STUDY ON STOCK AND INDEX FUTURES IN INDIAN DERIVATIVES MARKET

A Dissertation for

COM-651 & Dissertation

Credits:16

Submitted in partial fulfillment of Masters of Commerce Degree

M.com

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Date: May 2024

DECLARATION BY STUDENT

I hereby declare that the data presented in this Dissertation report entitled, "An Empirical Study On Stock And Index Futures In Indian Derivatives Market" is based on the results of investigations carried out by me in the Commerce department at the Goa Business School, Goa University under the Supervision of Asst.Prof.Aakruthi Alamkar and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University will be not be responsible for the correctness of observations / experimental or other findings given the dissertation.

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ABBREVIATIONS

Entity	Abbreviations
Spot Closing Price	SCL
Future Closing Price	FCL
Standard Deviations	Std.Dev
Probability	Prob
Ordinary Least Square Method	OLS
Observation	Obs
Co-integrating equations	CE

Abstract

To examine the Cause and Effect relationship between Spot and Futures of Index and Stocks in India. The first objective considers Granger Causality to test the Cause and Effect relationship and also Johansen Co-integration test for long relationship and VECM for short run relationship among variables the second objective is to estimate the hedge ratio and hedging effectivenss using OLS models . The purpose is to study the cause and effect relationship and to estimate the hedge ratio and hedging effectivenss between Future Closing Price and Spot Closing Price for Stocks and Index Future contracts traded on NSE India. The study is done only NSE India as it represents Indian Equity market. In this study only 23 Stock Futures and Nifty 50 Index Future Closing Price and Spot Closing Price traded on National Stock Exchange are analyzed. There are total of 2284 observations for all 23 Stock Futures and Nifty 50 Index data ranging from 1st April 2013 to31st of March 2023. For each series Descriptive Statistics and Unit root Test (Augmented Dickey Fuller) are performed to check the data structure and normality in order to process the further testing using Granger Causality and OLS model to estimate the hedg ratio and hedging effectiveness.

CHAPTER1: INTRODUCTION

1.1 Introduction to Derivatives

Derivative products are finanacial instrument who derives its value from the basis of their price of few underlying assets and specifies that the product has no individualistic value. The underlying assets can be in the form of financial securities, physical commodities , currency along with others.For instance, we visted as juice shop and order chickoo juice which was rs50 per glass , the value of juice is derived from the value of chickoo per kilo, let us say for rs100 per kilo chickoo the vendor is charging rs50 per glass of chickoo juice so if in future the price of chickoo per kilo increase the price of juice will also increase..Investors can use derivatives as a tool to minimize systematic risk which is associated with their investment portflio, for an investor diversifying the total portfolio in major compaines may not abe to reduce the risk connected with those stocks. In such Scenario investors can buy index derivatives to lighten the risk and have better returns in the future.

1.2 Derivatives In India

Following the introduction of derivatives trading in India, on November 18, 1996, SEBI established 24 committees, with Dr. L.C. Gupta sitting as head, to define the country's regulatory framework for derivatives trading. On March 17, 1998, the committee submitted its first report suggesting that derivatives be registered as securities.Additionally, in June 1998, SEBI established a committee headed by Prof. J.R. Verma to push for risk containment measures in the Indian derivatives market. The committee later delivered a report in October 1998. In 1999, amendments were made to the Securities Contract Regulation Act (SCRA). Index futures were the first derivatives to be introduced in the Indian market, followed by index options in June 2001. India's relationship with derivatives started in June 2000, when both the NSE and the BSE

started trading in equity derivatives with SEBI license., the Indian derivatives market is becoming more and more significant. The popularity of time derivatives has increased dramatically since they were first introduced in 2000. This is evident from the reality that the National Stock Exchange's derivatives segment currently has a daily turnover of Rs. crore, which is significantly more than the exchange's cash markets turnover(Paresh n.d.)

1.3 Types of Derivatives

- Futures:they are a standard contract that two investors enter into to purchase and receive an underlying asset at a certain price at a future date. Futures are bought and sold on stock exchanges that have rules governing futures trading. For instance, Company X purchases two-month contracts for $40 per barrel of crude oil.After the end of the period, the other party will now supply crude to Company X at $40 per barrel.
- Forwards: A forward is an agreement between two investors to buy and receive the underlying assets at a certain price at a later date.Over-the-counter (OTC) deliveries and sales are considered forwards. Parties to a contract may alter it to better fit their purposes.
- Option: With this type of derivative, the buyer and seller can decide to exchange the underlying assets at a later date and at a fixed price.However, the choice is free to buy and sell any particular thing. Purchasing put or call options, where a put option represents the right to sell and a call option represents the right to purchase, is involved.
- Swaps: In this case, exchanging securities with one another is agreed upon in order to change the conditions of contracts. The three most common types of swaps are interest rate, commodity, and currency swaps.Exchange investments are not made by these OTC contracts.

1.4 Participants of Derivatives

- Hedgers: A process in which an traded protect a position at spot market by utilising the opposite position in the derivatives market is know as a hedge. An Investor who hedges is called as hedger.Hedging is done in order to eliminate or minimize or reduce the risk involed on spot markets.
- Speculators: An investor who purchase and sells a contract in the desire of profits from the price movements is known as speculator. They do have any risk to hedge and gain profits by taking long and short position in the derivatives markets. In addition speculators can be the counterparties of hedgers.
- Arbitragers: they are the third participant of derivatives. Arbitrage they establish risk free profits by buying and selling identical or similar underlying assets in different markets.who arbitrages is called as arbitrageurs

.

1.5 Functions of Derivatives

- Price Discovery: The most important function of derivatives. It helps to provides information regarding the future spot prices in derivatives market. Where the particapants indulge in reasonable or fair prices therefore it facilates price discovery due to increased in number of participants.
- Risk Management : another function of derivatives.where investors may always chose to avoid risk. the most important elements of risk management is to minimise the risk, manage the risk to control the possible damages and managing the risk by spreading out risk across sources.

- Market Efficency **:** Derivatives play an important role in market efficency , market efficency is the extent to which prices fairly represent all the related information that public can refer . market efficency helps to reflect relevant and accurate information about the actual valueof the underlying assets.

1.6 Framework of Derivatives

1.6.1. Equity Derivatives

India entered the path of exchange traded equity derivtaives in 2000, namely the stock exchange Mumbai (BSE) and National stock exchange (NSE) where future contracts where made know in India. Index option was also introduced by NSE in july 2001, trading on individual future securities commence on November 2001.in india NSE is emerged as the largest derivatives exchange .

