentina.

	EGYPT		PHILIPPINES		SAUDI ARABIA		ARGENTINA	
	EGP	EGX30	PHP	PSEI	SAR	TASI	ARS	MERV
Mean	0.0005	0.0003	0.0000	0.0003	0.0000	0.0002	0.0005	0.0006
Standard Deviation	0.0120	0.0128	0.0042	0.0128	0.0004	0.0140	0.0101	0.0178
Kurtosis	1736.103	9.5191	122.205	15.974	687.393	47.484	1014.134	7.6103
Skewness	38.9947	-0.6671	-4.6979	0.2812	-4.6546	-1.1967	24.5836	-0.1753
Minimum	-0.0640	-0.1112	-0.1110	-0.1309	-0.0159	-0.2503	-0.1158	-0.1295
Maximum	0.5408	0.0731	0.0278	0.1618	0.0129	0.2249	0.4718	0.1612

The daily average return in Egyptian market is 0.05%. The risk is 1.20%. The maximum returns are earned 54.08% for currency and 7.31% for stock market. The utmost loss suffered is 6.4% for currency and 11.1% for stock market. The returns are found peaked for all markets. The Egyptian currency market is positively skewed and negatively skewed for Egyptian stock market.

The data is positively skewed for some market and negative for others. Same interpretation applied to Philippines, Saudi Arabia and Argentina.

Table 4.4 represents the mean, median, standard deviation, kurtosis, skewness, minimum and maximum values from currency market to equity market of Malaysia, Poland, South Africa and Greece.

	MALAYSIA		POLAND		SOUTH AFRICA		GREECE	
	MYR	KLSE	PLN	WIG20	ZAR	FTW	GRD	ATG
Mean	0.0009	0.00013	2.35E-	4.26E-	8.99E-05	0.00032	0.0001	-7.30E-
Standard Deviation	0.0049	0.0057	0.0078	0.0123	0.0101	0.0097	0.0047	0.0194
Kurtosis	3.9943	2.8919	7.7157	5.2790	20.6419	5.3169	4.3792	9.9892
Skewness	-0.4083	-0.2746	0.3452	-0.1888	0.9557	-0.2044	-0.0830	-0.7518
Minimum	-0.0360	-0.0274	-0.0731	-0.0844	-0.1118	-0.0773	-0.0300	-0.1771
Maximum	0.0203	0.0332	0.0559	0.0815	0.1602	0.0567	0.0243	0.1068

The maximum return earned in a day by Malaysian currency market is 2.03% and by stock market is 3.32%. The highest loss incurred is 3.60% by currency market and 2.74% by stock market. The average risk of currency market is 0.49% and by stock market is 0.57%. The average return of Malaysia stock market is 0.013% and 0.09% for Malaysian currency market. The returns of currency and stock are found peaked in all market. The data is positively skewed for Poland and South African currency and for all the remaining markets, it is negatively skewed. Same explanation applies to Poland, South African and Greece market.

Table 4.5 present the mean, median, standard deviation, kurtosis, skewness, minimum and maximum values from currency market to stock market of Korea, Pakistan, Taiwan and Thailand.

	KOREA		PAKISTAN		TAIWAN		THAILAND	
	KRW	KS11	PKR	KSE	TWD	TWII	THB	SET
Mean	1.16E-05	0.0001	0.0001	0.0007	9.88E-06	8.9E-	7.93E-	0.0002
Standard Deviation	0.0057	0.0129	0.0030	0.0126	0.0024	0.0116	0.0025	0.0085
Kurtosis	52.2575	10.7801	27.2165	4.6410	7.9069	6.2135	3.6905	7.5200
Skewness	-0.0040	-0.6885	0.6315	-0.2660	0.0626	-0.2985	0.0345	-0.3501
Minimum	-0.1095	-0.1281	-0.0332	-0.0774	-0.0175	-0.0994	-0.0137	-0.0581
Maximum	0.1022	0.1128	0.0371	0.0851	0.0182	0.0652	0.0142	0.0575

The data is negatively skewed for Korean currency and stock market. For the currency market of Pakistan, Taiwan and Thailand, it is positively skewed and for stock market of these countries, it is negatively skewed. The return of equity and currency market is examined peaked. The daily average return of Korea currency is 0.0011%, risk is observed as 0.57%, maximum return earned in a day is 10.2% and loss incurred is 10.95%. The Korean average equity returns are 0.010%, risk is 1.2%, maximum loss is 12.8% and maximum return earned is around 11.28%. Same implication applies to Pakistan, Taiwan and Thailand market.

