CHAPTER 4

REVIEW OF LITERATURE
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4.1. Introduction

Literature on market interdependence can be broadly categorized into three groups: the first group has investigated only the presence of market interdependence. This type of research has demonstrated existence or lack of interdependence among specific variables during the specific time period by using statistical methods and econometric models, for instance, Islami (2011), Sumner, Johnson and Soenen (2010).

The second group consists of some studies which consider the impacts of some special events, such as financial liberalization, regulation and policy changing, financial crisis, and any other event which affect the markets behavior. These types of study investigate the financial market interdependence for pre and post-periods of the events. In this type of study, the researcher may also consider the event as a dummy variable to assess the impact of this variable on the issue of interdependency. For example, Cho and You (2011) studied the fluctuations of the stock market in South Korea in the currency crisis of 1997 and the financial crisis of 2008. Beine and Candelier (2011) investigated the impact of financial liberalization on the co-movement of stock market in emerging economies. Connolly and Wang (2003) studied the influence of macroeconomic news announcements on equity market co-movement in the UK, the US, and Japan. Granger, Huangb & Yang (2000) investigated the Granger relation between stock prices and exchange rates in Asian countries affected by Asian financial crisis in 1997.

The third group includes some other studies which attempted to find the determinants and influential factors of financial markets interdependence. Regarding the determinants of cross-border market interdependency, researchers specified a few factors
such as macroeconomic interdependency, contagion effect, and the similarities of market characteristics (Pretorius 2002; Brockman, Liebenberg & Schutte 2010).

On the subject of market interdependence, several factors have been identified to justify the relationship among financial markets, which among are: liberalization and financial reforms, inflation and interest rate, monetary policies, business cycles, as well as activities and industries’ structural of companies: (Chan, Tse, & Williams, 2011; Chen & Rogoff, 2003; Chen, 2002; Chen, Rogoff & Rossi, 2010; Cashin, Céspedes & Sahay, 2004; Gagnon, 2009; Granger, Huang and Yang, 2000; Nicolau, 2010; Gagnon, 2009; Murphy, 1991).

This chapter is divided into two sections namely: Literature Review of Cross-Markets Relationship and Literature Review of Cross-border Markets Relationship. The background of the study is presented in these sections which include literature on internal and international financial markets as well.

4.2. Literature Review on Cross-Markets Relationship

Financial markets’ interdependence constitutes a considerable part of research literature in the economics and finance fields. Though, the theoretical explanations are clear in this regard, the empirical evidences attained from researches are not compatible with one another on the one hand and with the content of the respective theories on the other.

The existing empirical literature on the analysis of financial markets interdependence has focused on the relationship among various domestic asset classes or
cross border (international) interdependency across the same asset market. Hence literatures on financial market interdependence is provided in two categories include internal (domestic) and cross border (international) financial market interdependence.

In this section, literature for each pair of the variables is reviewed and it consists of currency, commodity, bond, and stock market.

4.2.1. Currency-Commodity Markets Literature

Chen, Tse, and Williams (2011) analyzed the statistical data of four countries, namely New Zealand, Canada, South Africa and Australia to study the relationship between future commodity market and the exchange rate. They have found out that in these countries, there was a relationship between the two variables of commodity price and exchange rate but it was not the causal one.

Chen, Rogoff, and Rossi (2010) used quarterly data in commodity and currency markets in the countries exporting commodity and studied the relationship between these two variables. The results of their research showed that money in the commodity exporting countries had a much greater power in predicting the world price of commodity compared to the commodity price in predicting the exchange rate of currency.

Hammoudeh and McAleer (2009) examined the relationship between commodity spot prices comprising aluminum, copper, gold, and oil and the US dollar/euro exchange rate in USA for the period of 1999-2007. Findings of their study showed that regarding exchange rate and commodities there was direct and indirect volatility and shocks transmissions, particularly among the oil, gold and exchange rate.
Clements and Fry (2008) investigated the relationship between exchange rate and commodity price in the countries exporting commodity and identified weak evidences on the effect of commodity on currency. Contrary to that, the results of their research showed a strong impact of currency on commodity.

Broda (2004) compared the effect of negative and positive shocks extant by using economic data of 75 countries within terms of trade (export and import of commodities) of countries on three factors include GDP, the real exchange rate, and the commodity price. The Researcher found out that the response of the studied variables to the positive and negative shocks within terms of trade was symmetric within the floating exchange rate system and asymmetric within the fixed exchange rate system. It means that in the floating exchange rate system, one negative shock within terms of trade had a great effect on the exchange rate and a minor impact on GDP compared to the positive shocks.

