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TIME VARYING CONDITIONALCORRELATION BETWEEN STOCK AND BOND RETURNS: EVIDENCE FROM CIVETS NATIONS

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ABSTRACT

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This thesis estimates long-run time variant conditional correlation between stock and bond returns of CIVETS (Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa) nations. Further, aims to analyse the presence of asymmetric volatility effect in both asset returns, as well as, obverses increment or decrement in conditional correlation during pre-crisis and crisis period, which lead to make a reliable diversification decision.

The Constant Conditional Correlation (CCC) GARCH model of Bollerslev (1990), the Dynamic Conditional Correlation (DCC) GARCH model (Engle 2002), and the Asymmetric Dynamic Conditional Correlation (ADCC) GARCH model of Cappiello, Engle, and Sheppard (2006) were implemented in the study. The analyses present strong evidence of time-varying conditional correlation in CIVETS markets, excluding Vietnam, during 2005-2013. In addition, negative innovation effects were found in both conditional variance and correlation of the asset returns. The results of this study recommend investors to include financial assets from these markets in portfolios, in order to obtain better stock-bond diversification benefits, especially during high volatility periods.

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1. INTRODUCTION

1.1 Background

Correlation analysis between stock and bond returns is one of the important statistical tools that determines diversification strategies in the financial econometrics sector. The estimated conditional correlation are broadly observed to be time varying with huge finance practical applications, such as asset allocation, risk management, and hedging (Markowitz 1952; Andersson, Krylova & Vähämaa 2008; Longin & Solnik 1995; Grubel & Fadner 1971). Generally, investors prefer to invest in those economies which have lower or negative correlation between an asset's return, since it indicates for better diversification opportunities. And, emerging markets (EMs) are believed to have low correlation between the stock-bond returns due to lower degree integration with the global market.

Practically, the co-movement analysis between assets return acts as an important input element in diversification. The importance of correlation estimation has increased in the present situation, due to its dynamic nature, especially during highly volatile period. Connolly, Stivers and Sun (2005) and Gulko (2002) revealed that the correlation between stock-bond shifts from positive to negative during stock market crashes, referring for enhanced portfolio diversification. Ideally, for diversification purpose correlation need to move from positive to negative sign, so that investors can obtain decoupling benefits. Decoupling, the return of assets moves in the opposite direction leading to maximization of diversification benefits during market crisis (that is the situation when diversification is highly required) due to flight-to-safety phenomena (Gulko 2002). Flight-to-safety means investors shifting investment from risky assets to non-risky assets such as treasury bills and bonds as per response towards the sharp fall of stock market (Maslov & Roehner 2004).

Similarly, analysis of asymmetric volatility effect on the conditional second moments has significantly gained attention in the finance literature. A recent study of Zhou and Nicholson (2015) suggests that the presence of asymmetric effects in

covariance of financial asset's return increases the benefits from mixed asset portfolio diversifications. One of the important feature of asymmetric effect is both conditional correlation and volatility tend to rise strongly on negative news or returns in comparison to positive news of the same magnitude [Nelson 1991; Longin & Solnik 2001]. So, unaware of this effect leads to under-estimation of Value at Risk (VaR), which subsequently lead to misapprehension of results obtained from different time variant models. In addition, early studies of Bekaert and Harvey (1997), Selçuk (2005), and Ghysels, Plazzi, and Valkanov (2010) based on EMs have found strong evidence of asymmetric volatility effect in stock returns recommending to invest in emerging stock market.

Over the recent years, the assets of EMs are in high demand among the investors. The financial liberalization policy in financial sector plays an important role to shift investment of global investors towards EMs assets (Panchenko and Wu 2009). Secondly, the undeveloped and pre-mature securities markets of EMs which consist of small-and-medium size listed firms provide higher expected returns and acts as a fascinating factor towards the investors (Eun, Huang & Lal 2008). Hence, participation of external investors in EMs are able to improve portfolio growth, as well as, gain risk diversification. Despite of such opportunities, very few earlier literatures are focused on the stock-bond market of EMs. In same case, a handful of studies are available that focus on CIVETS (Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa).

This thesis estimates the time varying stock-bond co-movement behaviour and asymmetric effect on CIVETS nations during 2005 to 2013, including the recent global financial crisis (GFC). CIVETS are recently coined group of emerging and frontier markets, which have rapid economic growth even after the 2008's crisis. In addition, these economies have huge youth population and large population shifting towards middle class status. Moreover, the analyses are performed in two phases; firstly uses whole data and secondly dividing the data as pre-crisis and during crisis period in order to examine changes in correlation trend which helps to make an effective diversification decision.

1.2 Objectives

The core purpose of this thesis is to analyse the time varying conditional co-movement between stock and bond market of CIVETS nations. As per existing arguments, the conditional correlation between stock and bond returns of emerging economies viewed to be strongly negative or weakly correlated, reflecting a high degree of diversification opportunities for both investors, domestic as well as international. Hence, the objective of this study is to assess the level of the estimated time variant conditional correlation in each domestic capital market of CIVETS nation and also to examine the direction of asymmetric volatility effect on assets' returns. Furthermore, the secondary objective of this study is to capture the changes in conditional correlation during pre-crisis and crisis period in order to identify whether there is diversification opportunities during market turmoil or not.

1.3 Research Question and Methodology

1. What sorts of conditional correlation exist between the stock and bond returns of CIVETS nations, and can investors benefit from portfolio diversification?

2. Is asymmetric volatility effect present in dynamic conditional correlation, and if any securities market experiences it, then which innovation effect could have significant impact in diversification.

3. Whether the time varying conditional correlation between asset returns of the domestic capital market increases or decreases during crisis periods? Is diversification possible during the market panic situation?

The answer of above listed research questions is provided by employing three ARCH/GARCH family models. The Constant Conditional Correlation (CCC) GARCH model and Dynamic Conditional Correlation (DCC) GARCH model aim to examine whether the conditional correlation between stock and bond return of each CIVETS nation have constant or time variant correlation. The third model is an Asymmetric Dynamic Conditional Correlation (ADCC) GARCH (1, 1) that observes the presence of asymmetric effect on the dynamic conditional correlation of domestic asset's return.

1.4 Motivation and Contribution to Existing Literature

The time variant correlation analysis has been viewed as an interesting research field in the finance literature; especially due to the growing diversification concept, and puzzling behaviour between stock and bond markets. Over the past decades, numerous studies have estimated the behaviour pattern of conditional correlation during high volatility periods and during tranquil periods, in order to measure whether diversification strategies are successful or not in turbulent periods [for example, Silvapulle and Granger (2001); Coeurdacier and Guibaud (2011)]. Similarly, earlier literature has also presented some inconsistent results, such as stock and bond prices moved in opposite direction (Barsky 1989), on the other hand some studies displayed positive co-movement between these assets' return (Ilmanen 2003). Theoretically, low level of correlation between asset returns is essential for better portfolio diversification, on the other side, involvement of emerging stock-bond markets with greater correlation still have potential to provide effective diversification. For instance, Gupta and Donleavy (2009) study based on Australian investors suggest that despite of increasing correlation in emerging economies, it could lead to substantial portfolio benefits.

This thesis contributes to existing literature can be explained in various prospects. First, it implements three advance non-linear GARCH models; the Constant Conditional Correlation (CCC) model, Dynamic Conditional Correlation (DCC) model, and the Asymmetric DCC model to estimate time variant stock-bond conditional correlation and asymmetric volatility effect on asset returns of EMs. Secondly, there is yet no any attempt in finance literature to study on stock-bond dynamic conditional co-movement analysis, as well as, asymmetric effect in CIVETS market. And, majorities of previous works are highly based on international portfolio diversification, but this study is based on the domestic capital market, which belongs to heterogeneous geographical regions. Thirdly, the study is analysed in two phases; first using whole data, and second by split data. These analyses inspect change in the trend of conditional correlation between long-run and short-run, mainly during the GFC periods. Therefore, correlation analysis of sub-sampled periods elaborate those studies which have focused on diversification benefits during market fluctuation period.

1.5 Scope and Limitations

Analysis of time varying conditional correlation between stock and bond returns has various practical financial implications. First, risk management is one of the essential tasks of fund manager or individual investor. And, this thesis aims to examine the risk level involved in the securities markets of CIVETS nations in order to evaluate whether there is better risk diversification opportunities or not. The increasing globalization and financial liberalization have encouraged global investors to create a portfolio from different background economies. Hence, the second important implication is portfolio diversification with assets from CIVETS nations, which is strongly supported by the results obtain from analyses.

Further, this study could be an important input source to understand the relationship between market volatility and conditional correlation, especially in emerging and frontier economies. Similarly, the financial managers can also be benefited by the results while performing valuation of any CIVETS government bond since it takes account of both constant and time variant conditional correlation on the basis of recent data.

This thesis examines the conditional correlation between asset returns with the help of traditional asset classes, which is one of the major limitation of the study. It includes bond and stock returns, the traditional assets of capital market, to determine the trend of conditional correlation during recent years. On the meantime, there are several advance asset classes that have high potential to provide maximum diversification benefits; such as, real estate investment trusts, commodity market, derivatives and others. In addition, bonds have found to be weak in the feature of covariance asymmetry (Cappiello, Engle and Sheppard 2006). Another important challenge is data availability, the CIVETS capital markets are recently developed, due to which these economies lacks data standardization. As a result, the analysis of Vietnam is started from December 2006, whereas for remaining economies the analysis is performed from the beginning of 2005. However, the silver lining of this study is to analysis the performance on the individual capital market that leads to no significant influence in overall results that could occur due to different starting points.

This study provides some remarkable results which extend the knowledge of joint behaviour pattern between stock and bond returns. First, the conditional correlation between stock and bond returns in CIVETS change over the time period. Both DCC-GARCH model and rolling window correlation method lead to the same conclusion of having time varying correlation. Second, ADCC-GARCH model reveals the presence of asymmetric effects in stock-bond returns. Third, the sub-sample analyses present less volatility in conditional correlation during pre-crisis than crisis periods, as well as, both increment and decrement trends during the highly volatile period. Therefore, these results recommend investors to participate in CIVETS capital market to obtain maximum diversification benefits.

1.6 Structure

This thesis consists of an introductory and seven other chapters. The introduction chapter provides brief overview of the entire study, objectives and research questions. Chapter 2 contributes to explain the behaviour pattern of correlation between stock and bond return and their role in diversification purpose while including emerging economies, such as CIVETS. In addition, it presents various GARCH models which deal with volatile asset returns, and earlier works performed base on those models. On the other hand, chapter 3 deals with historical background of CIVETS nations and some basic economic performance during crisis periods. In the same way, detail information about the stock-bond market development and factors affecting correlation are discussed in chapter 4. In the similar manner, the overall models employed in this thesis are presented in chapter 5. Chapter 6 specifies descriptive statistics and preliminary tests of the data employed in the study. The complete empirical analysis is presented in chapter 7 which includes both phases; whole data, and split data analysis. The final chapter is conclusion part that shows the significance of each model in CIVETS nation, some practical implications for investors, and lastly provides some recommendation for further studies.

2. LITERATURE REVIEW

2.1 Stock and Bond Correlation

Over the past decades, a large number of studies have performed to capture the salient behaviour between stock and bond returns, the primary assets of the capital market. For instance, Barsky (1989), Gulko (2002), Li (2002), Ilmanen (2003), Boyer, Kumagai, Yuan (2006), and Yang, Zhou and Wang (2009) are some highly valued studies based on fundamental correlation behaviour between asset returns. On the basis of these studies, two contradictory correlation behaviour results were observed. First, stock-bond returns are positively correlated, due to involvement of common macroeconomic conditions such as real interest rate, inflation rate, and economic growth situation (Li 2002; Gulko 2002). Second, the presence of negative correlation or shifting from positive to negative co-movement occurs when stock market volatility increases (Baele, Bekaert & Inghelbrecht 2010; Campbell and Ammer (1993); Connolly et al. 2005; Kim, Moshirian & Wu 2006). During the stock market uncertainty, investors highly oppose the risks as a result bond asset becomes highly attractive in comparison to equity or other riskier assets, so the investors shift capital from stock market to the bond market, perceiving bond as risk free assets, which creates “flight-to-safety” or “flight-to-quality” phenomenon [for more De Goeij and Marquering 2004; Baur and Lucey 2009]. In contrast, when economies experience expansion in stock market then investors become less risk-averse. Therefore, risky assets or stock market become more attractive towards investor and investment in stock increases, which finally lead to “flight-from-quality” phenomena (Baur & Lucey 2006). So, these two phenomena seem to be responsible to have negative correlation between stock and bond return. On the other hand, there are some works which indicate mixed signs correlation between asset returns (Yang et al. 2009; Ilmanen 2003). Hence, yet there is an absence of strong evidence in existing literature to answer whether the conditional correlation between stock and bond returns are positively or negatively correlated.

Numerous studies have been performed using various methods in order to understand appropriate joint behaviour between stock and bond markets. Shiller and Beltratti (1992) employed the dynamic present value model, an extension of

the Campbell and Shiller (1988), that presented correlation coefficient between the U.S. and the U.K annual stock-bond return are extremely high and unable to justify by correlation theory. Again, Stivers and Sun (2002) tried to analysis the relationship between stock and bond in short-run by the help of regime-switching models and discovered the flight-to-quality phenomena. And, it has witnessed that the conditional correlation between asset return, as well as, the trade volume of capital market declines during financial turmoil. On the other hand, investors become active in portfolio diversification in order to reduce the risk level associated with specific investment. So, the asset price and mean returns become incompetent to demonstrate the relationship between assets demand, primarily demand of complementary assets, such as bond and equity (Fanga & Limb 2004).

Furthermore, some literature were highly focused to analyse those factors which believed to affect the co-movement between stock and bond returns. The recent study of Chiang, Li, and Yang (2014) considered stock and bond market uncertainty as essential factors which determine the sign of correlation between asset returns. Where, stock market uncertainty led to negative correlation, and positive correlation assumed to be obtained by bond market uncertainty. Similar results was proposed by Connolly et al. (2005), since increase in stock market uncertainty increased demand in bond market. The increase in bond yield believe to bring the downfall in bond and stock prices, thus the correlation is highly determined by bond market risk. Moreover, Li (2002) stated that the uncertainty about the real interest rate and expected inflation influenced to increase the correlation between stock-bond returns, on contrast uncertainty about unexpected inflation decreased the correlation due to volatility in stock return with the help of three approaches: asset pricing model, GARCH (1, 1) model, and vector autoregression (VAR) model. Further, uncertainty about unexpected inflation significantly identified the major stock-bond correlation trends. d'Addona and Kind (2006) also agreed that volatility in real interest rate and inflation rate have a significant effect on correlation estimation of stock-bond returns. But, the important output was the disagreement with the result that volatility in inflation rate led to increase in correlation between stock and bond. Theoretically, increase in inflation has negative effect on bond return whereas stock has positive relation, hence

fluctuation in expected inflation brings positive correlation between stock-bond return (Campbell & Ammer 1993). On the other hand, Baele et al. (2010) used interest rates, inflation, cash flow growth rate, and the output gap to estimate stock-bond correlation in the U.S. market. Despite of significant results obtained from fundamental approaches such as Capital Asset Pricing Model (CAPM) of Sharpe (1964) by using inflation, interest rate, and economic growth, in order to interpret the relationship between stock-bond returns. These variables allow to perform analysis on long frequency data such as monthly, quarterly, or annually. Unfortunately, such long frequency data are unable to capture the short-run shocks in the financial markets [for example, Bekaert and Grenadier (2001); Mamaysky (2002)]. Thus, over the recent years various advance and modern tools are implemented to analyse the short-frequency (weekly, daily, and hourly) asset returns correlation during stock market uncertainty. For example, Connolly et al. (2005) used daily stock and bond return series to examine link between stock-bond co-movement and stock market uncertainty. It presented the negative relation between uncertainty and future co-movement between stock and bond returns.

Over the decades, several studies have been done to analyse the co-movement between assets' return using modern approaches based on various business cycles, mainly to capture short period crisis effect. Baur and Lucey (2009) analysed the conditional correlation between stock and bond returns, including the two major crises; the Asian crisis (1997) and the Russian crisis (1998) by employing the DCC GARCH (1, 1) model of Engle (2002). And, the analysis presented positive correlation during both crisis periods. On the other hand, Bansal, Connolly and Stivers (2014) found negative correlations between stock-bond return on the basis of asset risk dynamics, which was also supported by the conventional fundamental perspective methods. Among the earlier studies, Yang et al. (2009) could be taken as one of the important study in analysing correlation between stock and bond based on business cycles. Since, it covered 32 expansions or economic growth period and 32 downturns in the U.S. market. Similarly, it also included 22 growth phases and 21 market turmoil period for the U.K. during1855-2001. The study found mixed signed correction, such as low level

correlation between stock-bond returns during recessions for the U.S. market, whereas high level of correlation during recessions in the U.K. Hence, bond was considered as a hedging tool against stock market risk in the U.S. than U.K. In addition, this study considered monetary policy environment as one of the key dimensions to influence co-movement of stock and bond return and lead to time varying [for more, Ilmanen (2003)]. Besides, the mixed sign correlation behaviour of bond and stock returns during different business cycle, there has been observed new conflict, that is, conditional correlation as time invariant or variant.

2.2 Constant versus Time Varying Correlation

The estimated correlation between stock and bond returns observed to be strongly correlated and widely fluctuating over the recent periods. Thus, it has gained extreme emphasis among academics and practitioners, mainly after the several crises in emerging economies; such as the Asian Crisis (1997), the Russian Crisis (1998), Argentine turmoil (2001), as well as, recent U.S. sub-prime crisis (2007-2009). Before these events, stock and bond returns assumed to be constant or moving in a particular direction. Campbell and Ammer (1993), and Shiller and Beltratti (1992), both have implicit the time invariant relation between stock and bond prices [see Andersson et al. (2008)]. Nonetheless, majorities of recent literature have found stock-bond correlations to be extremely time-variant (Jones & Wilson 2004; Ilmanen 2003). A recent study of Bansal et al. (2014) has argued on existence of time-varying conditional correlation between bond and stock returns. Similarly, Baur and Lucey (2009) also observed correlation to be changeable over the period, and the correlation was strongly positive during market volatile periods.

Numerous studies have tried to analyse whether the economies consist of constant conditional correlation or time varying conditional correlation [for example, Kaplanis (1988); Ratner (1992); Von Furstenberg, Jeon, Mankiw, and Shiller (1989); Cappiello et al. (2006); Connolly et al. (2005)]. These studies have examined the conditional correlation between the cross-country assets, in addition majority of previous works are based on international assets markets rather than domestic asset market, due to the attractiveness of diversification. Ratner (1992) performed an empirical study based on a group of seven markets during 1973-

1989 and concluded the presence of constant correlation. Similar results was provided by Kaplanis (1988) when the researcher analysed ten markets over the period 1967-1982. On the other hand, Koch and Koch (1991) and Longin and Solnik (1995) rejected the null hypothesis of constant conditional correlation, probably due to the rapid growing market interdependent over the periods. In addition, Scruggs and Glabadanidis (2003) study focused on conditional correlations in the U.S. stock and bond returns, and illustrated the presence of time variant correlation. Another important study was done on G7 markets (Germany, France, United Kingdom, Switzerland, Japan, Canada and US) by Longin and Solnik (1995) to analyse existence of constant conditional correlation in cross country asset returns through Ljung-Box method and multivariate GARCH (1, 1) model. The analyses found both, time variant as well as constant conditional correlation, since Canada and France justified constant conditional correlation hypothesis. Whereas, remaining other countries (Germany, United Kingdom, Switzerland, Japan, and US) rejected the hypothesis and explained the presence of time varying conditional correlation. Chui and Yang (2012) presented fusion time-varying conditional correlation while anlayzing three developed countries; U.S., U.K., and Germany. The positive correlation between stock-bond returns were estimated during both bearish and bullish periods, but the level of correlation was found to be relatively stronger during bearish periods in comparison to bullish period in U.S and U.K markets. However, German market displayed extremely negative correlation, indicating for enhanced diversification opportunities.

Further, various efforts have been made to identify the economic drivers that create a time variant relationship between stock and bond returns. And, highest priority were given to stock market uncertainty (Connolly, Stivers & Sun 2007), macro-economic factors or news (Andersen et al. 2008) such as business cycle or economic growth (Yang et.al. 2009; Jensen & Mercer 2003). The study performed by Connolly et al. (2005, 2007) by using daily data found that increase in stock market uncertainty decreases the correlation between assets returns of the U.S. and other developed markets. Similar analysis conducted in European market also suggested in similar regards to the high volatility stock markets (Kim et al. 2006). In case of macro-economic factors, Ilmanen (2003) found that the correlation

increased during expansion periods, whereas it declined or reached negative valued during market crisis. By contrast, some studies found that the conditional correlation increases during market turmoil, but remain low or falls during the expansion period [see Jensen and Mercer (2003)]. Although, the number of studies towards time-varying stock-bond correlation is increasing very rapidly, yet the literatures are unable to provide satisfactory results.

2.3 Asymmetric Effect Perspective

In recent years, the analysis of asymmetric volatility effect in asset returns correlation and variance has been rising rapidly. Asymmetric effect is defined as, positive and negative shocks have different impact on conditional variance or correlation, especially negative shocks of equal magnitude in comparison to positive innovation have greater influence on asset returns (Cappiello et al. 2006). Further, some strong evidences have also been found that positive shocks have failed to bring significant volatility in the asset returns (Black 1979; Christie 1982; Campbell & Hentschell 1992). In addition, Scruggs and Glabadanidis (2003) stated that bond market return news or shocks have significant symmetric effect [see Hentschel (1995)] on the conditional bond market variance, whereas the stock market return news were unable to create any changes in stock market variance. In addition, it is the first study which identified that stock market variance asymmetrically response to both, stock and bond return shocks, similarly the asymmetric response of conditional stock market variability towards stock market return shocks was earlier discovered in Bekaert and Wu (2000).

Earlier literatures have given high emphasis on the asymmetric volatility analysis in the conditional covariance of expected returns. Since, presence of asymmetric volatility in conditional covariance could significantly influence the financial decisions, such as portfolio diversification, hedging and risk management. Kroner and Ng (1998) presented that when the expected return of one asset fluctuate due to the presence of asymmetric volatility effect, then it has also changed the expected return of those assets which were not affected by an asymmetric volatility occurrence but due to the co-movement with that specific asset. In addition, ignorance of such effect could under-estimate Value at Risk and create

serious problems in risk management (Chang, Chih Chou & Chou Wu 2014) Similarly, Braun, Nelson, and Sunier (1995), and Koutmos (1996) have also analysed the asymmetric effect in conditional covariance, and were unable to examine the asymmetric effect in conditional correlation. In the meantime, Bollerslev (1990) and Engle (2002) captured the asymmetric volatility effect in the conditional variance with assumption that the conditional correlation between stock and bond returns are constant. Whereas, Cappiello et al. (2006) succeed to analysis asymmetric volatility in both conditional variance as well as conditional correlation of stock and bond returns. And, the study revealed that the domestic stock market return has greater asymmetric effect in both conditional volatility and correlation in comparison to the bond market.