1.6.2. Products of Equity Derivatives

National Stock Exchange has excelled with a broadrange of products in equity derivatives. The exchange currently offers trading in future and options on 4 major indices and over 183 individual securities. Following are some products.

- Nifty 50
- Nifty Bank
- Nifty IT
- Nifty Midcap 50
- Nifty Financial Services

- Nifty PSE
- Nifty CPSE
- Nifty Infrastructure
- Individual Securities

1.6.3. Selection criteria for stocks and Indices

The Standard set by SEBI determines the eligibilty of stocks and indices for trading in derivatives market.According to the SEBI regulation and Guidelines the criteria for selection of stocks and indices are as follows.

1.6.3.1 Eligibility Criteria for Stocks

Stocks are chosen from top 500 stocks based on average daily market capitalisation and daily traded value over preceding six months on a rolling basis.,

The stock median quarter- sigma order size over the past six months must be at least 25 lakhs.

The stock's market wideposition limit on rolling basis should not be below Rs 500 crores. Addition, the average daily delivery value in the spot market on the rolling basis should not be less than Rs 10 Crores over preceding six months.

1.6.3.2.Re-introduction of Excluded Stock

The stocks must meet the enhanced eligibity critiria for six consecutive months to be introduced for trading in derivatives markets. Hence the stock that were removed may regain eligibilty in the derivatives trading.

1.6.3.3Eligibility criteria for Indices

F&O contracts for index is introduced only if stocks collectively make up 80% of the index weight to be eligibke for trading in derivatives markets. Additionally no individual ineligible stock in the index can have weightage exceeding 5%.

1.6.4 Trading Mechanism

- price band:The derivatives section does not have any applicable daily minimum or maximum price ranges.howerver the operating ranges and day minimum/maximum range are maintained as follows to avoid incorrect order entry at 10% of the base price is charged for each securities futures. Orders placed at prices that exceed the operating ranges would therefore be veiwed by the exchange as a price freeze.
- trading system:The futures trading system offers an online monitoring and surveillance system in addition to fully automated trading environment for screen based trading. The technology offers total trading operation information and enables and order driven market. Order are quickly processed for possible matching after being initially time stamped as soon as they are received.
- Order Conditions**:**Depending the needs , trading members can submit several kinds of orders. These circumstances can be broadly divided into two groups firstly conditions relating to timing and conditions relating to cost. Time and cost conditions.
- Risk management:An effective clearing and settlement depends on a strong risk management strategy. Risk containment strategies includes requiring members to have adequate capital, evaluating their performance and track the record, imposing position limitationbased on capital, keeping on eye on members positions online.

- Clearing and settlement: the clearing and settlement agency for all the transaction completed on derivatives futures segment is national clearing limited (NSE Clearing) know as National Securities Clearing Corporation limited (NSCCL). For all the transaction on the derivatives futures division of the NSE, NSE clearing serves as a legal counter party and ensures settlement.All the deals conducted by the Trading Members on NSE must be cleared and settled by a clearing members of NSE clearing, who handles this process on their behalf.

1.7 Global Derivatives Market

The global derivatives market plays a crucial role in the economy and international financial system by providing risk management tools and investment opportunities. Derivatives are financial instruments traded among market participants either over the counter or exchange traded. It allows the investors to hedge risks, reduce uncertainty about future prices, and trade on future price expectations, thus enhancing the efficiency of price discovery. Derivatives offer benefits such as risk protection with minimal open investment, low transaction costs compared to direct investing. The market for derivatives covers a wide range of assets globally, enabling exposure to various underlying assets and asset classes. The derivatives market has grown significantly over the years, becoming a sizable and truly global market with a substantial notional amount outstanding. It is a professional wholesale future market involving banks, investment firms, insurance companies, and corporates as main participants, with two competing segments. First the over the counter and exchange traded segments. The derivatives market contributes to economic growth, generates tax revenues, and employment, with european derivatives players playing a significant role in the market's development and revenue generation. Globally, the derivatives market is essential for risk management, innovation, and

efficiency in financial and trade markets, meeting the prerequisites of safety, innovation, and efficiency to deliver maximum benefits to users and the economy.

1.8 Hedge Ratios and Hedging Effectiveness

When it comes to futures markets, hedging's efficacy is a crucial component of risk management and financial judgment. Studies and research have demonstrated that using futures contracts for hedging can be a useful tactic for lowering price risk and return portfolio variability. The optimal hedge ratio, which is sometimes expressed as the coefficient of determination (R2), is a crucial factor in evaluating how successful futures contract hedging schemes are. The ability to lock in prices before sales, the influence on minimizing losses or gains in reaction to price movements, and the reduction of upside and downside risk are some of the metrics used to evaluate the hedging performance of futures markets. To effectively minimize portfolio variations, econometric models such as multivariate GARCH and OLS are used to calculate optimal hedging ratios.Research indicates that optimal hedge ratios, as determined by models such as VECH, are more successful than constant hedge ratios in reducing portfolio variation. For investors looking to protect their portfolios from the market dangers connected with futures contracts, these ratios are essential. Depending on the kind of futures contracts examined, the effectiveness of hedge ratios may vary, with certain contracts exhibiting greater hedging efficacy than othersThe accuracy of the hedge ratio, the integration of cash and futures prices, and the management of basis risk resulting from variations between the hedged asset and the underlying futures contract are some of the aspects that impact how effective futures markets are in hedging. All things considered, using futures contracts for hedging can be a useful strategy for controlling price risk and improving financial stability, especially when done so with an adequate

understanding of market dynamics and risk exposure.(Buyukkara, Kucukozmen, and Uysal 2022).

CHAPTALIZATION SCHEME

Chapter1: Introduction

This chapter includes the introduction of derivatives market with Indian context followed by types of derivatives, participants of derivatives, functions of derivatives, framework of derivatives which includes equity derivatives products of Equity Derivatives and selection criteria for stocks and Indices, trading mechanism, and global derivatives market. Research gap, objectives and the hypothesis of the study.

Chapter2 : Literature Review

This chapter offers a detailed overview of earlier research on derivatives related the causal relationship and hedging effectiveness to stock and index futures. The literature review covers both the Indian derivatives market and international derivatives market. Literature is divided in two sections as per the objectives of the study. This chapter also describes the methods, techniques and research approach used in the studies which gets gap fulfill in literature on stocks and index futures.

Chapter3: Research Methodology

This chapter gives detail attention to the methodology which utilized for the study with respect to the data period for 9 years, data variables used the study , sample size selected from the index and stocks in futures of NSE India .the statistical tools used for each objectives.