Cashin, Cespedes, and Suhay (2004) tried to answer the question that whether the exchange rate in the commodity exporting countries and the real commodity price in these countries move together in the course of time. Data in their research included 58 countries during 1980-2002. The results of their research revealed that the two mentioned variables had a long term co-movement only in one-third of the countries under study.

Chen and Rogoff (2003) investigated the behavior of the two variables namely exchange rate and the commodity price in the same three countries of Australia, Canada and New Zealand as the three important countries exporting commodity. They have found that in Australia and New Zealand, the price of exported commodity had a very strong
effect on the exchange rate in those countries but in Canada, these two variables had integrated relationship only in the long run.

Chen (2002) studied the relationship between the exchange rate and commodity price in Australia, Canada and New Zealand as the three important countries being members of Organization for Economic Co-operation and Development (OECD) during 1973-2001. The findings indicated that the exchange rate had a robust response to the moves of world prices of the exported commodities.

4.2.2. Currency-Bond Markets Literature

Jahjah, Wei, and Yue (2013) studied the effect of polices determining currency rate on pricing the international bond in 42 developed countries. They reached at the conclusion that policies for determining the currency rate are effective on the bond return. It is so much as that the countries having the flexible exchange rate system are more inclined to pay the higher rate of return on the bonds.

Clarida (2013) studied the changes in bond return and exchange rate in England, Japan and European Union for the period of 2001-2011. The findings showed that only 30 to 60 percents of the daily changes of exchange rate by the simultaneous changes in the fair value of bonds can be explained. This means that the effect of bond is not so much strong on the exchange rate.

Bansal and Shaliastovich (2013) investigated the relationship between the bond risk and uncertainty in predicting the economic growth and inflation in America and England in the years 1969-2010. They reached the conclusion that the bond return in any
of these countries was related to the prediction of foreign currency return in both short and long term horizon.

Sanati (2010) examined financial integration among foreign exchange, capital market, and money market (91-day Treasury Bill rate and the 10-year government bond) both on the domestic market in Indian and international markets consist of Italy, Germany, UK, US, Korea, China, and Brazil markets by using data for international markets from 1990 to 2007 and for domestic markets from 1997 to 2007.

The cointegration test in this study revealed the relationship among the domestic capital, money, and foreign exchange markets with robust co-movement between the foreign exchange and short-term money markets, researcher also pointed out that in Indian call money market rates the Law of One Price (LOOP) was observed.

A cross-country analysis on the short-term inter-bank rate showed cointegration among countries while, result of investigation and the 10-year government bond yield and the 91-day Treasury bill rate revealed very weak cross-border cointegration.

Gagnon (2009) investigated the relationship between the government bond and the exchange rate in great industrial countries. In this research, the currency crises are focused on the period of 1975-2004. The results of this research show that a decrease in currency value leads into a decrease in bond return (the increase of bond value). In other words, a decrease in currency value caused an increase in bond value.

Alexius and Sellin (2002) analyzed the differences between the two groups of the long-term bonds issued based on American dollar and German mark. The results of study
showed that the gained beta coefficient was 60 percent. Therefore, the assumption of return equality from investment in two groups of short and long-term bonds based on mark and dollar cannot be rejected. The researchers concluded that there was not a significant relationship between the exchange rate and long-term bond return.

Sturges (2000) in an investigation regarding the relationship between bonds and the exchange rate, reached at the result that the bonds’ return of the countries, namely England, Canada, Japan and Germany for the American investors had positive correlation with the currency return of those countries during the years 1980-1990, while, the investors in England, Germany, Canada, Japan encountered a negative correlation between the bonds’ return and dollars return of America during the same period for investing in the America’s bonds.

4.2.3. Currency-Stock Markets Literature

Patro, Wald and Wu (2014) and Glen (2002) studied the reaction of the stock market against the reduction of national currency value by the central banks in different countries. In both studies the researchers gained the same results that the stock markets had faced negative return months before the announcement of the reduction of national currency value.

