Chapter-1: Introduction

1.1 Background

Efficient Market Hypothesis (EMH) of Eugene Fama has been the guiding principle of empirical research in finance since 1970. Fama along with Lars Hansen and Robert Shiller are awarded the Nobel Prize in Economics in the year 2013 for their works related to the behaviour of asset prices. The term “Market Efficiency” means that asset prices incorporate available information about their values which implies that trading rules should not work as prices can't be predicted. William R. Easterly, an American professor of economics at New York University (NYU), once talking about EMH said that economists have done something better than predicting the crisis by predicting that they would not be able to predict it. As EMH specifies that it is not possible to compete with the market systematically which entails that if one can predict the crisis then obviously he would compete with the market. However, the idea of market efficiency has not been an entirely pleasant buzzword and has attracted severe criticism from a large group including academicians, practitioners and politicians. A number of studies test the efficient market hypothesis empirically and report that trading rules work and opportunities to make abnormal profits exist. The linkage between the parallel markets trading homogenous assets is one of the important approaches to test the market efficiency.

Over last few years financial markets have exhibited exponential growth in trading of homogeneous or closely linked assets in parallel markets. For example the trading of equity linked derivatives\(^1\) have grown substantially across markets globally. As per 2011 report of World Federation of Exchanges (WFE) the number of equity derivative contracts traded globally

\(^1\) We provide a detail explanation about derivatives, their evolution and role latter on in this chapter.
in 2011 was close to 16 billion compared to 6 billion contracts in 2004. The worldwide exchange traded equity derivatives turnover have grown from $1893 billion in December, 2001 to $4718 billion in December, 2011. According to EMH, any new information about an asset should be incorporated simultaneously in prices of all markets where the asset trades. However, due to differences in market organizations and trading processes the markets may differ in their speed to incorporate the new information. It is interesting and important to determine the market which leads in information dissemination when identical or related assets trade at multiple places. This question has drawn considerable attention in literature on price discovery in market microstructure.

“Price Discovery” and providing “Liquidity” are the two broad functions of any market (O’Hara, 2003). A market is said to be liquid if you can trade a large number of shares with ease without affecting the prices much. In other words liquidity is a measure of how easily and inexpensively you can trade in a market. Hasbrouck (2007) has defined liquidity as “Depth, breadth and resilience”. Depth is explained as availability of large quantity for sale at both little above and below the current market price. Breadth refers to the number of participants in the market whereas resilience means that trading causes little impact on prices and that too reaches status-quo quickly. Liquidity is brought to the market through a give and take process by multiple counter parties who communicate their trading intentions to exchange which subsequently leads to trade. Another essential function of security market is “Price Discovery” which is defined as process of finding market clearing price (Madhavan, 2000). It is the process by which market incorporates all available information to arrive at equilibrium price. However, the process of

---

2 Sundaram R. K. (2013) in the working paper series of NYU reports that global exchange traded equity linked futures and options turnovers in December, 2001 was $332b and $1562b respectively which grew to $985b and $3733b by December, 2011.
impounding the information into prices still remains unclear and is referred as “Black Box” in the literature.

This study is an attempt to investigate the role of equity derivatives in price discovery with a focus on Indian equity market and is largely related to the research in the area of Market Microstructure. The term "Market Microstructure" was coined by Garman in 1976 and it deals with purest form of Financial Intermediation as viewed by Stoll (2002). O’Hara (1995) defines Market Microstructure as “the study of the process and outcomes of exchanging assets under explicit trading rules”. To trade effectively in a market traders need to know these trading rules which determine who can trade; when, where and how one can trade, and what all can be traded? These protocols also determine what all information a trader can access about orders, quotations and trades; who all can have access to those information and when?

