CHAPTER 2

REVIEW OF LITERATURE
2.0 REVIEW OF LITERATURE

The Financial derivative market had been attracting lots of enthusiastic and risk taking entrepreneurs into its community and academicians for studying different aspects of the market. The researchers across the globe had researched the price discovery function of the Futures market and its lead lag behavior in the markets and given diversified results. The impact of the determinants of the Futures market and its impact over the Spot market and the Futures market were extensively researched in the developed markets. The current review of literature, efforts had been made to bring out the various research studies taken over by various researchers across the globe. The review of the literature revealed the various types of studies carried out over the focus of research and the context of it was also reviewed with reference to the methodology adopted.

This Literature review could be divided into two different sections. In the first section, the price discovery, efficiency and lead lag relationship are reviewed. The Price discovery and lead lag relationship was reviewed in the International context and the National context. In the second section, the volatility impact on the Spot and the Futures market was reviewed. The Volatility, Volume and Open Interest and their impact on the Spot and the Futures market was reviewed in the national and the international context. The Gap for the research was placed at the end of this chapter.
2.1 PRICE DISCOVERY, EFFICIENCY AND LEAD LAG RELATIONSHIP BETWEEN THE SPOT AND THE FUTURES MARKET

Schroeder and Goodwin (1991) had investigated the short term price leadership role and the long term efficiency of the cash and the Futures price relationship for live hogs. The regression model developed by Garbade and Silber was used for examining the short term relationship between the markets. The co-integration, Granger causality and the Engle and Granger models were used to examine the long term relationship between the markets. The study concluded that the price discovery takes place in Futures market and a roughly 65% of the information was passed from the Futures to the Spot market.

Abhay and Abhayankar (1995) had investigated the return and volatility dynamics in the FTSE 100 Stock Futures and its underlying asset in the Spot market and its Futures index prices. The researcher has used Generalised Autoregressive and conditional Heteroscedasticity (GARCH) and Exponential Generalised Autoregressive and conditional Heteroscedasticity (EGARCH) models and the study confirmed that the Futures price were leading and the Spot market lags behind.

Joel Hasbrouck (1995) had investigated the price discovery effect of the security traded in the different markets such as the main exchange and the regional exchanges. As the security is traded in different markets, it is to identify which of the market is playing a leading role in the price discovery process. The 30 shares of Dow Index were used and its intraday tick to tick data was obtained for the analysis. The Co-integration model and Vector Auto regression model is used for the analysis of the stocks. The results suggested
that price discovery is concentrated at the NYSE market and Futures market plays a dominant role in conveying the information.

Lihara et al. (1996) had investigated the intraday return dynamics between the cash and the Futures market of Japan. The study used the hourly data for analyzing the relationship between the markets, the bivariate error correction model with GARCH perturbations which captures stochastically the presence of an Intraday U shaped curve for both the Spot and the Futures market. The results suggest that unidirectional cross interaction from the Futures to the Spot market.

Pizzi et al. (1997) had investigated the price discovery, market efficiency using intraday data of Standard and Poor 500 Spot and the Futures index. It used co-integration analysis and error correction models for the analysis of the price discovery and market efficiency. The study has concluded that the Futures play leading role in the price discovery and strong lead effect.

Kong and Cheung (1998) had investigated the Profitability and Arbitrage opportunities between the stock index Futures and its underlying asset in the Hong Kong market. The study has taken the data for the analysis from 1st October 1993 to 30th June 1994. The study has confirmed that there were arbitrage opportunities in the Futures market.

Abhay and Abhayankar (1998) had made an investigation on linear and non linear Granger causality. The objective of the study was to find out the non linear causal relationship between the Index Spot and Index Futures in UK of FTSE 100. The Back and Brook test, Granger causality test and ARMA models were used in the study to verify the objectives. The results indicate that there
is contemporaneous correlation between the index Futures and the underlying asset is high.

Min, J H, Najund and Mohammad (1999) had investigated the lead lag relationship between the Spot and the Futures market in the Korean market. The econometric tools such as Vector Auto regression model and Granger causality model were used in the study. The study has concluded that the Futures market can explain more than the Spot market as the Futures market is leading and the Spot market is lagging behind.