Cho and You (2011) studied the fluctuations of the stock market in South Korea in the currency crisis of 1997 and the financial crisis of 2008. Data in their research covered the time period of 1980-2009. The results of their research indicate that the fluctuation of the stock return was more at the time of currency crisis than financial crisis period.
Islami (2011) investigated the Interdependence between Stock Markets and Foreign Exchange Markets in two groups of European Countries including four accession countries (Poland, Czech Rep., Slovenia, & Hungary) and four cohesion countries (Ireland, Portugal, Spain, & Greece) to examine the relationship between nominal exchange rate and stock market index. This study is based on the monthly data, from 1986 to 2008. The cointegration model for testing the long-term relationship, the VAR approach for short-term, and Finally, Granger causality tests for identification of the exogenous and endogenous variable were employed. The findings of this study showed that in five out of eight countries, significant links were observed between the foreign exchange rate and stock market index. The result surprisingly confirmed that there was a causation direction running from stock market index to the foreign exchange market.

Chattopadhyay and Gupta (2010) investigated integration among domestic financial in India. They examined the impact of seven different macroeconomic variables such as Call money rate, treasury bill Rate, FEDAI foreign exchange rate, RBI foreign exchange rate, FII and Inflation rate, and Gold price, on stock market and vice versa. Duration of the study covered period from 2005 to 2009 and they took S&P CNX Nifty index as the representative of stock market in India. The outcome of analyzing the data in this study showed that all the macroeconomic variables related to the different segments of financial system were integrated with the stock market in the long-run. This long-run relationship between stock market and inflation rate, and FEDAI’s foreign exchange rate was positive and with Gold price and Call money rate was negative. The Granger causality test also showed that stock market had a positive association with Inflation rate and the foreign institutional investment.
Mishra, Swain and Malhotra (2007) studied the volatility spillover between foreign exchange and stock markets in India. They considered four stock indices include: S&P CNX-500, S&P CNX NIFTY-50, SENSEX, and BSE-100, as representative stock markets in India from 1993 to 2003.

They found that there was a bidirectional volatility spillover between the foreign exchange market and stock market except the stock indices, namely S&P CNX 500 and S&P CNX NIFTY. They also found evidence of co-movement of both the markets and a long run relationship between them. On the whole, the results of bidirectional volatility spillover imply that these markets are integrated with each other. Therefore, investors can predict the movement of one market by using other markets information. The long run relationship also implies a unidirectional causality at least between the two variables.

Cumperayot, Keiysor, and Kouwenberg (2006) studied the link between the extreme event in the stock and currency markets in 26 countries during 1996-2005. They concluded that in some of the emerging markets which were influenced by the crisis, an extreme reduction in the stock market lead to an increase in the probability of an intense reduction in the currency market on the same day. They also observed the simultaneous reduction between the stock and currency markets among 17 countries out of 26 countries under study.

Jena, Murty and Narasimhan (2004) attempted to investigate the integration relationship among Indian markets. In their study the data were based on the monthly interval from 1993 to 2002 and the selected variables to study were credit market, money market, government security market, capital market, and foreign exchange market. In this
study, Cointegration analysis, Granger causality, and Error Correction mechanism have been utilized.

As a main finding of the study, they found no evidence on significant integration among Indian financial markets. They pointed out that there has been a relatively co-movement among various short-term markets, while, this is not so between the short-term markets and the capital market. In conclusion they believed that while the reforms have accelerated removing barrier to the free flow of capital across various segments of the financial market, the process of integration has not yet been appeared among the Indian financial markets. Therefore, financial market development in India is still required.

Nath and Samanta (2003) examined the relationship between the stock and foreign exchange markets in India based on the daily data for the period of 1993-2002 by including the S&P CNX NIFTY index of National Stock Exchange (NSE) and exchange rate (expressed in Indian Rupee per U.S. dollar). In this study, the cointegration as well as granger causality test has been applied for data analysis.

Contrary to the extant literature which suggests the existence of interdependence between the stock and exchange markets the findings of this study showed that generally returns in these two markets were not integrated, even in recent years. They found out only the existence of causality relationship running from stock market return to exchange rate.

Granger, Huang, and Yang (2000) investigated the relationship between the exchange rate and stock price using the model of Granger causality in four East Asian countries which were influenced by the 1997currency crisis. They came to different conclusions in different countries. Regarding South Korea, the evidence showed that the
exchange rate determines the direction of stock price while in the Philippines the reverse happened i.e., the changes of stock price caused changes in the exchange rate and no recognizable pattern was observed for the relationship between the currency and stock markets in Japan and Indonesia.