Various econometric models have been introduced to analysis the presence of asymmetric volatility. In the initial phase, Asymmetric ARCH model (Nelson 1991) and GJR model proposed by Glosten, Jagannathan, and Runkle (1993) were highly implemented, and these models demonstrated the presence of asymmetric volatility effect in univariate. Nevertheless, after the introduction of ARCH/GARCH model, various extension models were developed and became highly popular. For example, Asymmetric generalized DCC-MGARCH model to examine time-varying correlations of pairwise stock market returns, primarily during market hectic periods (negative innovation). In addition, Cappiello et al. (2006) and Scruggs and Glabadanidis (2003) analysed asymmetric volatility effect on stock and bond market of developed economies, and put forward that there were significant evidences of asymmetries in both asset returns. Similarly, Boyer et al. (2006) also studied correlation between stock and government bond returns during financial crisis, and advised that financial crises make the stocks of emerging markets more attractive with dynamic conditional correlation leading to better diversification facilities.

2.4 Diversification

The rapid growth of liberalization in financial sector has made the assets return extremely integrated, leading to limitation in diversification benefits. As per the Modern Portfolio Theory (MPT), diversification is based on a dictum: “don’t put all

your eggs in the same basket". MPT explains that combination of two or more than two assets with uncorrelated or weakly correlated returns helps to reduce the risk level by generating volatility lower risk than when these assets are considered independently [for more see Kaplan (1985)]. So, the assets with low or negatively correlated returns are selected in portfolio diversification, in order to reduce the volatility effect without affecting expected return.

Over the decades, financial econometric studies have extremely focused on diversification strategies, either within the single capital market with different asset classes or cross-country diversification along with same asset classes, as well as, different classes. Majorities of previous studies and global investors have shown keen interest on stock market linkages rather than bond market linkages while surveyed on cross-country diversification. For example, Forbes and Rigobon (2002), and Ang and Bekaert (2002) have analyzed across stock-stock diversification, whereas Dungey, Fry, González-Hermosillo and Martin (2006), and Clare and Lekkos (2000) examined bond-bond diversification opportunities. Nonetheless, researches have also been performed in order to analyse diversification between different classes of assets, such as stock-bond diversification within domestic market and international market (Baur & Lucey 2009; Connolly et al. 2005). Diversification process is highly complicated process due to the two folded objectives; reducing the risk, and maintaining or increasing the return (Markowitz 1952). Since from early periods, domestic investors were concentrated on capital assets return and assets management by traditional assets such as stock, bond, foreign exchange market, and commodities market (Fung & Hsieh 2001; Sharpe 1992). These assets believed to response differently in new information available in market, due to their salient feature and factors affecting them. For example, investment in bond and stock as an easiest and popularly adopted way to obtain diversification benefits. During high volatility period, the stock return response extremely and become highly uncertain in comparison to bond return, due to which the price of stock falls and demand of bond increases (Barsky 1989). As a result, the rational investors shift their investment or capital from stock to bond, that is, risk-free assets, despite of low expected return, and this phenomena is called as flight-to-safety. In addition, stock

diversification has observed to be high during large negative co-movement between the assets of domestic market (Silvapulle & Granger 2001). Hence, flight-to-safety process helps the investors to reduce risks during market crisis, and optimum level of diversification opportunity can be achieved in domestic capital market. In contrast, Campell and Ammer (1993) observed high chances of financial assets in domestic capital market to response in similar manner when the market suffer from financial turmoil, and the primary reason was due to common macroeconomic factors and country specific risk. As a consequences, benefits of diversification within the country assets reduces during market crisis, when it is highly required. But, after the development of cross-country diversification principles of Nobel Laureate Harry Markowitz (1952) large number of investors participated in international asset diversification process due to the expectation of higher return in comparison to national diversification. Moreover, the increasing liberalization in financial sector have opened the investment door for the global investors to participate in cross-country diversification.

On the other hand, growing globalization and liberalization in financial sector has increased the global integration. The increasing interdependence of domestic asset index with regional or geographical indices, indicates decrease in diversification benefits (Goetzmann, Li & Rouwenhorst 2001; Gupta & Donleavy 2009). As per Liljeblom, Löflund and Krokfors (1996), many large sized firms started participating in across the border diversification strategies from very early period through FDIs, which ultimately led to integrated financial market. As a result, the correlation between capital assets in global market has observed to be strongly increased and limited the diversification opportunities. Also, it has been believed that stock market with high correlation have made nearly impossible to reap benefits of cross border diversification (Karim & Gee 2006). Odier and Solnik (1993) could be a good example to explain diversification benefits, it stated that low chances of risk diversification in those economies which were strongly correlated, especially in the time of market turmoil, when diversification is highly required (the Murphy’s Law of Diversification) [for more see Silvapulle and Granger (2001)]. As a result, investment in assets having low or negative correlation between assets would have high chances of having risk diversified

within the specified assets allocation and investment in emerging and frontier economies could play important role in diversification. Berger, Pukthuanthong, and Jimmy Yang (2011) included data after the GFC period, and stated that EMs seemed to be integrated with global market in some level but frontier economies are still able to be apart from the effect of global distress and less integrated.

2.4 Emerging and Frontier Economies Perspective

The paucity of study on assets return correlation in emerging and frontier economies also motivated to perform this study. Majority of previous studies focused on stock-bond correlation analyses have been performed in developed economies, for instance Scruggs and Globadanidis (2003) and Chui and Yang (2012). Kelly, Martins, and Carlson (1998) is the first study to examine co-movement between stock and bond returns of EMs. Again, Panchenko and Wu (2009) studied stock-bond correlation of emerging markets by considering 18 economies and indicated that EMs have high level of diversification opportunities for foreign investors. Especially, investors who were interested in small and undeveloped stock markets found emerging capital market as an attractive financial market to diversify the portfolio.

In present situation, these EMs have become highly attractive among the external investor mainly after viewing that these economies were silence towards global turmoil. Graham, Kiviaho and Nikkinen (2012) analysed 22 emerging economies located in different geographical location against the U.S. market (example of develop market), in order to determine whether the EMs were able to provide diversification benefits for American investors during crisis of 2008. The study revealed various interesting results in prospect of emerging economies, such as Brazil and Mexico (American emerging economies) were the two countries which had higher correlation against U.S market among the 21 emerging economies referring that the American investors could be highly benefited by short-term investment rather than long-term in these economies. Second, the emerging European economies had low correlation against the U.S market and observed to have short term diversification. The final result was on the basis of Middle East/Africa markets against the U.S. market and concluded with similar outcome,

that is, very low correlation, mainly in Egypt and Morocco. On the other hand, the study also found that South African market were unable to provide high level of diversification, despite of being strong emerging economy. Whereas, high diversification opportunities are expected from emerging economies due to low correlations with developed or matured securities markets (Harvey 1995). Hence, the gratification of diversification various from country-to-country on the basis of capital market's basic characteristics.

Bekaert and Harvey (1995, 1997) stated some important characteristics of emerging capital markets which differentiate them from developed markets and encourage investors to participate in EMs. First, embedded with higher average returns due to greater country specific risk and involvement of small-and-medium listed companies. Second, low level of correlation between emerging capital assets and developed market assets, which ultimately provide diversification benefits. Finally, the returns of these assets are highly predictable and volatile in nature [for more see Richards 1996]. So, high volatility in assets price and presence of small-and-undeveloped companies make investors demand higher expected return to participate in emerging stock-bond market. Similarly, Kodres and Pritsker (2002) indicated that investors' response towards shocks available in one market by creating sustainable position in other markets through cross-market investment. In addition, Gupta and Donleavy (2009) revealed an interesting result by analyzing Australian market against seven emerging economies. The study found that despite of increasing financial globalization, Australian investors have huge chance to gain diversification benefits from emerging markets.

2.5 CIVETS Nations Perspective

Only a countable studies has been done on analysis of CIVETS nations' as a group, although large numbers of earlier works have focused in individual markets. Some recent literatures have started to include these emerging and frontiers economies for analysis purposes, such as Yi, Qi, and Wu (2013), Fedorova, Wallenius and Collan (2014), and Korkmaz, Çevik, and Atukeren (2012). Among these studies Yi, et al. (2013) has compared BRIC and CIVETS nation with an objective to evaluate whether CIVETS could be considered as next BRICs or not?

This study adopted scientometrics method, and revealed that there is no significant difference between BRIC and CIVETS, since the correlation between these two groups were very high (nearly 1). The only difference between them was available number of paper published. The BRICs nation had more than five times as much as CIVETS nations had, the difference in number of published paper could be due to reticent nature of these economies. Nevertheless, the existing gap in number of published paper could be perceived to reduce very soon, as BRIC nations are getting mature and their financial performance seem to be declining. As a consequences, global investors look like shifting their investment towards emerging and frontiers economies such as CIVETS nations, which could eventually bring these economies into spot of research.

Till present day, there seem to be absence of scientific studies done on stock and bond return co-movement in CIVETS market as a group. However, individual capital market of all CIVETS nations has been considered as an interesting emerging market to perform various financial decision analysis. For instance, Berggrun and Rausch (2011) and Guarín, Moreno and Vargas (2014) studied Colombian securities market and its role in diversification purpose, Lim (2009) and Jin, Grissom and Ziobrowski (2007) in Indonesia, Batten and Vo (2014) in Vietnam, Bouri (2013) in Egypt, Gökgöz, and Altintas (2013) in Turkey, and Goldberg and Veitch (2010) in South Africa. On the other hand, relatively smaller number of studies have tried to assess the securities market of CIVETS market. One of the important work in CIVETS could be Cifuentes and Córdoba (2013) which argued presence of DOW (Day-of-the-weekly) effect on all CIVETS markets by using daily stock returns. Whereas in case of return volatility, only some of the stock markets acquired it such as Indonesian, Turkish, and South African. In addition, recent study of Saleem and Ahmed (2014) analysed intra-market linkages of stock return and volatility among CIVETS markets and proposed to have certain inter-market linkage within equity market along with no evidence of spillovers. The inter-market linkage in equity market have high probability to limit the diversification benefits within the group. Furthermore, Almudhaf and AlKulaib (2013) performed an empirical study on CIVETS stock markets with a motive to analyse predictability of stock price by employing simple unit root test and variance

ratio test method. The approaches discovered contradicted result, unit root tests proposed that CIVETS stock market follow random walk process [supporting Karemera, Ojah and Cole (1999) that weak form of market efficiency have random walk in stock price]. Whereas, alternative method stated that stock markets of Indonesia, South Africa and Turkey could not reject null hypothesis of random walk, so there is probability of having unpredictability in stock price. As a result, Indonesia, South Africa and Turkey seem to be the three highly deep and liquid capital market where external investors could enjoy high level of diversification. Similarly result was observed in Buguk and Wade Brorsen (2003) while examining random walk process in the Istanbul Stock Exchange (ISE), sole stock exchange of Turkey. Again, the stock market price index of Stock Africa and Egypt too seem to be predictable [for more see Smith, Jefferis and Ryoo (2002)]. On contrast, Al-Jafari and Altaee (2011) suggested that Egyptian stock market seem to be highly predictable, since daily price of EGX30 rejected the random walk hypothesis.

Analysis of regional and internal integration of capital market has high important during making effective asset diversification decision. Korkmaz et al. (2012) focused on stock market return and volatility spillovers with the help of correlation and causal relationships. The empirical study shows that there exist volatile and low level of correlation which could even turn into negative. In addition, it indicated interdependence among the economies and some degree of intra as well as inter regional causal return and low level of volatility spillover effects [for more see Saleem and Ahmed (2014)]. While observing intra group integration, stock return of Egypt seems to be affected by the return of Turkey (Neaime 2006), moreover growth in Colombia could also affect the performance of Turkey. Similarly, Vietnamese capital market development might create problem in Egyptian capital market (Korkmaz et al. 2012). On the other hand, South African stock market is perceived to be highly integrated into global financial markets (Goldberg & Veitch 2010) and Turkish capital market has viewed to be extremely sensitive to global financial performance. Click and Plummer (2005) studied impact of the Asian Financial Crisis of 1997-1998 on ASEAN-5 (original member Indonesia, and currently Vietnam) economies and suggested that there are co-integration among the stock markets, but the degree of integration is not so perfect, as a result there

is assess to have some room for risk diversification for external investors. Gómez, Murcia, and Zamudio (2011) stated that in Colombia, correlation of bond with risky assets is high in stress period, and observed the highest level of correlation on September 2008 (bankruptcy of the Lehman Brothers). Therefore, external investors (mainly Latin American) need to understand the strong co-integration between Colombian and Latin American stock market that indicated huge diversification benefits for non-Latin American than Latin American investors. In addition, Graham et al. (2012) stated that American investor could gain diversification benefits in Colombia through short term investments. Hence, the investors from mature economies also have chances to gain diversification from the South African capital market. Similarly, Indonesia is original member of ASEAN-5, so it has been perceived to be highly co-integrated with ASEAN-5 stock markets but due to emerging nature of this group there is some chances for diversification opportunities for international investors within the group as well. Thus, CIVETS nations seem to have some degree of integration with regional as well as global markets, expressing scope for effective portfolio diversification opportunities for external investors.

2.6 Previous Studies using similar Models

After introduction of Autoregressive Conditional Heteroscedasticity (ARCH) model (Engle 1982) and Generalized ARCH (GARCH) model (Bollerslev 1986) in 1980s the time series volatility has extensively analysed in financial literature. ARCH/GARCH models assumed the presence of symmetric impacts of unconditional shocks, which means both positive and negative shock have same impact on conditional volatility (Chan & McAleer 2003). In addition, the basic framework of Multivariate Generalized Autoregressive Conditional Heteroskedasticity (MGARCH) model was formulated by Bollerslev, Engle, and Wooldridge (1988), then further extension were made from univariate to vectorized conditional variance matrix named as vech-representation. Vech and BEKK models are mostly used to study the volatility in multivariate, as an alternative model conditional correlations models could also be implemented. One of the most popular and simplest conditional correlation model is Dynamic Conditional Correlation (DCC) model considered as advance form of Constant Conditional

Correlation (CCC) model of Bollerslev (1990) with a restriction that conditional correlation to be constant over the time frame. Tsui and Yu (1999) implemented CCC GARCH model and proposed that there exist time varying conditional correlation in stock returns.

The constant conditional correlation model was extended with dynamic interaction between conditional variance equations, known as Extended Constant Conditional Correlation (Jeantheau 1998). The assumption of constant conditional correlation was found to be highly restrictive, primarily while dealing with extreme volatile asset returns. For example, Tse (2000) used Lagrange Multiplier (LM) to test for constant correlation hypothesis in three data sets; spot-futures prices, foreign exchange rate and stock market returns. Among these data sets stock market returns could not accept the hypothesis and suggested that there is time varying correlation, whereas other data sets accepted the hypothesis of constant correlation. Similarly, Nakatani and Teräsvirta (2009) tested the volatility interactions among assets with assumption of CCC and concluded that it is not always realistic restriction and recommended to test time-varying correlation. Moreover, a bivariate CCC GARCH model was also used to test the conditional correlation of Chinese stock market by comparing two major stock markets of China; Shanghai and Shenzhen stock exchange. The empirical analysis advocated that constant conditional correlation hypothesis of CCC GARCH model could not be supported. Then, DCC-GARCH model of (Engle 2002) explains conditional correlation as well as variance to be dynamic and numbers of parameters are few since conditional correlations are generated by first-order GARCH processes [for more see, Silvennoinen and Teräsvirta (2005)]. It is two steps estimation procedure; (a) univariate GARCH models are estimated, and (b) conditional correlation are estimated. A closely related formulation was also proposed independently by Tse and Tsui (2002) referred to their approach as a Varying Conditional Correlation (VCC-MGARCH) Model.

BEKK (Engle & Kroner 1995) and DCC (Engle 2002) models are two most popular multivariate GARCH models which deals with conditional correlation and variance-covariance. Caporin and McAleer (2008) performed an empirical analysis with the DAX, CAC40 and FTSE100 stock market indexes using scalar BEKK (indirect

DCC) and direct DCC models of Engle (2002), where the results from both models were compared at the end phase. From the comparison, it submitted that both models trend to be similar and provide similar forecasting of VaR. In addition, scalar BEKK model provides less volatile estimation of conditional variances and correlations in comparison to direct DCC model. While using DCC model, it excludes spillover effect among conditional variances and covariance indicating scope to have serious biasness in the result and estimation. Thus, it is preferable to use BEKK model for forecasting conditional covariance and DCC model for forecasting conditional correlation rather than conditional covariance (Caporin & McAleer 2012). It is generally assumed that there is presence of "[1]curse of dimensionality" in BEKK and not in DCC model. As a result, DCC model has been adopted for empirical applications and BEKK has used in theoretical nature studies.

Over the past years, DCC GARCH model has been getting widely popular due its simple but accurate estimation nature. It allows to estimated large covariance matrices using few number of parameters. So, this model has computational advantages than previous ARCH/GARCH models while estimating conditional correlation. And, it deals with time varying conditional correlation that are highly accurate than other simple GARCH models. For example, Lee (2014) used eight various multivariate GARCH models to analyze volatility spillover and asymmetric effect between REITS and stock price. It indicated that among those eight models, the DCC model provides better fitted result. Another similar study was done by Engle (2002), the analyst carried eight different methods to estimate correlation, and among those methods there were three DCC models; DCC IMA, DCC LL INT, and DCC LL MR Models. Finally, when the result obtained from all eight models were compared, DCC models estimation were more often accurate than other simple GARCH models. In addition, as per Billio and Caporin (2009) DCC GARCH model has huge implication in financial decision making process such as asset allocation, portfolio diversification, forecasting evaluation and others. Dajcman (2012) used DCC GARCH model to analyse stock return and sovereign bond

[1] Curse of dimensionality arises when high dimensional data are analyzed. In general use parameters increases with the order of $O(k^2)$ where VECH and BEKK model parameters increase with order of $O(k^4)$. On the other hand, fully parameterized DCC model increases with order $O(k^2)$ (Caporin & McAleer 2012).

yields comovement for the Eurozone nations, it included various crisis period; such as the 11 Septemeber 2001 terrorist attack, 2002's Internet bubble,

Beside of all these positive angles of DCC GARCH model, few literatures have shown as this model could be inappropriate approach to assess conditional correlation between the assets return. Firstly, when there is supposition that both direction and strength of movement of stock price together could affect conditional correlation, then it would be better to adopt some other model rather than DCC-GARCH (Silvennoinen & Teräsvirta 2005). Secondly, model keeps dynamic constrained equal for all correlation, which seems to be unrequired restriction. In simple term, DCC model assign single correlation dynamic to all the group that could be equal only among a particular group. Therefore, when a portfolio consists assets from different group then the correlation dynamic could vary and DCC model ignores this situation. Such group could be formed as geographically distributed (Asia, Europe, America or CIVETS), even as per assets types (stock, bonds, cash etc.). So, study done by Billio, Caporin, and Gobbo (2003; 2006) have suggested to adopt block diagonal structure, or FDCC (Feasible Dynamic Conditional Correlation) model rather than standard DCC model to get reliable result if empirical analysis is supposed to be done with different groups due to its constrain to have equal dynamic among groups of variables. Despite of all these drawbacks, dynamic conditional correlation model has been used in many academic and scientific research work [for example, Chiang, Jeon, and Li (2007); Syllignakis and Kouretas (2011); Bautista (2003); Cappiello et al. (2006); Manera, McAleer, and Grasso (2006)], nearly all of these studies have focused on asset returns and recommended that conditional correlation are time variant and strongly significant.

Moreover, asymmetries analysis in financial instruments is not a novel topic, it has been analyzed from very past decades. Asymmetric effects have been taken into consideration from very earlier time in financial econometrics as Asymmetric GARCH model (Engle 1990) to examine asymmetric effects of negative and positive innovations [see also EGARCH (Nelson 1991), GJR (Glosten et al. 1993), NAGARCH and VGARCH (Engle & Ng 1993)]. For example, Scruggs and Glabadanidis (2003) studies were done on developed market to appraise

asymmetric nature of stock and bond market conditional variances and their co-movement. Negative values of asymmetric reflects that huge response would be seen for positive shocks than for negative shocks of same absolute magnitude. Further, Globalization and liberalization in financial institutions have made assets return of capital market highly sensitive towards all sorts of information (domestic and global). As a result, the assumption made by ARCH and GARCH model to have symmetric impact found to be rejected and seem to have asymmetric effect in conditional variance. After knowing the role of asymmetric volatility in financial activities an extended DCC-GARCH model was proposed by Cappiello et al. (2006) defined as Asymmetric Dynamic Conditional Correlation.

The main objective of this ADCC-GARCH model is to investigate asymmetries volatility in conditional variance and correlation, which is very essential in financial risk analysis. Cappiello et al. (2006) revealed that equity returns have strong presence of asymmetric effect in conditional volatility in comparison to bond returns (analysis done in Europe, Australasia, and North America). So, the level of asymmetric impact as well as direction could be different for each market and asset classes. For example, Saleem (2011) figure out that there is positive asymmetries in bond return of Russian market and negative asymmetries in stock return. Similarly, Zhuang, Wang, Zhou, and Zhou (2008) have analyzed asymmetric responses in stock-bond correlations, again a case study was done on Vietnam stock market and detected presence of asymmetric volatility effect while analyzing against its major trading partners (USA, Japan, Singapore, and China) (Chang & Su 2010).

3. CIVETS MARKET

3.1 Historical Overview

CIVETS, which has also taken as next generation of tiger economies, is recently introduced group with six frontier emerging economies. The member countries are Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa. This group has been coined by Robert Ward, the Economist Intelligence Unit (EIU) in 2009, and the term became popular when the President of Anglo-Chinese HSBC, Michael Geoghegan used it in his speech given to the Hong Kong Chamber of Commerce

in April 2010. In the speech he stated, “CIVETS are new BRICS and emerging markets will grow three times as fast as developed countries this year (2010)” (Cárdenas 27 October 2011). The economic growth of these economies seem to be rapidly growing due to their huge potential to attract international investment towards them. In addition, dynamic features of each country, large youth population, low depended on external debts, and rapidly growing young economies, especially after drastic slowdown of BRIC countries have led to consider CIVETS as next BRIC economies too. Despite, ‘Civets’ term is named after shy and retiring feline mammal, the financial performance of these economies are getting highly active and have been success to fascinate international investors.