Chapter4: Data Analysis, findings and conclusion

This chapter involves statistical economic methods used in each objectives. For first objective descriptive statistics to check the performance and standard Augmented Dickey-Fuller test (ADF) is applied for the normality test, granger causality test is conducted for causality between future close prices. To measure the long run relationship using co-integration test and VECM model for short run relationship among the variables. And for the second objective to estimate the hedge ratio and hedging effectiveness the statistical tools used is ordinary least square method (OLS). Lastly the findings and conclusion of the study and the limitations is discussed.

Chapter 2: LITERATURE REVIEW

2.1 literature Review based on first objective to examine the Causal relationship between Spot and Futures Volatility of Index and Stocks in India.

This research looks into the possibility of a relationship between spot and future closing prices for NIFTY 50 stock futures on the Indian NSE for a subset of industry-specific stock futures. In order to achieve goal 14, choose equities from the Nifty 50 Index that are industry-specific and that were traded on NSE India between April 2005 and December 2015, taking into account additions and deletions from the index's components during that time. The study's sample consists of the spot closing prices and daily projected close prices for 14 specific equities that are traded on the NSE(Paresh n.d.). similarly 50 stocks that make up the CNX NIFTY Index are the focus, which looks at the causal links between volume and volatility in both spot and futures markets. Significant causal relationships between the spot and futures volume and the volatility are found, according to Granger non-causality tests carried out with vector autoregression (VAR) and asymmetric VAR models. For almost all equities, there were bidirectional causal links between spot and futures volume; however, few stocks showed a similar relationship between volatilities. The findings emphasize the significance of volume for information absorption and its role as a channel for information(Jain, Biswal, and Ghosh 2016) The impact of futures trading on India's underlying spot market volatility is examined in this research, with a particular emphasis on the time frame from Examining various viewpoints on how futures trading influences market dynamics and efficiency, the study examines how derivatives trading affects spot market risk. focuses on the effects of futures trading on India's spot market volatility, providing insight into the efficiency and dynamics of the market. examines several perspectives on how futures trading influences market dynamics and efficiency while examining the effect of derivatives trading on

spot market volatility(dr,srinivass n.d.) shows the effects of Thai securities futures on the underlying spot market is examined in the study and It looks at the Thai future market which help to stabilize the cash market or lower the price volatility as the future market contributes in improving market efficiency using GARCH model. Author studied the price discovery process and attempts to determine the lead-lag relationship between spot and futures markets in the Indian financial market by taking into consideration the high frequency price data of 12 individual stocks for one minute interval. The study applies co-integration and found spot-futures relationship using Vector Error Correction Mechanism (VECM) represented by EGARCH(Mallikarjunappa and Afsal 2010) .The study examines how stock price volatility and single stock futures trading are related, with a particular focus on whether the volatility of stocks listed on SSFs behaves differently from the volatility of stocks not listed on SSFs after the SSFs trading period.The effect of futures trading volume on stock price volatility has been the subject of conflicting research in the past; some studies have found that volatility has decreased, while others have showed an increase(Khan and Hijazi 2009)examines how trading in single stocks affects stock price volatility, paying particular attention to how SSF-listed equities behave after the SSFs trading period.gives factual proof of the possible decrease in stock return volatility and increase in market depth resulting from the implementation of SSFs trading in Pakistan's stock market.The study offers a thorough overview of the literature on stock market volatility and return analysis, with a particular emphasis on the performance of GARCH models. The abstract highlights the history of research effort over the past ten years and emphasizes the significance of evaluating the volatility of stock index returns to manage uncertainty and risk in the stock market.This article also examines how the introduction of futures has affected stock market volatility, with a particular emphasis on whether this effect is instantaneous and attributable just

to futures trading, or if it is also impacted by other market dynamics. By analyzing the connection between futures markets and underlying spot markets and addressing the controversy around whether futures trading stabilizes or destabilizes the cash market, it seeks to add to the body of existing work.(Bhowmik and Wang 2020). The 50 stocks that make up the CNX NIFTY Index are the focus of this study, which looks at the causal links between volume and volatility in both spot and futures markets. Significant causal relationships between the spot and futures volume and the volatility are found, according to Granger non-causality tests carried out with vector autoregression (VAR) and asymmetric VAR models. For almost all equities, there were bidirectional causal links between spot and futures volume; however, few stocks showed a similar relationship between volatilities. The findings emphasize the significance of volume for information absorption and its role as a channel for information(Shenbagaraman n.d.) the relationship between speculators, is examined such hedge funds and swap dealers, and volatility and price fluctuations using data from 2005 to 2009 that allows us to identify several groups of traders. We look at a number of sub periods with high price patterns and find minimal indication of financial market instability caused by speculators. , there is a negative correlation between changes in hedge fund positions and the volatility of the futures markets for natural gas, crude oil, and corn. there is little correlation between contemporaneous volatility and swap dealer activity. Our data supports the theory that hedge funds contribute significantly to futures market stabilization through providing essential liquidity.(Brunetti, Büyükşahin, and Harris 2016)

2.2 literature Review based on second objective to estimate the Optimal Hedge Ratios and Hedging Effectiveness of Index Futures and Stock Futures in India.

The hedge ratio and efficacy of hedging for the NIFTY 50 Index on the NSE in India are examined in this study. The NIFTY 50 Index, which is traded on NSE India, is taken into consideration for achieving the goal between April 2005 and December 2015. The NIFTY 50 Index NSE India daily future close prices and spot closing prices comprise the sample used in this study.. According to the analysis, the OLS model can be used to compute risk reduction and assist hedgers in evaluating and profit from various future positions for a particular position(Paresh n.d.)The current study uses the NIFTY50 index futures and its 17 stock futures to determine the effectiveness of hedging in the Indian equity futures market. Near month futures contracts from the time of their individual the start to March 31, 2017, are used in the analysis. The study uses eight techniques—Naïve, Ederington's OLS, ARMA-OLS, VAR, VECM, GARCH, EGARCH, and TARCH—that have been suggested in the literature to estimate the ideal hedge ratio. The OLS hedge ratio is found to offer the maximum hedging effectiveness, whereas time-varying and naïve models yield the lowest hedging effectiveness.(Kaur and Gupta 2018) The paper highlights the efficacy of hedge ratios derived using various econometric models and establishes optimal hedge ratios and hedging effectiveness for a variety of futures contracts on the Borsa Istanbul. Findings indicate that while currency futures contracts are less effective during the COVID-19 epidemic, BIST 30 equity futures contracts offer effective hedging. The study examines the efficiency of different hedging strategies by analyzing the hedging effectiveness of several futures contracts on the Borsa Istanbul.High hedging efficaciousness is demonstrated by both the dynamic GARCH and constant OLS models for BIST 30 stock futures contracts after 2010. The study also looks at how