Gay and Jung (1999) had investigated the Transaction cost, Short sale restriction and the Futures market efficiency in Korean markets. The objective was to examine the price discovery efficiency of the Korean stock exchanges. The study has used GARCH methodology and the results indicate that the substantial portion of under pricing in the Futures market was explained by the transaction cost. But even after adjusting the transaction cost, the mispricing remains in the prices.

Dennis and Sim (1999) had studied the impact of introducing the Futures contract on the Spot prices in the Sydney Futures exchange. The authors had employed Asymmetric Power Autoregressive Conditional Heteroscedasticity model to investigate the price volatilities of the firms with the underlying assets market. The results suggested that the Futures market does not have any volatility impact on the Spot market. In the case of small number of shares, the Futures trading is significantly related to the Spot market.
Kim, Szakmary and Schwarz (1999) had studied the trading cost hypothesis of price leadership with the low trading cost of Futures market in comparison with the Spot market. The Intraday data was obtained from the S&P 500, NYSE composite and MMI Futures of their Spot and the Futures price. The study has employed Multivariate co-integration model and Vector Auto regression model to analyse the impact on the Futures and the Spot market. The study revealed that the S&P 500 Futures market was leading than the other two indexes by five minutes.

Turkington and Walsh (1999) had studied the causal relationship between the Spot and the Futures price of Australian market. The ordinaries Index was selected and the study has employed the Autoregressive moving average (ARMA) and Vector autoregressive model for the price discovery and the causality analysis. The study concluded that the markets have bi-directional causality between the markets.

Speight and Macmillan (2000) had investigated the intraday volatility component of FTSE100 from 1992 to 1995. The study used the GARCH, ARCH, RCH – LM and BDS tests. The study’s results indicate that full decay of a stock to the transitory components parameter estimates is statistically insignificant at the half day frequency.

Frino and West (2000) had investigated the lead lag relationship between the equity and the index Futures and its underlying assets in the Australian stock exchange and the Sydney stock exchange around the information release. The study period was from 1995 to 1996 and the researcher has employed the Auto regressive integrated moving average (ARIMA) model for the study. The
result of the study indicates that lead lag relationship was influenced by the release of the macroeconomic and the stock specific information.

Gramming, Michael and Schlag (2000) had investigated the price discovery behavior of internationally traded firms and how the international stock price adjusted to an exchange rate shock. The study was conducted between from the year 1998 to 1999 and the researcher has employed the Co-integration and Vector Error correction models for addressing the research problem. The study has concluded that the home market influences and determines the random walk of internationally traded firms and the exchange rate shocks has affected the derivative prices.

Copeland and Jones (2001) had investigated the efficiency of screen trading on the index Futures market in Germany and Korea. The study period was from 1984 to 1994 and the researcher used Mok, Lam and Li procedure for analysis. The study concluded that the relative frequency of all maxima and maxima is greater and consistent with random walk.

Joel Hasbrouck (2001) empirically investigated the price discovery process of US equity index market. The study period was between 1998 – 2000 using the intraday prices and the methodology adopted was co-integration, Vector auto regression and Vector error correction models. The study concluded that the S&P 500 and NASDAQ 100 index was dominated by the Futures price.

Kim and Chirstoper (2001) had investigated the modeling linkage between Australian financial Futures market and its Spot market. The study was conducted from 1988 to 1999 and the Exponential Generalised autoregressive conditional Heteroscedasticity (EGARCH) model was used in the study. The
study concluded that the Australian financial Futures were strongly linked and they are developed.

Juan A Laufante (2002) had investigated that the return and volatility relationship between the Ibex 35 Spot and Futures markets. The study used one hour trading data for analyzing the relationship. The econometric models such as bi-variate error correction models and the Generalised Auto regressive conditional Heteroscedasticity (GARCH) model were used for investigating the relationship. The finding of the study suggests that the Futures market is leading the Spot market in order to incorporate the arrival of new information.

Roope and Zurbruegg (2002) had investigated that the intra-day price discovery between the Singapore exchange and the Taiwan Futures exchange. The study period was from January 1999 to June 1999. The study has used Error correction model, Granger and Autoregressive Integrated Moving Average (ARIMA) models. The study concluded that the Singapore index Futures play a role of price discovery significantly and greater than the Taiwan Futures exchange (TAIFEX).