Table 4.6 reports the mean, median, standard deviation, kurtosis, skewness, minimum and maximum values from currency market to stock market of Bahrain, Hungary, Nigeria and Sri Lanka.

	BAHRAIN		HUNGARY		NIGERIA		SRI LANKA	
	BHD	BAX	HUF	BUX	NGN	NSE30	LKR	CSE
Mean	0.0000001	-8.1E-05	0.0002	0.0002	0.0004	0.0001	0.0002	0.0005
Standard Deviation	0.0002	0.0038	0.0073	0.0102	0.0102	0.0090	0.0025	0.0126
Kurtosis	115.292	7.5836	3.6929	5.6961	791.218	9.5683	74.792	48.384
Skewness	1.3354	-0.7069	0.1425	-0.2817	22.8874	0.2955	4.0542	0.6574
Minimum	-0.0040	-0.0284	-0.0360	-0.0698	-0.0635	-0.0463	-0.0214	0.1391
Maximum	0.0048	0.0160	0.0351	0.0551	0.3499	0.0842	0.0389	0.1829

Bahrain currency market experienced the maximum loss is 0.40% and in stock market is 2.8%. Maximum return earned by the Bahrain currency market is 0.48% and for stock market is 1.60%. The average daily return is approximately 0.000011% for Bahrain currency market and 0.0081% for stock market. The average risk of Bahrain currency market is 0.023% and by stock market is 3.8%. Same behavior observed in other market with minimum variations. However, all markets are positively skewed except equity market of Bahrain and Hungary. The returns of stock market as well as currency market are found peaked.

Table 4.7 reports the mean, median, standard deviation, kurtosis, skewness, minimum and maximum values from currency market to stock market of Bulgaria, Oman, Kuwait and Jordan.

	BULGARIA		OMAN		KUWAIT		JORDAN	
	BGN	BSE	OMR	MSI	KWD	KWSE	JOD	AMG
Mean	0.0002	0.0002	-4.4E-08	0.0002	2.36E-05	-7E-05	-6.9E-	0.0002
Standard Deviation	0.0047	0.0068	0.0002	0.0078	0.0013	0.0048	0.0008	0.0120
Kurtosis	4.2441	9.1719	177.319	28.8619	9.7174	9.7780	104.041	668.115
Skewness	-0.0276	-0.0616	2.4427	-1.1678	-0.1910	-1.0442	1.5168	1.4367
Minimum	-0.0302	-0.0474	-0.0039	-0.0870	-0.0107	-0.0340	-0.0141	-0.4128
Maximum	0.0236	0.0564	0.0063	0.0804	0.0086	0.0320	0.0183	0.4383

The average daily return of Bulgarian currency is 0.02%, risk is 0.47%, and maximum return earned per day is around 2.36%, the maximum loss suffered by Bulgarian currency is about 3.02%. Same behavior observed in Bulgarian equity market with little bit variations. Same interpretation applies to Oman, Kuwait and Jordan markets. However, Bulgarian market is negatively skewed. The rest of the market is positively skewed except Kuwait market and Oman stock market. The return of currency market and stock market are found peaked.

Table # 4.8 reports the mean and variance volatility spillover from currency market to Equity market of Russia, Bulgaria, Poland, Hungary and Greece. ARCH term reports that past price behavior affects the current period volatility or not. GARCH captures the persistence of the volatility in the next period.

Table 4.8 Mean and Volatility spillover effect from Currency market to Equity market of Eastern Europe countries