The financial performance of CIVETS nation is measured by two indices; S&P Civets 60 Price Return Index (SPCIVET60TR), and S&P CIVETS 60 Index (SPCIVET60). In 2009, S&P Civets 60 Price Return Index (SPCIVET60TR) had risen up by 78% while the MSCI BRIC Index could gain only 52%. The SPCIVET60, tradable index, was launched in May 2011 with 60 leading companies from these six countries through 10 liquid stocks traded in their respective domestic stock exchange. The index has been moving ahead than S&P BRIC 40 and S&P Emerging BMI over one and three years (Greenwood September 19, 2011). In addition, HSBC Global Asset Management launched HSBC GIF CIVETS fund to invest in a portfolio of CIVETS stocks (Colombia 11.25%, Indonesia 22.3%, Vietnam 1.7%, Egypt 6%, Turkey 28.9%, South Africa 28.1%, and remaining cash) which were mainly available for UK investors (HSBC Global Asset Management 31 August 2012) with a main motive to increase FDIs in CIVETS.

Further, the member countries of CIVETS have been seen together in various groups such as all CIVETS countries have joined the WTO (World Trade Organization), Vietnam and Indonesia are important members of ASEAN. Similarly, Turkey, Italy, Indonesia, and South Africa are major economies of G-20, moreover Indonesia and Turkey are also kept together in MINT nations, and Next 11 economies too consists Egypt, Indonesia, Turkey and Vietnam as key members.

3.1.1 COLOMBIA

Colombia is considered as one of the most attractive investment destination for international investors. A large portion of Colombian FDIs is in the oil (third largest exporter to the USA), coal (World's fourth largest exporter) and natural gas industries, since investment in natural resource can lead to have extreme diversified portfolio. It is a single country in South America which have access on two oceans (the Atlantic Ocean and the Pacific Ocean) and lies in the Northern part of South America with large quantity of natural resources, therefore, it could successfully pull maximum FDIs toward it.

Colombia has perceived to have never defaulted on sovereign debt and external debt that maintain confidence in investors. The economic sectors seem to be protected from foreign threats by adopting *low risk – low return development strategy*. Under this strategy, both government and investors highly avoid risks, therefore high level of investment is made in low risk bearing projects although those projects provide a very low return or zero return. As a result, economic growth and development of Colombia appears to be mildly fluctuated during market turmoil (Echeverry 2009). It could be one of the major reasons which helped Colombia to perform smoothly even during and after the global financial turmoil. In addition, Colombian financial performance seems to be highly dependent on its domestic macro-economic factors, so occurrence of any domestic financial crisis could have a huge impact on.

Over the last decades, Colombia has experienced various domestic financial crises and encountered huge impact on financial performance. The deepest financial crisis was faced at late 1990s till early 2000s, due to the failure of banks and financial system. Implementation of financial liberalization policy in 1990s brought huge involvement of foreign investors in financial as well as government owned institution. As a result, financial performance expanded very high in first half of 1990s, which ultimately caused financial stress between 1991 and 1997 due to credit boom in economy (Gomez-Gonzalez & Kiefer 2007). During the same time, there were 189 listed companies (in 1997) in Colombia Stock Exchange with a market value of $19.5 billion, that fell by double and reached to

$9.56 billion from 123 companies in 2000, whereas, in 2012 the market value raised and reached to $262.1 billion which is nearly 13.5 and 27.5 times greater than 1997 and 2000 (Index Mundi 2013).

3.1.2 INDONESIA

Indonesia is the world's fourth most populous nation and the most populous country among CIVETS nations with faster growing potential. The economic performance has been growing very rapidly, with more than 5% annually, and one of the important reasons for continuous growth could be due to massive domestic consumption. The huge portion of private consumption has led to low suffering from any types of global financial turmoil. For example, during late 1990s crisis (the great Asian Financial Crisis) the consumption of Indonesia was highly growing, where consumption expenditure was amounted to about 60% of GDP, out of that 80% was from private consumption (Nasution 2002). Hence, massive population has successfully protected the financial performance of Indonesia. In addition, it has the lowest labour cost among the Asia-Pacific region with highly educated manpower, as a result large share of FDIs are in manufacturing sector, especially by reforming financial and economic policies after hard suffering from the Asian crisis.

The Asian financial crisis of 1997, highly affected the economic and financial performance of Asian countries including Indonesia. Till the end of 1990s, Indonesia was highly dominated by government through maintaining control over major national income producing sectors such as mining, manufacturing and agriculture sector. After the crisis in 1997, IMF (International Monetary Fund) played a vital role to change the regulatory system of Indonesia, since the IMF ensures fair competition and implementation of flexible economic reforms, which cover different areas of economic development including the tariff and tax removal policies, removal of restrictions on FDI, reduce the number of SOEs (State-Owned Enterprises) and others. As a result, the Indonesian 1999 act was formulated with decentralization (local government responses to local condition) program mainly focusing on economic and political sector. Finally, it was successful to bring rapid change in national economic performance and named as "Big Bang" [see Hofman

and Kaiser (2004)]. Then after, the highly centralized dictatorship country was later on transformed to democratic market by approval of the decentralization program in 2001. And, perceived it as a new bridge to democracy as well as more efficient and fairer government (Alm, Martinez-Vazquez, & Indrawati 2004). Subsequently, it encouraged domestic investors to highly participate in economic activities.

After the event of 2001, the participation of domestic as well as external investors has been drastically increased. At the end of 2000, the market capitalization value of Indonesian Stock Exchange was $26.83 billion, which reached to $211.70 billion in 2007, and it has reached to $396.77 billion in 2012 with 459 listed companies. Another important impact is a reduction in the number of SOEs which indicates that the government prefers to have the huge participation of private sectors (such as individual, organization, external investors, and others) in economic performance. At the end of 2013 there were 139 with $345 billion asset value and have aimed to reduce to 120 till the end of 2014 (Siahaan 2014). Further, in the present context the legislative system seems to be highly developed with an objective to improve the economic efficiency and people's welfare by creating equal opportunities for small, medium and large business firms (Dowling 2006).

3.1.3 VIETNAM

Vietnam is located in Southeastern Asia, enjoying huge benefits of being the proximity of China. It has been successful to attract extreme FDIs primarily in establishing manufacturing hubs sectors. Foreign investors are highly interested in the Chinese market (an important member of BRIC), and Vietnam appears to be playing bridge way to China. According to the Hong Kong Trade Development Council Research (2009), Vietnam's economy has found to be relatively healthy with more than 5.3% growth rate in 2009 (see Table 1) being topper in the ASEAN league, when the global economy was suffering from financial tsunami. Moreover, following Chinese gradualism, Vietnam changed its policy reforms in 1986 and started financial liberalization with an objective to expand industry sector, and increase the inflow of FDIs in the economy.

In recent years, many new economic reforms are formed in order to increase private investments. One of the most important economic reform is the Three Pillar

Economic reform which was proposed in early 2012. This reform is still ongoing with its main objective to restructure three primary pillars; public investment, banks, and SOEs to improve economic activities of Vietnam. Among three pillars, high focus is given on reduction of SOEs either through full or partial privatization. One of the vital target of this reform has been set to reach SOEs around 690 by 2015, and at the end of 2020 to be near to 200. The increasing demand of privatization illustrates, high involvement of domestic investors as well as growing participation of external investors. Some major privatization plans for 2014 includes Vietnam Airlines, and Vietnam National Textile and Garment Group (Vinatex) which has been supposed to be highly attractive for both domestic and external investors. In case of banking restructuring, the foreign investors were allowed to have a bigger share in local banks (from 15-20%) mainly for foreign strategic investors (KHTDC RESEARCH 2014). Similarly, in order to attract foreign investor Vietnam has been continuously amending its economic reforms, and has signed various agreements.

Over a few decades, Vietnam has shown extremely high response in global performance by involvement in foreign trade and investment agreements. In January 2010, CAFTA (China-ASEAN Free Trade Area) was officially established and Vietnam was one of the important member of it. This agreement helped Vietnam to eliminate 90% of its tariff while trading with China (main trade-partner). And in the same year, Vietnam also took part in the Trans-Pacific Partnership trade agreement where the key members are Australia, US, Japan, Chile, Canada, Singapore, Malaysia, Mexico and others. This agreement allows the member countries to have free trade and investment opportunities. Recently, in May 2014 there was anti-Chinese riots which destroyed many foreign-invested factories (many were from Taiwan and China mainland), as a consequence the confidence level of foreign investors towards Vietnamese government started to deteriorate, thus government have passed different strategies such as tax breaks and land rent exemption to the affected companies with a motive that these investors would continue their investment in Vietnam (Einhorn, Folkmanis and Boudreau 2014).

3.1.4 EGYPT

Egypt is one of the fast-growing economies with a benefit to join Europe and Africa. It lies in the Middle East of Northern Africa. It is a suitable example of transition economy which have been moved from state planning to open market. Initially, the open market too could not help to enhance Egypt's economic performance due to its complex legal framework. In the meantime, introduction of "open-door" policy could be considered as one of the important steps of Egyptian government towards the internationalization process.

Internationalisation process in Egyptian economical, as well as the financial sector was started from 1970s. In 1974, a new policy was introduced as "open-door" with an aim to modernize the economic system and accelerate economic growth. This policy was made with an objective to attract foreign investors, but unfortunately it could not bring noticeable remarks in the economic performance. But, after the Gulf War of 1990/91, the Egyptian government sought help from the IMF and the World Bank in order to reduce its SEOs and improve the economic situation. Whereas, the international trade got limelight in 2001 when the government declared "export expansion to be a matter of life and death" then foreign investors' interest started to grow in Egyptian industry, and in the beginning of 2004 the government decided to reduce the trade barriers (Smith & Kulkarni 2010). Before 2004, the economic reforms were highly centralized, as a result in 2004, an aggressive economic reform was formed. These reforms were highly focused to attract the foreign investors and private sectors in economic and financial development. Therefore, another important step is Financial Sector Reform Program 2004-2008; its main objective was to improve financial-sector and foster an enabling environment for an efficient, increase private-led, growth and development of Egypt. The program included five major pillars; banking sector, insurance sector, capital market, mortgage market, and other financial institutions and services [for more see Nasr (2008, p.10)].

Moreover, the EU-Egypt Association Agreement (June, 2004) helped Egypt to perform trade with EU countries. Some more negotiations that Egypt has made are; the Pan Arab Free Trade Agreement, the Common Market for Eastern and

Southern Africa, the Agadir Agreement, Mercosur-Egypt FTA, EFTA-Egypt Free Trade Agreement, and the Egypt-Turkey FTA. Furthermore, Egypt has also made a trade agreement between the US and Israel (HKTDC Research 2012). All these agreements make the economy more easy and reliable to perform new FDIs for interested investors.

3.1.5 TUKEY

Turkey is the sixth largest nation in Europe, and a bridge between Europe and the Middle East economies. The natural gas pipeline projects has been taken as the main sector to attract FDIs and these projects make Turkey as an important energy corridor between Europe and Central Asia. Therefore, it is recognized as one of the major energy producing country in the Middle East. In the last decades, Turkey seems to be highly active in privatization process keenly focusing on telecommunication, hydro-power and other projects. In addition, an important step was taken by the Turkish government in 1989, by implementing fully liberalized capital market as a result, the global investors too were allowed to participate in Turkish Stock Exchange market with limited restrictions.

Among the CIVETS nation, Turkey seems to be the highly sensitive country towards the global performance. The macroeconomic performance of Egypt is highly dependent on capital flows, due to its extreme level of liberalization in securities market. For instance, the Gulf War (1991) attacked the economic performance of the world including Turkey, especially by increasing capital outflow which took it into a big recession. Likewise, the Russian crisis in 1998 has also become successful to keep effective impact on the performance of Turkey. Beyond the global crises, it has also faced some domestic crisis; such as 1993 high current account deficit, and primary deficit. On the other hand, Turkey seems to have highly successful years during 1980-87, since the GDP, inflations, and other economic indicators were improved, resulting rapid growth in economic performance. The growth was unable to continue for longer time frame, as a result it started to slow down from 1988. And later in 1990, it tried to recover which was indicated by appreciated value of Turkish Lira with more than 20% than previous year (Yilmazkuday & Akay 2008).

Implementation of liberalization policy has helped the Turkish economy to grow very rapidly. For instance, the market capitalization value of the Turkish Stock market was $ 6.78 billion in 1989, and reached to $ 286.57 billion in 2007. As previously stated, the economic performance of Turkey is highly sensitive to the global environment, Turkey faced a huge downfall during the GFC in 2008 and took three consecutive years to return back to its normal situation with a market capitalization value of $ 306.66 billion in 2010 (see table 11, APPENDIX 1).

3.1.6 SOUTH AFRICA

South Africa is one of the most developed economies among CIVETS nation. It includes a large amount of middle class population, huge natural resources (export of gold and platinum), developed financial and legal system, advance tele-communications infrastructure, energy and transport sectors. In addition, the South African Stock Exchange is the world 16th largest securities market. And, the foreign investors are keenly interested in natural resources industries such as gold and oil. Further, the investors are also interested in creating a business processing outsourcing (BPO) mainly in industrial sector, due to its highly educated huge population.

The government seems to have a high emphasis on the industrial sector and its development. Generally, South Africa acts as a global hub and assembly hub, especially for the mining industry and automotive industry respectively. Recently, industrial policy action plan 2013-15 has been approved which main motive is to improve the industrial sectors. Similarly, in January 2013 it has enforced the Automotive Production Development Plan (APDP) in order to attract more investments in the industry sector. Again, the renewed demand in automotive and chemical industries, as well as organization of World Cup 2010 has enhanced the attractiveness of international investors towards South Africa. Moreover, the HSBC viewed long-term growth potential in mining, energy and chemical firm, thus it has considered Sasol Ltd. as one of the important area to invest in South Africa (Greenwood September 19, 2011).

In addition, South Africa has joined different associations for better economic alignments. The most important agreement could be considered that have been

performed in April 2011 by joining BRIC, which later on renamed as BRICS [Brazil, Russia, India, China, and South Africa]. It helped to drive the attention of foreign investors toward it. For example, in fifth BRICS summit [March, 2013] a decision was made to launch projects in order to develop the infrastructure and financial services in South Africa (HKTDC Research 2013). Similarly, it has also been a member of the WTO, the South Africa Customs Union (SACU), in addition it has signed various free trade agreements with US, EU, China, Singapore, Japan, Nigeria and others.

The above section has tried to explain in detail about the peculiar features and basic financial historical background of each member in CIVETS. But, it has still some unanswered questions such as, why should external investors invest in these countries, and what factors make them different from other emerging economies? The answer to these question are believed to be provided by following listed characteristics of CIVETS:

I) Rapidly Growing Economies: The economic growth rate of CIVETS nations has been drastically increasing, even after the GFC of 2008. Table 1 demonstrates the Gross Domestic Production (GDP) value of each country from the year 2005 - 2013, along with the average growth rate of CIVETS. GDP is one of the important indicators to analyse the growth trend of any economy, and calculation of average growth rate helps to compare the economic performance among the member countries. As per Table 1, the annual growth rate of all CIVETS nations is greater than 3%, and Vietnam has the highest average GDP throughout the periods. The increasing inflows of FDIs in manufacturing and service industries in Vietnam seem to be an important element for the continuous rising GDP value. The CIVETS economic performance appears to be effected very low during the GFC, except for Turkey and South Africa. These two countries had negative growth rates, probably due to the huge participation of foreign investment in service sector rather than industrial sector. However, the negative growth rate remained for very short periods, since the growth rate was in positive, as well as nearly similar to the normal growth rate at the end of 2009.

Table 1: Increasing GDP and GDP Growth Rate of CIVETS

Table reports GDP in terms of billion US dollar and GDP annual growth rate which is presented inside the brackets.

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	Avg.
Colombia	146.5 (4.71)	162.8 (6.70)	207.5 (6.90)	244.1 (3.55)	234.4 (1.65)	287.0 (3.97)	336.6 (6.65)	369.6 (4.21)	378.2 (4.26)	263.0 (4.73)
Indonesia	285.9 (5.69)	364.6 (5.50)	432.2 (6.35)	510.2 (6.01)	539.6 (4.63)	709.2 (6.22)	846.3 (6.49)	878.0 (6.23)	868.4 (5.78)	603.8 (5.88)
Vietnam	57.6 (7.55)	66.4 (6.98)	77.4 (7.13)	99.1 (5.66)	106.0 (5.40)	115.9 (6.42)	135.5 (6.24)	155.8 (5.25)	171.4 (5.42)	109.5 (6.23)
Egypt	89.7 (4.47)	107.5 (6.84)	130.5 (7.09)	162.8 (7.16)	189.0 (4.69)	218.9 (5.15)	236.0 (1.76)	262.8 (2.21)	272.0 (2.10)	185.5 (4.61)
Turkey	483.0 (8.40)	530.9 (6.89)	647.2 (4.67)	730.3 (0.66)	614.6 (-4.8)	731.1 (9.16)	774.8 (8.77)	789.3 (2.24)	820.2 (4.05)	680.2 (4.45)
South Africa	247.1 (5.28)	261.0 (5.60)	286.2 (5.55)	273.1 (3.62)	284.0 (-1.6)	363.2 (3.09)	401.8 (3.46)	384.3 (2.55)	350.6 (1.89)	316.8 (3.28)
Source: World bank database										

II) Youth and Large growing Population: Another important reason to participate in CIVETS nation is to enjoy the benefits of having a huge youth population and massive domestic consumption market. These two factors provide relatively higher labour cost advantage with highly educated and motivated employees. And, CIVETS nations have more than 1% annual population growth rate, whereas other emerging economies have less than 1%; for example, Brazil, China, and Russia had 0.9%, 0.5%, and 0.2% respectively in year 2013 (Worldbank, 2014). In the same year, the developed countries such as the U.K. and U.S. had 40.4, and 37.6 years as an average age respectively, but CIVETS had 27 years, indicating a huge youth population than developed economies.

Economies having a large portion of youth population are more likely to have strong economic and financial performance. As per Modigliani and Brumberg (1954), life cycle hypothesis, the consumption-saving pattern of individual differs as per the age group. For example, young individual participates highly in financial activities by investing or purchasing assets and saves for old age, whereas aged investors withdraw financial assets to support retired life. This example could be better explained by overlapping generation model of Allais and Maurice (1947).

Therefore, economies with huge youth generation believed to have higher asset prices than those economies which have massive aged population.

In year 2013, the CIVETS average population age was 27 years and. Table 2 shows the median age and rank hold by each country on the basis of world population size in 2013. Among the CIVETS countries, Egypt has the lowest median age by holding the 15th rank of the world large population size. So, the assumption could be made that extreme youth participation would be present in the Egyptian financial market in near future.

Table 2: Average age of population in CIVETS (2013)

Median age has been retrieved from factbook, and source for Rank of economies on the basis of population size is World Development Indicators database, World Bank, 1 July 2014.

Countries	Median age (2013)	Rank
Colombia	28.6	28
Indonesia	28.9	4
Vietnam	28.7	14
Egypt	24.8	15
Turkey	29.2	18
South Africa	25.5	25
Average	27.62	

III) Abundance of Natural Resources: Investment in natural resources such as oil, coal and gold industries are highly significant for portfolio diversified. And, CIVETS' nations have been blessed with an abundance of natural resources. Among the CIVETS countries, Colombia is the third largest oil exporter in the world, also the fourth largest coal exporter in the world. So, huge share of inflow FDIs in Colombia are in oil and mining sectors (Proexport Colombia 2011). Similarly, South Africa, Egypt, and Indonesia have a significant contribution by annual revenue from the export of oil and gas in the economic development. In addition, South Africa has also been considered as one of the largest exporter of gold and platinum in the world. Whereas, Turkey has been ranked in world's tenth

highly diversified mineral producer, hence there is an extreme level of natural resource industries and scope for international investors.

IV) Low foreign debts: Government of CIVETS nations has been successful to avoid of external debts in comparison to other emerging economies. It means, the government of CIVETS nations is weakly dependent on foreign debts, as a result it would be protected from any sorts of global stocks in near future. For example, after the 2008 crisis many emerging countries suffered from huge external debts such as Mexico, Uruguay, Argentina, even BRIC economies, but CIVETS had a relatively low volume of external debt. And, this situation has been taken as a positive side for both, domestic and international investors.

V) Unemployment and low labor cost: Normally, high unemployment rate in an economy reflects negative performance of a country. But, in case of international investment, economies having a high unemployment rate are taken as a good indicator of foreign investor for risk diversification.

Table 3: Unemployment rates from 2005-2013 of CIVETS

The annual unemployment rates from 2005-2013 of each individual country of CIVETS are presented. Source: World Bank Database

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013
Colombia	11.3 %	10.5 %	12.0 %	13.2 %	12.0 %	11.6 %	10.8 %	10.4 %	9.7 %
Egypt	11.2 %	10.6 %	8.9 %	8.7 %	9.4 %	9.0 %	12.0 %	11.9 %	13.4 %
Indonesia	11.2 %	10.3 %	9.1 %	8.4 %	7.9 %	7.1 %	6.6 %	6.6 %	6.6 %
Turkey	10.6 %	10.2 %	10.3 %	11.0 %	14.0 %	11.9 %	9.8 %	9.2 %	9.3 %
Vietnam	2.1 %	2.3 %	2.3 %	2.4 %	2.3 %	2.3 %	2.0 %	2.0 %	1.3 %
South Africa	23.8 %	22.6 %	22.3 %	22.7 %	23.7 %	24.7 %	24.7 %	25.0 %	24.9

Countries as South Africa with high unemployment rate (see table 3) has low labour cost, as well as other labour related policies would be relatively low and flexible than those countries which have high employment. As a result, large

multinational companies focus to relocate their manufacturing industries in emerging economies such as CIVETS and BRIC countries. Table 3 demonstrates the annual unemployment rates of CIVETS from 2005-2013, where Vietnam has very low unemployment rate indicating that there is a large number of manufacturing industries which were able to provide nearly 98.7% of total population some kind of employment. Indeed of low labour cost and high involvement of external investors, South Africa has a high level of unemployment rate over the decades. It could be probably due to strict legal system to protect the interest of marginalized.