Kurov and Lasser (2002) had investigated the pricing relationship between the NASDAQ 100 and its underlying index during the introduction of CUBES. The study period was from the July 1991 to October 1991 and it has used Autoregressive and Regression model for analysis. The study concluded that, average magnitude of mispricing and frequency of violations reduces after introduction of the cubes in the market.
Chu and Gideon (2002) had investigated that the pricing efficiency and arbitrage opportunities that exist between the S&P depository receipts and its index Futures. The study period was from 2001 to 2002 and it has used Vector Auto Regression model (VAR) for analysis. The study concluded that, there exist a close price relationship between the SPDR and the S&P500 Index Futures.

Kumar and Mukhopadyay (2002) had investigated the short term linkage between NSE Nifty and NASDAQ. The study period was from 1999 to 2001 and it has used Auto Regressive Moving Average, Granger Causality test and Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model for the analysis. The study concluded that the unidirectional linkage between the NASDAQ and NIFTY. The previous day returns of the NASDAQ have significant impact on the NSE nifty.

Asjeet S Lamba (2003) had investigated the dynamic relationship between South Asian markets and the developed equity markets. The study is from July 1997 to February 2003 and it has used multivariate co-integration and Vector error correction model. The study concluded that the Indian market was influenced by the developed market such as USA, UK and Japan; influence had strengthened from January 2000 to February 2003.

Chen et al. (2003) has investigated the effects of the trading halts in the price discovery of NYSE stocks. The study period was 1992 and it has used Co-integration and Vector Error Correction Model (VECM) for analysis. The study concluded that the significance of the price discovery depends on the type of news and its significance of the news items.
Shah and Moonis (2003) had investigated the time variation in Beta from the period 1996 to 2000 in Indian Capital market. The study has used Kalman filter model and Bivariate Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model for analysis. The study concluded that the hedge ratios were frequently adjusted on the arrival of new information.

Darrat and Otero (2003) had investigated the price discovery and volatility spill on index Futures market in Mexico exchange from the period of April 1999 to July 2002. The study used Exponential Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model for analysis. The study concluded that the newly established Futures market serves as price discovery tool and also Futures lead to instability in the Spot market.

Simann (2003) had investigated the price discovery process on the most actively traded options. The study was done in the year 2000 and it has used co-integration and Vector Error correction model (VECM) for the analysis. The study has concluded that the electronically equipped exchanges are the leaders in providing the latest and informative quotes.

George et al., (2003) had investigated the level and accuracy of price discovery in the Mexican share market. The study period was from 2000 to 2002. The study has used Law of one price model and Error correction model for the analysis. The Study has concluded that the deviations from Law of one price occurs and lead to error correction and it happens on the next trading session.

Cheng et al., (2004) had investigated the information content for the extended trading in the Hong Kong Index Futures exchange. The study period was from 1998 to 2000 and it has used weighted period contribution and Generalised
Autoregressive Conditional Heteroscedasticity (GARCH) model for the analysis. The study has concluded that the Pre-open of the Futures has a positive impact on the overnight returns.

Mattos and Garcia (2004) had investigated the relationship between the Spot and the Futures price in the Brazilian agricultural market. The study has used the Co-integration, Autoregressive Conditional Heteroscedasticity (ARCH), Generalised autoregressive conditional Heteroscedasticity (GARCH) and Error correction models. In the highly traded market, Futures plays the price discovery role, whereas in the thinly traded securities the market interacts weakly in the short term price discovery process.

Mukherajee and Mishra (2006) had investigated the lead lag relationship between the Spot and the Futures market in India from the period ranging from April 2004 to September 2004. The study has used Vector Auto regression (VAR) model and Granger Causality test for analyzing the objectives. The study has concluded that the symmetric spill over among the stock return volatility and the Futures market is leading and it is not strengthening even for major information release.