**Basabi and Jaydeep (2000)** investigated the causal relationship among the stock price and macroeconomic variables in the foreign sector in India including foreign exchange rate, RBI exchange rate and trade balance by using the cointegration techniques and the long-run Granger non-causality test. In this study, the BSE Sensitive Index was used as a proxy for the Indian stock market based on monthly data for the period of 1990-2001. The results of the study showed that there was no causality relationship between stock prices and other variables consist of foreign exchange rate, RBI exchange rate, and trade balance.

**Gupta, Chevalier and Sayekt (2000)** examined the causality relationship between exchange rate, interest rate, and stock price in Jakarta by using five years data from 1993 to 1997 and employing the Granger Causality method and AREMA model for analyzing data. The results of this study showed that a unidirectional causality running from stock price to interest rate and vice versa. They also found a weak unidirectional causality running from exchange rate to stock price.

**Abdalla and Muride (1997)** investigated the relationship between the exchange rate and the stock return in India, Pakistan, South Korea and Philippines. They reached at the result that exchange rate will determine the direction of stock return. It means that the exchange rate had a direct impact on the stock price.
Bahmani-Oskooee and Sohrabina (1992) used the indexes of dollar exchange rate and S&P 500 for studying the relationship between the stock market and dollar exchange rate. The Granger causality and co-integration tests were employed to analyze the two mentioned variables. They found out that there was a bidirectional causality relationship in the short term between the stock and currency markets. But the co-integration test does not confirm the same relationship in the long term.

4.2.4. Commodity-Bond Markets Literature

Brown and Cronin (2010) studied the relationship among commodity, inflation and money supply in the US economy. They found out that there is a relationship among commodity, consumer price (inflation) and money supply (currency) in both short and long-term horizons and the effect of commodity on inflation is done through currency. This research implicates that in response to inflation caused by the increase of commodity price, the appropriate monetary policies regarding money supply will be complied and these policies will influence the bond price through interest rate. It means that commodity has an effect on the bond price.

Nicolau (2010) studied the relationship between the bond value and the commodity price based on data for 1991-2003. The findings showed that there is a reverse relationship between bonds (US-TB) and commodity (CRB-SPOT). The researcher, as an explanation to this result, states that an increase in commodity price would lead to the rise of inflation and inflation, on its own, increases the interest rate. Since, there has always been a reverse relationship between the interest rate and the bond price, therefore, an increase in commodity price would cause a reduction in the bond price and vice versa.
Bredin, Hyde and Reilly (2010) investigated the relationship between the monetary policies and bonds in America, England and Germany. They found out that the bonds return reacts to the monetary policies. The findings of this research showed that the bonds return increased and decreased in response to the strict monetary policies in Germany and England respectively. This research implicates those strict monetary policies which are adopted for reduction of the inflation resulting from the increase in commodity price will affect the bonds. In fact, the result of this research confirms the effect of commodity on bonds.

Nimark (2006) studied the effect of bonds on the monetary policies in America. The empirical evidence of this research showed that extant information in the long term bond return with the maturity of less than one year can help compile the appropriate currency policies in order to control the economic shocks. In this way, the results of this research indicated that the bonds market will affect the commodity market through currency policies.

4.2.5. Commodity–Stock Markets Literature

Kang, Hu, and Chen (2013) studied the causality relationship between the world price of food commodity and the stock market in the years 2000 to 2010 in China. The results of this research showed that the indexes of the stock market in China had a bilateral causality relationship with the future world market of food commodity. They also investigated the instantaneous reaction of the variables through which they found out that the stock market had a negative response to the increase in the price of future market of
food commodity while the future price of food showed to be a positive reaction to the increase of stock index in China.

**Bhunia (2012)** studied the causality and co-integration relationships between the commodity market (gold and crude oil price) and the stock market in India for the period of 1991-2012. The findings of this study showed that Granger causality relationship existed running from stock market to gold price but there was a bidirectional Granger causality relationship evident between the stock market and crude oil price.

**Rossi (2012)** investigated the relationship between the commodity and stock markets in Canada, Australia, New Zealand, Chile and South Africa based on quarterly data from 1973 to 2008. The results showed that the value of stock markets of the countries under study had a considerable ability in predicting future price of commodity.