	Russia		Bulgaria		Hungary		Poland		Greece	
	RUB	RTSI	BGN	BSE	HUF	BUX	PLN	WIG20	GRD	ATG
ϕ_0	0.0000 (0.933)	0.0007* (2.2767)	0.0001 (0.6798)	0.0001 (0.2003)	0.0003 (1.2486)	0.0001 (0.3181)	-0.0002 (-1.2065)	0.0002 (0.9464)	0.0002 (0.7957)	-0.0005 (-0.6733)
ϕ_1	0.0098 (0.8329)	0.0438* (3.3713)	-0.0064 (-0.2941)	0.0378 (1.4956)	-0.0319 (-1.5388)	-0.0086 (-0.3544)	-0.0009 (-0.0732)	-0.0022 (-0.1609)	-0.0007 (-0.0327)	0.0415 (1.5891)
ϕ_2	-0.4219 (-0.1458)	0.5116 (0.4794)	-1.8655 (-0.1795)	3.306 (0.5106)	-3.9206 (-0.6862)	2.2926 (0.5211)	1.1803 (0.4491)	-0.3217 (-0.1630)	-3.9757 (-0.3855)	1.3614 (0.6551)
λ_1		0.016 (0.3882)		-0.0391 (-1.2590)		-0.0659* (-2.1151)		-0.1049* (-5.2685)		-0.1316 (-1.4681)
α_0	0.0000* (15.5589)	0.0000* (7.867)	0.0000* (5.7916)	0.0000* (8.2648)	0.0000* (3.3329)	0.0000 (0.3767)	0.0000* (9.6007)	-0.0000* (-4.5652)	0.0000* (6.1967)	0.0002* (34.2622)
α_1	0.0432* (68.2921)	0.0539* (23.2291)	0.0221* (8.8345)	0.1022* (12.8161)	0.0243* (7.9987)	0.0546* (8.4354)	0.0416* (16.9499)	0.0298* (13.8278)	0.0218* (8.3903)	0.0741* (6.5987)
α_2	0.9615* (2659.22)	0.9287* (308.421)	0.9750* (378.747)	0.8014* (56.9544)	0.9715* (276.646)	0.8806* (85.4533)	0.9519* (349.4699)	0.9619* (409.7063)	0.9741* (355.562)	0.0033 (0.3431)
λ_2		0.0000* (9.6577)		0.0000* (5.9822)		0.0000* (12.1707)		0.0000* (11.2813)		0.0003* (20.2003)

The result reveals that significant and positive volatility spillover exists from Russian currency market to Russian equity market. However, the Coefficient of volatility spillover is very low. The ARCH and GARCH term are significant and positive indicating the past prices behavior has influence on current period volatility. Persistence of volatility is also observed as GARCH term is significant and persistence is in long run as sum of ARCH and GARCH term is closer to one. However, no mean spillover is observed as λ_1 is found insignificant. The positive relationship indicates that market moves in same direction. Same behavior is observed for Bulgaria, Hungary, Poland and Greece. The Coefficient of 0.0003* volatility spillover is high for Greece in comparison to four other countries indicating that currency market has more influence on equity market in Greece. It also indicating that shock in currency market increases the volatility of stock market.

The mean spillover from currency to equity market is significant and negative for Hungary and Poland. Shocks arising from the appreciation in currency leads to increase the returns of the stock market. It means that shock in currency market have transmitted to equity market. In case of Russia, Bulgaria and Greece mean spillover is found insignificant.

Table # 4.9 describes the mean and volatility spillover from exchange rate market to equity market of Egypt, South Africa and Nigeria.

Table 4.9 Mean and Volatility spillover effect from currency market to equity market of African countries

	Egypt		South Africa		Nigeria	
	EGP	EGX30	ZAR	FTW	NGN	NSE30
ϕ_0	0.0005* (1.9037)	-0.0007 (-1.2176)	0.0004* (2.1446)	0.0003 (1.6414)	0.0004 (1.5903)	0.0001 (0.4405)
ϕ_1	0.0391* (1.9208)	0.1465* (6.0061)	-0.016 (-1.1649)	0.0198 (1.4421)	-0.0668 (-2.8170)	0.2349* (9.8488)
ϕ_2		8.1235* (1.9423)	-4.7805* (-2.0192)	3.133 (1.3140)		0.0744 (0.0153)
λ_1		0.0195 (0.2031)		-0.073 (-5.7001)		0.0316* (1.7808)
α_0		0.0000* (12.8992)	0.0000* (8.3248)	-0.0000 (-0.5689)		0.0000 (6.6927)
α_1		0.1008* (12.1029)	0.0501* (24.7802)	0.0574* (17.415)		0.0798 (11.773)
α_2		0.7517* (44.2958)	0.9404* (312.4703)	0.9196* (29.1556)		0.8979 (101.4309)
λ_2		0.0161* (3.3861)		0.0000* (11.2175)		-0.0004 (-0.8237)

The results indicate the significant and positive volatility spillover from Egyptian currency market to Egyptian stock market. Same case observed in South Africa. However, Nigerian currency market is negative and insignificant which shows that it has no volatility spillover effect from currency market to equity market. The Coefficient of 0.0161 of volatility spillover is high for Egypt showing exchange rate market has more influence on stock market in Egypt. The ARCH and GARCH term is positive and significant which means past price behavior has an effect on current period volatility. The sum of ARCH and GARCH Coefficient is closer to one which shows that persistence of the volatility is long run in nature.