important events, such as the COVID-19 pandemic and changes to FX regulations in 2017, affect how well currency future contracts hedge against risk.All things considered, the study offers insightful information on the best hedge ratios and the efficacy of hedging for various futures contracts, with implications for investors wishing to safeguard their portfolios in the Turkish derivatives market.(Buyukkara, Kucukozmen, and Uysal 2022).In this empirical investigation, one dynamic hedging model (bivariate GARCH Minimum Variance) and four static hedging models (OLS Minimum Variance Hedge Ratio, Mean-Variance Hedge Ratio, Sharpe Hedge Ratio, and MEG Hedge Ratio) are used.(hedging Ratio) in order to determine the best hedging ratios for futures on the indexes of Taiwan stocks, the S&P 500 stocks, the Nikkei 225 stocks, the Hang Seng stocks, the Singapore Straits Times stocks, and the Korean KOSPI 200 stocks. Additionally, the efficacy of these ratios is assessed. The findings show that various markets require different approaches to effective hedging. Nonetheless, independent of hedging strategies or horizons, the empirical findings validate the effectiveness of stock index futures as direct hedging instruments.(Lee, Wang, and Chen 2009)Cross hedging is required if a direct hedge is not available where new theory portfolio theory is used , in these types of situations, a composite hedge—which uses two or more hedging instruments to hedge a single spot position—will be beneficial. Perhaps because it requires the estimate of two or more hedge ratios, the study and use of composite hedging have received little attention. This study shows that employing S&P 500 and New York Mercantile Exchange crude oil futures for composite hedging of the Amex Oil Index results in a statistically significant increase in out-of-sample effectiveness. this calculate the hedging ratios and to accounting for transaction costs, dividends, and futures contract maturity.(Chen and Sutcliffe 2012).By analyzing three indices—the Nifty, BankNifty, and CNXIT—as well as the 84 most liquid individual stock futures traded on the

National Stock Exchange of India over the sample period of January 2003 to December 2006, the current study aims to recommend a suitable hedge ratio for Indian traders. In the least variance hedge ratio framework proposed by Ederington (1979), the efficiency of hedge ratios estimated by OLS, VAR, VECM, GARCH(p,q), TARCH(p,q), and EGARCH(p,q) is compared in the current study. The study's conclusions support the theoretical characteristics of futures markets and indicate that the unconditional hedge ratio performs better than the conditional hedge ratio once basis risk has been taken into account. Since both markets are co integrated, the results support the hedging ratios estimated using VAR or VECM.(Gupta and Singh 2009) The Standard & Poor's (S&P) 500 stock index futures contract's hedging efficacy is examined in this study using weekly settlement prices for the months of July 1992 through June 30, 2002. It specifically focuses on three areas of interest: identifying the right model to estimate a hedge ratio that minimizes return variance; assessing the stability of optimal hedge ratios over time and their effectiveness as hedging and conducting an in-sample forecasting analysis to assess the hedging performance of various econometric techniques. The effectiveness of this contract's hedging is evaluated in light of alternate techniques for calculating more efficient hedge ratios, both constant and time-varying. According to the findings, hedgers can rely on the ideal hedge ratio, which takes into account non-stationarity, the long-run equilibrium connection, and short-term dynamics.(Kenourgios, Samitas, and Drosos 2008).study uses the NIFTY50 index futures and its 17 stock futures to determine the effectiveness of hedging in the Indian equity futures market. Near month futures contracts from the time of their individual the start to March 31, 2017, are used in the analysis. The study uses eight techniques—Naïve, Ederington's OLS, ARMA-OLS, VAR, VECM, GARCH, EGARCH, and TARCH—that have been suggested in the literature to estimate the ideal hedge ratio. The OLS hedge ratio is found to offer the maximum hedging

effectiveness, whereas time-varying and naïve models yield the lowest hedging effectiveness.(Kaur and Gupta 2018)This study uses wavelet analysis to investigate the lead-lag relationship, correlation, and hedging ratio between the stock and futures markets. firstly the stock and futures markets have a relationship that holds true throughout time scales. secondlly the wavelet correlation between two markets fluctuates over periods of investment but stays relatively highand lastly the hedge ratio and the effectiveness of hedging strategies rise with increasing wavelet time scale. Simulation for utility comparisons demonstrates that the efficacy of hedging is dependent on both the time horizon and the investor's individual risk avoidance coefficient.(In and Kim 2006) In a relatively new and untested Greek futures market, the study looks at the hedging effectiveness of FTSE/ATHEX-20 and FTSE/ATHEX Mid-40 stock index futures contracts. Using weekly and daily data, the in-sample and out-of-sample hedging performances are analyzed, taking into account both constant and time-varying hedge ratios. The findings show that while time-varying hedging techniques outperform straightforward additional benefits for reducing risk in-sample. Furthermore, futures contracts perform well in their risk management capacity and provide favorable results when compared to outcomes in global stock index futures markets. Comparable outcomes in terms of model selection are obtained by estimating investor utility functions and the accompanying optimal utility maximization hedge ratios. We find that there are speculative components for the FTSE/ATHEX Mid-40 contracts that result in utility-maximizing hedge ratios that are different from the minimum variance hedge ratio solutions.(Kavussanos and Visvikis 2008).single stock futures provide an advantage that has never before in the financial literature. For international investors who want to take on the equities risk but not the associated foreign exchange risk, they can be almost ideal hedging tools. These investors were forced to trade illiquid OTC goods,

whose pricing is based on the accuracy of a covariance forecast, or adopt less successful hedging tactics, like a static hedge using foreign exchange forwards, prior to the emergence of these instruments.

Chapter 3:RESEARCH METHOLOGY

Research Methodology gives detail attention to the methodology which utilised for the study with respect to the data period for 9 years, data vairables used the study , sample size selected from the index and stocks in futures of NSE india.the statistical tools used for each objectives.

3.1 Research Gap

Following is the identification of the research gap after an review of the Indian and international literature.

1. Many Research has examined the expected and unexpected aspects of variables when examining the causal relationship between futures prices.
2. Research on Index and Stock Futures has taken into account data from the beginning of derivatives in India, which might not provide accurate or wholesome results and conclusions therefore persent study is consider
3. Studies have considered data from of derivatives in India with respect to Index and Stock Futures which may not give precise or wholesome results and conclusions.