**Liu (2012)** examined the dependence structure of commodity futures and Stocks in USA markets. The study used a bivariate model of ARCH, Correlation tests and Likelihood ratio test to examine the variables. This study employed the weekly data time series from 1979 to 2010. The main findings of this study showed that the stock and commodity market in USA were not dependent on each other. In other words, commodity futures were usable for risk diversification since, they do not transfer the volatility to U.S. stocks. The correlations between commodity futures and U.S. stock returns were also very low in which increased in periods where commodity and stock markets were volatile.

**Yahyazadehfar and Babaie (2012)** investigated the relationship among the macroeconomic variables such as gold price, house price, and interest rate on stock price in Iranian markets. They used a monthly data from 2001 to 2011 and employed the vector
auto regression (VAR) model and Johansen-Juselius Cointegration model to investigate of variables. The findings of this study showed that there was a positive relationship between house and stock price, while, the gold price and nominal interest rate with stock price exhibited a negative relationship. Furthermore, the results of applying the Impulse-Response Functions shocks and decomposition variance showed that stock price had a robust reaction to the shocks and the house price had a strong effect on the stock price fluctuation

Oleg (2011) attempted to find out the relationship between the future market of commodity, stock, and bonds markets in China. This study covered the period of 2006-2010. The evidence from this research showed that on the one hand, at the time of recession when the market risk increases, the correlation among the further markets of commodity and stock increased in China. On the other hand, the correlation between bonds and future market of commodity increased when bonds faced with volatility.

Nicolau (2010) used the indexes of CRB-SPOT and Dow Jones to investigate the commodity and stock prices respectively in America. The obtained results showed that there was a negative correlation between the two above mentioned variables in the years 1991-2003. The researcher introduces the two factors of inflation and interest rate as the key elements in explaining and justifying this relationship. The researcher believes that an increase in commodity price which is the proceeding index of inflation increases the interest rate. Therefore, the interest rate has a positive correlation with the commodity price. But an increase in interest rate will decrease the lenders-borrowers activities and this causes the economic activities to decline. A decrease in demand for commodity and service
would create a decline in the consumption and production. Therefore, a contraction in the business activities leads into a decrease in value of stock of companies.

**Buyuksahin, Haigh and Robe (2008)** investigated the relationship among commodity indices include GSCI and DJ-AIG (the Goldman Sachs Commodity Index and Dow-Jones's DJ-AIG total-return commodity index) and also two equity indices consist of S&P 500, DJIA (Standard and Poor's S&P 500 index and Dow-Jones's DJIA index) in USA. To assess short-term correlations and long-term cointegration between variables, they employed returns and return volatilities data based on the daily, weekly, and monthly interval for seventeen years, from 1991 through 2008.

The most important finding of this study was that the commodity and equity market moved in tandem with each other in the last fifteen years. They also did not observed an increase in co movement of variable during periods with extreme returns. This finding implies that, the returns on commodity and equity indices have not significantly changed.

4.2.6. Bond–Stock Markets Literature

**Sumner, Johnson and Soenen (2010)** attempted to document the interdependence among bonds, stocks, and gold for the period from 1970 to 2009. By using the correlation test and VAR (Vector Auto Regression) based on spillover index methodology, they examined relationship among U.S. stock and bond market movements and gold returns and volatilities. The findings showed that most of the volatility spillover was observed from shocks in stocks to bond return while, there was not observed significant relationship between stocks and gold and bonds and gold.
Goyenko and Akho (2009) studied the long term relationship between the bond and stock markets. They have found out that there was a lead-lag and bilateral Granger causality relationship between these two markets. The evidence showed on the one hand, the effect of stock liquidity on bond liquidity is compatible with the concept of flight to quality, and on the other hand, the bonds act as a channel which through that the shocks from monetary policies will be transferred to the stock market.

Fang, Lim, and Lin (2006) investigated the volatility transmission between the stock and bond markets in America and Japan in 1988 to 2004. The results of this empirical research showed that the volatility transmission was unilateral from the stock market to the bond market among the domestic markets in each country. But different results were achieved about the domestic and foreign markets of the two countries in the sense that the transmission of volatility was very strong among the stock markets and was weak between stock and bond markets.