The Egyptian currency returns are not heteroscedastic in mean spillover. So, we have not applied the GARCH-M model. We have only estimated the returns of lagged value and then put that value in stock market. Same interpretation applies to Nigeria.

The mean spillover is positive and significant only for Nigeria which describe that Nigerian currency market significantly influences with Nigerian stock market. Shocks arise from the appreciation in currency leads to higher stock returns. The same is in line with the argument that foreign inflows increase demand of the local currency and stock. So, both appreciates. Meanwhile, no mean spillover exists in Egypt and South Africa as the results are not significant.

Table # 4.10 present the mean and volatility spillover effect from exchange rate market to stock market of China, India, Indonesia, South Korea and Malaysia.

Table 4.10 Mean and Volatility spillover effect from currency market to equity market of

ASIAN countries

	China		India		Indonesia		South Korea		Malaysia	
	CNY	HIS	INR	BSE	IDR	JKSE	KRW	KS11	MYR	KLSE
ϕ_0	-0.0001* (-1.7640)	0.0001 (0.6113)	-0.0000 (-0.0471)	0.0005* (2.3210)	0.0000 (0.7693)	0.0007* (2.4436)	-0.0001* (-1.6953)	0.0002 (1.0076)	-0.0000 (-0.1035)	-0.0002 (-0.8596)
ϕ_1	-0.0117 (-1.0051)	-0.0068 (-0.5006)	-0.0140 (-0.9213)	0.0450* (2.6724)	0.0629* (4.2592)	0.0826* (5.0082)	-0.0180 (-1.4391)	-0.0184 (-1.2371)	0.0308 (1.1921)	0.0624* (2.3873)
ϕ_2	73.6880* (2.0299)	1.9874 (1.2997)	0.3831 (0.0939)	1.4224 (0.9623)	-0.0905 (-0.0312)	0.6433 (0.3264)	1.5151 (0.5512)	1.8721 (1.3995)	6.2927 (0.7047)	17.0753* (1.8629)
λ_1		-0.3518* (-2.7347)		-0.1668* (-3.3471)		-0.0435 (-1.2355)		-0.1150* (-4.1741)		-0.1050* (-3.5758)
α_0	0.0000* (43.7144)	0.0000* (8.6997)	0.0000* (25.3761)	0.0000 (0.7891)	0.0000* (10.8673)	0.0000* (7.6228)	0.0000* (12.4012)	0.0000* (-9.3754)	0.0000* (5.7947)	0.0000* (6.3436)
α_1	0.0371 (32.3491)	0.0371* (20.2045)	0.1145* (21.9410)	0.1011* (16.7278)	0.0648* (46.8440)	0.1064* (16.4132)	0.0550* (23.5710)	0.0443* (20.6483)	0.0835* (9.2154)	0.0868* (8.9709)
α_2	0.9570 (2829.76)	0.9570* (440.9461)	0.8946* (235.8076)	0.8761* (147.915)	0.9422* (1297.917)	0.8292* (135.1571)	0.9409* (418.0082)	0.9534* (458.4826)	0.8949* (86.5565)	0.8650* (64.3065)
λ_2		-0.0000001 (-1.3837)		0.0000043* (9.5911)		0.0000072* (13.656)		0.0000015* (13.3686)		0.000001* (3.6265)

The result provides the positive and significant volatility spillover effects from Indian currency market to Indian stock market. The Coefficient is very low in volatility spillover. The ARCH term is positive and significant explains past price behavior effects the current period volatility. Persistence of the volatility is also noticed as GARCH term is positive and significant. The sum of ARCH and GARCH Coefficient is closer to one indicates that persistence of the volatility is long run in nature. Same interpretation applies to Indonesia, South Korea and Malaysian for volatility spillover. Positive and significant volatility spillover indicates market flow in same direction. The shocks in currency market increase the volatility of stock market so it doesn't provide the opportunity for diversification to investor. However, the volatility spillover for Chinese market is negative and insignificant. The Coefficient of 0.000072 of Indonesian volatility spillover is greater showing that exchange rate market has more effect on stock market in Indonesia in comparison of India, South Korea and Malaysia.

The mean spillover is significant and negative from Chinese currency market to Chinese equity market and same behavior observed in India, South Korea and Malaysia which shows the inverse relationship between these two markets. Shocks arise from the appreciation in currency leads to higher stock market returns. Indonesian currency market is not significantly influences to stock market.