VI) Shifting towards Middle Class Status: The growing middle class status of huge population has helped the emerging economies to recover from different financial turmoil. Generally, Urbanization and high level of consumptions are the main indicators which reflect the status of any economy. The urban population of CIVETS nations is increasing, and in 2013 Colombia had 76% of the total population living in urban areas with high living standard. More likely, Turkey had 73%, South Africa had 63%, Indonesia, Egypt, and Vietnam had 52%, 44%, and 32% of the total population respectively. Meanwhile, the domestic consumption of private sector has been increased drastically and this situation could also help to combat during global crisis, especially for economies like Indonesia which has a consumption-based economy.

VII) Geographical Location Benefits: CIVETS nations are geographically highly dispersed from each other, which have added extra attraction factor towards global investors. In this group, Colombia is the only Latin American country, hence it could provide investment opportunities for Non-Latin investors and enjoy the high diversification in assets return. Similarly, Indonesia and Vietnam are located near to China and India (BRIC countries), especially Vietnam is the neighbouring country of China which have capacity to increase profitablility of investment by creating manufacturing hubs. Egypt’s Suez Canal is the biggest geo-strategic asset which help to establish trade hubs between Europe and Africa. Likewise, Turkey has been considered as another important asset of CIVETS in case of geographical location, since it is located between Europe and Asia. As a result, investors of Turkey have opportunities to be highly benefited from the trade

performance between these two continents. On the similar way, South Africa is located at the southern tip of the Africa, the world's second largest continent, which is also known as the *Rainbow Nation* due to its open gateway to perform business with other African countries.

4. STOCK AND BOND MARKETS

Stock and bond markets are two primary components of capital market and co-movement between them have a significant role in financial activities. "Historically, rising equity prices have been associated with falling bond prices (rising bond yields), as stronger economic fundamentals drove investors to stocks and away from bonds, and weaker economic growth produced the reverse," [2]Minerd (2014). In contrast, recent studies have suggested that stock and bond prices move together, most probably due to the heavy floods of liquidity in both the markets. In the bond market, investors normally get regular and fixed return, whereas in case of stock returns, investors get dividend which is time varying and intensely distributed by profitable firms among its shareholders. Generally, stock market are highly uncertain and investors expect for higher returns in comparison to the bond market, since it is considered as risk free assets and generally issued by government bodies. Due to this volatile nature of stock, during market crisis there is shifting of investment towards safer assets such as bonds and treasury bills which is also termed as flight-to-safety.

4.1 Stock and Bond Markets in CIVETS

4.1.1 Overview of Stock and Bond Markets

According to the English publication CFI, the Colombian Securities Exchange (BVC) has been considered as the best Latin American exchange in 2013. Bolsa de Valorse de Colombia (BVC) is the authorized institution to control and issue securities in Colombia. It was established in 2001 after the merger of Bolsa de Bogotá (1928), Bolsa de Medellín (1961), and Bolsa de Occidente (1983). The first stock exchange was Bolsa de Bogotá which was formed with a main objective to have judicial and effective operational framework for the newly established firm,

[2] Scott Minerd is the Global Chief Investment Officer of Guggenheim Partners, privately held which provide asset managemet, investment banking and capital market services, insurance services and others.

and it started trading stock with 17 listed companies. Whereas, Colombian's bond market mainly compose of sovereign debt securities, which have very long maturity period. Hence, the volatility of bond return shows the economic fundamentals and related sovereign risk. Colombia has also introduced IDXTES index which reflects the Colombian local bond price index and volatility, similarly another important index is IGBC (Indice General de la Bolsa de Valores de Colombia) which expression correlation between the 10 years Colombian Bond and the Stock Market index. Here, it has been observed that the index provides positive value over the long run, and during the financial crisis the value tends to be negative. It means there is a time-varying correlation between stock and bond return, probably due to the flight-to-quality phenomenon (Cabrera et al. 2014), which seems to be occurred during financial stress. And, Colombia has gone through various domestic as well as global crisis such as bank failure stress which occurred in the late 1990s and early 2000s and others.

Gómez, Murcia and Zamudio (2011) has recognized three financial stress period in Colombia between 2000 to 2008. The first stress period was between July and September of 2002, which caused huge turbulence in the government bond market and increased local interest rates. As a result, bond prices were reduced, huge market volatility was observed, and financial institutions faced huge losses during their operation. Although, the impact of financial variables were very strong, it could not create a significant effect on economic performance of Colombia. Likewise, decision of Fed to increase the policy rate, as an effect there were huge withdrawn of FDIs from Colombia since invested took back their investments from emerging economies (including Colombia) and invested into US assets with the expectation of higher return which introduced second stress period (between February and June of 2006). And, the last stress period was September 2008 when Lehman Brothers were declared as bank corrupted. This event created huge volatility along with low correlation between local markets assets (bond, stock, money, foreign exchange, and more). As a consequence, the economic activities were significantly affected and fallen-down very rapidly after September 2008. Hence, Colombia has high co-integration with Latin American economies and indicates that there is very limited opportunities for diversification by investing

within Latin American countries, but there could be high chances of diversification by investing in non-Latin American countries.

Indonesia Stock Exchange (IDX), locally known as BEI (Bursa Efek Indonesia) was established in 2007 after the merger of [3]Jakarta Stock Exchange (1977) and the [4]Surabaya Stock Exchange (1989). The Indeks Harga Saham Gabunga (IHSG) is the main indicator used in index calculation for all listed companies in Indonesia. As per IHSG, the market capitalization value seems to be growing, and it was equal to 45.3% of GDP in 2012 from 459 listed companies. The milestone of Indonesian capital market took place in December 14, 1912 through the Dutch East Indies Government by opening a branch of Amsterdam Capital Market in Batavia (Jakarta) by the name of Vereniging voor de Effectenhandel (stock exchange). It was founded to trade securities and bonds of Dutch companies operating in Indonesia, issue government bonds, issue stock certificates of American companies whose administrative offices were located in the Netherlands, as well as the securities of other Dutch companies (Indonesia Stock Exchange 2014). Then, the Indonesian Credit Rating Agency was formulated in 1994 in order to provide rating for corporate bonds, government bond, banks and financial institutions, to ensure the investors about the risk associated in a particular investment. Moreover, Indonesia stock exchange has two stock indices which represent the market performance, and they are the Jakarta Composite Index (JCI), the benchmark stock index, and the Jakarta Islamic Index (JII). The benchmark stock index (JCI) of IBX reflected a significant drop-down in the performance during the Asian crisis (1997).

In 2012, the IBX provided $396.8 million as the market capitalization value of all the listed companies. In Indonesia, the market capitalization value has been increasing very rapidly; for example, at end of 2008 the value was $98.8 billion but in consecutive two years it reached to $178.2 and $360.4 billion (for more see table 11, APPENDIX I). Similarly, the number of corporate bond issuers has also

[3] Jakarta Stock Exchange (JSX) was Jakarta based stock exchange which was established in 1977 after the World War I and II. The primary stock indices were JSX Composite and the Jakarta Islamic Index (JII), benchmark for measuring market performance.

[4] Surbaya Stock Exchange (SSX) was established on June 16, 1989 with thirty six shareholder. The main motive was to help in the development of capital market and the economic growth of

been growing and has reached to 109 from 99 in 2012, meanwhile the listed government securities have reached to 96 series in 2013 from 92 previous years. In addition, the new government securities have been increased from 42 series to 43 in 2013. At the same time, year 2013 has supposed to be the challenging year for domestic bond market, due to its constantly increasing inflation rate and weak exchange rates. These two factors lead to increase the expected risk in investing bond which directly increased the yield rate and reversely decrease bond prices.

The HO Chi Minh City Stock Exchange (HOSE) performance is drastically growing with full responsibility for issuance of new stock and bond, and also acts as a secondary market for existing assets. The first stock exchange of Vietnam is named as the Ho Chi Minh City Stock Exchange (HOSE), which was established in July 2000. It started its operation with only five listed companies, but in 2005 the number of companies increased and reached to 33 companies with $270 million total market capitalization. In the meantime, it opened an over-the-counter exchange with a motive to speed up the process of equitization of state-owned enterprises (SOEs), which was named as Hanoi Stock Exchange (HNX). So, in present situation Vietnam has two stock exchange centres which basically trade state-owned companies and other securities issued by the listed companies. Although, the size of Vietnam's stock exchange is very small, it had contributed 21.1% of its Gross Domestic Product in 2012. It has been observed that the performance of Vietnam has been significantly changed from 2006 (see table 11, APPENDIX I), probably due to joining the WTO (World Trade Organization). In addition, during 2006 various regulations were amended, such as increase in the number of trading days from 3 to 5 days a week in the HNX from 1st of June 2006, and increase in working hours unsurprisingly increased the market liquidity thus on 14th of June 2006, the HOSE increased its number of order matching phases from 2 to 3 phases a day in order to meet the investors' trading demand (Nguyen 2014). External individual as well as institutional investors seem to be highly attracted in investing small-and mid-cap stocks, might be due to its rapid growing potential and higher expected returns. In present condition, the bond market of Vietnam has been rapidly improving and its credit rating has been shifted from B2 to B1 (Moody) along with stable outlook (Global Credit Research 2014).

The capital market of Egypt is relatively smaller than other emerging economies, although it has a very old stock market history. The history of Egyptian Exchange was started in 1883 with the foundation of the Alexandria Stock Exchange. And, another stock exchange was established in 1903 as the Cairo Stock Exchange which was also governed by the same board of director. The current Egyptian Exchange was formed in 2009 by a combination of both the stock exchanges, and named as the *Cairo and Alexandria Stock Exchange (CASE)*. Previously, EGX 30 index was used to examine the performance of listed companies, whereas in the current situation, CASE 30 is used to demonstrate the performance of the 30 largest companies in Egypt. In 2005, 744 companies were listed in EGX with the market capitalization of $79.67 billion, that uproar to $139.29 billion from 435 listed companies in 2007, which was equal to 107% of Egyptian GDP (shown in table 11, APPENDIX I). But, after the global crisis of 2008 the performance has begun to loosen up, as a result in 2012 the market capitalization value has reached to $58.01 billion (nearly three times lower than 2005). Especially, primary market of Egypt is not as active as it need to be which could be one of the main reasons for continually falling down of the capital market.

The main reason that the Egyptian Stock Exchange is inactive due to the strict regulatory system. The stock and bonds are primarily issued by big frames, as SMEs are unable to access the capital market due to its small size and creditworthiness. The inadequate legal system could be considered as another reason, since it has a poor legal framework for the new asset issue. As a result, the issuance of bond and equities are very limited. In addition, weak regulatory reforms and supervision system played an important role in the capital market development. Moreover, there are very low active domestic investors to invest in the capital market. Thus, an Egyptian capital market consists huge portion of government equity and few corporate bonds, whereas issuance of Eurobond has not been yet started in Egypt. As per Morgan Stanley, Egypt is one of the most attractive economy on the basis of valuation perspective ranked in third position on the basis of price-to-book value and fourth in price-to-earnings out of 20 countries represented in the iShares Emerging Market Index (NYSE:EEM) (Investment U January 31, 2011).

The Borsa Istanbul (BIST) is solely responsible for all the securities exchange trading in Turkey such as stock, treasury and bills, bonds, foreign securities and others. It is established on April 3, 2013 through merging the Istanbul Stock Exchange (ISE), the Istanbul Gold Exchange, and the Derivatives Exchange of Turkey. Whereas, the Capital Markets Board of Turkey formed in 1982 is responsible to regulate and supervise the Turkish capital market. This capital market has seen both flourish and declension phase, it had very strong and rapidly growing market before the global financial crisis, and the crisis brought steep down trend in market value. The total market capital of ISE in 2007 was $286.6 billion which fell down by more than half and reached to $117.9 billion from 319 listed companies. During the same time, the benchmark index (ISE-100) of Turkey too sloped down from 55,538 to 26,864 points in 2008 (Istanbul Stock Exchange 2013). And, from 2009 it started to use Greece-Turkey 30 Index (GT-30) as the benchmark index, which was launched in October 2009 with an agreement between the ISE and the Athens Stock Exchange of Greece. As a result, the total market capitalization was significantly improved and reached to $225.7 billion in 2009 from 315 companies. In addition, the government bond market of Turkey has been growing drastically due to the strategic decision taken by government to substitute foreign debt by domestic currency bonds. As the output, in 2010 Turkey's bond market was in 14th largest among the world as per measuring percentage of GDP, similarly it was in the sixth largest local currency bond market in terms of size among the emerging economies (Private and Financial Sector Development Europe and Central Asia Region 2012). Since then the increasing trend in Turkish capital market has continued and considered year 2013 as a year of *'change and transition'*, whereas from year 2014 it would be taken as '*rapid and consistent growth period*'(Istanbul Stock Exchange 2013).

Johannesburg Stock Exchange (JSE) is the largest stock exchange among CIVETS as well as in Africa. It was established on 8th November 1887 with a main motive to raise fund for the enhancement and development of mining industry in South Africa. In the present context, JSE consists a large number of listed companies from the non-mining sector too, but the dominate ownership seems to be those few numbered large conglomerate firms which were originated as mining

organization. The JSE has the largest market capitalization value among CIVETS, in 2012 with $612.3 billion from 348 listed companies. It has been ranked as 17th largest stock exchange in the world as per market capitalization. Stock Exchanges Control Act of 1995 took initiative for financial liberalization and opened the door for non-South African to participate in the capital market of South Africa. As per Yartey (2008), the stock market of South Africa is perceived to be determined by four factors, and they are banking sector development, private capital flows, income level, and political risk. Whereas, Bond Exchange is responsible to handle the bond market and has been licensed under the Financial Markets Control Act. In addition, the operating hour of JSE has also encouraged the foreign investors to involve in stock trading, since the early-day trading align with trading hours in Europe. Also, launch of JSE/FTSE Africa indexes has highly facilitated international investors to participate in South African market [for more see Irving (2005); JSE/FTSE (25 September 2014)].

4.1.2 Factors Affecting Stock and Bond Correlation

In financial analysis, mostly the variables are inter-related to each other. Some common factors such as macro-economic factors, information available or fluctuation in market situation affect many financial variable at the same time and in a similar manner. Hence, some major factors which have been discussed extremely in previous literature as macro-economic factors that affects the co-movement between stock and bond returns are further discussed in context of CIVETS environment.

I) Inflation rate: Inflation is one of the main factors which seems to have an inverse relationship with the correlation of stock and bond returns (d'Addona and Kind 2006). Investors' expectation about the increase in inflation rate has high impact on the discount rate, as a consequence it reduces the correlation between stock and bond return. Li (2002) states that uncertainty in expected inflation significantly determines major changes in the stock and bond correlation. Some major countries of CIVETS are highly fluctuating inflation rate which could lead to obtain time varying conditional correlation. Table 4 demonstrates, the annual inflation rate of all CIVETS countries from 2005-2013, and shows that 2008 is the

particular year when all the countries had their inflation rate very high over the observed period. It indicates the inflation rate significantly responds to the market volatility and the responding level is extremely strong in frontier economies such as Vietnam, and Egypt.

Table 4: Fluctuating Inflation Rate

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013
Colombia	5.0 %	4.3 %	5.5 %	7.0 %	4.2 %	2.3 %	3.4 %	3.2 %	2.0 %
Indonesia	10.5 %	13.1 %	6.4 %	9.8 %	4.8 %	5.1 %	5.4 %	4.3 %	6.4 %
Vietnam	8.3 %	7.4 %	8.3 %	23.1 %	7.1 %	8.9 %	18.7 %	9.1 %	6.6 %
Egypt	4.9 %	7.6 %	9.3 %	18.3 %	11.8 %	11.3 %	10.1 %	7.1 %	9.5 %
Turkey	10.1 %	9.6 %	8.8 %	10.4 %	6.3 %	8.6 %	6.5 %	8.9 %	7.5 %
South Africa	3.4 %	4.6 %	7.1 %	11.5 %	7.1 %	4.3 %	5.3 %	5.4 %	5.7 %

II) Interest Rate: Real Interest rate shows the ability of an investor to invest in new assets as well as probability to change the existing portfolio of stock and bonds. Generally, the interest rate and stock-bond correlation have an inverse relationship. When the interest rate increases the co-movement between two assets decreases so investors' interest shifted from low interest bearing assets to higher interest providing assets (Ilmanen 2003). Hence, one of the reasons to have a strong correlation between stock and bond during market hectic period could be low interest rate in the particular market.

III) Business Cycle: Historically, it has been seen that during recession or drop in the market, the correlation between stock and bond are highly correlated. Moreover, in the short run, stock and bond tries to move in the opposite direction as per flight-to-safety phenomena, but in long run these assets are supposed to move in together. During a recession, the capital market gets highly volatile making both assets react in a similar manner due to the effect of macro-economic new announcements (Andersson et al. 2008). Further, the cash flow may have a

significant effect during a recession, whereas discount rate may be high valued during the expansion period. So, positive correlation is expected during expansion periods in comparison to recession period [for more see Fama and French (1989)]. In contrast, Jensen and Mercer (2003) stated that the correlation between these assets observed to be higher during recession period than expansion periods.

5. METHODOLOGY

Knowledge about volatility and correlation is very important when the central issue is return of assets or investment for any financial activities. Here, return volatility is the key tool to measure risk level in of investment, on the other hand, correlation helps to interpret the relationship between or among assets available in the market or portfolio. It is always better to predict future volatility of an asset's return, and Autoregressive Conditional Heteroscedasticity (ARCH)/Generalized-ARCH (GARCH) model (Bollerslev 1986) has been used widely in financial analysis since last 2 decades. GARCH model is one of the popular and easiest model to analysis volatility in time series. GARCH (1, 1) is generally represented as GARCH (p, q) model which explains that previous lag have significant influence in current value. Although, the most common and widely used form is GARCH (1, 1) studies could also apply higher-order models mainly when available data set have very long time frame such as many decades with short frequency as daily data or yearly hourly data [see Engle and Lee (1999)]

5.1 ARCH Model

Conventional approaches of econometric have assumed, forecasted conditional variance for a short period (1 year) of time seems to be constant. Engle (1982) introduced Autoregressive Conditional Heteroskedasticity (ARCH) model which is believed to be one of the important works performed in time series analysis to examine time-varying variances. The study was done to forecast today's value based on past information through forecasting conditional variance which depends on previous information and conditional variance assumed to be a linear function of lagged squared residuals. ARCH effect testing simply means of analysis whether the variance of the errors term is constant or not, varying in the variance of the errors term is termed as *heteroskedasticity*. The residual obtained from

simple regression is squared and secondary regression is run and such error term is required to be normally distributed along with zero mean and varying conditional variance. This model is preferable to perform volatility analysis of high frequency time series data which normally have cluster volatility on it. ARCH (1) model could be expressed as an equation (1). Here, h_t refers for conditional variance and calculated by using a weighted average of past error terms, coefficient of ω and α_i need to be non-negative so that the variance would be in positive.

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 \tag{1}$$

In 1992, new model was proposed by Bera & Higgins (1993) called non-linear ARCH model. Since, the majority of studies implying a classical ARCH test during this period found conditional variance was not only a linear function of lag squared residuals but also includes some other elements on it [Bollerslev (1986); Granger, Robins and Engle (1986)], conditional distribution had skewness (flat tail) and leptokurtoses, so data were non-normally distributed (Engle & Bollerslev 1986), and over-dispersion due to the high emphasis on functional form rather than data. In addition, Bera and Higgins (1993) has also suggested that NARCH model would enhance the forecasted conditional variance value.

5.2 GARCH Model

Univariate GARCH Model is the generalized ARCH model which reduces the number of parameters used in the model. Generally, the stationary GARCH model is also restated as an ARCH model including infinite number of lags. As per Bollerslev (1986), selection of appropriate lag is one of the difficult tasks in the ARCH model which could lead to having negative definition. In order to reduce the effect of negative definition, GARCH model was introduced with the must require restriction to have positive or non-negative definition in model equation i.e. $\alpha + \beta < 1$ but should not be a negative value. Both, ARCH and GARCH models assume that conditional mean and conditional variance are linear functions of their past information.

$$h_t = \omega + \sum_{j=1}^{q} \alpha_j \varepsilon_{t-j}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} \qquad \text{Equation (2)}$$

The primary condition for GARCH model is to have a positive definition in conditional variance which is justified when ω, α_j both are greater than 0, and j = 1,…,q as well as β_j too need to be greater than 0 for all *j* and here j = 1,…,p. In addition, $\alpha_j + \beta_j$ <1, this condition also needs to be met which is known as unconditional variance.

As previously stated, the most popular GARCH form is GARCH (1, 1) where both p and q are equal to 1. In parenthesis first number shows the number of autoregressive lags or ARCH terms and second value point outs number of moving average lags or GARCH terms. This model has been built to forecast variance for short periods such as one year or one period, even could be two periods by using unit lag. But, in some situation more than one lag is required to be considered in the model equation to have accurate forecasted variance, especially while forecasting long horizon.

Univariate ARCH/GARCH model has been extended into various forms mainly due to three major reasons; (a) Integration of first, second, and higher moments, (b) generalization to high-frequency data, and (c) multivariate extensions. The normal distribution of return and assumption of independence of first and second moments during forecasting could be generalized by non-normality distribution of conditional error term along with dependency of first and second moments (Engle, Focardi, & Fabozzi 2008). One important limitation of GARCH model was to ignore the effect of volatility asymmetries which could significantly influence outcome of the model and misinterpretation of VaR value. Furthermore, existing studies of stock and bond market have also indicated that drop-down in the market has a higher volatility effect than growth of the market. After recognizing the role of asymmetric effect in the volatility behavior of returns various models have been developed such as the Exponential GARCH (Nelson 1991), threshold ARCH (Rabemananjara & Zakoïan 1993), and GJR (Glosten et al. 1993). Among these models, GJR model has been considered as the better model to analyse

asymmetric effect since it includes various effects of both negative and positive innovation information. Under this model, simply '$\alpha_2 S_{t-1}^{-}\varepsilon_{t-1}^2$' term is added in univariate GARCH model and positive value specifies that there is a negative innovation effect and vice versa. The GJR GARCH model expresses the expected variance as shown in equation (3) Wang (2009).

$$h_t = \omega + \sum_{j=1}^{q} \beta_j h_{t-1} + \sum_{i=1}^{p} \alpha_{1i}\varepsilon_{t-1}^2 + \alpha_2 S_{t-1}^{-}\varepsilon_{t-1}^2 \qquad (3)$$

Here, the value of S_{t-1}^{-} is either equal to 1 or 0; when $\varepsilon_{t-1} < 0$ then the value is equal to 1, similarly when $\varepsilon_{t-1} \geq 0$ then S_{t-1}^{-} is equal to 0. In addition, $p \geq 0 \leq q$, $\omega > 0 < \alpha_i$ i=1, 2,3 …p, j=1, 2, 3…q, as well as $\beta_j > 0$ restriction should be fulfil in order to have positively defined asymmetric GARCH or GJR-GARCH model.