Chordia, Sarkar and Subrahmanyam (2005) examined relationship between the Treasury bond and stock markets over the period 1991 to 1998 in USA. In this study, cross-market dynamics has been used for liquidity by employing a VAR model for volatility, returns, and liquidity in the stock and bond markets. They have also used Granger causality and correlation to analyze data. The findings of this research showed that a shock in one market affects both bond and stock markets, and the return volatility has an important role as a driver of liquidity. Innovations to bond and stock market liquidity were significantly correlated; it means that volatility and liquidity in both markets are driven by common factors. Moreover, they found that flows to the government bond and stock sectors were significant in predicting bond and stock liquidity.
4.2.7. Currency, Commodity, Bond, and Stock Markets Literature

Nicolau (2010) investigated the linkage of commodity, bond, and stock markets in America. This study covered period from 1991 to 2003. The obtained results showed that there was a positive correlation between commodity, bond, and stock.

Murphy (1991) studied the relationship among US financial markets include currency, commodity, bond, and stock market over the period 1990s. The researcher, in general, found out a key relationship among variables underling and argued that there is a kind of causality relationship running from currency, commodity, bond, and stock markets respectively.

4.3. Review of literature on Cross Border Financial Markets Relationship

Zhang (2012) studied the financial interdependence among Scandinavian stock markets including Sweden, Denmark, Finland, and Norway. Results of the Johansen’s co-integrating model revealed the existence of cointegration relationship among variables over the sample period 2001-2011 which indicated that the markets are integrated to some extent. A spillover between most pair wise stock volatilities has also been confirmed convincingly by the short-term dynamics. The researcher argued that the improved interdependence between stock markets in Scandinavian countries could be explained as a result of reforming in the financial markets in this region.

Iqbal, Khalid and Rafiq (2011) examined whether US stock exchange and two stock exchanges of Pakistan and India are integrated. They employed Johnson cointegration model and Toda-Yamamoto approaches based on Granger-causality test.
This study covered daily data from Bombay, Karachi and New York stock exchanges for 2003 to 2009. The results of Johnson cointegration test indicated that there is no long-run equilibrium relationship among the three equity markets, suggesting that the diversification of portfolio in those equities markets is beneficial in long-run. The outcomes of Toda-Yamamoto model based Granger-causality test showed that there was a unidirectional causality running from New York stock exchange to Karachi and Bombay stock exchanges. But, Karachi and Bombay stock exchanges did not cause New York stock exchange.

Samarakoon (2011) examined the shocks transmission between the U.S. Stock market and 22 markets of Africa, Asia, Middle East, Europe, and Latin American countries to explain the contagion effects of the 2008 U.S. financial crisis using the shock models including partially-overlapping and non-overlapping frontier and emerging markets.

The findings of the study showed a bi-directional interdependence and contagion between the U.S. and emerging markets, but, with regional variations. The interdependence among stock markets was driven more by U.S. shocks than by emerging market shocks, whereas contagion was driven more by emerging market shocks than by U.S. shocks. While Asian emerging markets did not impact the U.S. in tranquil periods, they had a strong contagious effect on the U.S. during the crisis. Except for Latin America, there was no contagion of U.S. crisis to emerging markets in other regions, whereas there was a strong contagion from emerging markets in all regions to the U.S. There was evidence of interdependence and contagion, although small in magnitude, in frontier markets with respect to U.S. shocks. Frontier markets were influenced by U.S. shocks more during crisis
than during normal times, and the U.S. financial crisis had a more contagious effect on frontier markets than on emerging markets.

**Beiney and Candelon (2011)** investigated the impact of financial liberalization on the stock market co-movement among 25 emerging economies by using a sample of data for 15 years. The researcher employed a panel data framework in order to estimation of time-varying cross-country correlations among the countries. The results of this study supported very strong evidences in favor of existing positive impact of financial liberalization on the correlation among stock markets.

**Jeyanthi (2010)** attempted to examine the Indian stock market integration with stock markets in the Japan, U.K, and United States before and after the structural reforms by using daily data for the period 1998 to 2008. The finding indicated that the long-run relationships was not found between the stock prices of India and other selected countries as Indian major trading partners after and before the structural reforms. In terms of short-run movements of stock market returns, bidirectional Granger observed between the Indian stock returns and those of Japan, UK and US after the structural changes but the result of the study corroborated a unidirectional relationship between the UK and Indian markets before the structural changes period. Evidence of volatility spillovers from UK and Japan were not found for prior the structural changes and volatility spillovers from Japan and US was significant after the structural changes. The results also identified the Japan and US markets as the main sources of volatility spillovers for the Indian stock market.

Based on the results of this study they found that the relationship between co-movement and the business cycle was stronger in those countries in which financial markets has not been developed, and countries without strong accounting and less transparency standards.