Roll (1984) first presented the idea that the fundamental value of a stock may differ from the observed market price of the stock due to market organization and trading process. Thus the role of microstructure of a market becomes important because the trading mechanism across markets differs and that may significantly affects the behaviour and trading venue decision of traders in different markets. Consequently it may allow the results, in terms of market’s contribution in price discovery, to differ across markets. Further, the unprecedented growth and internationalization of markets, proliferation of financial instruments and the ever evolving field of finance make this particular field of study ever interesting and ongoing subject of research for the simple reason that there is rarely a single price of even same assets trading in multiple markets.
Black (1975) is the first study to argue that options markets are trading venue for informed traders and play a role in price discovery as it offers the trading incentives like reduced capital requirement, lesser transaction cost, absence of short selling restrictions and limited downside risk. The literature on price discovery function of derivatives has evolved broadly in two ways. One group of researchers have studied the impact of introduction of derivative instruments on returns and volatility of the underlying assets, whereas others have focused on how trading in derivative contracts has affected and contributed to the price discovery process. This study attempts to focus on the latter for the reason that it remains less explored especially in the context of developing markets like India. Moreover, the conflicting results of existing literature regarding informational role of derivatives, astronomically growing Indian derivatives market, and lack of such studies in the context of an emerging market adds to the relevance of the study.

1.2 Derivatives: Concepts, Origin and Growth

Derivatives are defined as specialized contracts which derive their value from some underlying assets. They are primarily futures and options and the underlying assets could take many forms like commodities such as coffee beans, orange juice; precious metals such as gold, silver; financial instruments such as stocks, bonds; and many more. The International Monetary Fund while defining derivatives highlights its three important characteristics: First, derivatives are financial instruments linked to a specific financial asset, indicator or commodity which helps in trading specific financial risks. Second, derivatives derive their value from the price of an underlying asset, such as a stock or index and third that unlike debt securities, no principal is advanced to be repaid and no investment income such as dividends accrue. Futures are contracts between two parties to buy or sell an asset at a certain price in future whereas options are
contracts that give buyers the right and sellers the obligation to buy or sell a certain asset at certain price in future. To fulfil the obligation seller collects premium from the buyer. The two types of options are *Call* and *Put*. Buyer of call/put options has the right to buy/sell the underlying whereas seller of the call/put options has the obligation to sell/buy the underlying asset as per contract specifications.

Derivatives started their journey as specialist contracts to help create commodity price certainty over time and across globe. Futures trades are assumed to have their origin in Dojima, the rice market of Osaka, Japan around 1650. The major event in the development of derivatives is assumed to be the set up of CBOT (Chicago Board of Trade) by US in 1848 where the farmers would trade their grains. Chicago Board of Options Exchange (CBOE) set up in 1973 was another significant event for derivatives. Despite criticism of derivatives about it causing instability to the market and being highly risky, which are yet debatable, countries around the world allowed for derivatives trading due to its important functions i.e. price discovery, risk minimization, market efficiency. Derivatives have witnessed extraordinary growth around the world in last two decades and now a days it includes a wide range of financial contracts that are complex and perform far more diverse functions.

*Derivatives in India*

Although trading in derivatives in India is in existence for a long time in one or another form\(^3\), equity derivatives trading formally commenced in June 2000 in its current form after SEBI's approval of derivatives segment based on the recommendations of L.C Gupta committee. A

---

chronology of derivatives in India is presented in Table-1. Though, derivatives trading in India started only a decade ago on two exchanges of India i.e. National Stock Exchange (NSE) and Bombay Stock Exchange (BSE); NSE has found itself in global competition since its introduction of first derivative contract. Recently in 2010, as per report of World Federation of Exchanges (WFE), it has been ranked 2nd and 3rd in trading number of stock index options and number of single stock futures contracts respectively. It is also ranked 7th worldwide based on number of total derivatives contracts traded. The growth rate of derivatives trading in India has also been astounding with a CAGR of above 100% for turnover and contracts traded of index based derivatives.