Financial liberalization has brought plenty of opportunities for investors to invest in various classes of assets in both domestic and global markets. As a result, analysis from single variable enhanced to understand volatility behaviour as well as co-movement pattern within multiple assets or portfolios. The major challenges in multivariate GARCH models are; determining H_t (conditional covariance matrix) with positive definite, use of limited parameters, and presence of weak stationary in the residuals (Engle et al. 2008). In 1988, the first multivariate GARCH model was recommended by Bollerslev et al. (1988) with vech notation where a vech operator, includes a lower triangular portion of *NXN* matrix i.e. *N(N+1)/2X1* vector, is used. VEC model is expressed in equation (4) as below:

$$h_t = \omega + A\eta_{t-1} + Bh_{t-1} \qquad (4)$$

Where, h_t represents vech (H_t) and H_t is NXN conditional variance-covariance matrix, ω is *N (N+1)/2X1*, and *A, B* are *N (N+1)/2 X N (N+1)/2* matrices. This model was assumed to be highly complicated, simply because if N equals to 3 then it need to estimate the variance by using 78 parameters. Additional, Bollerslev et al. (1988) suggested Diagonal VECH model with main objective to limit the parameters and assume that *A* and *B* need to be diagonal matrices.

Another important MGARCH model was proposed by Engle and Kroner (1995) as the BEKK model which mainly focused to maintain positive definite in H_t.

The models explained above are based on an unconditional covariance matrix of return which are extremely complicated and time consuming, meanwhile in 1990 hallmark concept was kept in front of the financial Econometrics field by Engle, Ng, and Rothschild (1990) with an assumption of dynamic market factor in dynamic conditional covariance. After this idea, various new models were proposed on the basis of factor models such as the F-GARCH model (Lin 1992), the orthogonal O-GARCH model (Kariya 1988), and others. At the same time, Bollerslev (1990) recommended a new form of GARCH model which deals with constant conditional correlation and time varying conditional variance called as the CCC-GARCH model which was later generalized as the Dynamic Conditional Correlation (DCC-GARCH) model.

5.2.1 Constant Conditional Correlation:

The Constant Conditional Correlation (CCC) GARCH model proposed by Bollerslev (1990) assumes that each individual series or asset estimates univariate GARCH model with time invariant conditional correlation. The CCC GARCH model is taken as a benchmark model which has been extended later into different multivariate GARCH models. The standard closed form of maximum likelihood estimates (MLE) correlation estimator using transformed residuals are used to estimate correlation matrix. The major assumptions of the CCC GARCH models are as follows:

i. The correlation must be constant over the time frame.
ii. The estimator must be positive definite, means every univariate conditional variance need to be non-negative and the estimated correlation matrix need to be fully ranked.
iii. The MLE of the correlation matrix is same as a sample correlation matrix.

Among the assumptions, the first assumption was considered to be rejected in certain studies [see Tsui and Yu (1999); Bera and Kim (1996); Tse (2000) for more discussion] which lead to consider the presence of constant conditional correlation

in financial time series as only empirical question. As per Bollerslev (1990), the Constant Conditional Correlation (CCC) GARCH model estimate conditional covariance matrix by implementing following equations:

Suppose, y_t represents $N \times 1$ vector of log return of assets at time *t* with time varying conditional covariance matrix H_t.

$$y_t = E\left(y_t \middle| \Psi_{t-1}\right) + \varepsilon_t \qquad (5)$$
$$Var\left(\varepsilon_t \middle| \Psi_{t-1}\right) = H_t$$

In equation (5), Ψ_{t-1} is the σ - field generated by the information available till time *t-1*, and H_t is the conditional variance matrix which needs to be positive definite for all *t*. Formation of H_t in equation (5) is a portion formation, the complete expression is shown in equation (6).

$$H_t = D_t \Gamma D_t, \qquad (6)$$

In equation (6), $D_t = diag(h_{iit}^{1/2} \ldots h_{NNt}^{1/2})$, D_t represents a diagonal matrix $(N \times N)$ of time-varying conditional volatility elements $\sigma_{1t}, \ldots, \sigma_{Nt}$ and Γ denotes $(N \times N)$ time invariant conditional correlation matrix with $\rho_{ij}\sqrt{(\omega_i \omega_j)}$.

Assumption of normality, $y_t \middle| \Phi_{t-1} \sim N(0, D_t \Gamma_t D_t)$ the conditional log likelihood of asset return or series y_t could be estimated as expressed in equation (7) [for more see Bollerslev (1990)].

$$L(\theta) = -\frac{TN}{2}\log 2\pi - \frac{1}{2}\sum_{t=1}^{T}\left(\log\left|H_t\right| + \varepsilon_t^{'} H_t^{-1} \varepsilon_t\right) \qquad (7)$$

Here, θ shows all unknown parameters in ε_t then H_t is substituted by the help of equation (6) and generate an equation (8).

$$L(\theta) = -\frac{TN}{2}\log 2\pi - \frac{1}{2}\sum_{t=1}^{T}\left(\log\left|D_t \Gamma D_t\right| + \varepsilon_t^{'} (D_t \Gamma D_t)^{-1} \varepsilon_t\right) \qquad (8)$$

'$\tilde{\varepsilon}_t = D_t^{-1}\varepsilon$' is $N \times 1$ a vector of standardized residuals. And, further simplification provides an equation (9), this equation is similar to the quasi-maximum likelihood method (QMLE) function which provide relatively low bias result in the GARCH model [for more discussion see Bollerslev and Wooldridge (1992)].

$$L(\theta) = -\frac{TN}{2}\log 2\pi - \frac{T}{2}\log|\Gamma| - \sum_{t=1}^{T}\log|D_t| - \frac{1}{2}\sum_{t=1}^{T}\tilde{\varepsilon}_t'\Gamma^{-1}\tilde{\varepsilon}_t \qquad (9)$$

5.2.2 Dynamic Conditional Correlation (DCC) GARCH Model

The DCC GARCH model is the extended form of univariate GARCH model which avoids all sorts of complexity of the conventional multivariate GARCH model. This model is proposed by Engle (2002) as a generalized model of CCC estimator Bollerslev (1990) which allows for time varying correlations. DCC model is the first model which suggests that estimated conditional correlation would be time varying with unity (1) value of conditional variance. Under this the DCC GARCH model, it estimates conditional correlation by following two simple steps:

I. Estimate variance equation using the mean equation of each asset in univariate GARCH model
II. Estimation of correlation among the series

This MGARCH model has potential to perform an estimation even in extremely large correlation matrices, since the correlation estimation process is independent with a number of assets. It allows to imply as many assets required to estimate in the mean equation, the first phase of the DCC model. It has a high level of computational advantages over multivariate GARCH models (Engle & Sheppard 2001) and facilitate to implied the DCC model for large covariance matrices.

Engle (2002) study used eight methods to estimate conditional correlation which included two multivariate GARCH models. After the estimation, it was concluded that the Dynamic Conditional Correlation methods estimated result were either best or very close to the best method. It has explained the accurate measure of conditional correlation estimated under this model. As per the theoretical

background of Bollerslev (1990), and the empirical result provided by Engle and Sheppard (2001) and Engle (2002) the conditional correlation between stock and bond are assumed to be time variant and it considers a time series of $\{y_t\}$ where *t=1…T* with *K* elements each which becomes $y_t = (y_{1t} ... y_{Kt})$. The null hypothesis for the CCC-GARCH model assumes conditional correlation between stock and bond as constant over time. And, the possible variations over time in conditional covariance are occurred due to changes in corresponding variances.

$$y_t = \mu_t + a_t \text{, where } (a_t | \Psi_{t-1} \rightarrow N(0, H_t) \qquad (10)$$
$$a_t = H_t^{1/2} \varepsilon_t$$

Where, y_t is the log return of the asset at time *t,* μ_t is the expected value of the conditional return at time *t,* and a_t is mean correlated returns of assets at time t, so $E[a_t] = 0$ and $Cov[a_t] = H_t$.

The CCC and DCC GARCH models both rewrite the conditional covariance matrix as:

$$H_t = D_t R D_t, \text{ …… from equation (6)} \qquad (11)$$

Where $D_t = diag\left\{\sqrt{h_{i,t}}\right\}$, D_t variable represents $N \times N$ a diagonal matrix of the conditional volatility of returns on each assets with $\sqrt{h_{i,t}}$. '$h_{i,t}$' represents estimated conditional variance of each asset, and i = 1,…, N on its diagonal entries. Similarly, *R* represents the conditional correlation matrix and (Engle 2002) has expressed the time varying conditional correlation as:

$$R_t = diag\{Q_t\}^{-1} Q_t diag\{Q_t\}^{-1} \qquad (12)$$

Where $Q_t = (1 - \alpha - \beta)\overline{Q} + \alpha \varepsilon_{t-1} \varepsilon_{t-1}^{'} + \beta Q_{t-1}$ and Q_t denotes $N \times N$ with standardized residuals representing $\varepsilon_{it} = r_{it} / \sqrt{h_{it}}$. On other hand, $\overline{Q} = E[\varepsilon_t \varepsilon_t^{'}]$ $N \times N$ matrix but with unconditional variance matrix of standardized residuals. In Q_t equation function *α*, and *β* are the scalars which should be non-negative and satisfy the

condition of α + β < 1 to have a positive definite in the model. This decomposition of correlation matrix ensures that the covariance matrix are positively defined.

The log likelihood estimator is expressed as Engle (2002) shown in equation 10:

$$r_t = \mu_t + a_t \,(a_t | \Omega_{t-1} \rightarrow N(0, H_t)$$

$$L = -\frac{1}{2}\sum_{t=1}^{T}\left(n\log(2\pi) + 2\log|D_t| + \log|R_t| + a_t^{'} R_t^{-1} a_t\right) \qquad (13)$$

This estimated formulation helps the analyst to perform their analysis easily even with large covariance matrix.

5.2.3 Asymmetric Dynamic Conditional Correlation (ADCC) GARCH Model

The Dynamic Conditional Correlation GARCH model (Engle & Sheppard 2001) believed to be focused on time-varying conditional correlation and captured asymmetric in variance but ignored asymmetric in correlation. As a result, an extended form of the DCC GARCH model has been introduced which allows to analyse the asymmetric response in both variance and correlation in time-varying conditional correlations based on the GJR threshold model. Returns are seen to be extremely volatile at present of negative innovation information in comparison to positive equal magnitude information. The DCC GARCH model has an assumption that assets would share same news impact curve while looking correlation whereas, the new model allowed to have different news impact curves for correlation calculation among assets [for more see (Cappiello et al. 2006)].

Markets are assumed to be highly efficient, simple means highly reactive to each and every new information available in the market (both domestic as well as across the border). When the negative shock or information brings a high level of volatility in comparison to the equal magnitude of positive information, such changes are known as *Asymmetric Volatility*. Some previous works have also shown that positive shocks might not be able to bring any significant changes in the performance of certain assets as per negative shocks. The empirical study performed by Cappiello et al. (2006) found beardown evidence about the presence of asymmetric conditional volatility in both national equity indices as well as bond

return. But, stock return indicated to have a strong response towards bad news in comparison to bond does.

In some recent empirical analysis, it has been observed that there is presence of asymmetric effect in conditional correlations. The major effect of ignorance of asymmetric creates mispricing of asset, and poor forecasting which are the key factors to make asset allocation and risk management. Normally, negative shocks increase the variance of two assets return (through CAPM) indicating investors to expect more returns from investment in risky assets (Cappiello et al. 2006). As a result, the price of both assets (stock and bond) falls down and correlation between them increases, especially during market turmoil.

Since, the DCC GARCH model ignores the correlation asymmetric and it does not accommodates with different news impact curves for correlations across distinct assets, the above equation need to be slightly modified so that it would capture asymmetric effect [for more see Sheppard (2002)]. As a result, the Asymmetric Dynamic Conditional Correlation (ADCC) GARCH (Cappiello, et al. 2006) model was developed and it is mathematically expressed as in equation (14).

$$Q_t = \left(\overline{Q} - A'\overline{Q}A - B'\overline{Q}B - G'\overline{N}G\right) + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + B'Q_{t-1}B + G'n_{t-1}n'_{t-1}G \tag{14}$$

In equation (19), *A, B,* and *G* represent diagonal parameter matrixes, and $n_t = I[\varepsilon_t < 0] \circ \varepsilon_t$ ('$\circ$' is [5]Hadamord product). In addition, $\overline{N} = E[n, n'_t]$ and its expectations is infeasible as same for $\overline{Q}$, and are replaced by sample analogues, such as $T^{-1}\sum_{t-1}^{T}\varepsilon_t\varepsilon'_t$ for $\overline{Q}$ and $T^{-1}\sum_{t-1}^{T}n_t n'_t$ for $\overline{N}$. Cappiello et al. (2006) has further presented a generalized form for all three models; the CCC, DCC and ADCC MGARCH models which are shown in equation 15, 16, and17 respectively.

$$A, G = [0] \tag{15}$$

$$G = [0], A = [\alpha_{ij}] = \lfloor\sqrt{\alpha}\rfloor, B = [\beta_{ij}] = \lfloor\sqrt{\beta}\rfloor \tag{16}$$

$$A = [\alpha_{ij}] = \lfloor\sqrt{\alpha}\rfloor, B = [\beta_{ij}] = \lfloor\sqrt{\beta}\rfloor, G = [g_{ij}] = \lfloor\sqrt{g}\rfloor \tag{17}$$

[5] Hadamard product is also known as Schur product which perform binary operation by taking two same dimension matrices where each element of ijth term of one matrix multiply with ijth term of another matrix.

6. DATA

This study used weekly [6]Total Return Index of Stock Market and Bond Market for CIVETS nations over January 2005 to December 2013. Data for stock indices and bond indices were calculated by MSCI and the JP Morgan Emerging Index respectively and retrieved from DataStream. The return indices were chosen in US dollar currency denoted value, in order to maintain standardization in values and also to omit miss calculation, which might occur due to frequent changes in exchange rate. The dataset contains 469 observations for each country in both the assets return series, except for *Vietnam*. In case of Vietnam, the capital market has been recently developed and have information from 12th December 2005 for bond return whereas, stock return information is provided one year later on it (from 11th December 2006). Although, the bond return information was available from 2005, it could not be included in analysis from the very beginning as multivariate GARCH models would not allow empty series. Therefore, the analysis of Vietnam was carried from 11th of December 2006 to end of December 2013 with 369 observations. Despite of difference in starting point and observations, general result would not be affected since the analysis was carried separately for each economy.

The figure 1, illustrates bond return indices for all economies are in a rising trend, among CIVETS economies Egypt has relatively low growth rate, probably due to lack of active domestic investors and extreme restriction in the bond market. Unsurprisingly, during the end of 2008 stock return strongly fluctuated in comparison to bond return (the Egyptian bond was entirely unaffected) and rapid recovery of stock return indicates that these economies seem to have high risk diversification opportunities for external investors. In the meantime, Egypt and Turkey have a highly volatile stock return due to the extreme participation of external investors in domestic stock exchange, whereas South Africa has very low

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[6] Total Return Index (RI) is calculation by using $RI_t = RI_{t-1} * \frac{PI_t}{PI_{t-1}} * \left(1 + \frac{DY_t}{100} * \frac{1}{N}\right)$ formula in DataStream; where, RI_t represents the return index on day t, RI_{t-1} is previous day's return index, PI_t is price index on t, PI_{t-1} is previous day's price index , dividend yield percentage on t and N is the total working days in the period such as 260 in a year.

growth in stock return which might be due to its low risk low return strategies. Noticeably after a plunge at the end of 2008, Vietnam stock return has regarded to be quite stable with similar return referring that companies listed in Vietnamese stock exchange are unable to build trust among investors.

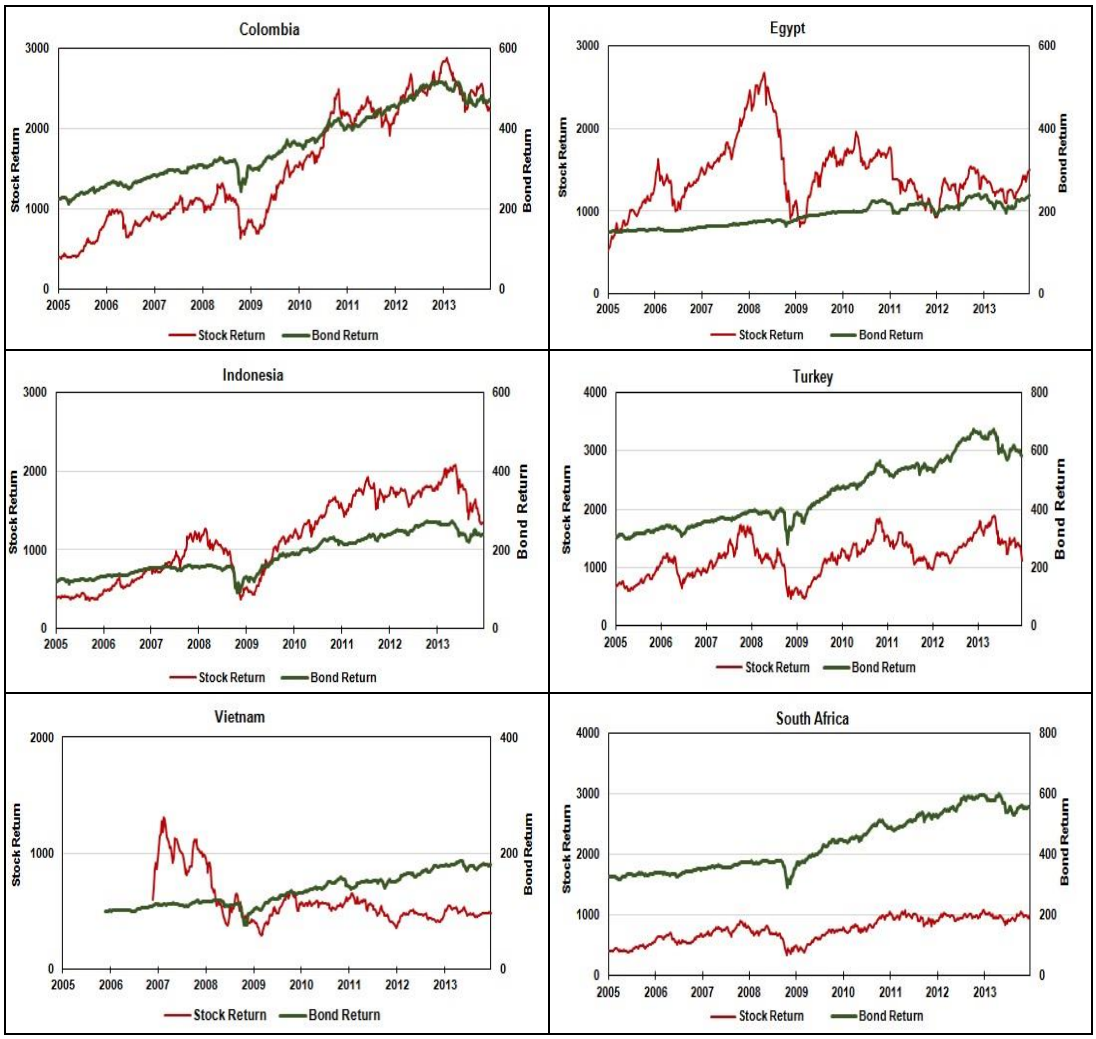


Figure 1: CIVETS Stock-Bond Return Index

In addition, figure 1 demonstrates that investors in Colombia, Indonesia, Turkey and South Africa seem to be equally interested in both assets. Since, stock-bond returns are very well coordinated and rationally increased. Among CIVETS, Colombia has the highest stock return index which is followed by Indonesia and Turkey, in case of bond return, Turkey has the highest bond return index tracked by South Africa and Colombia. In contrast, the Vietnamese capital market appears to be new and in developing phase, since it has the lowest return on both assets. After downfall in 2008, bond return of Vietnam recovered faster than stock return

probably because a large portion of bond is issued by the State Treasury (90% of the total bond issue) (VPBS 2014) reflecting that investors in Vietnam were unable to gain trust in the stock market. On the other hand, Turkish and South African capital market could be considered as moderately developed and highly sensitive towards global information and have extremely high participation of international investors. In all economies, there is significant slope-down on the asset's return during the end of 2008, the global financial crisis, as a result empirical analysis is performed in two phases; first on whole dataset and the second phase by splitting the data into two sub-categories as pre-crisis and crisis period. The downfall at the end of 2008 and rapid come back in mid of 2009 in all CIVETS nations' stock and bond return indicates that entire investors reacted in a similar way during the GFC period.

The weekly return indices retrieved from DataStream were transformed into first logarithmic difference (shown in equation 23), in order to acquire appropriate and reliable outcome.

$$Y_t = \log (Y_t/Y_t (-1)*100 \qquad (18)$$

Where; $Y_{t,}$ is weekly total return index.

The wide range of descriptive statistics for weekly stock and bond return indices are presented in table 5. It includes mean, standard deviation, skewness, excess kurtosis, Bera-Jarque (B-J) test statistics, p-value for normality hypothesis testing in BJ test, and total number of observations included in empirical analysis. Mean informs the average weekly return of asset, greater value is highly preferable, in opposite negative mean are not accepted by rational investors for diversification. Among CIVETS nations, Vietnam is the only country which has negative mean in stock return denoting that stock return falls during the sample period. As consequences, investors are unable to identify diversification benefits in the stock market and highly attracted towards bond market. Similarly, standard deviation shows weekly volatility of the asset and desired to have low value to enjoy portfolio diversification.

Table 5 reports the descriptive statistics of weekly returns for stock and bond returns of CIVETS nations over January 2005 to December 2013.

Table 5: Descriptive Statistics of CIVETS during 2005-2013

The descriptive statistics are calculated on first logarithmic difference of weekly stock and bond return indices of individual CIVETS nations, where the raw time series were denoted with US dollar. The following outcome is obtained from the Eviews 8.