Diebold and Yilmaz (2009) based on a new approach to measure the asset returns interdependence and volatilities which formulated by researcher, they attempted to examine precise and return spillovers as well as volatility spillovers in nineteen global equity markets of development and emerging countries by using the variance decomposition based on VAR model from 1992 to 2007. They found evidence of different behavior in the dynamics of return spillovers vs. volatility spillovers: while, return spillover were a gently increasing, whereas volatility spillover showed no trend but clear bursts.

Glezakos, Merika and Kaligosfiris (2007) examined the short and long-run relationships among major world financial markets with special reference to the Greek stock exchange by using monthly data for the period of 2000-2006. The research methodology employed includes the Dickey-Fuller and the Phillips-Perron approach to test data stationary, VAR model for the implementation of the Granger Causality test, and Johansen-Juselious tests to investigate financial markets integration.
The empirical results of study confirmed that the short-run dynamic linkages as well as the long-run co-integrating relationships among selected world financial markets are strengthened over time. The results also revealed the dominance of the USA financial market on all world financial markets of sample. Furthermore, their findings showed that the Athens stock market was strongly under influence by the German and US the markets.

Cheung, Fung and Tam (2008) assessed the interdependence and contagion among equity markets in the 11 EMEAP countries’ markets and the US, and across the EMEAP markets using two approaches, namely the spillover index and the dynamic conditional correlation for the period of 1996-2008. The findings of the study showed that interdependence among equity markets increased steadily since early 2006, and it rose sharply in September 2008, following the collapse of the Lehman Brothers in US. But, there was not found significant evidence of contagion between equity markets in the EMEAP region and the US.

Liu, Lin and Lai (2006) attempted to apply correlation test for the US and a number of countries as US trading partners. That study aimed to examine the trade relation hypothesis which, argues that difference in trade relations among countries can lead to difference interdependence in the stock market.

The findings of the study revealed that the hypothesis can be hardly generalized as a rule in all countries or in all trade relations. The most interesting finding was that the hypothesis is true for the European countries, but failed to explain about the Asian countries. In the American countries, however, evidences were different. The correlation was weak in the US export relations with its trading partners, but it was strong in the
export relations of Mexico with foreign countries. For Canada, the hypothesis also failed to be true.

**Chong and Miffre (2006)** studied the conditional correlations between 7 stock, 6 bond (fixed-income) indices as well as 25 commodity futures indices. The dataset covered a period of time from 1981 to 2004. They have employed the generalized autoregressive conditional Heteroskedasticity model, GARCH (1, 1) model to investigate the volatility forecasting and they also have employed the Dynamic Conditional Correlation model (DCC) upon estimating the GARCH (1, 1) model for estimating the conditional correlation.

The results of their research showed that there was no the conditional return correlations between the S&P500 index (stock) and commodity futures over time. This suggests that equity markets and commodity futures have not become integrated and, thus, commodity futures were over time better alternative for strategic asset allocation. Researchers also observed that the conditional correlations between global equity returns and commodity futures fell in periods of market turbulence in most of countries. Indeed, it is precisely implied that whenever stock market is in high volatility the benefits of investment diversification are most appreciated.

**Avouyi, Dovi and Neto (2004)** analyzed the degree of interdependence among US and European stock markets by using the conditional correlation based on the stock returns. The empirical findings of the study corroborated the assumption that correlations vary over time. Researchers also observed the existence of periods with strong and weak correlations and similar periods for volatility. Moreover, the results of the study showed a close link between the volatilities observed and correlations in different stock markets.
In periods of high volatility, the correlation was more than its medium-term average; inversely, in phases with lower volatility, markets seem to have greater independence. Furthermore, the high correlation coefficient showed that German and French stock market indices have been integrated in recent years which reflect the growing converging of these two markets.

Bellotti and Williams (2004) investigated the stock market interdependence among 15 European Countries (EC) stock markets plus Norway, Switzerland and the US (New York) for the period 1987 to 2003. They employed a multivariate BEKK GARCH model for analyzing the daily stock market index data from selected countries. They also estimated the effect of information or news spillovers from one market on the next day returns in other markets. They found that generally, integration of stock market increased after 1999 although northern and southern European markets were differences in the levels of interdependence. They also observed that Information spillover were transmitted more through noise than price changes though volatility transmission between Germany, and the UK was through price changes after 1999. The major European markets were increasingly integrated with the international (US) market. The results supported the view that financial deregulation leads to financial market integration.