### Derivatives in India: A Chronology

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 18, 1996</td>
<td>L.C. Gupta Committee set up to draft a policy framework for introducing derivatives</td>
</tr>
<tr>
<td>May 11, 1998</td>
<td>L.C. Gupta committee submits its report on the policy Framework</td>
</tr>
<tr>
<td>May 25, 2000</td>
<td>SEBI allows NSE and BSE to trade in index futures</td>
</tr>
<tr>
<td>June, 2000</td>
<td>Trading on Nifty and Sensex futures commences on NSE and BSE</td>
</tr>
<tr>
<td>June, 2001</td>
<td>Trading for Nifty options commences on the NSE</td>
</tr>
<tr>
<td>July, 2001</td>
<td>Trading on Stock options commences on the NSE</td>
</tr>
<tr>
<td>November, 2001</td>
<td>Trading on Stock futures commences on the NSE</td>
</tr>
<tr>
<td>August, 2008</td>
<td>Currency derivatives trading commences on the NSE</td>
</tr>
<tr>
<td>August, 2009</td>
<td>Interest rate derivatives trading commences on the NSE</td>
</tr>
<tr>
<td>February, 2010</td>
<td>Launch of Currency Futures on additional currency pairs</td>
</tr>
<tr>
<td>October, 2010</td>
<td>Introduction of European style Stock Options</td>
</tr>
</tbody>
</table>

Source: Compiled by the researcher from Vashistha A. and Kumar S. (2010) and www.nseindia.com

---

4 Reported in NSE Factbook March, 2011 by Muthukumaran T. and Somasundaram V. K.
5 Reported by Kohli R. in NSE newsletter of May, 2010
The unprecedented proliferation in the size of the trade and complexity of derivatives transactions concern regulators, academicians, and governments around the world and particularly to fast growing emerging markets like India. Academicians have studied the different aspects of derivatives extensively but most of these studies have focused on the developed American and European markets and the popular derivatives contracts in those countries. The field remains less explored for most of the developing markets and particularly for some derivatives products like Single Stock Futures (SSFs). Further, the relationship between spot and derivatives markets using price and trading activity data have been examined in some detail (Stephen and Whaley, 1990; Easley et. al., 1998; Chan et. al., 2002), but the question about information content in price discrepancy (particularly for SSFs) and volatility information trading have not been addressed in literature. This study on informational role of derivatives in Indian market using both futures and options contract on equity is motivated by the following facts.

1.3 Motivation

First, the highest trading volume of SSFs in India in comparison to other mature markets where Options trades the highest and have evidence of informed trading in options. The derivatives trading pattern of Indian market has been quite different from that of other mature markets (Kohli R 2010). Unlike preference of options contracts in mature markets, trading in SSFs has been popular in Indian market since its introduction in 2001. India's NSE stood second in 2010 in terms of number of SSF contracts traded after NYSE LIFFE Europe which is the global derivatives business of NYSE Euronext. It may be due to the fact that SSFs were introduced very late worldwide when compared to introduction of options. SSFs trading began on Sydney
Futures Exchange, Australia in 1994; on National Stock Exchange, India in 2001; on two other exchanges one Chicago and NQLX, US in 2002; and then followed by many other countries, whereas first stock options traded on CBOE (Chicago Board of Options Exchange) in 1973. Nonetheless, even after a decade of SSFs introduction in US and many other markets the trading in SSFs have not taken-off globally whereas NSE has the largest trading volume in SSF worldwide (Kumar and Tse, 2009). The index futures trading too haven't succeeded in attracting much volume as compared to options in developed countries. As the options market prices and trading activities have been found quite informative regarding spot market prices in studies on several markets (Manaster and Rendleman, 1982; Chen et al., 2005; Sarwar G., 2005), it inspires to examine the potential link between preference of a derivative instrument and its role in price discovery of the underlying asset i.e. informational role of SSFs in India. We argue that if this informational role is a phenomenon due to preference of traded instrument by informed traders in any market, we should find similar phenomenon for stock futures market in India. We would examine the information content in mispricing of SSFs for this purpose.