	Asset	Mean	Std. Dev.	Skewness	Kurtosis	Bera-Jarque	Prob.	Obs.
Colombia	Stock	0.36	3.97	-1.52	11.66	1645.88	0.00	469
	Bond	0.15	1.42	-2.30	31.61	16410.60	0.00	469
Indonesia	Stock	0.27	4.55	-0.81	7.17	390.94	0.00	469
	Bond	0.15	2.60	-2.65	53.39	50169.87	0.00	469
Vietnam	Stock	-0.06	5.05	0.18	4.93	59.11	0.00	369
	Bond	0.13	2.06	-0.53	57.39	51911.34	0.00	369
Egypt	Stock	0.24	4.52	-0.87	6.55	305.42	0.00	469
	Bond	0.10	1.15	-0.41	13.05	1986.338	0.00	469
Turkey	Stock	0.12	5.64	-0.32	5.58	138.01	0.00	469
	Bond	0.14	1.68	-1.65	31.95	16586.76	0.00	469
South Africa	Stock	0.18	4.37	0.03	8.00	488.00	0.00	469
	Bond	0.12	1.18	-1.35	21.62	6916.712	0.00	469

As per Mean-variance analysis (Markowitz 1987), the rational investor prefer to have higher expected returns at given level of risk. Table 5 illustrates, Colombia has the highest expected weekly stock return followed by Indonesia, Egypt, South Africa, and Turkey. In all CIVETS nations, stock return has higher volatility than the bond return which indirectly means that stock return demands more return in comparison to the bond (Gulko 2002). And, Turkey has the highest volatile stock return followed by Vietnam, Indonesia, and Egypt, whereas in the case of the bond market, Egypt and South Africa seem to have the lowest volatile market among CIVETS nations. The average bond return of CIVETS is 0.13, that is, close to all individual bond markets so the return associated with bond investments in all markets is similar. Hence, on the basis of Mean-variance analysis Colombian bond, as well as the stock seems to be highly fruitful to have portfolio diversification.

Jarque-Bera (J-B) test is used to analyse normality in time series of stock and bond returns. B-J test has been considered as one of the best and simple method

to test the normality of time series data. It examines skewness and kurtosis of individual data series with assumptions that normally distributed data have no skew, and kurtosis coefficient lies below or equal to 3 [Jarque and Bera (1980); Brooks (2014)]. In table 5, the column headed skewness, kurtosis, J-B, and Prob. are used to analyse normality of data. The table shows, the skew value of CIVETS countries has a different value than zero (0), showing present of skewness in both asset series. Further, stock return of Vietnam and South Africa have positive skewness indicating that the distribution of these assets are non-normal and more skewed toward right than normal distribution. On the other hand, remaining countries of CIVETS' both assets have a negative skew suggesting both asset returns are non-normally distributed and skewed toward left than normal distribution. In case of kurtosis, all asset returns have *leptokurtosis*, means kurtosis value is greater than 3 and it is one of the normal characteristic of time varying series. Theoretically, J-B coefficient needs to be close to zero, in order to display that the data are normally distributed (Jarque & Bera 1980), but CIVETS nations' both asset return series have very high value than zero and strongly significant at the 1% level. Hence, on the basis of J-B test a conclusion is drawn that both asset return series are non-normally distributed. Further, J-B test was implemented on both split data sets. And, a similar conclusion was drawn, that is, non-normally distributed with flat tails and leptokurtosis (see Table 12 and 13, APPENDIX II)

Furthermore, unconditional correlation between stock and bond return of each domestic capital market was calculated. Unconditional correlation shows the co-movement between two or more than two assets, and the calculated coefficients need to lie between -1 and 1. In table 6, during 2005-2013, Turkish capital market has the highest correlation and Vietnam has the lowest correlation value among CIVETS nations. Correlation coefficient close to 1 arouses that assets moves together and there are very low chances of having diversification opportunities. In case of CIVETS, the highest correlation value is 0.63 (Turkey during crisis period) which is greater than 0.5 but not so close to 1, hence there might have some room for diversification opportunities (for more see Table 18, APPENDIX VIII).

Table 6: Unconditional Correlation between Stock and Bond in Domestic Market

Full period includes whole data from 2005-2013, whereas normal period includes data series from 2005 to end of 2008 and remaining datasets represent crisis period. Unconditional correlation is calculated by using Pearson's correlation coefficient formula: $\rho = \frac{\mathrm{cov}(x, y)}{\sigma_x \sigma_y}$ where, ρ is correlation coefficient, x and y are bond and stock returns.

	Colombia	Indonesia	Vietnam	Egypt	Turkey	South Africa
Full Period	0.57	0.51	0.22	0.31	0.62	0.52
Normal Period	0.65	0.48	0.22	0.32	0.62	0.54
Crisis Period	0.39	0.63	0.26	0.35	0.63	0.48

Meanwhile, correlation in three scenarios has a different correlation between the stock and bond return on CIVETS nations denoting the presence of time variant relationship between the assets of the domestic capital market. Colombia has highest dynamic unconditional correlation since the correlation coefficient during normal period was 0.65 and later on shifted to 0.39 during crisis period, enforcing high probability to have diversification opportunities. By contrast, Turkey has the highest correlation which is followed by Colombia, South Africa, and Indonesia referring these economies also have some level of diversification opportunities through involving in outward FDIs. On the other hand, Vietnam has the lowest stock-bond return correlation in all three scenarios so it is considered as adorable capital market for risk diversification. As per theoretically implication, during market hectic period assets return need to move together due to high fluctuation, but in the case of Colombia and South Africa, stock-bond correlation appears to be falling in crisis period than in normal situation (see Table 6). By contrast, Vietnam, Egypt, Indonesia, and Turkey stock-bond correlation seem to have an increased correlation coefficient during crisis period than in normal situations. Unconditional correlation analysis in CIVETS nations provides mixed results of correlation behaviour between stock and bond return during highly volatile situation, which encourages to analysis advance and dynamic conditional correlation methods.

Preliminary Tests for GARCH Model:

Before using GARCH (1, 1) family model, it is reasonable to ensure that data series achieves the basic requirement of GARCH models such as individual series are stationary, have cluster volatility, and presence of ARCH effect. As per Engle (1982), financial data must be stationary and have ARCH effect on each series in order to enhance reliability of outcome and eliminate biases, as well as unrealistic result from the analysis. Similarly, volatility cluster means the tendency of having large changes to be followed by large and small changes by small (Brooks 2014). The unit root test would be analysed by using Phillips and Person (1988) z test, and Ljung and Box (1978) would help to inspect the presence of serial autocorrelation in the time series.

I. Unit Root and Stationary Test

The first preliminary test was to examine the presence of a unit root in assets return series. And, Phillips Perron (PP) Test is considered as the easiest and reliable method to test unit root of time series. The test runs a simple regression including constant and its lag as explanatory variables. Phillips and Perron (1988) test states null hypothesis as present of unit root in the series and alternative hypothesis as residuals are stationary. In addition, the PP test analyse unit root by comparing t-value and [7]critical value of the series, when t-value is greater than the critical value with at least 5% significance level then null hypothesis is rejected. In case of CIVETS, both the assets return had their t-value greater than the critical value even at 1% significance level (see table 7, third column), so residual were stationary. An alternative test for PP test, Kwiatkowski- Phillips-Schmidt-Shin (KPSS) test is also implemented to crosscheck the stationary of residual. In case of Kwiatkowski- Phillips-Schmidt-Shin (Kwiatkowski, Phillips, Schmidt, & Shin 1992) test, the null hypothesis is stated as residual is stationary and alternative hypothesis is residual is non-stationary. And, the analysis of stationary is done by comparing the test statistic value against [8]asymptotic critical values where the null hypothesis cannot reject when test statistic value is smaller than asymptotic critical

[7] The critical values for 1%, 5%, and 10% levels are -2.5699, -1.9415, and -1.6162 respectively.
[8] Asymptotic critical values for 1%, 5%, and 10% are 0.7390, 0.4630, and 0.3470 respectively.

value. In CIVETS nations, all series had test statistic value smaller than asymptotic critical value even under 10% level of significance (see table 7, fourth column), hence the null hypothesis cannot be rejected and concluded that residuals are stationary.

Table 7: Preliminary Tests Results

	Assets	PP test	KPSS	LB_{24}	$LB^2_{(24)}$	ARCH-LM	
						F-Stat.	Chi-squ
Colombia	Stock	-22.138*	0.158	20.95	44.53	204.35*	408.70*
	Bond	-22.551*	0.090	29.89	7.29	168.98*	337.95*
Indonesia	Stock	-22.727*	0.157	21.39	11.30	705.12*	1410.25*
	Bond	-23.324*	0.054	34.64	28.66	428.87*	857.74*
Vietnam	Stock	-16.250*	0.051	24.18	22.07	3139.28*	6278.56*
	Bond	-20.784	0.042	37.19	22.29	1695.70*	3391.41*
Egypt	Stock	-20.600*	0.296	26.68	21.32	422.81*	845.62*
	Bond	-20.798*	0.026	34.12	14.57	6634.91*	13269.83*
Turkey	Stock	-22.246*	0.085	26.614	17.601	399.26*	798.51*
	Bond	-21.991*	0.066	24.47	14.95	707.47*	1414.94*
South Africa	Stock	-24.101*	0.052	20.45	15.45	173.52*	347.05*
	Bond	-19.352	0.059	25.40	14.59	658.87*	1317.74*

*significant under 1% level

II. ARCH Effect Test:

The next preliminary test needs to be performed to observe the presence of cluster volatility, as well as ARCH effect in the residual of an asset's return. Mandelbrot (1963) is the first paper to talk about cluster volatility and explained the importance of its presence. Mandelbrot stated that when residuals are plotted in the graphical form and presents large changes tend to be followed by large changes – of either sign - and small changes tend to be followed by small changes is known as cluster volatility or volatility pooling. It mainly explains the tendency of markets during high volatility which produces more dispersion in returns in comparison to the low volatility period, as a consequence returns spread out in high volatility period (Taylor 2011). Cluster volatility is one of the basic

characteristics of financial data that instigate to use non-linear models. And, in case of CIVETS, it seems to be present in all the three scenarios of data sets (shown in figure 4 and 5, APPENDIX III). The figures illustrate, higher cluster volatility in stock returns (highly risky assets) rather than bond returns, primarily due to its risk free nature. In addition, there is significant volatility in both assets of CIVETS nations at the end of 2008 indicating the global crisis's effect. In Egypt, the bond return has continued cluster volatility even after 2010 to end of 2013 which could be due to its high fluctuating political environment and its domestic macro-economic factors.

Then, the final preliminary test was performed to analysis ARCH effect in each individual asset's return series. The ARCH Heteroskedasticity test states null hypothesis as there is ARCH effect and alternative hypothesis as absence of ARCH effect. The ARCH-LM (Engle 1982) test was implemented to analyse ARCH effect in CIVETS returns, and confirmed presence of ARCH effect in both assets return of all six economies, since all the series accepted the null hypothesis. In addition, it also concluded that there is significant influence of GARCH (1, 1). In table 7, ARCH-LM column refers F-statistic and Chi-square values obtained from coefficients test of GARCH (1, 1), and all the coefficients are strongly significant even at the 1% level. The Ljung-Box test (Ljung & Box 1978) statistic using correlogram of standardized residuals as well as it's squared along with 24 lags is used to analysis presence of serial correlation in residual. In table 7, value of Q-stat were highly insignificant under 5% level referring that the sampled asset's return is free from serial correlation.

Furthermore, the entire procedure was applied in split data as well, and all the preliminary tests responded as similar to the whole data set. Hence, all the basic requirements for implementing conditional GARCH (1, 1) family model are fulfilled, then the empirical analysis of the conditional correlation matrix of GARCH (1, 1) model could be employed in the observed data set.

7. EMPIRICAL RESULTS

This chapter concentrates on empirical analysis, which extremely focuses to provide logical justification for the research questions stated in the introduction

section of this thesis. The core purpose of this analysis is to examine the time varying conditional correlation between stock and bond returns in the domestic capital market of CIVETS nations. In addition, it analyses the asymmetric volatility effect in conditional covariance of stock and bond returns. The result obtained from this analysis is assumed to provide relevant suggestions for investors to have better diversification opportunities in CIVETS nations. And, the empirical analysis is performed in two phases; the first phase with whole data (from 2005-2013), and the second on split data.

7.1 First Phase: Whole Data

In this phase, the analysis observes the long run time varying conditional correlation between stock and bond return by including return indices from January of 2005 to the end of 2013. The selected data set includes both normal as well as market hectic period, that is, the recent global crisis. Thus, the result obtained from this analysis would evoke what kind of conditional correlation is present in CIVETS individual capital market in the long run. Therefore, the first hypothesis for this study is, *whether there is time varying conditional correlation between stock and bond return in CIVET nations.*

The hypothesis was tested by employing two highly definite GARCH (1, 1) models; the CCC GARCH model (Bollerslev 1990) and the DCC GARCH model. As previously stated, the null hypothesis of the CCC GARCH model was the conditional correlation between assets return is constant over the period. And, the assumptions of this hypothesis helped to state that all variances of conditional covariance are time varying due to changes in each of two conditional variances. Since, this study mainly focuses on co-movement between assets of the domestic capital market, the analysis was performed on each market separately by repeating the same procedure for every economy. Moreover, the analysis was done in two simple steps; the first step was to estimate the mean equation, and then estimated variance equation. At this point, the mean equation includes μ and ω which exhibited the dependence between the lag return of assets, and variance equation used the function of past information defined by α and β parameters.

Therefore, the significance of these parameters indicates the presence of conditional heteroskedasticity in the asset's return.

Table 8: Estimation of Constant Correlation through CCC GARCH model

Here, 'μ' is the mean of the series, ω represent constant, 'α' is alpha, 'β' is beta, and 'ρ' is the constant conditional correlation of the series.

Countries	Assets	μ	ω	α	β	ρ
Colombia	Stock	0.529*	3.114*	0.268*	0.556*	0.482*
	Bond	0.233*	0.321*	0.379*	0.437*	
Indonesia	Stock	0.382*	2.464*	0.215*	0.666*	0.440*
	Bond	0.188*	0.281*	0.446*	0.516*	
Vietnam	Stock	-0.008	0.219	0.084**	0.905*	0.215*
	Bond	0.207*	0.231*	0.538*	0.547*	
Egypt	Stock	0.416**	1.860*	0.181*	0.737*	0.273*
	Bond	0.109*	0.012*	0.250*	0.791*	
Turkey	Stock	0.642*	3.927**	0.115*	0.751*	0.619*
	Bond	0.252*	0.155*	0.368*	0.617*	
South Africa	Stock	0.320***	1.615**	0.110*	0.788*	0.357*
	Bond	0.168*	0.076*	0.364*	0.606*	

*significant with 1% level
**significant with 5% level and
***significant with 10% level

Table 8 illustrates, the constant conditional correlation between stock and bond return of CIVETS nation in their respective domestic capital market. The coefficient of mean equation as well as the variance equation is positive and strongly significant in all economies, excluding stock mean return in Vietnam. The coefficient are positive and significant at the 5% level, indicates that asset returns were highly interdependent on their lag return. In addition, both assets return react in a similar manner in particular situations, that is, rise or fall together. On the other hand, negative and close to zero coefficient value of mean stock return of Vietnam refers very low inter- dependence on their lag return. On the basis of the CCC GARCH (1, 1) model, all CIVETS stock-bond returns' constant co-movement is positive and below 0.65. Vietnam has the lowest stock and bond correlation valued of 0.22 among the CIVETS nation. So, as per diversification theory, investment in bond seems to be a strong hedging tool in Vietnam, as well as great scope for

portfolio diversification. After Vietnam, investors can get good risk diversification benefits by investing in assets of Egypt and South Africa. In contrast, Turkey has the highest correlation among the CIVETS group with 0.62, since the coefficient is greater than 0.5 it could be considered as strongly correlated and have a huge probability that both assets move together by lowing diversification benefits. But, the correlation is not perfectly correlated, hence it implies that diversification could reduce risk but cannot eliminate it (for more see table 18, APPENDIX VII). Therefore, it could be believed that the investors of Turkey can have better diversification opportunities by investing in similar class assets of different markets.

Secondly, the dynamic conditional correlation (DCC) GARCH model was implemented with the null hypothesis that there is time invariant conditional correlation, and the volatility is based on lagged squared innovations and volatility of its own. Whereas, the alternative hypothesis was drawn as there is present of time variant conditional correlation, and the volatility is modelled as a linear function of square lagged errors and lagged of conditional variance. As it has been previously stated that the analysis would be done in an individual capital market separately, so all CIVETS markets (except Vietnam) rejected the null hypothesis of the DCC GARCH model, since both coefficient of δDCCI and δDCCII are non-significant at the 5% and 10% significance level (shown in table 9)

The table 9 represents the result obtained from DCC GARCH model (1, 1) employed in RATS (Regression Analysis of Time Series) software. It demonstrates evidence of time varying conditional correlation between stock and bond returns of CIVETS nations. As theoretically, the summation of coefficient assesses to δDCCI and δDCCII need to be close to 1 in order to propose that there is high chances of having time varying conditional correlation. And, the table shows that all significant markets have their summation value close to 1, where South Africa and Turkey have approximately 1, referring that these two countries have strongest chance to grab the diversification opportunities due to time varying correlation. Over the past decades, both the market is highly successful to make huge participation of investors in their respective capital markets. Whereas, remaining countries also have summation value greater than 0.5, mostly lies between 0.60 to 0.95. In

addition, both the asset's return has positive and highly significant coefficient in all the markets, only excluding mean coefficient of Vietnam stock return which has a negative value. This asset has a negative coefficient probably due to high liquidation of equity market, thus the domestic and international investors are highly participating in bond market rather than the stock. Therefore, CIVETS have extreme time varying conditional correlation between stock and bond return (except Vietnam) with better diversification opportunities.

Table 9: The Dynamic Conditional Correlation between Stock-Bond Returns

Here, 'μ' is the mean of the series, ω represent constant, 'α' is alpha, 'β' is beta, and δDCCI and δDCCII shows the dynamic conditional correlation of the series.

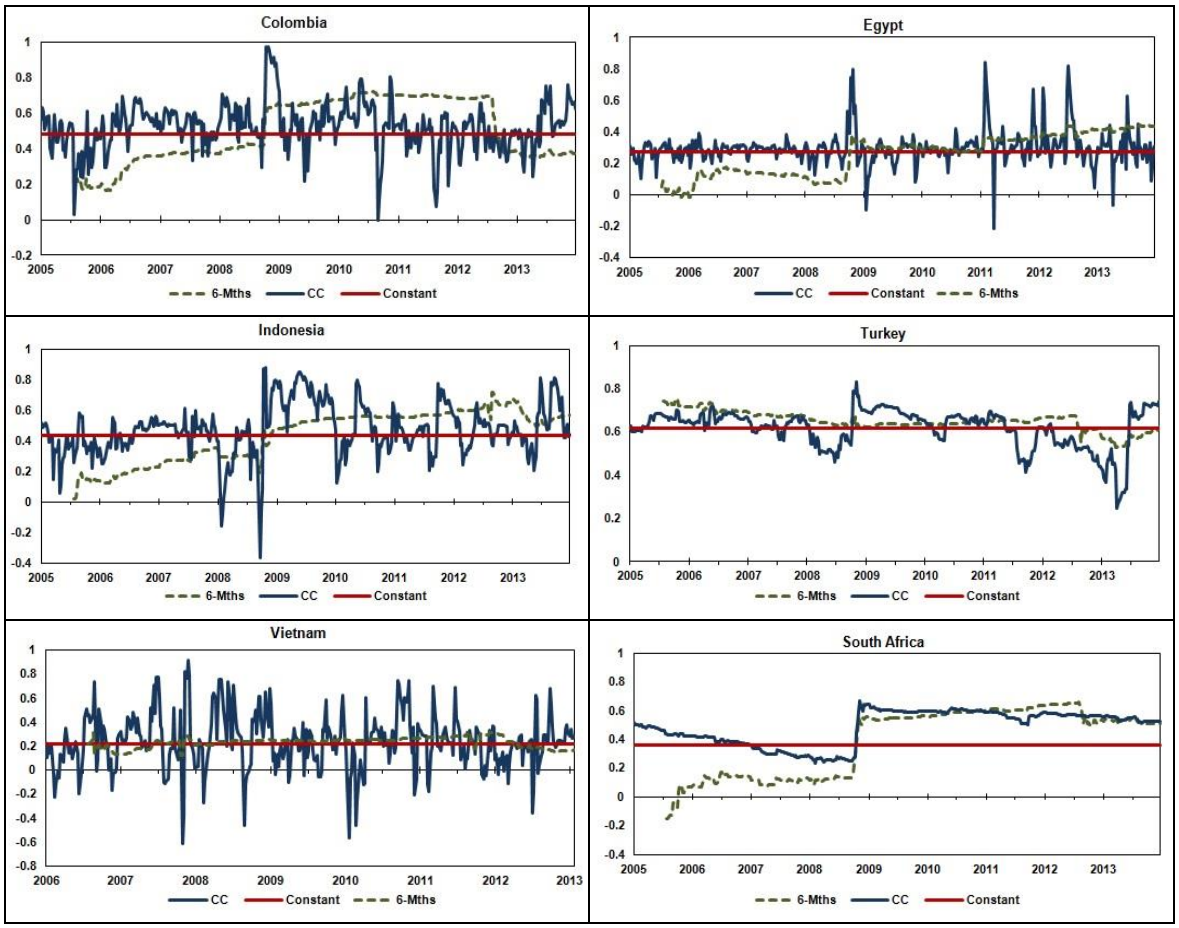
Country	Assets	μ	ω	α	β	δDCCI	δDCCII
Colombia	Stock	0.54*	3.12*	0.29*	0.56*	0.16*	0.68*
	Bond	0.25*	0.27*	0.40*	0.48*		
Indonesia	Stock	0.34**	2.12*	0.25*	0.68*	0.17*	0.77*
	Bond	0.19*	0.24*	0.47*	0.54*		
Vietnam	Stock	-0.04	23.36*	0.07*	-0.02	0.01	0.00
	Bond	0.24*	0.21*	0.40*	0.61*		
Egypt	Stock	0.42*	1.79*	0.17*	0.75*	0.12**	0.49**
	Bond	0.11*	0.01*	0.26*	0.79*		
Turkey	Stock	0.56*	3.22**	0.12*	0.77*	0.04**	0.96*
	Bond	0.24*	0.13*	0.36*	0.64*		
South Africa	Stock	0.26***	1.17**	0.12*	0.82*	0.03*	0.97*
	Bond	0.16*	0.07*	0.36*	0.65*		

*significant with 1% level
**significant with 5% level and
***significant with 10% level

The time varying conditional correlation coefficient obtained from the DCC GARCH (1, 1) model was further carried to compare with the result obtained from the *rolling window approach,* a benchmark method for dynamic conditional correlation analysis. The rolling window approach analyses the time series with an assumption that the model uses constant parameters over the observation period. The key idea of this approach is to estimate parameter over a specific rolling window which is supposed to be of fixed size during the whole analysis phase [for more see Zivot and Wang (2003) and Dopfel (2003)]. In this study, six-month rolling window has been used to analysis the rolling window correlation coefficient

for both stock and bond return, that is, estimated by dividing the weighted covariance equally over last 130 trading days and square root of the product of two 130-day estimated variance. The comparison between conditional correlation obtained from the DCC GARCH model and the Six-Months Rolling window is shown in figure 2.