Connolly and Wang (2003) investigated the co-movement among international equity markets with special attention to economic fundamentals. They examined the impact of macroeconomic news announcements on the return co-movement of stock markets based on a set of time series data in three countries including the U.S., U.K., and Japan.
The results of this study showed that there was no found evidence of linkage between co-movement in the international equity markets and public information about economic fundamentals.

**Beelders (2002)** attempted to analyze the interdependence among the US, UK, and South Africa’s stock market. Researcher employed the S&P 500 index, the FTAS index and the JSE Index to represent the stock markets of the US, UK, and South Africa respectively. Daily data for the three indexes have obtained from 1990 to 1999, and the time-varying integration model used to analyze data.

The findings showed the interdependence was weak before 1995 when exchange controls and a dual exchange rate regime were in place. After the removal of exchange controls and unification of the exchange rates, the interdependence increased considerably between South African and the US stock markets but, there was little interdependence with the UK after March 1995. The increase in interdependence between South African and the US market was consistent with the increasing purchases of South African equities by US after March 1995.


In each of these three crises period, data analyzing based on the unadjusted correlation coefficients showed contagion in several countries, while based on the adjusted coefficients no contagion was found. This suggests that high market co-movement occur during the crises periods.
Zhao (2002) investigated the degree of relationship between the international future commodity markets and China commodity future markets. To this object, the researcher selected the Chicago Board Of Trade (CBOT) and commodity exchange of Dalian as variables of study. Based on the collected data over the period of 1995 to 1999, the researcher applied the cointegration model for data analysis. Results of this study showed a high association between the Chicago Board of Trade and the commodity exchange of Dalian. These findings demonstrated the principal of segmentation between the future price and spot price.

Simpson (2002) examined the strength of the relationship between the commodity prices and nominal Australian/United States exchange rate by using cointegration and causality approaches based on monthly data for the period of 1986-2001. The researcher found that there was no evidence on the existence of cointegration as well as long-term relationship among variables in the level of time series data. However, they found that the negative correlation and dual causality, with the significantly stronger causality relationship running from commodity prices to AUD/USD exchange rate.

Pretorius (2002) attempted to determine the fundamental factors that influence the correlation and evolvement of the correlation between emerging stock markets namely Argentina, Brazil, China, Greece, India, Korea, Malaysia, Mexico, South Africa and Turkey for the period 1995 to 2000.

The results of this research showed that only the industrial production growth and the bilateral trade were statistically significant in explaining the correlation between countries on a cross-sectional basis.
4.4. Research Gaps in The literature Review

While there is a large body of literature examining the interdependence among international financial markets, there are relatively few studies regarding domestic financial market interdependence in India. Additionally, in a few studies which have concentrated on the interdependence of Indian financial markets, the variables considered in the studies have not been exhaustive. In this connection it can be stated that the background of study shows that none of them has carried out research on financial market interdependence among stock, bond, currency, and commodity markets all together. In a few studies on the interdependence of Indian financial market, commodity index has rarely been taken as a variable, although, commodity market plays a significant role in financial market and financial investment has become increasingly important on commodity exchanges. Mayer (2009) found that financial investors regard commodities as an asset class and do not necessarily trade on the basis of fundamental supply and demand relationship in specific commodity markets.

Therefore, to fill this gap in the literature, this research aims to explore the interdependence of stock, bonds, commodity, and currency markets in India based on the statistical and econometric methods. The whole period under study is from 2000 to 2012. This period is very important because the global financial crisis of 2008 has fallen into the duration of investigation which provides an opportunity to investigate behavior of selected financial markets in before, during, and after the financial crisis time.

The present study has been differentiated from the previous studies in several aspects; the main ones are as follows:
a) This study has been focused on the domestic financial market interdependence in India, while previous studies have largely concentrated on the financial market integration.

b) It has concentrated on four essential financial markets including stock, bond, currency, and commodity markets considered together and such an analysis had seldom been carried out in India.

c) Most of the studies have come out with the results using data with quarterly or monthly intervals, but this study has taken data with weekly observations.

d) This study has used a relatively longer sample period by analyzing data from 2000 to 2012 on the whole and three sub-periods including 2000-2007, 2008, and 2009-2012. This period of investigation coincides with the financial market development in India and occurrence of the world financial crisis of 2008.