3.2 Objectives of the Study

1. To examine the Causal relationship between Spot and Futures Volatility of Index and Stocks in India. {Citation}
2. To estimate the Optimal Hedge Ratios and Hedging Effectiveness of Index Futures and Stock Futures in India.

3.3 Hypothesis Formulated

H0: There is no Causality between the Futures and Spot Price

H0: Constant Hedge Ratios does not provide greater variance reduction than the Time Varying Hedge Ratios in terms of Hedging Effectiveness

3.4 Nature and source of data

Secondary data is used as the base study. the duration of the study and data on spot and fuure closing prices are gathered from National Stock Exchange (NSE).(www.website.com). Also the equity spot price are obtained from the relevent market

3.5 Data Period and Variables

The study covered the time since the NSE india futures market is establised but because data points for all indices and stocks were unavailable, the study period was extended to April 2014 to March 2023, taking into considaration all the addition and subtractions fromNSE India. 23 stocks traded in NSE and nifty 50 Index between April 2014 to March 202. The variable included in the study compress of daily future markets . the majority trades were observed in NSE for near month contract and are examined in the study.The data for the study was collected from the National stock exchange (NSE) website (www.nseindia.com) .

3.6 Description of Sample Index Futures and Stock Futures

Table1: Description of sample

Index Future		**Symbol**
Nifty 50		NIFTY
Stock Futures	Industry	Symbol
ACC Ltd.	Cement & Cement products	ACC
Adani Enterprise Ltd		ADANIENT

Ambuja Cements Ltd.	Cement & Cement products	AMBUJACEM
Apollo hospital enterprise Ltd.	Healthcare	APOLLOHOSP
Apollo tyre Ltd.	Tyre	APOLLOTYRE
Ashok Leyland Ltd.	Automotive	ASHKLEY
Asian paints Ltd.	Chemicals	ASAINPAINT
Aurobindo Pharma Ltd	Pharmaceuticals	AUROPHARMA
Bata India ltd	Footwear	BATAINDIA
Bharat Forge Ltd		BHARATFORG
Bosch Ltd		BOSCHLTD
Bharat Petroleum Corporation Ltd.	Energy	BPCL
Cipla Ltd	Pharma	CIPLA
Dabur India Ltd	Consumer goods	DABUR
Dr's Reddy Laboratories Ltd	Pharmaceuticals	DRREDDY
Grasim Industries Ltd	Textiles	GRASIM
HDFC Bank Ltd	Financial services	HDFCBANK
Hero MotoCorp Ltd.	Automobile	HEROMOTORS
Hindustan Petroleum Corporation Ltd	Energy	HINDPETRO
Hindustan Unilever Ltd	Consumer goods	HINDLVR
Infosys Ltd.	IT	INFY
I T C Ltd.	Consumer goods	ITC
Tata Motors Ltd	Automobile	TATAMOTORS
Tata Steel Ltd	Metal	TATASTEEL

3.7 Statistical and Econometrics Tools Used

3.7.1 To examine the Cause and Effect relationship between Spot and Futures Volatility of Index and Stocks in India

There is a complicated interplay between futures and spot markets that is influenced by many different factors. The notion of storage, which contends that futures prices shouldn't be lower than spot prices plus storage and interest charges, is frequently used to link futures pricing to spot prices. The notion of convenience yield adds more complexity to this relationship by emphasizing the need of keeping a good on hand so that you can react quickly to unforeseen demand. Based on market efficiency theory, the Law of One Price in futures markets suggests a relatioshipbetween spot and future prices.Futures and spot prices may have a reciprocal relationship in the sense of cause and effect Studies suggest that because of things like decreased transaction costs, futures markets might outperform spot markets(Frino, Walter, and West n.d.)

3.7.1.a Descriptive Statistics

We have calculated daily logreturns of the selected 23 stocks and nifty 50 index based on their daily future close price and spot close price between April 1, 2013, and March 31, 2023, in order to examine the cause and effect relationship between future close price and spot close price.In order to get understanding of the distribution pattern and stock performance, a descriptive study of the spot close price is conducted.

3.7.1.b Unit Root Test

The main issue with the time series data, which is what this study is focusing on, is non-stationarity. The findings of a hypothesis test will be incorrect in the absence of stationarity. This study uses the Augmented Dickey-Fuller (ADF) to determine the order of variance required to bring stationarity and to check for the presence of unit root. (Choudhary and Bajaj 2012)

3.7.1.c granger Causality Test

The process for determining if future close prices and spot close prices are statistically responsible is known as the "Grangercausality" test, which was first introduced by C. J. Granger in 1969. Granger causality is based on the simple logic that effect cannot precede cause. Granger causality test is based on bi-variate regression model.

3.7.1.d Johansen Co-integration test

o-integration test can be used to examine stable long-run relations between two or more variables. Co-integration means that one or more combination of the variables is stationary even though each variable is not. If we can reject the null hypothesis about the unit root, we can conclude that the variables are co-integrated of the orders CI (1). If there exists 81 co-integration between variables, we can test short-run dynamics between two series within the framework of an error correction model.(pooja kerker n.d.)

3.7.1.e Vector Error Correction Model (VECM)

It is used to examine both the short- and long-term associations between various time series variables. Specifically designed to describe cointegrated variables—variables with a long-term equilibrium relationship but potential short-term deviations from that equilibrium it is a multivariate expansion of the autoregressive (AR) model. There are two ways for representing the VECM model the component form and impact form. The model is stated in terms of deviations from the long-term equilibrium in component form and in terms of the influence of shocks on the variables in impact form.

3.7.2 To estimate the Optimal Hedge Ratios and Hedging Effectiveness of Index Futures and Stock Futures in India

Hedging is a strategy used to manage or lower the risk of unfavorable price fluctuations through futures trading. With the introduction of stock index futures contracts, market participants could

now control the market risk in their portfolios without changing the composition of their holdings. The standard strategy highlights how futures contracts can be utilized to lower risk. It's an extremely basic approach where the hedger opens a futures position (h = −1) that is the same size as the spot market position but has the opposite sign. Price risk will be avoided if equivalent price fluctuations in the spot market precisely represent those in the futures market(Kenourgios, Samitas, and Drosos 2008)

3.7.2.a Ordinary Least squre (OLS)

OLS regression is used in this study to calculate the ideal hedge ratio and the effectiveness of hedging.The model is a simple linear regression of change in spot prices on the change in futures prices. $rst = \alpha + \beta rft + \varepsilon t$ …….Eq (1)

Where, rst is the spot return, rft is the future return, εt is the error from OLS estimation and the slope coefficient β is the optimal hedge ratio