The figure 2 presents three types of conditional correlations obtained from three approaches: the Constant Conditional Correlation (CCC) GARCH (1, 1) model, the Dynamic Conditional Correlation (DCC) GARCH (1, 1) model, and rolling window methods. The constant correlation of all CIVETS nations is positive and below 0.5 (except for Turkey with 0.62). So, the diversification opportunity in Turkey is relatively less than other economies of CIVETS. The CC curve denotes time varying conditional stock-bond correlation during 2005-2013 based on the DCC-GARCH (1, 1) model. The estimated correlation for all economies are highly time variant over the period, thus supporting the results of Gulko (2002), and Connolly et al. (2005). In addition, the correlation shows initially downfall from the normal level before the crisis period, then significant increment in the crisis event period (September 2008) supporting Chiang et al. (2007), and Longing and Solnik (1995), then significant decrement in correlation at the beginning of 2009. This behaviour of estimated correlation in all economies (except for South Africa and Vietnam), indicates that the investors of CIVETS economies responded similarly during the GFC periods. Further, the trend of correlation coefficient is different in each economy, such as Colombia, Turkey, and South Africa have a positive correlation throughout the observation period and enjoy decoupling benefits (for more see Gulko 2002), whereas Egypt and Indonesia have mostly positive but also had fewer periods with negative correlation and lasted for a very short period, especially during the GFC. On the other hand, the correlation coefficient of Vietnam is frequently moving from positive to negative and vice-versa over the observation period, referring occurrence of regular flight-to-quality and contagion phenomenon.

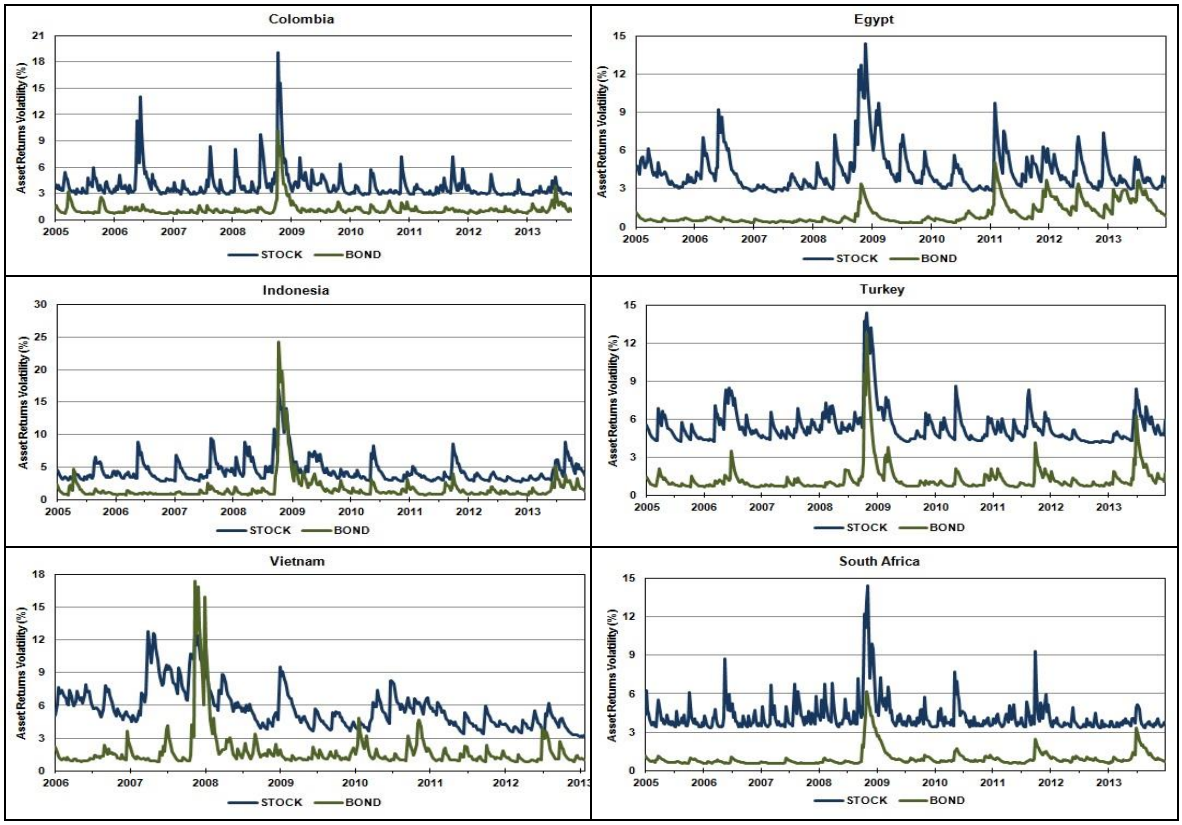


In figure, 6-mths represents the conditional correlation coefficient obtained from Six-Months Rolling Window Approach, CC refers to conditional correlation obtained from DCC GARCH model and Constant denotes to constant conditional correlation obtained from CCC GARCH model. The curves have been drawn from the result obtained after employing stock and bond return in RATS software applying the model specific equations.

Figure 2: Comparison among Estimated Conditional Correlation

In addition, figure 2 illustrations the presence of cross-asset contagion, significant increment in correlation coefficient during the market turmoil period in comparison to benchmark period (Baur & Lucey 2009) in CIVETS markets. After mid-2008 (during crisis) all the economies have significantly higher estimated correlation than normal period (Forbes & Rigobon 2002). In addition, Colombia, Indonesia, Egypt, Turkey, and Vietnam indicate to have some flight-to-safety phenomena, since during crisis period the estimated correlation seem to be negative or very low (De Goeij & Marquering 2004). Whereas, South Africa is the only economy in CIVETS nation, which has very low time variant conditional stock-bond correlation over the observation period. The third curve in figure 2 represented by 6-Mths denotes, the six month rolling window correlation coefficient. The degree of

dispersion among these three curves, mainly between Constant and 6-mths help to identify whether the economy bear dynamic conditional correlation or not. And the figure presents that all the CIVETS nations have certain dispersion among the curves (except for Vietnam), it states that CIVETS economies have extreme dynamic conditional correlation over the observation periods.



The conditional volatility curves for stock and bond returns have been drawn on the basis of volatility obtained from volatility equation applied in DCC GARCH model estimation.

Figure 3: Conditional Volatility of Stock and Bond Return

The examination of stock and bond volatility pattern has been taken as one of the essential steps for the global investors. Since, bond market volatility represents yield spreads, as well as security values (Johnson & Young 2002). And, stock market uncertainty has an important role in asset allocation. In addition, Connolly et al. (2005) found better stock-bond diversification opportunities could be obtained as an increase in volatility of the stock market. So, figure 3 demonstrates the conditional volatility of stock and bond returns in CIVETS nations. The bond market observes very low volatile in comparison to the stock market, even during the end of 2008 except for Indonesia and Vietnam. The bond volatility of these two countries is higher than stock volatility at the end of 2008, probably due to high

involvement of international investors in the bond market than in the stock market. Further, Colombia and Indonesia have highest stock volatility during observed period, while in the case of bond market, Indonesia and Vietnam have highest volatility among the CIVETS nations. And, both the situation were occurring in the particular point of time, that is, at the GFC period. As, it has been believed that stock and bond volatility would reach to its highest position when the market is pessimistic or optimistic. In addition, pessimistic situation is considered as the best time to enjoy portfolio diversification benefits.

As some recent studies (for example Cappiello et al. 2006) have suggested the idea of analysing asymmetric effects on conditional correlation, as well as the effect of unawareness about it could lead to mispricing and poor in- and out-of-sample forecasts motivated to carry the analysis in the next step. As a result, the second hypothesis of this study was developed. And, it is stated as *there is presence of asymmetric volatility effect in both stock and bond returns of CIVETS capital market*. It is always essential to have accurate variance and correlation of the asset returns while making portfolio decisions and risk managing. But, the DCC GARCH model was unable to capture the asymmetric effect in conditional correlation. So, the Asymmetric Dynamic Conditional Correlation (ADCC) GARCH model (Cappiello et al. 2006) was carried to examine the asymmetric effect in conditional variance, as well as in conditional correlation. The table 10, demonstrations the result obtained from ADCC GARCH (1, 1) model, which includes similar elements as of the DCC GARCH model but with an additional asymmetry measuring parameter ‘γ’.

Table 10 presents interesting result of having positive coefficient value in both asset returns, as well as in asymmetric parameters in all CIVETS markets. It indicates that both conditional variance and conditional correlation response highly to joint negative shocks than towards positive news of the same magnitude. So, the conditional correlation and variance of stock-bond return of CIVETS nation increases during market turmoil than the normal situation. The Colombian, Indonesian, Egyptian, and Turkish bond returns have higher positive asymmetric in comparison to stock return, whereas Vietnamese and South African stock return have higher positive asymmetries than bond returns. It illustrations that the

Vietnamese and South African stock return becomes highly volatile than bond return towards any kind of negative shocks in the financial market. On the other hand, bond return of Colombia, Indonesia, Egypt, and Turkey are more sensitive to negative shocks than the stock market.

Table 10: Estimation of Asymmetric Volatility Effect using ADCC GARCH model

Here, 'μ' is the mean of the series, 'ω' represent constant, 'α' is alpha, 'β' is beta, 'γ' represent the asymmetric information in the series, and δDCCI and δDCCII shows the dynamic conditional correlation of the series.

Country	Assets	μ	ω	α	β	γ	δDCCI	δDCCII
Colombia	Stock	0.46*	3.93*	0.16**	0.50*	0.26**	0.18*	0.63*
	Bond	0.20*	0.26*	0.21*	0.52*	0.27*		
Indonesia	Stock	0.20*	2.63*	0.13*	0.65*	0.21*	0.18*	0.74*
	Bond	0.12*	0.25*	0.20*	0.55*	0.46*		
Vietnam	Stock	1.98*	1.83*	0.06*	0.79*	0.29*	0.57*	0.70*
	Bond	0.57*	0.36*	0.65*	0.52*	0.25*		
Egypt	Stock	0.27	1.78*	0.09**	0.74*	0.17*	0.12*	0.52**
	Bond	0.07*	0.01*	0.11*	0.79*	0.30*		
Turkey	Stock	0.23	4.52*	0.02	0.74*	0.17*	0.04**	0.96*
	Bond	0.16*	0.15*	0.03	0.66*	0.49*		
South Africa	Stock	0.27**	6.69*	0.18*	0.39*	0.17*	0.01	0.99*
	Bond	0.15*	0.06*	0.10*	0.77*	0.15*		

Notes: *significant with 1% level
**significant with 5% level and
***significant with 10% level

In a similar way to DCC GARCH model, the summation value of the dynamic conditional correlation need to be closer to one. And, the table 10 displays that South Africa and Turkey have a very close value to unity, whereas Indonesia, Colombia and Egypt summation value are quite far from 1 but lies between 0.64 – 0.92. On contrast, an interesting result is seen in Vietnam market, that is, the summation value is greater than unity value along with a strongly significant coefficient. Hence, in case of Vietnam, ADCC-GARCH (1, 1) could not provide reliable output. Nevertheless, these models help to conclude that there is time varying stock-bond conditional correlation in each domestic capital market of

CIVETS nations, which can provide better opportunities for investors to diversify their portfolio. Moreover, the positive asymmetric volatility effect in both stock and bond return of CIVETS refers that these market are highly enticing for portfolio diversification especially during market panic period.

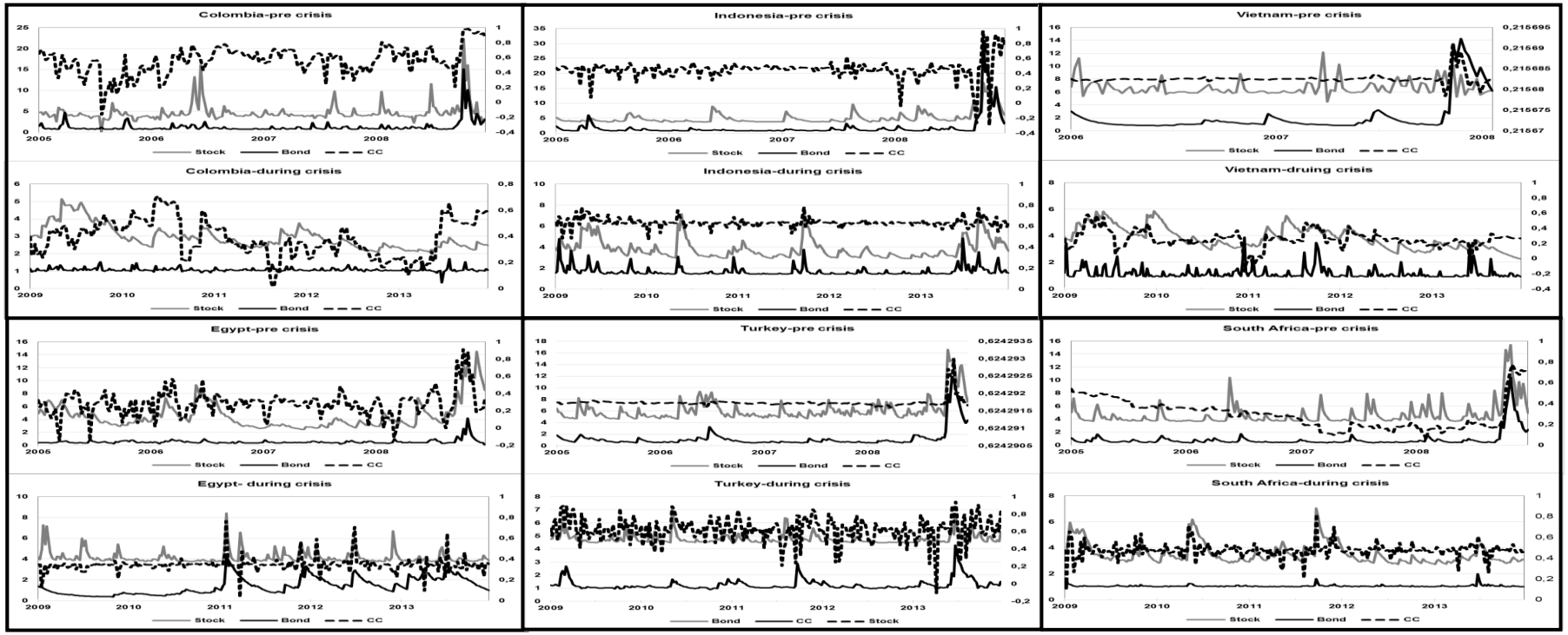
7.2 Second Phase: Split Data set

The main objective of this phase is to obtain reliable answer of the last research question of this thesis, which is stated in introductory chapter. In this phase, all the procedures of previous phase are repeated, and the only changes that have been made was the number of observation and time frame. The whole data set used in first phase has been divided into two parts; first part begins from January 2005 to December 2008 just after the actual effect of the GFC of September 2008, and second part starts from January 2009 to December 2013. Hence, the third hypothesis for this study is stated as *there is increase in time varying conditional correlation between stock and bond during crisis period or market volatile period*.

The third hypothesis was assumed to be vague, so it was further divided into two small hypotheses. The first sub-hypothesis would analyse whether there is time-varying conditional correlation in both pre-crisis and during-crisis period, as well as it observes whether the stock-bond returns during-crisis are highly correlated than pre-crisis period. The first step began by estimating constant conditional correlation of each economy in both the situation by employing CCC-GARCH (1, 1) model as in first phase. The result of CCC- GARCH (1, 1) model for pre-crisis and during-crisis are presented in table 14 and 15 (shown in APPENDIX IV) respectively. Both the tables display positive and strongly significant coefficient values of mean and variance equation. As it has been already stated that it denotes high interdependent between the lag returns of the assets return. Unsurprising, in this phase also the coefficient of Vietnam stock has negative mean coefficient, and both the means are non-significant, indicating that the return of assets are not dependent on its lags. In pre-crisis period, Egypt has the lowest constant correlation, whereas Turkey has the highest correlation among the CIVETS nations On the other hand, Vietnam has the lowest constant correlation

coefficient and Turkey continuous to have the highest constant correlation coefficient even during the crisis (as in first phase).

After estimation of constant correlation, the next step was to implement the DCC GARCH model in the split data. The model provided two interesting results; first, in pre-crisis period Vietnam and Turkey were unable to reject the null hypothesis of having constant correlation. Secondly, during crisis period Vietnam had the extreme time varying correlation among CIVETS. The results are shown graphically while comparing conditional correlation obtained from the DCC GARCH model and the Six-Months Rolling window approach (see Figure 7 and Figure 8, APPENDIX V). The figures show that Colombia, Egypt, Indonesia, and South Africa have certain dispersion between the conditional correlation and six month rolling window correlation, whereas Turkey and Vietnam have constant correlation. In addition, Turkey has new constant conditional correlation that is lower than constant correlation estimated by the CCC GARCH model. So, it could be perceived that Turkey could be less challenging than for the investors in Vietnam due to the strong evidence of constant conditional correlation between stock and bond returns. And, over the recent years it has found that the bond and stock returns are highly time variant and strongly correlated during market turmoil. Hence, figure 4 helps to identify whether CIVETS nations stock-bond correlation gets stronger during crisis period or not.



Here, it includes three curves; first stock volatility, second bond volatility, and third conditional correlation. The main objective is to compare the average conditional correlation of pre-crisis and during crisis period. The curves of pre-crisis show that at the end year 2008, there is high fluctuation in both stock and bond which ultimately increase the conditional correlation between these two assets return. The left hand side scale represent volatility, whereas right hand scale shows correlation coefficient.

Figure 4: Increase/Decrease of Conditional Correlation on Split Data

Figure 4 presents, the relationship between stock-bond volatility and conditional correlation during the observed period. In figure, each cell consists of two sub-figures; the upper figure represents relationship of volatility and correlation during pre-crisis period whereas lower figure shows similar relationship but during crisis period. The stock and bond volatility are obtained from DCC GARCH model which tries to show the variance of asset returns. As per the figure, there is strong relationship between stock market volatility, as well as bond market volatility with conditional correlation between stock-bond returns, since at the end of 2008 (see end of upper figure) all three curves have significantly raised up. So, it could be clearly stated that the shocks in the financial market makes the stock and bond conditional correlation more positively stronger. Further, while comparing the conditional correlation obtained in two phases, a mixed result has been obtained. Indonesia, Vietnam, Egypt, and South Africa have higher level of average time-varying conditional correlation, whereas Vietnam and Turkey have lower average conditional correlation during crisis period than the pre-crisis period. And, the last step was to analysis the asymmetric effect in the split data by the help of the ADCC-GARCH model. The result obtained from the model is shown in table 16 and 17 (presented in APPENDIX VI), which illustrate that all the assets of CIVETS nation response highly to negative shocks, excluding for Colombian assets. Although, Colombia demonstrated to have negative asymmetric volatility in both the assets during crisis period, the negative coefficient of asymmetric effect in stock market is non-significant even at 10% level, so it could have better portfolio diversification benefits in CIVETS markets during both situations.

8. CONCLUSION

Analysis of time variant conditional correlation has been acknowledged as one of the most important input for portfolio diversification. The main objective of this thesis was to examine whether there is portfolio diversification opportunities in emerging markets by examining the conditional correlation between stock and bond returns. And, for the analysis purpose, this study has considered CIVETS (Colombia, Indonesia, Vietnam, Turkey, and South Africa) as the appropriate and effective market, since it includes frontier emerging countries from different geographical local of the world with unique macro-economic backgrounds and rapid growing economic performance. These countries implicit to have extreme dynamic conditional correlation over the period, in addition it has been seen that such emerging countries normally have very low or negative correlation between stock and bond returns. Generally, it has been said portfolio diversification opportunities could be achieved in maximum level when the correlation between or among the assets of portfolio are low. Furthermore, analysis of asymmetric volatility effect in both stock and bond return was the secondary objective of this study. Since, presence of such effect has significant effect on the portfolio diversification decisions.

This study has applied highly advanced form of ARCH/GARCH (1, 1) volatility model known as DCC GARCH (1, 1) model, proposed by Engle (2002). This model is generalized form of CCC GARCH model (Bollerslev 1990) with the assumption of time invariant conditional correlation and variant conditional variance matrix. Hence, both CCC and DCC GARCH models were implemented in the empirical phase to analyze the nature of conditional correlation. In addition, for more assurance six-months rolling window method, benchmark model for time-variant correlation analysis, has been run against DCC GARCH model. Furthermore, the asymmetric form of DCC GARCH model proposed by Cappiello, Engle et al. (2006) has also been used to cover the limitation of the DCC model that is ignoring asymmetric effect in correlation. This model was employed with a motive to examine whether there is positive or negative innovation effect in both asset returns, so that it could help to make portfolio diversification decision during crisis period.

As per CCC GARCH model, Vietnam and Egypt are the two best market in CIVETS with very low constant conditional correlation between stock and bond return. Whereas, investment in Turkish securities market seem to be more challenging among CIVETS during market crisis period, as other economies have correlation less than 0.50. Turkey have strongly correlated capital market probably due to the high sensitiveness towards global market. On contrast, DCC GARCH model resulted that Vietnam could have constant conditional correlation rather than time varying correlation, since its summation value of dynamic conditional coefficient is equal to zero. And unsurprisingly, six-months rolling conditional method also concluded with similar result, because 6-months rolling window and constant conditional coefficient lied close to each other, indicating to have conditional time varying correlation nearly close to constant correlation. Hence, CIVETS nations, expect Vietnam assume to have the time varying conditional correlation between stock and bond returns. Furthermore, the ADCC GARCH model reveals that both stock and bond return of CIVETS have positive asymmetric volatility effect, indicating that both asset returns tend to response highly on bad news rather than good news. So, these market could be considered as better portfolio diversified economies.

