CHAPTER 9

SUMMARY AND POLICY RECOMMENDATION

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9.1 INTRODUCTION

Every economy on the path of growth and development requires a sound and efficient financial system that allows for the development of three types of finance – budgetary finance, bank finance and securities finance – in a coordinated manner. They are like three legs on a stool: stable when they work together, unstable when they don't. Developed economies in Europe and north America, in contrast to developing economies in Asia, have a highly developed financial system and stock market that performs the resource allocation function much more efficiently. Considering the fact that experiences of developed countries do not always suit the conditions of the developing countries. Nonetheless, it is vital to acknowledge the stock market's contribution and to analyze its future prospects.

The stock market's performance, according to the majority, is the best indicator of a country's economic health. As a result, they serve as a barometer for the economy's current cycle, as well as the hopes and fears of those who drive growth and success. Stock markets have existed for centuries and will probably continue to be the major publicly regulated marketplaces for the acquisition and sale of various companies' shares. Although today's markets are vastly different from those of the 1600s, stocks remain the most popular investment option due to their profit potential and opportunistic character. The stock market encourages saving by giving households with investible funds with a new financial instrument that better meets their risk and liquidity requirements. By providing capital to businesses, an efficient stock market plays a critical role in the economy and indicates the route to a well-functioning economic system.

The Indian stock market has played a key role in defining resource allocation in the country since the advent of market-oriented economic reforms in 1991. The trading volume on all 23 stock exchanges in the country has increased considerably during the last decade. As a result of the reforms, the relative importance of several stock exchanges in the market has substantially changed. The public's interest in the stock market was aroused as a result of this. Due to the stock market's buoyancy and rising public interest, the study of stock market price movement, the risk it implies, and the expected return has taken on great importance in recent years. We have numerous studies indicating the relationship the stock market has with various macroeconomic variables, volume, yield. Price-to-earnings ratio, market capitalization or ex-dividend rate. Some studies also focus on the emotion/sentiment factor that also has a huge impact on the stock market's price movements. However, there are relatively few studies which concentrate on the characteristics of returns distribution and underlying

dependence of the distribution of various sectoral indices with the benchmark indices. In this framework, the current study's findings are discussed, as well as policy ramifications.

9.2 CHAPTERIZATION

The study's broad aims are as follows:

1. To inquire into the nature and pattern of volatility in Indian stock markets, namely the S&P BSE Sensex (Bombay stock exchange) and the Nifty50 (National Stock Exchange).

2. To model the volatility of Indian stock markets with the ARCH and GARCH family models viz, SGARCH, EGARCH, GJRGARCH, APARCH and FIEGARCH models.

3. To analyze the associations among the Bombay and National stock exchanges' broad market indexes, sectoral indices, and thematic indices with the help of various copulas.

The study spans over more than 14-year period from 2nd January 2006 to 31st August 2020. This time period was chosen because it coincided with substantial market fluctuations, regulatory changes and also changes in the market's institutional framework. The sample of the study consists of India's two prominent benchmark indices namely S&P BSE Sensex and CNX Nifty50. The study is organized into eight chapters. Chapter one gives a broad introduction on problem surrounding risk modelling. It discusses conceptual and analytical framework for risk, expected return and the underlying distribution. The chapter discusses various measures of risk and the stylized facts of return distribution. Thereafter, it discusses about sectoral allocation and introduces copula, various types of copulas specifically concentrating on the ones discussed in the thesis.

Chapter two presents review of theoretical as well as empirical studies that have been taken place on the subject of risk involved in the Indian stock market. The survey is broken down into four sections. The first section goes into the history of the capital asset pricing model, as well as its changes and criticisms. The second part examines the literature pertaining to the various stylized facts of financial asset return distribution, each characteristic included in the stylized facts is presented with its own set of literature. Third part discusses the sectoral allocation studies of the stock market of India and the fourth part of the chapter reviews the literature pertaining to copula, copula studies in India and types of copulas used. Some studies focus on theoretical

foundation of the concepts; while, some focus on econometric modelling of the various stylized facts as well as studies on types of copulas.

