CHAPTER 1

INTRODUCTION

Liquidity of a financial asset has been identified as a very important factor in the smooth functioning of financial markets as it helps market participants to overcome unexpected financial needs without undergoing major losses. The liquidity of a security and how it varies over time is of major concern to every market participant. It is generally defined in the market microstructure literature as the ease with which investors can buy and sell securities without having much impact on the prices. In the extant literature, liquidity has three dimensions associated with it; tightness, depth, and resiliency. Bid-ask spread used as a proxy for tightness quantifies how far the trade prices deviate from the average market prices. Depth quantifies the change in price due to a shock in the size of the order flow and resiliency quantifies the speed with which prices recover from a random shock (Kyle, 1985). The prominence of liquidity is observed in every aspect of the functioning of stock markets. The amount of profit earned by any market participant is dependent on the liquidity of the asset.

Securities markets, the world over are classified into two major types; Quote-driven markets and the Order-driven markets. Most of the developed markets operate as quote-driven systems or as a combination of quote and order-driven systems. The order-driven systems have become predominant in many of the relatively newly developing markets because of the technology advancements and financial market reforms (Brockman and Chung, 2002). Due to

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1 In a quote-driven market there is designated market maker who always supplies liquidity to the market, but there is no supplier of liquidity in an order-driven market. In quote driven markets, the quotes of the market makers alone are displayed, but in an order-driven market the quotes of all the market participants are displayed and hence they are more transparent. The order-driven trading systems are anonymous and it is not the case with quote-driven systems.
the different types of market systems, the liquidity dynamics differ in these markets. As there is a designated market maker in quote-driven market, it is highly liquid as the market maker supplies liquidity to the market. Whereas, order-driven markets are less liquid as there is no liquidity supplier of last resort. The determinants of liquidity in a quote-driven versus the order-driven markets are not the same. In a quote-driven market such as the NASDAQ or the NYSE, there are three main determinants of liquidity; information asymmetry, order-processing costs, and inventory maintenance risk (Stoll, 1978). But, in an order-driven market such as NSE (India), the main determinant of liquidity is asymmetric information. As the order-driven markets are a recent phenomenon, they provide good opportunity for research on liquidity provision and consumption.

1.1 Market Structure of NSE

The National Stock Exchange of India (NSE) came into existence in the year 1993 and it has become a market leader in securities trading industry because of its high quality services possible due to superior infrastructure. The screen-based electronic trading platform of NSE known as NEAT (National Exchange for Automated Trading) system helps in price formation and makes trading easy for investors located at different locations on the globe. This trading system supports all types of trading; equity, debt, and derivatives and works on the same principle of Electronic Communication Networks (ECN) used by developed countries like the United States. NSE takes the credit for introducing the usage of satellite communication technology for trading. At present NSE provides trading in four different segments such as cash, debt, options and futures, and currency derivative segments\(^2\).

NSE, unlike some of the leading developed market exchanges is an open electronic order driven market (limit order book market) where the investors directly place their orders into the system and the transaction gets executed as soon as the matching order is identified. The orders are matched on the basis of giving first priority to price and then to time which has advantages of saving time, decreasing costs and also being error-free. The market participants can place limit or market orders with many options making it very flexible for the users. The clearing system of NSE follows a T+2 rolling settlement cycle. NSE is the most liquid exchange in India with an average of 95% of the stocks trading in a year compared to Bombay Stock Exchange (BSE) which has only 40% of the companies trading in a year on an average. On an average, more than 90% of the firms trade for more than 100 days a year on NSE. The trading members/brokers play a significant role in bringing the buyers and sellers together and have direct access to the trading platform. NSE has several important indices which are widely tracked by the investors such as the NIFTY 50, CNX Nifty Junior, CNX 100, S&P CNX 500, etc.

The main objectives in setting up NSE are to ensure identical access to all the market participants throughout the country; to establish a trading facility all over the nation to trade all types of instruments; to provide an efficient and transparent market system; to allow shorter settlement cycles, and to meet the global standards. NSE has been performing an active role in restructuring the market with respect to microstructure practices. From the time of its operations, NSE has been practicing the best form of demutualized setup. NSE, due to its innovative attempts such as shorter settlement cycle, better risk-management, setting up a well-functioning clearing corporation with respect to clearing and settlement could eliminate settlement risks.

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3 The investors’ pay-in and pay-out are finalized latest within one day after trading (T+1) and settled on the second day after the trading.
4 In a demutualized setup the ownership, management, and right to trade lie in the hands of three different categories of people.
NSE has a trading platform for different types of tradable securities such as equity, debt, and derivatives. After getting recognition as a stock exchange in April 1993, the exchange started operations in debt segment from June 1994, Equity segment in November 1994, and in the F&O segment from June 2000. The trading of retail government debt was started in January 2003, and currency futures were introduced in August 2008. The currency option trading was started in October 2010. The trading in derivatives of major global indices such as S&P 500, Dow Jones, and FTSE 100 were started in August 2011. The exchange’s equity derivatives platform allows trading of an extensive range of derivative products such as futures on Index, Options on Index, Index on stock futures and options, and futures contracts on some of the major global indices.