Raymond and Yiuman Tse (2004) had investigated the understanding of the information processing by investigating the process of information transmission in the Hong Kong markets. The study was conducted from 1999 to 2002 and the econometric models such as Multivariate Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model for the analysis. The study has concluded that the Futures market plays a major role in the price discovery process followed by the Index.
Kurov and Lasser (2004) had investigated the price dynamics in the S&P500 and the NASDAQ 100 Index Futures market and its underlying asset. The study period was from May 2001 to September 2001 and Vector Error correction model (VECM) was used to address the objective. The study has concluded that the order flow is more informative in the NASDAQ than the S&P 500 market.

Dimitris F. Keourgios (2004) had investigated the informational linkage between the FTSE and Athens Stock Exchange-20 stock index and its three months Futures contracts and the role of price discovery from August 1999 to June 2002. The study has used Johansen co-integration, Vector error correction (VECM) and Wald test model to analyse the relationship. The study has concluded that Futures contract serves as a price discovery tool and its important role in the Greek capital markets were inevitable.

Spyros I Spyrou (2005) had investigated the introduction of Futures trading leads to increase volatility and uncertainty in the underlying market in an emerging Athens stock exchange. The study was undertaken in 2003 using Generalised Autoregressive conditional Heteroscedasticity (GARCH) model. The study has concluded that the ASE Futures market did not destabilize the underlying Spot market.

Mukerjee and Mishra (2006) had investigated the Lead lag relationship between the Futures and the Spot market and its variation during the information release. The researchers have used Cross correlation, Vector Error correction model and Granger Causality test. The test was conducted on the Nifty Index and the results of the study supports the Futures market is leading the Spot market.
Kang, Lee and Lee (2006) had investigated the intraday price change relationship in the KOSPI 200 index Spot market, Futures and its option market. The study period was from October 2001 to December 2002. The Black - Scholes model was used to study the relationship. The study has concluded that estimation of lead lag relationship of volatilities indicated that the realized volatilities of the stock index by around 5 minutes.

Hoque, Ki and Pyun (2006) had investigated the market efficiency of eight different Asian emerging markets (Hong Kong, Indonesia, Malaysia, Korea, Singapore, Philippines, Taiwan and Thailand). The study was undertaken on the weekly closing prices from 1990 to 2004. The study has used Variance ratio test to find out these eight markets prove to be mean reverting or not. The study has concluded that five markets such as Indonesia, Malaysia, Philippines, Singapore and Thailand shows specific mean-reverting and predicative behavior whereas two markets, Taiwan and Korea shows some mean-reverting and unpredictable patterns in the time series.

Hsu et al., (2007) had investigated the Lead lag relationship between implied growth rate Index Futures return and its Spot returns. The researcher has employed Vector Auto Regression (VAR) model, Granger Causality test and Granger impulse response function. The Study has concluded that there is lead lag relationship between the Futures and Spot returns. But the relationship is weakening as the Spot return decreases due to the imperfection in the market.
Sathyasaroop Debasish (2007) had investigated the lead lag relationship between the NSE nifty index and the Futures and its option contracts. The study period was from July 2000 to June 2008 and it has used co-integration and Autoregressive Moving average models for investigating the relationship between the markets. The study has concluded that the option market, call and put move broader, but the call option reacts more quickly than the put option prices. Transaction cost also plays a major role in the market.

Suchismita Bose (2007) had investigated the price of Indian stock index and Futures market contribution to the pricing process of the stock markets. The study period was from March 2002 to September 2006 and it has used Johansen co-integration and Vector error correction model for analysis. The study has concluded that Futures market response faster to the previous period deviation from the long run equilibrium. Arbitrage trading is more than the momentum trading in the underlying Spot market.

Illueca and La fuente (2007) had investigated the effect of Futures trading on the distribution of Spot index returns in Spanish market. The study period was from January 2000 to Dec 2002 and it has used Auto regressive integrated Moving average (ARMA) and Generalised Autoregressive conditional Heteroscedasticity (GARCH) model for analysis. The study concluded that Futures trading activity is a significant variable to explain the distribution of Spot returns.
Gupta and Singh (2008) have investigated the price discovery and arbitrage efficiency of India in the long run relationship. The study period was from April 2003 to March 2007 and it has used the Johansen co-integration procedure, Vector Error correction model and Engle Granger causality for analysis. The study has concluded that there is strong stable long run co-movement between the Spot and the Futures market. Indian equity Futures market plays a lead role in information assimilation compared to the Spot market.