The third chapter reviews the history of Indian stock market its growth and development from its formation in 1850s until today. The chapter is separated into several historical periods to show significant changes in market structure, policy changes, or market crashes as a result of economic/financial crises in both the domestic and foreign markets. The study also covers the period of universal health crises due to the widespread of coronavirus which ultimately lead to a pause in the economic production activities of the entire world. It entails a through discussion on the movement of prices of the broad market indices of Bombay stock exchange – Sensex and National stock exchange – Nifty50.

The fourth chapter examines the composition of the Bombay stock exchange's sectoral indices as well as the National stock exchange's selected sectoral and thematic indices. Beginning with the establishment of the Bombay Stock Exchange and the classification of 21 indexes that comprise stocks, bonds, T-bills, and other investment vehicles. The chapter than proceeds to discuss the performance of each sector included in the sector and industry index of Bombay stock exchange compared to the performance of its base index. Further, the chapter includes a discussion on formation of national stock exchange and its various indices followed by the description of the selected sectoral and thematic indices.

The methodology used in the thesis, as well as the data collection approach, are addressed in depth in the fifth chapter. At the start of the chapter, the problem description and study objectives are presented, followed by the sample used in the study. The secondary data sources required for the investigation are also discussed. The chapter is broken into three sections. The first section covers exploratory data analysis, which includes the statistical formulas that were utilized to conduct the preliminary study. The statistical and econometric approaches used to analyze the stylized features are presented in the second half of the chapter, time series analysis. Finally, there is a section on probability theory, which contains statistical and econometric analysis of the various types of copulas utilized in the study.

The following chapters sixth, seventh and eighth are data analysis and interpretation. This again is divided further into three chapters viz, exploratory data analysis, time series analysis of stylized facts of financial returns distribution and copula analysis. The sixth chapter gives a preliminary study of all of the indexes' time series data. All of the indices examined in the study's trend, price movements, descriptive statistics, normality test, beta values, and correlation analysis are presented. The seventh chapter examines secondary data for two Indian stock market indexes, the BSE Sensex and the Nifty50, as well as selected sectoral and theme indices.

Models from the ARCH and GARCH families, including as SGARCH, EGARCH, GJRGARCH, APARCH, and FIEGARCH, are used to analyze the stylized facts. The presence of heavy tails, clustering and persistence of volatility, the absence of autocorrelation, leverage effect, the slow decay of autocorrelation in absolute returns, and long memory of various indexes were all examined in this chapter.

Finally, the eight chapter on data analysis and interpretation presents the results of granger causality and copula models. Granger causality with respect to the benchmark index of the sectoral indices as well as the thematic indices for both the stock exchanges is presented. Additionally, causality within the sectors is also demonstrated in the section. Furthermore, this section also includes analysis with the help of different types of copulas. The analysis is in the form of graphical presentation along with the values of parameters corresponding to the respective types of copulas.

9.3 KEY FINDINGS

1. The Indian stock market's return series for both the benchmark indices – BSE Sensex and Nifty50 appear to be leptokurtic, with much wider tails and larger peaks, according to the descriptive statistics. The GARCH models can deal with the data's attribute.

2. In accordance to the descriptive statistics, the value of skewness for both the benchmark index and the descriptive statistics is negative, indicating that the distribution is negatively skewed to the left, implying that the left tail is larger.

3. The descriptive statistics of the sectoral analysis of Bombay stock exchange reveal highly asymmetric negatively skewed as well as leptokurtic with wider left tails return series.

4. The descriptive statistics of sectoral and thematic indices of the National stock exchange also reveal highly asymmetric negatively skewed and leptokurtic with broader left tails return series.

5. Jarque-Bera test indicates that benchmark indices, as well as sectoral and theme indices, are not normally distributed. In this case, the first alternative hypothesis is accepted.

6. According to the beta analysis carried out states that banks, capital goods, metal, oil and gas, power and realty are highly volatile sector in relation to the benchmark index of BSE - Sensex. While,

financial services, commodities, service sector, private banks, PSU banks, and infrastructure are highly volatile sectors with respect to Nifty50.