CHAPTER4: ANALYSIS AND CONCLUSION

4.1 To examine the Cause and Effect relationship between Spot and Futures Volatility of Index and Stocks in India

4.1 Descriptive statistics

Table2: Descriptive Statistics of Spot Closing Price

Stock/Index	Mean	Std.Dev	Skewness	Kurtosis	Jarque Bera	Prob.	Obs
ACC	0.000189	0.028057	-19.4478	711.4395	4790.6845	0	2284
AMBUJACEM	0.000504	0.019535	-0.480548	9.41148	3998.056	0	2284
ADANIENT	0.001566	0.04968	-1.52059	179.9219	2979.69	0	2284
APOLLOHOS	0.000868	0.021136	0.494301	8.898629	3505.643	0	2284

APOLLOTYRE	0.00769	0.02406	-0.190943	5.956159	845.1581	0	2284
ASHKLEY	0.001266	0.26511	0.19937	13.35519	1021.538	0	2284
ASAINPAINT	0.000895	0.016572	0.003099	7.581392	1996.542	0	2284
AUROPHARMA	0.000498	0.0264828	-2.658854	61.90305	3327.327	0	2284
BATAINDIA	0.000561	0.02957	-18.75913	598.9912	3393.768	0	2284
BHARATFORG	0.00745	0.02528	-3.440834	78.42214	5456.231	0	2284
BPCL	0.00036	0.025572	-4.693065	89.46629	7195.748	0	2284
CIPLA	0.000496	0.016857	0.58264	7.894215	222.529	0	2284
DABUR	0.000616	0.014753	0.171143	8.07396	2460.939	0	2284
DRREDDY	0.000526	0.017338	0.034555	10.32433	5522.834	0	2284
GRASIM	0.00058	0.17784	-9.499641	273.2112	7005.1531	0	2284
HDFCBANK	0.000136	0.027462	-23.2002	188.763	6345.6741	0	2284
HEROMOTCO	0.000211	0.017731	0.003777	82.137267	2553.904	0	2284
HINDPETRO	0.000534	0.29464	-5.863245	127.849	1496.475	0	2284
HINDULIVR	0.000673	0.015205	-0.303821	23.2351	3998.515	0	2284
INFY	0.00071	0.024841	-10.7313	216.4571	4371.198	0	2284
ITC	0.00236	0.017499	-2.797545	53.6655	2470.832	0	2284
TATA MOTORS	0.00411	0.02721	0.529998	9.87873	4607.896	0	2284
TATA STEEL	0.00275	0.030578	-10.99629	324.9046	9901.9032	0	2284
Nifty50	0.0021	0.023686	-3.2634	138.141	1831.08	0	2284

Source: complied by Author

.Represents the descriptive statistics of spot close return series for select 24 stocks and NIFTY50 Index. It shows positive mean returns for all the 24 stocks & NIFTY50 Index indicating that the spot close prices performed superior there is no negative mean returns were observed .

The standard deviation is high for HINDPETRO stock with 0.29464 & lowest for HINDULVR with 0.015205 followed by DABUR 0.014753.

The skewness for 15 stocks with nifty50 is found to be negatively skewed except in case of 8 stocks namelyAPOLLOHOS,ASKLEY, ASIANPAINT,CIPLA , DABUR, DRREDDY HEROMOTOCO & TATAMOTORS stocks.

Kurtosisof all the stocks and index value exceeds 3, showing a leptokurtic curve whichindicates that the return distributions are not normally distributed. JB test confirms that the normality test which is rejected at p-value of almost 1% level of significance

Table 3: Descriptive Statistics of Future Closing Price

Stock/Index	Mean	Std.Dev	Skewness	Kurtosis	Jarque Bera	Prob.	Obs
ACC	0.0009	0.027532	-20.95697	763.776	5524.776	0	2284
AMBUJACEM	0.000556	0.019823	-0.502855	9.4008	4041.491	0	2284
ADANIENT	0.001615	0.05802	0.001851	224.6812	4676.327	0	2284
APOLLOHOS	0.000876	0.020698	0.491242	9.343953	2000.525	0	2284
APOLLOTYRE	0.000774	0.024342	-0.20907	6.050433	901.7833	0	2284
ASHKLEY	0.001266	0.026589	0.261963	12.02133	7767.812	0	2284
ASAINPAINT	0.000888	0.016186	-0.038321	8.532848	2912.564	0	2284
AUROPHARMA	0.00499	0.06544	-2.631651	61.01793	323.057	0	2284

BATAINDIA	0.000533	0.02986	-18.49835	587.3966	326.274	0	2284
BHARATFORG	0.000527	0.25362	-3.46874	77.4244	531.744	0	2284
BPCL	0.000354	0.025429	-4.867155	92.45162	7701.365	0	2284
CIPLA	0.000494	0.016806	0.617111	8.120211	2686.497	0	2284
DABUR	0.000624	0.015168	0.172249	7.318113	1785.786	0	2284
DRREDDY	0.000523	0.017053	0.042566	10.65122	6025.614	0	2284
GRASIM	0.000577	0.017686	-9.619554	281.1108	9739.271	0	2284
HDFCBANK	0.000123	0.0274	-23.8243	26.8324	64977.69	0	2284
HEROMOTCO	0.000206	0.017453	0.324044	8.82145	31.2444	0	2284
HINDPETRO	0.000527	0.029267	-6.018479	313.217	157.8342	0	2284
HINDULIVR	0.000754	0.014059	0.84793	11.39328	6974.832	0	2284
INFY	0.00069	0.024479	-10.94843	222.49	4634.543	0	2284
ITC	0.000227	0.017094	-2.87662	55.7309	7267.648	0	2284
TATA MOTORS	0.000414	0.0271	0.46254	9.84365	4536.214	0	2284
TATA STEEL	0.000281	0.03077	-10.8019	316.8502	9414.394	0	2284
Nifty50	0.000124	0.023261	-3.0731	139.719	1178.08	0	2284

Source: complied by Author

The mean returns of the future close prices of the 24 & INDEX are positive which implies the price series had increased over the period from April 2014 to March 2023.

The least volatile stock is with standard deviation of HINDLVR 0.014059 &DABUR with 0.015168. The highest standard deviation is observed in the BHARATFORG with 0.25362.indicating the most highly volatile stock in terms of the future close prices.