Thenmozhi and Kumar (2008) had investigated the information on the mutual fund flows can be used to predict the changes in market returns and volatility. The study period was from January 2001 to April 2008 and it has used Exponential Generalised Autoregressive conditional Heteroscedasticity (EGARCH) model for analysis. The study has concluded that there is significant and positive correlation between the returns and sales fund flows and negative correlation between the net fund flows and returns.

Richi, Daigler and Gleason (2008) had investigated the potential limit of arbitrage regarding the S&P 500 Spot Index and SPDR could be used to price the S&P Futures contract and its arbitrage opportunities. The study period was from 1998 to 2002 and it has used cost and carry model. The study has concluded that there is Mispricing exists between S&P 500 and SPDR relative to the Futures contract.
Floros and Vougas (2008) had investigated the efficiency of Greek Stock index Futures market. The study period was from 1999 to 2001 and it has used Granger two step analysis and Vector error correction model for analysis. The study has concluded that the Spot and the Futures are co-integrated implies that the markets are efficient. Current Spot market prices adjust to the long run difference between the Spot prices and the Futures price and it leads the Spot return.

Ulkem Basdas (2009) had investigated the lead lag relationship between the Spot and the Futures price for the ISE 30 in the Turkish derivatives exchange. It also studies the forecasting ability of the share. The study period was from February 2005 to May 2008 and it has used Error correction model with Cost of carry, ARIMA and Vector auto regression model. The study has concluded that there is lead lag relationship and it includes the explanatory power to model the path of services.

Singh and Agarwal (2009) had investigated the nature and strength of relationship between the Nifty Spot and its Futures price. The study period was from January 2004 to January 2007 and it has used Granger Causality model for the analysis. The study evidenced that the Futures lead the Spot market for Nifty.

Gupta and Singh (2009) had investigated the information efficiency of Indian equity Futures markets. The study period was from January 2003 to December 2006 and it has used GARCH, EGARCH and ARMA model for analysis. The study has concluded that the GARCH model implies that the price change response asymmetrically to the positive and negative news in the market.
Ozum and Erbaykal (2009) had investigated the risk transmission from Futures market to the Spot markets without data stationary in Turkey market. The study period was from January 2006 to March 2008 and it has used Autoregressive distributed Lag (ARDL) model for analysis. The study has pointed out that there is a co-integration relationship between the Spot and the Futures price.

Bohl and Salm (2010) had investigated the impact of the introduction of index Futures trading in the Poland market. The study period was from November 1994 to December 2007 and it has used Markov Switching GARCH model for analysis. The study concluded that the introduction of index Futures trading did not lead to an increase in the volatility of the Spot prices.

Sivakumar (2010) had investigated the Lead lag relationship between the Spot index and its Futures in the BSE Market. The researchers have used Generalized Autoregressive and conditional Heteroscedasticity (GARCH) model for analysis and the study has confirmed that the Futures play a predominant role in the assimilating the information and leads the Spot market.

Brogaard, Hendershott and Riordan (2011) had investigated the price discovery and the Price efficiency of NASDAQ. The study period was from 2008 to 2009 and used correlation analysis. The study has concluded that the High frequency traders have no role in the market stability and instability in the prices.
Osler et al. (2011) had investigated the price discovery process in the currency markets. The study period was 4 months in 2001 between the currency pair USD and EURO. The study has concluded that there is strong price discovery process in the Futures market followed by the Spot market.

Yavas and Yildrim (2011) had investigated the price discovery in the Real estate markets. This study is using the dynamic conditional correlation (GARCH) model, Granger Causality test. The study has concluded that there is price discovery happening in the securitized public market.

Choudhary and Bajaj (2012) had investigated the high frequency data of the Index shares traded in NSE from the April 2010 to March 2011. The study used a Johansen co-integration model, Engle and Granger residual based approach, Granger causality test and the Vector error correction model for providing the causality and the lead lag relationship between the markets. The study concluded that both the Spot and the Futures market play an important role in the price discovery process.