7. Similarly, with respect to the sectoral and thematic indices correlation with the broad market index, it is discovered that automobiles, banks, basic materials, capital goods, consumer durables, energy, finance, FMCG, healthcare industrials, IT, Oil and gas, and Teck are all highly correlated with the BSE Sensex. While the financial services index, media index, commodities index, consumption index, service sector index, and private bank index are all highly correlated with the Nifty50, the financial services index, media index, commodities index, consumption index, service sector index, and private bank index are not.

8. The ARCH LM tests show that ARCH effects are present in the return series in all of the indices. Furthermore, given that market volatility portrays time variable behavior, the persistence of volatility, mean reversion behavior, and asymmetric impact of return innovations may all be seen in the Indian stock markets.

9. The traditional GARCH models are outperformed by asymmetric GARCH models. We may say that there is a presence of leverage impact in both the benchmark indices using asymmetric GARCH models - EGARCH, GJR GARCH. According to these models, volatility appears to be higher when prices fall than when they rise. The results of APARCH models show even better results which is supported by the information criterion – Akaike and Hannan-quinn.

10. The news impact curve, which measures how new information is factored into volatility forecasts, is also shown in the GARCH family of models. The asymmetric GARCH models were found to be suitable for representing the return data generation process. The Indian stock market's indices were discovered to react to news in a variety of ways. When unanticipated negative news reaches the market, volatility jumps dramatically, while favorable news remains unresponsive for the most parts. In this case, the second null hypothesis is accepted which stated that all the time series data considered confirm the presence of stylized facts in the study.

11. Using the granger causality test, the study examines an interdependence structure of the stock markets. The results of the test suggest bidirectional causality in returns between BSE Sensex and basic materials, energy, finance, FMCG, and industrials; while, in case of NSE, bidirectional relationship can be observed between Nifty50 and services sector, manufacturing sector, respectively. The results

also suggest unidirectional relationship from Sensex to bank, consumer durables, and IT. Whereas, it also shows unidirectional relationship from power, telecom and utilities to Sensex, respectively. In case of Nifty50 we find unidirectional relationship from Nifty50 to financial services, media, and private banks, respectively. In addition, consumption index, infrastructure index, and PSU banks also has unidirectional causality towards Nifty50, respectively. In this case, the third null hypothesis stating causal relationship between sectoral/thematic indices and benchmark indices is accepted.

12. The Granger causality test is used to determine causality with the sectoral indices for BSE and sectoral as well as thematic indices for NSE. In BSE, there are 31 bidirectional relationship and 68 unidirectional relationships. Whereas, in NSE, there are 9 bidirectional relationships and 18 unidirectional relationships. In this case, the fourth null hypothesis stating causal relationship among the sectoral and thematic indices is partially accepted.

13. Further in the thesis, to comprehend the co-movements of financial time series and to depict the dependence structure with more flexibility, several types of copulas are examined. The results indicate that t-copulas were a better fit model for the data based on the selection (information) criteria. In this case, the fifth and sixth null hypothesis stating association between sectoral/thematic indices and benchmark indices; as well as, among the sectoral and thematic indices is partially accepted.

14. The analysis highlights two broad category of sectors – one that is highly correlated with the market index and are dependent on the economy’s resilience, while the other is relatively low correlated with the market index and are to some degree independent of the economic swings. The ones which are highly correlated, of cyclical nature have heavier tails and higher correlation and sectors of defensive nature with lower correlation both signals a pattern of movement which in turn will be extremely useful for the investors of all kinds to diversify and minimize risk with maximum returns.

15. Any type of investor profile – be it moderate, conservative or aggressive can take the advantage of sectoral allocation studies to diversify their portfolio by allocating certain percentage to each sector. As a result, a well-diversified portfolio should have exposure to as many sectors as feasible, rather than concentrating too many funds in a single or related area. Because if the portfolio's sectoral weight is too much skewed towards one sector, the portfolio's fate will be determined by that sector's performance.