The market design of NSE is such that the exchange is accessible only to the trading members of the exchange. The trading members play a role similar to that of the market makers in quote driven markets. They bring the buyers and sellers together. The brokers trade on their account or on behalf of their clients. Once the buy and sell orders are matched, trades are executed. A broker can be a member of the exchange only when he/she fulfills the requirements or regulations specified by exchange. The trading mechanism is facilitated through NEAT and any member has the provision to enter the order quantity and the price at which he/she is willing to trade, and the trade is executed once a matching order arrives. The clearing and settlement process on the exchange comprise of three major activities; clearing, settlement, and risk management. NSCCL, which is a fully owned subsidiary of NSE clears and settles the trades as per the regular settlement cycle which comprise of nine working days after the trading day.

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6 The National Securities Clearing Corporation Limited (NSCCL) is a fully owned subsidiary of NSE.
7 If T is the trading day, clearing process is completed in T+2 days, the settlement process is completed in T+4 days and the post-settlement process is completed between T+6 to T+9 days.
To control stock price volatility which is a major concern for all the stakeholders of the market, the Securities and Exchange Board of India (SEBI) has set up a system of circuit breakers. The circuit breakers halt the entire trading process on all the equity and derivatives markets. There are three stages to the index-based market-wide circuit breaker which applies either way at 10, 15, and 20 percent. For individual securities, there are three different price bands applicable to three different categories of securities at 5, 10, and 20 percent on a daily basis either way. No price bands are applicable on those underlying securities which have an option or a future.

1.2 Liquidity Commonality

The traditional research on liquidity has been mainly concentrated on individual assets till the seminal work of Chordia, Roll and Subrahmanyam (2000) (CRS hereafter) which directed the attention of research on liquidity to a new territory. They show that individual market structure phenomenon such as liquidity has common underlying determinants and hence should not be treated in isolation. This phenomenon is termed commonality in liquidity and is formally defined as the proposition of how much a firm’s liquidity is at least partly explained by the market-wide and industry-wide factors (Brockman and Chung, 2002). After the seminal work of CRS (2000), there has been an increasing volume of research documenting the presence of liquidity commonality and the role of common liquidity factors in several markets (Huberman and Halka, 2001; Hasbrouck and Seppi, 2001; Brockman and Chung, 2002; Pastor and Stambaugh, 2003; Fabre and Frino, 2004; Coughenour and Saad, 2004; Domowitz, Hansch, and Wang, 2005; Kamara, Lou, and Sadka, 2008; Kempf and Mayston, 2008; Brockman, Chung, and Perignon, 2009; Hameed, Kang, and Vishwanathan, 2010; Karolyi, Lee, and van Dijk, 2012).
There are various reasons that can be quoted from the literature to highlight the importance of liquidity commonality and its related research. Given that liquidity affects asset prices, then liquidity commonality also affects asset prices. This fact is not taken into consideration by the conventional models in the asset pricing literature. Hence, these models have to be modified to incorporate the effect of liquidity commonality on asset prices. Now, the issue of concern for the market participants is to know whether the market liquidity is priced or whether the market risk factor due to commonality in liquidity enters the stochastic discount factor. If the asset returns are strongly associated with market returns, the determinants of liquidity commonality may establish a non-diversifiable risk factor and hence this is a priced risk factor. Hence, investors holding such assets in their portfolio require a risk premium to bear the extra risk. This also creates problems for portfolio managers in diversifying their risk who depend on choosing stocks that do not correlate in returns (Domowitz, Hansch, and Wang, 2005). Commonality in liquidity is of major concern to government regulators as well as reserve banks as it is a non-diversifiable risk factor. The basic behavior of liquidity commonality is that any shocks to it causes market-wide effects and impacts the smooth working of the financial markets. In worst case scenario, shocks to liquidity commonality leads to financial crisis or stock market crashes. The sudden disappearance of market liquidity across various markets is the major factor causing the Asian financial crisis in 1997-98 as well as the recent 2008 global financial crisis.