Table # 4.11 present the mean and volatility spillover effect from Currency market to Equity market of Pakistan, Philippines, Sri Lanka, Taiwan and Thailand. For all countries, ARCH term is observed positive and significant in volatility spillover which means past behavior effects the current period volatility. GARCH term is also significant and positive which captures the persistence of the volatility. The aggregate of ARCH and GARCH Coefficient is greater than one indicates persistence of the volatility is in long run.

Table 4.11 Mean and Volatility spillover effect from currency market to equity market of ASIAN countries

	Pakistan		Philippines		Sri Lanka		Taiwan		Thailand	
	PKR	KSE	PHP	PSEI	LKR	CSE	TWD	TWII	THB	SET
ϕ_0	0.0000 (0.5375)	0.0009* (5.0325)	0.0001 (0.8132)	0.0001 (0.5154)	0.0000* (2.3887)	0.0001 (1.6233)	-0.0001 (-1.3717)	0.0002 (1.1379)	-0.0001 (-0.6245)	0.0003 (1.0041)
ϕ_1	-0.2081* (-12.8594)	0.0652* (4.2066)	-0.0409* (-2.7266)	0.1140* (6.6335)	0.1529* (17.7520)	0.2251* (18.8055)	-0.0207* (-1.9481)	-0.0157 (-1.0956)	0.0525* (2.4480)	-0.0370 (-1.4368)
ϕ_2	8.7897* (1.9834)	0.9745 (0.6253)		2.7199 (1.2781)	0.1179 (0.0210)	2.5894 (1.5299)	13.4241 (1.5372)	1.0348 (0.6249)	23.2322 (0.9515)	4.1617 (0.9455)
λ_1		0.0066 (0.1165)		-0.3743* (-8.0258)		-0.0238 (-0.7227)		-0.2795* (-5.3873)		-0.2709* (-3.7622)
α_0	0.0000* (57.4220)	0.0000* (10.9432)		0.0000* (10.2213)	0.0000* (103.7637)	0.0000* (16.2404)	0.0000* (19.0724)	0.0000 (0.4083)	0.0000* (6.1898)	0.0000 (1.1603)
α_1	0.1683* (41.1985)	0.1452* (20.0660)		0.1395* (14.5663)	0.1278* (73.4754)	0.1670* (39.5829)	0.0420* (37.3053)	0.0375* (20.9944)	0.0455* (8.8987)	0.0667* (9.3092)
α_2	0.8324* (370.7406)	0.8267* (120.5944)		0.7704* (62.6804)	0.9137* (1442.7400)	0.8412* (245.2498)	0.9545* (933.6245)	0.9583* (485.5988)	0.9271* (110.1372)	0.8795* (96.1923)
λ_2		0.0000* (9.0586)		0.3794* (9.4891)		0.0000* (7.9670)		0.0000* (6.1159)		0.0000* (12.6530)

The result shows the positive and significant volatility spillover effect from Pakistan currency market to Pakistan equity market. Same behavior observed in Philippines, Sri Lanka, Taiwan and Thailand. The positive and significant result reveals that market moves in same direction as shocks in the return of currency market raises the volatility of the stock market. Coefficient 0.3794 in Philippines volatility spillover is higher in comparison of other countries which reveals that currency market has more effect on stock market in Philippines.

The returns of Philippines currency market are not heteroskedisitic, so we cannot apply GARCH in mean. We have only estimated the lagged value returns of currency market and then put it to the stock market.

However, the mean spillover from currency market to equity market is significant and negative for Philippines, Taiwan and Thailand. So, there is an inverse relationship between two markets in these countries. Shocks arising from the appreciation in currency leads to higher stock market returns and shocks associated with depreciation in currency market results in reduction in equity market returns. The same is in line with the argument that demand and supply of domestic currency and stock increases by the foreign inflows. There no mean spillover effect in Pakistan and Sri Lanka. The Coefficient of Philippines mean spillover has greater influence from currency to equity market of Philippines in comparison of Taiwan and Thailand.

Table # 4.12 describes the mean and volatility spillover effect from currency market to equity market of Mexico, Argentina, Chile, and Brazil.