Negatively skewed implies that the return distribution of stock futures have a heavier tail of larger values and hence a higher probability of earning higher returns for all the stocks except for ADANIENT,APOLLOHOS, ASHKLEY, CIPLA, DABUR, DRREDDY, HEROMOTOCO, HINDLVR, TATAMOTORS which are having positive skewness which means there are higher chances of generating lower returns. Kurtosis value exceeds 3, showing a leptokurtic curve indicates that the unconditional return distributions are not normal. JB test confirms that the normality is rejected at p-value of almost 1% level of significance

4.2 Unit Root Test

H0- Has a unit root (i.e. the data is non-stationary)

H1- Does not have a unit root (i.e. the data is stationary)

Table 4: ADF Test Results for Future Close Price & Spot Close Price

STOCKS &INDEX	FUTURE CLOSE PRICE			SPOT CLOSE PRICE		
	INTERCEPT	TREND & INTRECEPT	NONE	INTERCEPT	TREND & INTRECEPT	NONE
ACC	-32.05185*	-32.08263*	-32.06738*	-31.98833*	-31.99788*	-32.00135*
AMBUJACEM	-48.37596*	-48.36680*	-48.35555*	-48.33455*	-48.32516*	-48.31415*
ADANIENT	-33.36584*	-33.35478*	-33.31127*	-45.10828*	-45.10244*	-45.09718*
APOLLOHOSP	-46.85541*	-46.85771*	-46.78533*	-46.81831*	-46.81961*	-46.74993*
APOLLOTYRE	-47.88204*	-47.87253*	4-7.84291*	-47.63930*	-47.62999*	-47.59989*
ASHKLEY	-46.41274*	-46.44894*	-46.32083*	-45.80764*	-45.84395*	-45.71727*
ASIANPAINT	-49.61643*	-49.61749*	-49.47576*	-49.71410*	-49.71302*	-49.57450*
AUROPHARMA	-48.44746*	-48.47716*	-48.44063*	-48.21717*	-48.24786*	-48.21034*
BATA INDIA	-35.55856*	-35.55322*	-35.57332*	-34.76289*	-34.75824*	-34.77769*

BHARATFORG	-47.148630*	-47.15417*	-47.12104*	-46.83710*	-46.84337*	-46.80973*
BPCL	- 47.2 0847*	-47.22279*	-47.20970*	-49.283538	-49.29854*	-49.28449*
CIPLA	-49.608320*	-49.59881*	-49. 57500*	-49.28978*	-49.28060*	-49.25676*
DABUR	-49.811010*	-49.81852*	-49.73248*	-50.39728*	-50.40525*	-50.31955*
DRREDDY	-46.385400*	8-46.3784*	-46.35403*	-46.53094*	-46.52401*	-46.50053*
GRASIM	-36.923370*	-36.93748*	-36.86511*	-36.96512*	-36.97945*	-36.90728*
HDFC BANK	-35.28486*	-35.33749*	-35.29941*	-35.52136*	-35.57229*	-35.53553*
HEROMOTORS	-47.77971*	-47.78708*	-47.78368*	-47.40928*	-47.41714*	- 47.41316*
HINDPETRO	47.90828*	-47.93105*	-47.903368	-47.86015*	-47.88833*	-47.86015*
HINDUNILVR	-49.65368*	-49.65494*	-49.51650*	-51.74167*	-51.73932*	-51.61428*
INFY	-47.66642*	-47.69106*	-47.67688*	-47.69639*	-47.71835*	-47.70856*
ITC	-46.89943*	-46.91181*	- 46.90158*	- 47.19075*	-47.20113*	-47.19264*
TATAMOTORS	-47.03565*	-47.03730*	-47.03501*	-46.68328*	-46.68406*	-46.68283*
TATASTEEL	-50.60819*	-50.60023*	-50.61487*	-49.98382*	-49.97630*	-49.9906*
NIFTY 50	-25.53278*	-25.53766*	-25.55331*	-21.98239*	-21.00192*	-21.931138

Source: complied by Author

The data used for are daily future close prices and spot close prices covers for a period From April 2014 to March 2023.The data used for are daily future close prices and spot close prices covers for a period from April 2014 to March 2023. All the daily values are converted to natural logarithm, calculated as Rt= LN(Pt / Pt-1) where Pt and Pt1 are natural logarithms on day t and t-1 respectively. The variables for the study after converting to natural logarithms the series are found to be stationary at level and hence we reject the null concluding that the series has a unit

root. Thus, the series are stationary since the null hypothesis is rejected that the data is non-stationary or has a unit root as represented in the table

4.3 Granger Causality Test

H0- Spot Close Price does not granger cause Future Close Price

H01- Future Close Price does not granger cause Spot Close Price

Table 5 : Granger Causality Test Results

STOCKS & INDEX	**SCL>FCL**	**FCL>SCL**
ACC	0.13037 -0.2443	1.37297 -0.2313
AMBUJACEM	1.46708 -0.1973	2.1508 -0.0569
ADANIENT	2.21715 -0.0501	**6.77452** **(0.0005)***
APOLLOHOSP	0.83682 -0.5234	1.1622 -0.3254
APOLLOTYRE	0.93696 -0.4558	1.35007 -0.2304
ASHKLEY	1.97129 -0.799	0.69621 -0.6263
ASIANPAINT	1.90503 -0.0903	**5.41556** **(0.0005)***
AUROPHARMA	1.60765	2.10441

	-0.1546	-0.0621
BATA INDIA	0.52967 -0.754	0.65979 -0.654
BHARATFORG	0.24075 -0.754	1.11851 -0.3482
BPCL	0.65047 -0.6612	0.49684 -0.7788
CIPLA	1.33113 -0.248	**4.79753** **(0.0002)***
DABUR	0.4539 -0.8107	2.05718 -0.068
DRREDDY	1.55523 -0.329	1.68484 -0.1348
GRASIM	0.67267 -0.6442	0.2931 -0.917
HDFC BANK	0.46478 -0.8027	0.29395 -0.1965
HEROMOTORS	**2.57099** **(0.0251)***	1.41219 -0.2166
HINDPETRO	**2.35136** **(0.0381)***	1.65617 -0.1419

HINDUNILVR	1.33314 -0.2472	**2.48284** **(0.0293)***
INFY	0.42718 -0.83	1.0865 -0.3657
ITC	0.23242 -0.9484	0.88282 (0.4916
TATAMOTORS	1.7741 -0.1148	**4.12719** **(0.020)***
TATASTEEL	0.23734 -0.9461	0.19356 -0.9561
NIFTY 50	1.34028 -0.2443	0.95477 -0.4443

Source: complied by Author

The results of Granger Causality test wherein it is witnessed that there no exist a bi-directional causality from spot to future close price returns. There exist unidirectional causality from futures to spot for ADANIENT,ASAINPAINT, CIPLA,HINDLVR, whereas from spot to futures is observed in HEROMOTORS & HINDPETRO. No causality was found between spot and futures for ACC, AMBUJACEM, APOLLOHOSP, APOLLOTYRE, AUROPHARMA, BATAINDIA, BHARATFORG, BPCL, DABUR, DRREDDY, GRASIM, HDFC, INFY, ITC, TATASTEEL & NIFTY50 indicates that spot causing the future so also the future is causing the spot for the study period.