The research on liquidity commonality provides a completely new platform to understand the dynamics of liquidity, since it focuses on the market-wide common factors compared to the single asset focus. The current literature mainly focuses on liquidity commonality of the mature markets and very few studies exist for understanding the phenomenon of liquidity commonality
in the context of emerging order-driven markets. Even though liquidity commonality has been widely documented in the literature, the fundamental sources of liquidity commonality are still not understood comprehensively. The variation in liquidity commonality over time is driven by microstructure factors such as inventory risk, asymmetric information risk. The supply-side factors which arise due to the funding constraints faced by market participants, demand-side factors caused due to correlated trading activity, and also macroeconomic factors have not been examined in detail. It has been proven theoretically and illustrated more recently that market liquidity risk impacts asset prices both for the equity and derivatives markets and is a priced risk factor.\(^8\)

Our objective is to comprehensively study commonality in liquidity for the stocks and options listed on National Stock Exchange (NSE) of India. The study analyzes liquidity commonality for stocks and options at three levels; market level, industry level, and portfolio level. This study will fill a gap that exists in the current literature relating to the documentation of liquidity commonality in an emerging order driven market. An emerging order driven market like NSE is quite different from the developed quote driven stock exchanges around the world as discussed before. We also check whether our results are comparable with those of the quoted driven market studies. For the equity market, this study comprehensively analyzes the various determinants of liquidity commonality. We study the asymmetric information risk as a source of liquidity commonality since adverse selection costs are a very important determinant of bid-ask spreads. We focus on the supply-side, demand-side, macroeconomic sources of liquidity commonality along with the cross-sectional determinants of liquidity commonality. However, for

\(^8\) For the equity markets, Pastor and Stambaugh (2003) theoretically and empirically show that market-wide liquidity affects asset prices. Acharya and Pederson (2005) gave a more general asset pricing model called liquidity adjusted capital asset pricing model and show empirically that liquidity affects asset prices. For the derivatives markets, Cetin, Jarrow, Protter and Warachka (2006) show that liquidity risk could impact option prices significantly.
the options market we restrict the analysis of commonality sources to asymmetric information risk as the literature in this area is still in the infant stage. The study also analyses the relation between liquidity commonality and market returns. More specifically, the study examines the impact of negative market returns (stock market declines) on liquidity commonality to examine whether liquidity commonality increases dramatically after large negative market returns similar to the effect observed for stock return co-movement in the literature.

1.3 Motivation for the Study

Given that liquidity commonality, its sources, its impact on asset returns have critical ramifications for asset pricing, stock market performance and most importantly its survival, many studies have taken up the issue of liquidity commonality across various markets. Almost all the studies on commonality in liquidity have documented significant evidence for the existence of liquidity commonality. The main motivation for all these studies has been the concern that shocks to commonality leads to financial crises such as 1997 Asian financial crisis and the recent 2008 global financial crisis. Given the importance of liquidity shocks to emerging markets responsible for crises, there are very few studies dedicated to understand liquidity commonality in these markets. The lack of ample evidence with respect to liquidity commonality in emerging markets creates a huge gap in our comprehensive understanding of commonality in liquidity. In this context, we draw our first motivation from the fact that India is one of the most important and leading emerging markets of the world. The performance of Indian market not only affects the performance of other regional Asian markets such as Taiwan, Singapore, Malaysia, but also has implications for investors worldwide. So, documenting comprehensive evidence related to liquidity commonality and its sources for the Indian stock market leads to a better understanding of liquidity commonality in the case of emerging markets.
The structural difference in terms of the trading system in place on the Indian stock market relates to our second motivation. The trading system in place on the Indian markets is an order driven trading system compared to the quote driven trading systems of the developed markets. An order driven market structure such as the stock market of NSE provides a classic case to understand commonality in liquidity. In an order driven market, the barriers to entry are very low. Due to this more market participants will be interested in supplying liquidity to the market resulting in a healthy competition. But in a quote driven market, the presence of market makers leads to high barriers to entry killing competition. According to Brockman and Chung (2002), an order driven market system generates liquidity demand and supply schedules on an equal basis under perfect competition. Whether liquidity co-movement is different or not in these two types of market structures is purely an empirical question and we deal with this issue accordingly.

Our third motivation relates to the understanding of two important aspects of liquidity commonality. First aspect is the lack of research in comprehensively understanding all the possible determinants of liquidity commonality. To the best of our knowledge there is no single paper devoted to understand comprehensively the sources of liquidity commonality for a particular market, order driven or quote driven. Second, the lack of research in documenting liquidity commonality in the case of order driven options markets as the emerging research shows that option prices are affected by liquidity risk. We deal with all these issues by identifying possible sources of liquidity commonality on NSE.

1.4 Organization of the Thesis

The thesis is organized into seven chapters. The second chapter discusses a detailed and critical literature review of liquidity commonality. The broad objectives, gaps in the literature,
formulation of hypotheses, data, and methodology are discussed in chapter 3. The data and research methodology employed in the study is explained in chapter 4. Chapter 5 is devoted to empirically examine the existence of liquidity commonality in both stock and options markets of NSE. The various sources of liquidity commonality and the relationship between market returns and liquidity commonality are empirically examined and explained in chapter 6. Finally, chapter 7 summarizes the major findings of the thesis and concludes with important policy implications.