	Mexico		Argentina		Chile		Brazil	
	MXN	MXX	ARS	MERV	CLP	IPSA	BRL	BVSP
ϕ_0	-0.0000 (-0.0610)	0.0004* (2.0625)	0.0005* (3.6840)	0.0005 (1.2956)	-0.0001 (-0.3992)	0.0003* (1.6542)	-0.0001 (-0.6750)	0.0003 (0.7210)
ϕ_1	-0.0694* (-4.5545)	0.0538 (3.0802)	-0.0319* (-2.4532)	0.0235* (1.7894)	0.0456* (2.7790)	0.1641* (9.4031)	-0.0484* (-0.0020)	-0.0112 (-0.6141)
ϕ_2	1.0038 (0.3497)	2.4475 (1.4948)		1.6421 (1.2358)	1.5550 (0.3234)	4.2460* (1.9785)	-1.5245 (-0.3838)	1.5026 (1.0371)
λ_1		-0.1394* (-5.0585)		-0.0158 (-0.4367)		-0.0322 (-1.5487)		-0.0516* (-1.6610)
α_0	0.0000* (6.4129)	-0.0000* (-5.7156)		0.0000* (13.6434)	0.0000* (5.105178)	0.0000* (3.6607)	0.0000* (7.5825)	-0.0000* (-2.4140)
α_1	0.1038* (17.6125)	0.0762* (12.1917)		0.0527* (21.4794)	0.0612* (16.3050)	0.1323* (12.2590)	0.1219* (16.5932)	0.0684* (10.2026)
α_2	0.8842* (126.5036)	0.9054* (137.2830)		0.9285* (281.1800)	0.9288* (196.7967)	0.8209* (66.6922)	0.8758* (130.7870)	0.8880* (111.8078)
λ_2		0.0000* (12.5398)		0.0084* (3.9079)		0.0000* (6.9783)		0.0000* (11.9378)

The analysis reports the positive and significant volatility spillover exist from Mexican currency market to Mexican equity market. However, the Coefficient value is very small. ARCH and GARCH term are significant and positive which describe past behavior affects the current period volatility and persistence of the volatility effect from Russian exchange market to Russian stock market. The sum of the Coefficient of ARCH and GARCH term is closer to one which indicates that persistence of the volatility is long run in nature. Same behavior observed in Argentina, Chile and Brazil. The positive relationship between these two markets is observed which reveals that market moves in same direction. As the movement of currency market is increases, the returns of the stock market will also be increases. The Coefficient of 0.0084 of Argentina volatility spillover is greater than Mexico, Chile and Brazil showing currency market has more influence on stock market of Argentina.

However, mean spillover is significant and negative for Mexican and Brazilian country. There is an inverse relationship between Mexico and Brazilian currency to their stock market. Shocks association with currency appreciation increases the stock market returns. In case of Argentina and Chile, the mean spillover is insignificant. -0.1394 Coefficient of Mexican means spillover is higher in comparison of other countries that shows Mexican currency have more inverse effect on Mexican equity market.

Table # 4.13 shows the mean and variance spillover effect of Bahrain, Jordan and Turkey. ARCH term is significant and positive in Bahrain volatility spillover showing past price behavior influence the current period volatility. GARCH term is also observed as significant and positive that captures the persistence of the volatility.

Table 4.13 Mean and Volatility spillover effect from currency market to equity market of Middle East countries

	Bahrain		Jordan		Turkey	
	BHD	BAX	JOD	AMG	TRY	BIST100
ϕ_0	-0.0000 (-0.0492)	-0.0001 (-0.4226)	-0.0000 (-0.2977)	-0.0013* (-13.6562)	0.0001 (0.8085)	0.0012* (4.4226)
ϕ_1	-0.4744* (-16.5392)	0.0310 (1.4129)	-0.3524* (-40.1349)	-0.1981* (-12.5702)	-0.0235* (-1.7992)	-0.0419* (-2.8625)
ϕ_2	9.3618 (0.1185)	1.6527 (0.0856)	11.8705 (1.1871)	5.6234* (25.3316)	-0.5653 (-0.2772)	-2.3810* (-1.7774)
λ_1		-0.0199 (-0.0626)		0.1160 (1.2012)		-0.2100* (-7.5878)
α_0	0.0000* (71.1358)	0.0000* (8.0736)	0.0000* (112.7278)	0.0000* (20.2271)	0.0000* (11.4139)	-0.0000* (-1.2462)
α_1	0.1302* (26.8628)	0.0465* (8.5907)	0.0791* (125.5609)	0.1331* (71.0052)	0.0669* (27.9540)	0.0612* (15.2984)
α_2	0.8858* (586.5979)	0.8714* (66.7826)	0.9486* (5593.4140)	0.8611* (374.1538)	0.9255* (385.3846)	0.8744* (175.0640)
λ_2		0.00000006* (4.3783)		-0.00000009* (-176.8045)		0.0000157* (23.7518)