Yang et al. (2012) had studied the intraday price discovery and volatility transmission in the stock index and its underlying assets. This study used the High frequency data and analysed using GARCH model. The study pointed out cash market play the lead role after the sharp decline.

Namitha and Geetanjali (2013) had studied the impact of Futures market on its volatility. The authors have applied the Bivariate EGARCH models to investigate the impact. The study has confirmed that volatility spillover between the Spot and Futures market is unidirectional from Spot to Futures
market and Spot market dominates the Futures market in terms of return and volatility.

Pandey and Deo (2014) had studied the price discovery, long-term causal behavior in the currency derivatives market in India. The author applied Johansen Co-integration test and Vector Error Correction Model (VECM) to test the long-term causal behavior between the markets. The study evidenced the long-term relationship between the markets and the disequilibrium is adjusted soon by the arbitrage process.

Wang (2015) had studied the Lead lag relationship among the various financial markets. The author has applied VAR model and two-step regression model to test the empirical relationship between the markets. The study concluded that all the markets were having circular lead lag relationship between the markets.

2.2 VOLATILITY, VOLUME AND OPEN INTEREST AND ITS IMPACT ON THE FUTURES MARKET

Alfrod and Boatsman (1995) had investigated the long-term return volatility prediction for the stock return for five years. The study period was from 1990 to 1994 and the study has used Kolmogorov – Simonov goodness of fit test for the analysis. The study concluded that the historical format does not exist.

Thenmozhi (2002) had investigated the change in the volatility in the Nifty index due to introduction of Nifty based Futures. The study period was from 1998 to 2002 and it has used GARCH model for analysis. The study concluded that Futures lead the Spot market returns by One day.
Ferris, Park and Park (2002) had investigated the dynamic interaction and causal relation between the volatility, Open interest and volume in the S&P 500 Futures markets and its underlying asset. The study used Vector Auto Regression (VAR) model and the study period was from November 1993 to June 1998. The study pointed out that the level of Open interest is not affected by the increase of volatility and open interest.

Nguyen and Faff (2002) had investigated that the determinants of derivative markets in the Australian companies. The study period from 1999 to 2000 and the study used Tobit model for analysis. The study has concluded that there is positive relationship between firms’ size and the likelihood of derivative usage.

Snehal and Ghosh (2003) had investigated the impact of the introduction of derivatives market in the Spot market. The study has used Autoregressive Conditional Heteroscedasticity model (ARCH) and Generalised Autoregressive conditional Heteroscedasticity model (GARCH). The study has found out that the introduction of derivatives decreased the volatility in the Spot market.

Pramalatha Shenbagaraman (2003) had investigated the impact of introducing index Futures and option contract on the underlying stock index volatility in India. The study period was from 1995 to 2002 and it has used GARCH and EGARCH models for the analysis. The study concluded that derivatives introduction does not have any significant impact.

Shenbagaraman (2004) had reviewed the role of non-price variable in the stock option market for determining the price of underlying assets. The non-price variables discussed here are Open Interest, Trading volume and other factors. The study has taken four months from Nov 2002 to Feb 2003 for the option
contracts. The study pointed out open interest of the stock option plays a significant role in the pricing of an underlying asset. The Open interest variable carries more significance than the Volume of the securities in determining the price of underlying assets.

Mukerjee and Mishra (2004) had investigated the impact of the non-price variables open interest and trading volume in the Nifty Index and its underlying market. The study period is from 2001 to 2004 and it has used multiple regression and Granger causality tests for analysis. The study has concluded that open interest plays a significance role in predicting underlying cash markets.

Yang and Fung (2004) had investigated the informational role of open interest in Futures markets. The study period is from 1991 to 2002 and it has used Johansen co-integration and error correction model for analysis. The study has concluded that open interest and the Futures price shares common long run information for storable commodities and vice versa for non-storable commodities. The Futures price cause open interest and not vice versa.