Second, Lack of study on the informational role of options trading activity regarding future price volatility. The leading role of options market recognized in literature is attributed to the trading incentives offered by this market. However it is also argued that traders informed about future volatility of stock prices can make their bet only in options market due to its non-linear pay-off structure. Consequently, volume and change in open interest in options market may follow

---

6 However, recently since 2009 we find enormous growth in index options trading leaving SSFs share behind (64% share of index options alone in total turnover against approx. 33% joint share of futures including both stock and index in 2010-11) and thus the informational role may be found shifting too. We also intend to examine whether this change in preference of derivative contract is due to change in market conditions for the fact that this preference shift is witnessed around the global financial crisis of 2007-08.
futures volatility. Volume changes due to increased participation after arrival of a new information whereas open interest changes due to the divergence in trader's certainty of the information as suggested by Bessembinder et al., 1996. The existing studies on options market have mostly examined price to price, volume to volume, price to volume links. Studies on the relationship between equity future volatility and options trading activity which is very important for risk managers has not been examined in length, particularly in emerging markets like India. It motivates us to examine the direction of information flow between options and stock market using implied volatility, volume and changes in open interest. This will help to understand the kind of use of options in the Indian market i.e. hedge related v/s volatility information based use and take favourable positions in the market accordingly.

Third, to examine whether the information contained in prices and trading activity of equity derivatives is independent of market conditions and contract specific factors. Though the research on informational role of derivatives is not new and research exploring the inter-linkage of Indian spot and derivatives market exist (i.e. Srivastava, 2005; Bhatia, 2007; Kumar K, 2007; Debashish S, 2009) but most of them have studied the lead lag relationship using aggregate data and have reported mixed results. Chen et al., 2005; argue that a trader is not entirely indifferent in deciding venue of trade when trading mechanism differs; market conditions and contract factors change. For example, a trader who prefers leverage over liquidity would trade options, whereas the trader whose concern is transaction cost would prefer to trade futures due to large spread in options and minimum brokerage and commission charged for futures trade. Similarly, a trader with negative news for stocks would trade stock futures in India due to short selling restriction in spot market and less liquid stock options market, whereas with negative market-
Wide news the trader may prefer to trade index options for it being highly leveraged and liquid. Likewise, an out-of-the-money (OTM) option may be preferred due to high leverage associated with it whereas an at-the-money (ATM) option may be preferred due to its high liquidity. Besides, though SSFs are inexpensive substitute of equity for investment and speculation that should appeal to traders but this leverage can also amplify the losses from SSFs. Considering these issues, we propose to account for various potential factors in our study that may influence the trading and the information content in derivative contracts.

*Fourth, the linkage between equity and equity derivatives markets considering both price and trading activity together have more economic usefulness but is less researched.* It is well argued that information content in prices and trading activity examined jointly makes more economic sense than they make when examined in isolation. However, most of the existing studies on informational role of options have examined the price and trading activity variables separately. We intend to consider both prices and trading activity together following Chen et al. (2005) and examine the flow of information between the spot and derivatives markets. We conduct this study using daily data from the website of NSE, India for the period January, 2004 to March, 2012 and contribute to the existing literature on Price Discovery function of derivatives with a focus on single stock future contracts and volatility informed trading.

The remainder of this study is organized in the following way. Chapter 2 describes the review of literature on the informational role of equity derivatives in price discovery for this study. In the same chapter 2 studies based on common variables are grouped together and results and conclusions thereof are discussed in chronological order. Chapter 3 discusses the identified
research gaps and objectives of this study along with the formulated hypotheses and proposed methodology to test those hypotheses. Chapter 4 is the empirical study on information content of implicit spot prices of single stock futures which concludes that perceived mispricing in the stock futures market is useful for traders to profit in spot market. Chapter 5 is empirical examination of informed trading in Indian index options market based on the volatility related information whereas Chapter-6 examines the informational role of options based on the directional information. We find strong evidences of informed trading in index options market in both of the investigations. Chapter 7 draws conclusion based on our all three empirical examinations and highlights the implications of the study along with the scope for future research.