The aggregate of ARCH and GARCH Coefficient is greater than one indicates persistence of the volatility is in long run. The result provides the significant and positive volatility spillover influence from Bahrain currency to Bahrain equity market. Same pattern observed in Jordan and Turkey. The positive relationship indicates that market moves in same flow as the shocks in the currency returns increase, it will lead to increase the volatility of the equity market. The Coefficient of 0.0000157 of Turkey volatility spillover is greater in comparison of Bahrain and Jordan that reveals currency market has more influence on stock market in Turkey. In volatility spillover, the positive and significant result does not provide any diversification benefits to investors. However, the negative sign gives the opportunity of portfolio diversification because it decreases the volatility from currency market to stock market.

Mean spillover is significant but negative only for Turkey as λ_1 is significant. The results are insignificant for Bahrain and Jordan in mean spillover. We find an inverse relationship from Turkish currency market to Turkish stock market. Shocks association from the appreciation in currency leads to increase the returns of the stock market.

Table # 4.14 reports the mean and volatility spillover from currency market to equity market of Kuwait, Oman and Saudi Arabia.

<u>Table 4.14 Mean and Volatility spillover effect from currency market to equity market of Middle East</u>						
	Kuwait		Oman		Saudi Arabia	
	KWD	KWSE	OMR	MSI	SAR	TASI
ϕ_0	0.0001* (2.5132)	0.0001 (0.7124)	0.0000 (0.6877)	0.0002* (2.2944)	0.0000* (4.5351)	-0.0002 (-0.1553)
ϕ_1	-0.1803* (-9.5462)	0.0974 (4.0400)	-0.3851* (-20.7314)	0.2683 (20.8505)	-0.0141* (-2.7024)	0.0361 (0.9043)
ϕ_2	-36.9901 (-1.4681)	1.2709 (0.1720)	-54.1967* (-2.9920)	1.9078 (0.9381)	52.1996* (8.1950)	1.1851 (0.4434)
λ_1		0.0209 (0.3542)		-0.7857* (-2.7869)		-0.9244 (-0.9467)
α_0	0.0000* (6.1321)	0.0000* (13.1935)	0.0000* (110.8577)	0.0000* (31.8496)	0.0000* (17.7266)	0.0002* (14.3398)
α_1	0.0265* (10.3214)	0.0897* (16.5509)	0.6608* (65.6062)	0.1336* (37.5908)	0.2991* (178.5208)	0.1499* (7.9244)
α_2	0.9675* (354.7413)	0.8764* (141.3099)	0.5023* (110.9931)	0.8622* (328.5821)	0.8615* (1427.7330)	0.5987* (24.0918)
λ_2		-0.0000002* (-4.9373)		6.41E-09 (1.0416)		-0.00000037* (-59.2771)

The result reveals the significant and negative volatility spillover effect from Kuwait currency market to Kuwait equity market. There is an inverse relationship and market does not move in same direction. The negative shock in the currency market of Kuwait reduces the returns of the equity market. Same behavior observed in Saudi Arabia as λ_2 is significant and negative. However, the volatility spillover is insignificant for Oman. ARCH and GARCH term is significant and positive indicates that past price behavior has influence on volatility. Persistence of the volatility is captured in GARCH. The sum of ARCH and GARCH Coefficient is closer to one show that persistence of the volatility is long run in nature. The Coefficient value is very small for all three countries. However, the highest coefficient value is -0.00000037 of Saudi Arabia among all three countries which shows that Saudi currency market has more influence on Saudi equity market.

The mean spillover from currency to equity market is significant and negative for Oman only as λ_1 we found significant. It means that shocks in currency market have inverse relationship with the stock market of Oman. The shock arising from the appreciation in currency market increases the returns of the stock market. Same is in line with the argument that demand and supply of domestic currency and stock increases by the foreign inflows. The mean spillover is insignificant in case of Kuwait and Saudi Arabia.

CHAPTER # 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Over the 1970s, there is a speedy expansion in foreign investment and international trade and adoption of freely fluctuating exchange rate regime of many industrialized economies added pressure to create the risk of exchange rate and volatility. Unexpectedly, the firm's economic exposure to currency risk is increased. Stock markets are mainly response to the cumulative volatility and excess movement of exchange rate. Exchange rate also very sensitive to the innovation of stock market and global investment due to financial market integration and deregulations over the 1980s which accelerated the capital flows across borders faster and easier than ever before.