Moreover, the empirical analysis was done in split dataset using all three GARCH models in two sets as pre crisis and during crisis. Again, in both the cases the models stated that there is better opportunities to have portfolio diversification in CIVETS due to its time varying conditional correlation nature and presence of positive asymmetric volatility effect. And, the comparison between average time-varying conditional correlations presented mixed behavior in changing trend, since correlation coefficient has increased in Indonesia, Vietnam, Egypt, and South Africa, whereas Colombia, and Turkey’s stock-bond correlation have decreased reflecting that during high volatility these assets provide huge portfolio diversification.

In present context, analysis of CIVETS capital market could be taken as an important empirical analysis among the emerging market for the global investors to diversification their portfolio. The stock-bond returns of this group have superior opportunities to optimize the return of rational investors. This thesis could be

helpful for those individual and institutional investors who are looking forward for investment in CIVETS nations or similar emerging economies, since it has used recent data and had tried to analysis the effect of current global crisis. Furthermore, it could also be supportive for the future studies which would be done on CIVETS market based on diversification and asset allocation strategies too.

Eventually, it would be motivating to perform asset allocation strategies in CIVETS capital market. This could enhance investor to allocate the assets within the domestic as well as intra group market. In addition, advance analysis could also be done by including major trade partners of each member country, meanwhile these countries are the one who might be highly interested to diversify their risks. Further, a comparison analysis using similar time frame and models in BRIC and CIVETS markets could too be done to analyze whether CIVETS are actually suitable market for diversification than BRIC.

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APPENDIX I: *Market Capitalization of listed companies*

Table 11: Market Capitalization of CIVETS

Market Capitalization is the share price times the number of shares outstanding. World Bank data has listed only those domestic companies which are domestically incorporated on the country's stock exchange at the end of the year 2012. Listed companies do not include investment companies, mutual funds, or collective investment vehicles

Here, the first value in particular cell indicates the market capital value in billion US dollar, second shows the annual percentage of GDP equal to market capitalization value and the final value within parameter provides information about the number of companies listed in particular domestic stock exchange.

Country	2005	2006	2007	2008	2009	2010	2011	2012
Colombia	46.0	56.2	102.0	87.0	133.3	208.5	201.3	262.1
	31.4 %	34.5 %	49.1 %	35.7 %	57.0 %	72.6 %	60.0 %	70.8 %
	(114)	(114)	(96)	(96)	(86)	(84)	(79)	(76)
Indonesia	81.4	138.9	211.7	98.8	178.2	360.4	390.1	396.8
	28.5 %	38.1 %	49.0 %	19.4 %	33.0 %	50.8 %	46.1 %	45.3 %
	(335)	(344)	(383)	(396)	(398)	(420)	(440)	(459)
Vietnam	0.5	9.1	19.5	9.6	21.2	20.4	18.3	32.9
	0.8 %	13.7 %	25.2 %	9.7 %	20.0 %	17.6 %	13.5 %	21.1 %
	(33)	(102)	(121)	(171)	(196)	(275)	(301)	(311)
Egypt	79.67	93.48	139.29	85.89	89.95	82.49	48.68	58.01
	88.8 %	87.0 %	107%	52.7 %	47.6 %	37.7 %	20.6 %	22.1 %
	(744)	(603)	(435)	(373)	(305)	(213)	(231)	(234)
Turkey	161.5	162.4	286.6	117.9	225.7	306.7	201.8	308.8
	33.4 %	30.6 %	44.3 %	16.1 %	36.7 %	41.9 %	26.0 %	39.1 %
	(302)	(314)	(319)	(317)	(315)	(337)	(362)	(405)
South Africa	565.4	715.0	833.5	491.3	704.8	635.3	523.0	612.3
	229 %	274 %	291 %	180 %	248 %	174 %	129 %	160 %
	(388)	(401)	(422)	(379)	(363)	(360)	(355)	(348)
Source: World Bank 2013								

APPENDIX II: Descriptive Statistic for Split Data

A. Descriptive Statistic for Pre-Crisis Period

Table 12: Descriptive Statistic for Pre-Crisis Period

	Asset	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs.
Colombia	Stock	0.35	4.89	-1.79	10.58	609.05	0.00	208
	Bond	0.14	1.76	-2.56	29.39	6261.62	0.00	208
Indonesia	Stock	0.14	5.24	-1.24	6.99	191.16	0.00	208
	Bond	0.03	3.42	-2.56	39.81	11970.79	0.00	208
Vietnam	Stock	-0.35	7.06	0.24	3.35	1.58	0.45	108
	Bond	-0.01	2.75	-0.39	37.55	7961.32	0.00	108
Egypt	Stock	0.37	4.86	-1.29	7.34	220.76	0.00	208
	Bond	0.08	0.61	-2.08	23.11	3655.84	0.00	208
Turkey	Stock	-0.01	6.60	-0.18	5.54	57.13	0.00	208
	Bond	0.10	2.01	-1.75	32.93	7869.43	0.00	208
South Africa	Stock	0.02	5.13	0.16	8.20	235.11	0.00	208
	Bond	0.04	1.33	-1.53	25.69	4541.70	0.00	208

B. Descriptive Statistic for Crisis Period

Table 13: Descriptive Statistic for Crisis Period

	Asset	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.
Colombia	Stock	0.37	3.06	-0.17	4.61	29.23	0.00
	Bond	0.16	1.08	-0.53	4.76	45.67	0.00
Indonesia	Stock	0.36	3.93	0.13	5.36	61.10	0.00
	Bond	0.23	1.69	-0.03	5.85	87.83	0.00
Vietnam	Stock	0.06	3.94	0.18	4.80	36.37	0.00
	Bond	0.23	1.21	-0.01	6.35	121.82	0.00
Egypt	Stock	0.11	4.22	-0.38	5.37	66.78	0.00
	Bond	0.11	1.45	-0.27	8.85	374.21	0.00
Turkey	Stock	0.22	4.75	-0.52	3.53	14.58	0.00
	Bond	0.16	1.37	-1.03	8.87	419.99	0.00
South Africa	Stock	0.27	3.64	-0.15	4.23	17.43	0.00
	Bond	0.17	1.04	-0.91	9.92	554.66	0.00

APPENDIX III: Cluster Volatility

A. Clustering Volatility in Stock Market

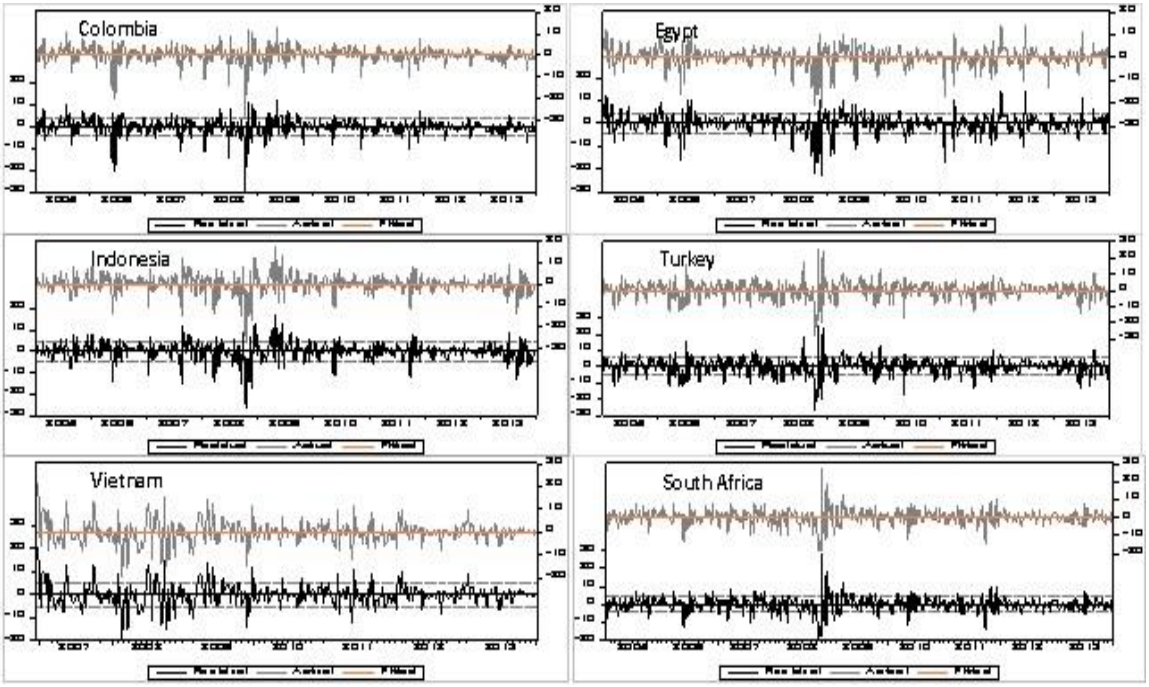

Figure 5: Clustering Volatility in Stock Market

B. Clustering Volatility in Bond Market

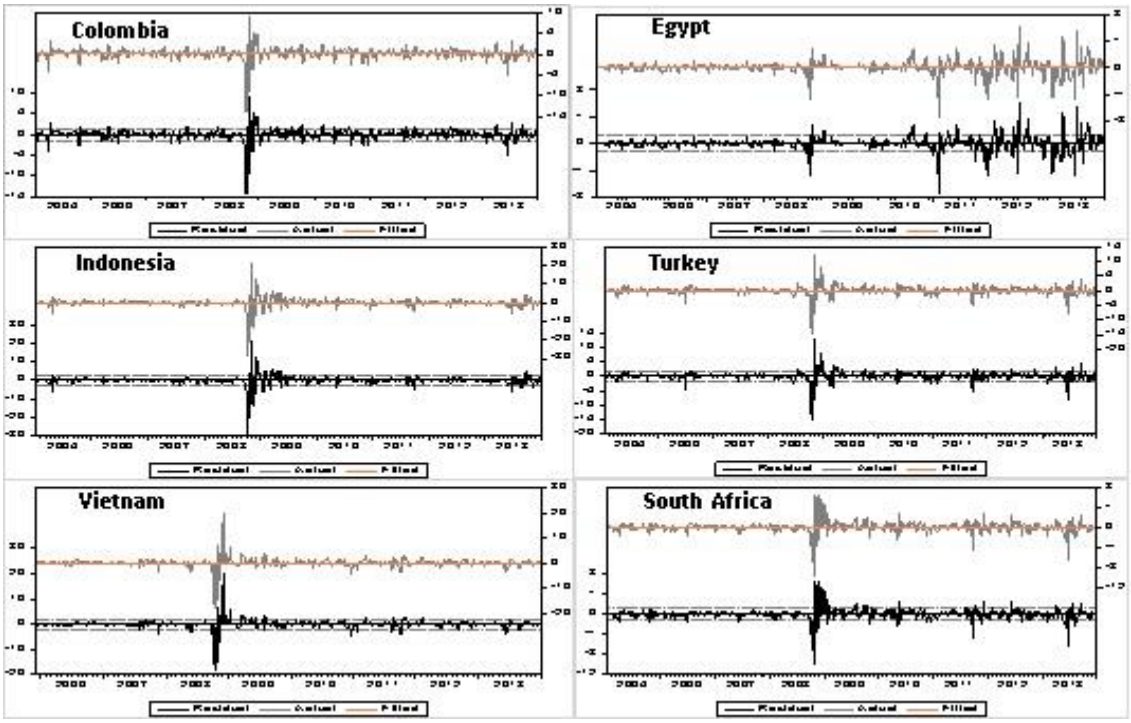

Figure 6: Clustering Volatility in Bond Market

APPENDIX IV: CCC GARCH Model on Split Data

A. CCC GARCH model during Pre-Crisis

Table 14: CCC GARCH (1, 1) during Pre-Crisis

Countries	Assets	μ	ω	α	β	ρ
Colombia	Stock	1.009*	6.762*	0.333*	0.427*	0.566*
	Bond	0.278*	0.462*	0.727*	0.124*	
Indonesia	Stock	0.518***	3.230**	0.200*	0.689*	0.351*
	Bond	0.154*	0.344*	0.832*	0.279*	
Vietnam	Stock	-0.986	8.429	0.343***	0.507*	0.213**
	Bond	0.066	0.044	1.741*	0.451*	
Egypt	Stock	0.790*	1.492***	0.393*	0.610*	0.186*
	Bond	0.111*	0.051*	0.260*	0.564*	
Turkey	Stock	0.858**	5.517***	0.163*	0.704*	0.681*
	Bond	0.213*	0.109*	0.484*	0.575*	
South Africa	Stock	0.331	5.936***	0.189**	0.524**	0.220*
	Bond	0.145*	0.074*	0.656*	0.374*	

Notes: *significant with 1% level
**significant with 5% level and
***significant with 10% level

B. CCC GARCH model during Crisis Period

Table 15: CCC GARCH (1, 1) during Crisis Period

Countries	Assets	μ	ω	α	β	ρ
Colombia	Stock	0.173	0.435	0.068***	0.880*	0.392*
	Bond	0.174*	0.185***	0.104***	0.733*	
Indonesia	Stock	0.279	1.856**	0.179*	0.690*	0.537*
	Bond	0.198**	0.236*	0.178*	0.716*	
Vietnam	Stock	0.022	0.142	0.059	0.928*	0.248*
	Bond	0.234*	0.925*	0.565*	-0.050*	
Egypt	Stock	0.205	8.244**	0.174**	0.367	0.308*
	Bond	0.147*	0.013**	0.287*	0.789*	
Turkey	Stock	0.359	18.970	0.065	0.086	0.620*
	Bond	0.203*	0.464*	0.156*	0.582*	
South Africa	Stock	0.303	0.813	0.103*	0.829*	0.445*
	Bond	0.226*	0.131*	0.192*	0.693*	

Notes: *significant with 1% level
**significant with 5% level and
***significant with 10% level

APPENDIX V: Conditional Correlation Comparison on Split Data

A. Comparison Among Three Models During Pre-Crisis

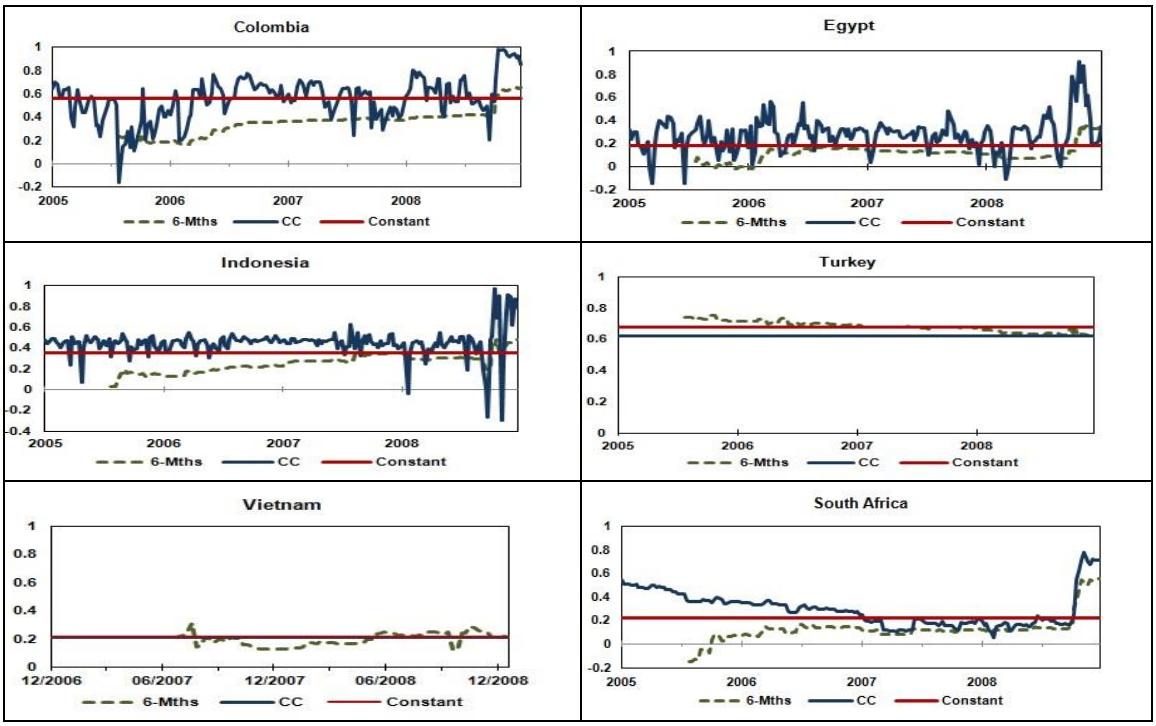

Figure 7: Conditional Correlation Comparison During Pre-Crisis

B. Comparison Among Three Models During Crisis Period

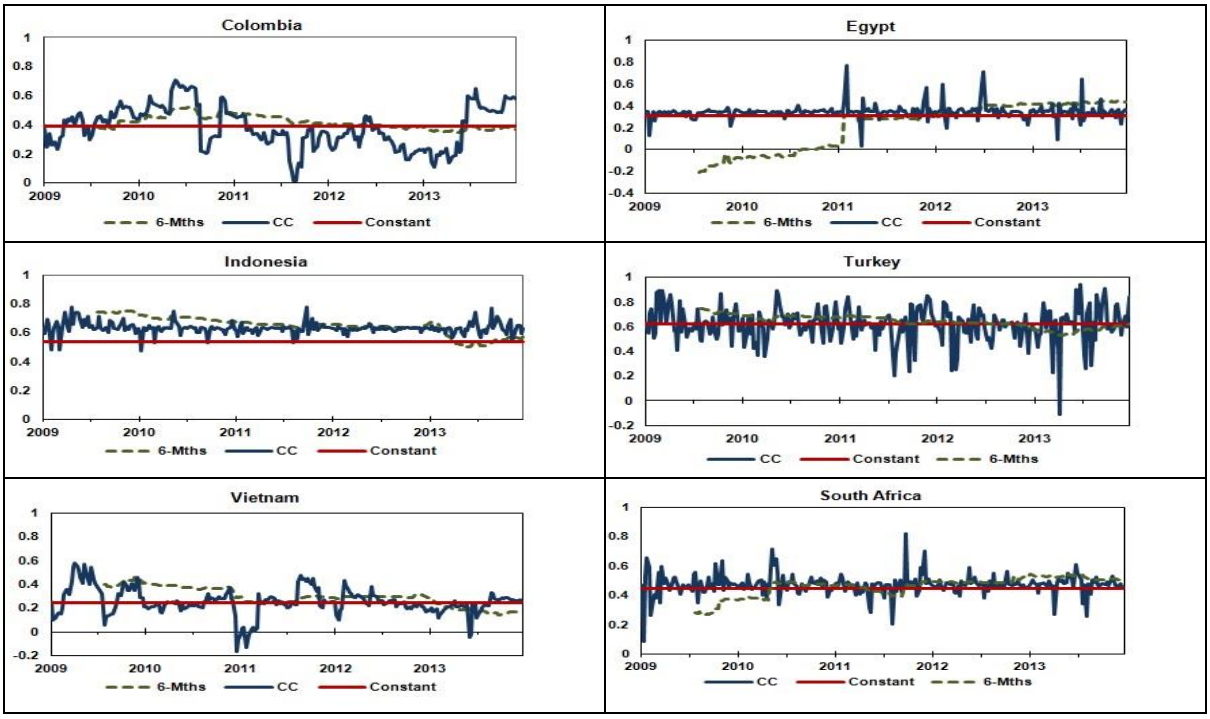

Figure 8: Conditional Correlation Comparison During Crisis

APPENDIX VI: Asymmetric Effect on Split Data

A. Asymmetric Effect During Pre-Crisis

Table 16: ADCC GARCH (1, 1) model during Pre-Crisis Period

Countries	Asset	μ	ω	α	β	γ	δDCCI	δDCCII
Colombia	Stock	0.61*	11.19*	-0.16*	0.28*	0.73*	0.26*	0.66*
	Bond	0.24*	0.42*	0.39*	0.13*	0.71*		
Indonesia	Stock	0.05	5.43*	-0.03	0.63*	0.37*	0.31*	0.13
	Bond	0.05	0.35*	0.01	0.42*	1.09*		
Vietnam	Stock	-0.63	38.94*	0.22*	-0.13**	0.11	0.00	0.35
	Bond	0.10**	0.17*	0.11*	0.72*	0.38*		
Egypt	Stock	0.80*	1.40*	0.21*	0.73*	0.05	0.20*	0.49*
	Bond	0.13*	0.08*	-0.16*	0.42*	0.89*		
Turkey	Stock	0.60*	10.77*	0.17*	0.47*	0.13**	0.00	0.77**
	Bond	0.17*	0.07*	0.15*	0.68*	0.30*		
South Africa	Stock	-0.01	8.92*	0.03	0.33*	0.50*	0.02*	0.98*
	Bond	0.11*	0.06*	0.16*	0.48*	0.73*		

Notes: *significant with 1% level
**significant with 5% level and
***significant with 10% level

B. Asymmetric Effect During Crisis Period

Table 17: ADCC GARCH (1, 1) model during Crisis Period

Countries	Asset	μ	ω	α	β	γ	δDCCI	δDCCII
Colombia	Stock	0.18	0.37	0.08	0.88*	-0.03	0.06**	0.89*
	Bond	0.17*	0.90*	0.22	0.16	-0.25**		
Indonesia	Stock	0.41*	2.76*	0.08*	0.67*	0.15*	0.07	0.00
	Bond	0.28*	1.66*	0.06*	0.21*	0.45*		
Vietnam	Stock	-0.07	0.31	0.06	0.91*	0.03	0.07	0.77*
	Bond	0.25*	0.84*	0.36*	0.02	0.30		
Egypt	Stock	0.18	8.68*	0.06	0.38*	0.12**	0.08	0.00
	Bond	0.16*	0.02*	0.07*	0.84*	0.20*		
Turkey	Stock	0.40**	11.97*	0.04	0.40*	0.07	0.33*	0.00
	Bond	0.19*	0.32*	-0.04*	0.70*	0.27*		
South Africa	Stock	0.21	1.45*	0.05*	0.77*	0.14*	0.10***	0.00
	Bond	0.17*	0.74*	0.06***	0.27*	0.01		

Notes: *significant with 1% level
**significant with 5% level and
***significant with 10% level

APPENDIX VII: Correlation Coefficient

Table 18: Interpretation of Correlation Coefficient in Diversification

Asset's Correlation Range	Diversification Value in Portfolio
Negative	Outstanding
0.0 to 0.5	Excellent
0.5 to 0.6	Very Good
0.6 to 0.7	Good
0.7 to 0.8	Ok to poor
0.8 to 0.9	Poor to Bad
0.9 to 1	Worthless