Sah and Omkarnath (2005) had investigated the changes in the Indian stock market due to the changes in the volatility after introduction of derivative securities in the market. The study period was from 1998 to 2005 and used ARCH and GARCH model for analysis. The study concluded that the surrogate index taken into consideration and S&P Nifty showed declining volatility.
Puja Padhi (2007) had investigated the effect of introduction of Stock index Futures and its underlying assets. The study tested the impact of the introduction of stock index Futures in its underlying asset. The study period was from 1995 to 1997 and used GARCH and EGARCH models for analysis. The study concluded that there is less impact on the Nifty, but there is increasing trend in the Nifty junior after introduction of Futures in the derivatives market.

Chen and Jim (2007) had investigated the open interest of Hang Seng Index Futures and its relationship with the underlying index. The study period is from 2000 to 2004 and used correlation and regression for the analysis. The study highlighted that open interest and the Spot market turnover is positively correlated and the level of volatility of the index was not statistically significant.

Epaminontas Katsikas (2007) had investigated the volatility and autocorrelation in European Futures markets. The study period was from 2000 to 2006 and the study has used Generalised error distribution model for analysis. The study has concluded the high volatility autocorrelation is statistically no significant and volatility itself is an asymmetric function of a past error.

Christos and Floros (2007) had investigated the price and the open interest in the Greece stock index Futures market. The study period was from 1999 to 2001 and it has used GARCH model for analysis. The study has concluded that, there is strong relationship between the open interest and the Futures price.
Suchismita Bose (2007) had investigated the nature of volatility of returns in the Index Futures market and its underlying index and to estimate the extent of spillovers between the markets. The study period was from June 2000 to March 2007 and it used Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model for analysis. The study has concluded that Index volatility has no tendency to drift in the upward direction over indefinite period; it has mean or normal level which it reverts.

Kumar and Singh (2008) had investigated the relationship between the trading volume and returns in Indian context. The study period was from 2000 to 2008 and used Ordinary least squares, Vector Auto regression and Generalised Autoregressive conditional Heteroscedasticity (GARCH) model for analysis. The study concludes that there is positive relationship between the trading volume and unconditional volatility.

Vipul (2008) had investigated the relationship between the mispricing, volatility, volume and open interest of stock based Futures and its underlying assets in the Indian market. The study period was from January 2002 to November 2004 and used co-integration and Vector Auto Regression (VAR) model for the analysis. The study has concluded that the increase in volatility of the Futures is having impact on its underlying for the next 1 – 2 days.

Kallinterakis and Shikha Khurana (2008) had investigated the relationship between feedback trading and volatility from markets in evolutionary perspective. The study period was from 1992 to 2008 and used the Sentana and Wadhwani model for analysis. The study has concluded that the volatility from the trading is significant.
Bhaumik et al. (2008) had investigated the Futures trading leads to increase or decrease in Spot volatility. The study period was from 1995 to 2007 and used bivariate dual memory model and ARFI, GARCH for analysis. The introduction of Futures leads to decrease in the Spot market volatility. The migration of some speculators was accompanied by decrease in the volume and its underlying security.

Sakthivel and Kamaiah (2009) had investigated the Futures trading activity affects the underlying assets market volatility or not. The study period was from July 2000 to February 2008 and used ARCH, GARCH and GJRGARCH model for the analysis. The study has concluded that unexpected open interest has positive effect on the underlying Spot market volatility.

Dawson and Staikouras (2009) had investigated the impact of the volatility in derivatives trading on the S&P500 Index. The study period was from January 2000 to May 2008 and the GARCH model was used for the analysis. The study has concluded that the volatility in derivatives trading contributed to lowering the underlying asset under normal market conditions.

Yen and Chen (2010) had investigated to find the relationship among the Open interest, Volume and Volatility in the Taiwan Futures market. The study period was from July 1998 to December 2001 and it has used EGARCH, GJR, APARCH, GARCH and IGARCH model for analysis. The study has concluded that there is significant relationship among the Futures daily volatility and the lagged volume and the lagged open interest.
Chandra Pati and Rajib (2010) had investigated the volatility persistence and trading volume in the NSE nifty stock index Futures. The study period was from January 2004 to December 2008 and used ARMA-GARCH model for analysis. The study concluded that there is time varying volatility that exhibits high resistance and predictability in the Indian Futures market.