Emerging stock market has become an interest of the practitioners as well as policy makers during last few decades. Foreign investors have attracted to investigate the relationship of Emerging stock market due to well diversification opportunities. These markets are more feasible and attractive for international investors due to risk return framework.

In this paper, we explore the relationship of mean and volatility spillover from currency market to stock market of twenty eight Emerging countries. Sample era starts from 1st January 2000 to 31st December 2016. This study uses GARCH-M method to check the mean and volatility spillover. The emerging countries are divided into different regions as Eastern Europe, African, Asian, American and Middle East countries. The objective of this study is to provide insight about mean and volatility spillover between foreign exchange market and stock market.

The analysis reveals that past behavior affects the current period volatility in almost all emerging countries. This study also find persistent of the volatility in all emerging markets. The persistence of the volatility is long run in nature between foreign exchange market and stock market. The first region of emerging market is Easter Europe stock market which has Russia, Bulgaria, Poland, Hungary and Greece countries. Russian currency market is significantly positively influence with the Russian stock market in volatility spillover. Same behavior

observed in case of Bulgaria, Hungary, Poland and Greece. Positive results show that market moves in same direction. In mean spillover, there is negative spillover effect from Poland and Hungary to their currency which means that shocks of currency market has an inverse relationship with the stock market of these two markets. There is no mean spillover exist in Russia, Bulgaria and Greece markets. Shocks arises from the currency appreciation increases the returns of the equity market and shocks association with the depreciation in foreign exchange market results in decreases the stock market returns. The same is in line with the argument that foreign inflow increases the demand of the local currency and stock. So, both appreciates.

Mean and volatility spillover effect from currency market to stock market of Egypt, South Africa and Nigeria which fall in African region. The statistically significant results provide the positive relationship between these two markets for Egypt and South Africa in volatility spillover. There is no volatility spillover exist in Nigeria. As per analysis, only Nigerian currency market is positively influence with their stock market in mean spillover among all three markets.

The Asian emerging markets include China, India, Indonesia, South Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan and Thailand. There is a significant and positive volatility spillover effect from Indian exchange rate market to Indian equity market. Same behavior observed in Indonesia, South Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan and Thailand. The significant and positive volatility spillover in these countries suggests that market moves in same direction. As the shock of the currency market increases it lead to increase the volatility of the stock market. However, there is no volatility spillover exist in case of China. In mean spillover, there is an inverse relationship of China, India, South Korea, Malaysia, Philippines, Taiwan and Thailand. In this case, both these markets are not move in same direction. The negative and significant sign indicates that shock association from the appreciation in currency leads to increase the returns of the stock market. There is no mean spillover effect in Indonesia, Pakistan and Sri Lanka.

Mexico, Argentina, Chile and Brazil are the American emerging countries. The results reports that volatility spillover exist from Mexican currency market to Mexican stock market. Same case applies with Argentina, Chile and Brazil. The positive relationship is observed which reveals that market flow in same pattern. The shock in currency market increases the volatility of stock

market. For Mexican and Brazilian market mean spillover influence negatively. So, we find inverse relationship between these two markets. For Argentina and Chile, mean spillover do not exist.

Mean and volatility spillover effect from currency to stock market of Bahrain, Jordan, Saudi Arabia, Kuwait, Oman and Jordan which fall in Middle East region. The error term of volatility spillover is positively influence from Bahrain currency market to Bahrain stock market. Same pattern in observed in Turkey which reveals that market moves in same direction. However, the negative and significant volatility spillover influence from currency market to stock market of Jordan, Kuwait and Saudi Arabia which suggests that shock in these currency market decreases the volatility of these stock market. There is no volatility spillover exist in Oman market.

5.2 Recommendations

Investor need to be vigilant in the perspective of volatility. Within financial market, investor need to analyze that both currency and stock market provides the opportunity of diversification or not.

This study is useful for Investors, Portfolio manager, FPI, Portfolio formation investor, multinational firms. Financial manager can use this information to manage the portfolio risk internationally, devising diversification, and can make strategy against currency risk.

5.3 Direction of Future Research

The future research can be studied on the behavior of developed, developing and emerging market because we have only taken emerging countries in our study and most of the countries are from Asian region. Furthermore, this study may also extent to investigate the determinants of market integration of both these markets (currency market and stock market).

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