9.4 AREA OF FURTHER RESEARCH

The subject of risk modeling has been extensively researched in the developed as well as few emerging economies. However, not much work has been done with respect to the various sectoral as well as thematic indices. The present study attempts to carry out a considerable comprehensive analysis of the sectoral, thematic as well as the broad market indices of the stock market of India. Nonetheless, there are a number of research options that have yet to be investigated. It would be worthwhile to do substantial research in these areas and provide useful contributions to capital market stakeholders. Any of the following areas of research can be pursued:

1. The present study has restricted itself to two of the broad market indices, viz, Sensex and Nifty50 and selected sectoral and thematic indices of the BSE and NSE. Nowadays, various other indices present under the purview of NSE and BSE constructed to track the performance of specific industries or sector can also be used to conduct similar analysis.

2. GARCH family models can be used to investigate its applicability on various other indices and also individual company's share price data to analyze the stylized facts.

3. GARCH models applicability can be extended to derivative markets. The GARCH models may be used to explore the effects of a variety of parameters, including margin trading, derivatives, and the addition of circuit filters, among others.

4. There are numerous factors that affect the stock market be it various macroeconomic variables, international factors or factors such as price earnings ratios, volume, dividend rate etc. which are not considered in the study. The magnitude of these variables' impact on the stock market must also be known.

5. Research can also be conducted to determine the extent of integration of the stock market of India with other emerging countries and developed countries stock markets. This aspect is particularly appealing in light of India's growing globalization and the listing of Indian companies on US, European, and other stock exchanges. Cointegration studies of Indian stock markets with other financial markets, such as the money market and the foreign currency market, are also possible.

6. GARCH models can be used to try to explain intra-day, weekly, and monthly volatility behavior. A study of this could reveal vital information on the elements that impact stock market, along with the true nature/characteristics of the stock market.

7. Forecasting volatility is important in a range of risk management applications. Different forecasting models can be compared to discover which is the most accurate in terms of prediction accuracy, which could be valuable to investors.

8. ARCH and GARCH models are restrictive. Their process is deterministic rather than being stochastic; therefore, stochastic models should be considered to analyze various stylized facts specifically volatility.

9. Copula used for the study is limited to Elliptical and Archimedean copulas. The analysis can be carried out with vine copulas and factor copulas which presents better results.

10. Better visualization techniques such as 3D can be used to have a thorough understanding of the distribution.

11. Further study can be conducted to study negative tail dependence and the structure of dependence.

12. Research of the relationship between international correlation and stock market turbulence might be conducted, and the results could be very useful for portfolio selection.

13. Tail behavior and its upper and lower bound dependency can be studied with the help of extreme value theory.

14. A study can also develop a model which determines the percentage an investor can invest in various sectors in order to have a well-diversified portfolio with the best possible sectoral allocation. Although, this is largely dependent on the economic conditions of the country and various other internal and external factors, generalization can be made for broader economic scenarios.

9.5 POLICY RECOMMENDATION

1. Indian stock markets are riskier to invest in than any other developed and developing stock markets throughout the world. The investor needs to be well aware about the investment (s)/he is going to undertake. Rigorous actions need to be for increasing the depth of the markets by enticing more reputable enterprises to participate and also curb excessive speculations.

2. There is a lot of asymmetries in the market and therefore policymakers must ensure a reliable risk-return relationship to keep the educated and institutional investors invest in the market. Activities like insider trading and other sources of illicit profit-making opportunities should be strictly monitored and regulated.

3. The requirement for risk modeling has piqued the interest of stock exchange management, brokers, investors and regulators alike. For the advantage of investors and the smooth operation of the stock markets, policymakers and stock exchange regulatory agencies should develop appropriate policy recommendation.

4. In lieu of equity portfolio risk and stock exchange returns, high volatility has ramifications for trading tactics and risk management. Portfolios of investors and firms can be destabilized as a result of bad news in the market and therefore it is necessary to take risk mitigation measure as a form of hedging against the news cacophony.

5. Sophisticated models could be used to forecast future volatility in the market which again can be used to devise policies.

6. Sectoral allocation can help the investors to diversify his/her portfolio in order to reduce risk. It helps them to understand the sectors and combine it with their risk appetite for long term returns. Furthermore, awareness about volatility and correlation of each sector can help to balance the portfolio, therefore it makes sense to use sectors with lesser volatility/correlation as anchors in a portfolio.