Lucia and Prado (2010) had investigated the speculative and hedging activities in the Futures market with the readily available activity data. The study period was from March 2000 to December 2006 and Ratios were used for analysis. The study concluded that change in ratio of volume to open interest can be negative or positive implying opening of new positions or liquidating old positions.

Jinliang Li (2010) had investigated the effects of cash market liquidity on the return volatility of stock index Futures. The study period was from 1980 to 2005 and the GARCH model was used for analysis. The study concluded those S & P 500 index Futures are less sensitive to the underlying assets relative to NYSE composite index Futures.

Garag and Ramesh (2010) had investigated the relationship between the Futures price and open interest in the stock and its Futures in the Indian stock market. The study is based on the EoD data collected from NSE website for 16 shares and used correlation for the analysis. The study has concluded that there is no relationship between the Futures price and open interest. It does not provide any directional information about the shares.
Mayank Joshipura (2010) had investigated the derivatives trading causes increased volatility in the market. The study period was from 2001 to 2008 and used Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model for analysis. The study has concluded that the effect of introducing derivatives trading has significant influence on the return of underlying assets.

Hatrick, Sō and Chung (2011) had investigated the dynamic relationship in the realized volatility, volume and number of trades in the stocks listed on the Hong Kong stock exchange. The study used Vector Auto Regressive model (VAR) and the impulse response function to analyse the impact. The study has concluded that the realized volatility has a positive effect on the lagged average trade size. In the Intraday data, the causal relationship among the volatility, volume and number of trades is different from the daily data.

Deepti Gulati (2012) had investigated the relationship between the price and the open interest in the Indian capital markets. The study investigated the relationship between the Futures price and the open interest for the five index of the National stock exchange. The study pointed out that the open interest is a good indicator of the long-term information of the Futures market.

Boonvorachart T and Lakmas K (2015) had investigated the price volatility, trading volume and market depth in Asian commodity Futures exchanges. The study period is from the 2006 to 2012 data and used GARCH and AGARCH model for analysis. The study has concluded that speculative deals are proxied by the volumes and it tends to increase the Futures volatility and the hedging activities are proxied through the open interest to stabilize the markets.
Cheng lai and Min wang (2015) had investigated the relationship between the Institutional investors and the trading behavior in the Taiwan stock exchange. The study confirmed that there is negative feedback between traders and FII. The trading volume of FII’s has a positive significant impact on the returns of index. The impact of open interest has a positive significant effect on the Taiwan stock index Futures returns.

Jena (2016) had investigated the sequential information hypothesis through the examination of dynamic relationship between the trading volume and the volatility of CNX Nifty in NSE. The study used the nonlinear Generalised Autoregressive Conditional Heteroscedasticity (GARCH) framework for analysis. The study pointed out there is unidirectional causality from volatility to trading volume rejecting the sequential information hypotheses. The nonlinear GARCH framework suggests lagged trading volume has no explanatory power of conditional volatility.

Kadioglu, Kilic and Ocal (2016) had investigated the determinants of price volatility of Futures contracts in the Turkish derivatives markets. The study period is from 2008 to 2015 and used conditional variance model for analysis. The sample consists of different underlying assets from the commodities and the equity markets. The study concluded that time to maturity; volume and open interest have significant impact on the volatility of the Futures contracts.

Srinivasan et al. (2016) had investigated the relationship between the price volatility, trading volume and open interest in the Indian stock market. The study period is from 2005 to 2012 and used Generalised Autoregressive conditional Heteroscedasticity (GARCH) model and AGARCH for the
analysis. The study concluded that the market depth does not have any significant effect on the volatility.

2.3 RESEARCH GAP

From the above Review of Literature, it was observed that there were no findings in Indian context that studied the price discovery of Mid-cap shares. Studies have considered different index and stocks in different period of time of study, but not taking the study period since inception. Studies have considered only data from either from pre financial crisis or post financial crisis, but there were no studies that include both the study period. Studies have considered only index and stocks during the full period of study, but there were no studies available for testing the price discovery relationship in the Bull phase and Bear phase of the market in Mid-cap stocks. Studies have considered the relationship of the volatility, volume and open interest in the Index and stocks but not on the Mid-cap shares. Therefore, the strategy was set as per the need cum relevance of the study.