4.4 Johansen Co-integration test

H0- there is no co-integration between Future Close Price & Spot Close Price

H1- there is co-integration between Future Close Price & Spot Close Price

Table 6: Johansen's Co-integration Test Results

Stocks & Index	No of CE(S)	Eigenvalue	trace value	probability
ACC	None	0.129995	534.4693	0
	At most 1	0.091147	217.5221	0
AMBUJACEM	None	0.267609	1078.56	0
	At most 1	0.149582	369.0969	0
ADANIENT	None	0.162062	621.1512	0
	At most 1	0.122375	297.2313	0
APOLLOHOS	None	0.323788	1418.7	0
	At most 1	0.206468	527.0434	0
APOLLOTYRE	None	0.283839	1160.56	0
	At most 1	0.161058	400.0489	0
ASHKLEY	None	0.346868	971.2242	0
	At most 1	0.255788	673.7591	0
ASAINPAINTS	None	0.328146	906.3908	0
	At most 1	0.204639	521.9767	0
AUROPHARMA	None	0.315324	863.3079	0
	At most 1	0.20341	518.2795	0

BATAINDIA	None	0.279005	745.5127	0
	At most 1	0.086827	207.0018	0
BHARATFORG	None	0.331567	918.0243	0
	At most 1	0.211424	541.3215	0
BPCL	None	0.315778	865.1976	0
	At most 1	0.249189	653.4501	0
CIPLA	None	0.2409	875.8336	0
	At most 1	0.103593	248.7947	0
DABUR	None	0.288499	775.7224	0
	At most 1	0.166988	416.3906	0
DRREDDY	None	0.311244	919.494	0
	At most 1	0.185166	504.9636	0
GRASIM	None	0.357984	1010.363	0
	At most 1	0.270901	720.3564	0
HDFCBANK	None	0.277347	740.6044	0
	At most 1	0.005155	11.78437	0
HEROMOTORS	None	0.334076	927.0028	0
	At most 1	0.255465	672.5907	0
HINDPETRO	None	0.255068	671.0807	0
	At most 1	0.187167	447.1806	0
HINDUNILVR	None	0.352449	990.3561	0
	At most 1	0.180505	456.6763	0
INFY	None	0.337588	939.4711	0

	At most 1	0.249193	656.7847	0
ITC	None	0.335247	931.0152	0
	At most 1	0.257775	679.673	0
TATAMOTORS	None	0.265946	740.294	0
	At most 1	0.155729	385.6242	0
TATASTEEL	None	0.304623	828.3256	0
	At most 1	0.261358	690.709	0
NIFTY50	None	0.250435	658.9683	0
	At most 1	0.078648	187.253	0

Source: complied by Author

Johansen Co-integration test is used to examine the long run relationship. It is well known that Johansen Co-integration is very sensitive to the choice of lag length. So first a VAR model is fitted to the time series data in order to find an appropriate lag structure. The AIC, SC, LR are used to select the number of lags required in co-integration test. The cointegration test indicates there exist one co-integrating vector at the 5% level of significance. This indicates that the future close price and spot close price is co-integrated in long run. The trace test indicates the existence of two co- integrating equation at 5 % level of significance. Maximum Eigen Value test makes the confirmation of this result. Thus the 2 variables of the study have a long run equilibrium relationship between them.

4.5 Vector Error Correction Model (VECM)

Table 7 : Vector Error Correction Model Results

STOCKS & INDEX	LNF CL (-1)	D LNF CL(-1)	D LNF F CL (-2)	D LNS CL (-1)	D LNSCL(-2)	C

ACC	0.449668	-0.986873	-0.519593	0.4594212	0.227595	1.65E-05
	0.948353	-0.669523	-0.39792	0.302227	0.18658	1.02E-05
	0.04732	0.0496	0.0417	0.05849	0.04359	0.00042
AMBUJACEM	0.729545	-1.439854	-0.849813	0.734797	0.479483	1.52E-05
	2.320039	-1.647827	-0.91884	0.969807	0.555038	1.10E-05
	0.39745	0.3065	0.18273	0.18274	0.18238	0.0047
ADANIENT	-0.859395	-0.078976	-0.087377	0.282797	0.108398	4.16E-05
	-0.397697	0.283671	0.094157	-0.558492	-0.258878	8.30E-06
	0.03391	0.02722	0.02094	0.0273	0.01857	0.0095
APOLLOHOS	1.370977	-1.910183	-0.9690333	1.276475	0.649714	2.74E-05
	3.242169	-2.28577	-1.069817	1.664641	0.755768	4.71E-05
	0.41594	0.31247	0.18199	0.31172	0.17815	0.0005
APOLLOTYRE	1.504334	0.470988	0.185155	-1.157554	-0.52439	1.73E-05
	0.285555	0.109608	0.058103	-0.792278	-0.395508	1.57E-05
	0.39131	0.2968	0.17295	0.29405	0.17361	0.29726
ASHKLEY	-1.820823	0.437528	0.171679	-1.053809	-0.478543	2.93E+05

	-0.255034	0.202918	0.127473	-0.325756	-0.436496	2.53E+05
	0.42356	0.32145	0.19835	0.31838	0.18855	0.00064
ASAINPAINT	2.812148	-2.64473	-1.195078	1.962093	0.863583	4.33E-06
	4.551437	-2.94321	-1.290698	2.294391	0.978084	4.97E-07
	0.38005	0.29203	0.1715	0.294391	0.17272	0.0039
AUROPHARMA	0.346661	-0.973944	-0.293446	0.299874	-0.061337	5.88E-07
	2.143925	-1.309967	-0.409743	0.648883	0.061677	5.92E-07
	0.66131	0.50294	0.28823	0.50296	0.28806	0.00067
BATAINDIA	-2.12944	0.789513	0.391281	-1.463131	-0.761192	0.000436
	-0.474095	0.490974	0.289281	-1.175528	-0.669044	0.000434
	0.141109	0.31129	0.18826	0.30796	0.18865	0.00067
BHARATFORG	-0.15366	-0.605599	-0.290466	-0.03085	-0.04733	1.76E-05
	1.796559	-1.03167	-0.426443	0.405368	0.095841	1.61E-05
	0.47604	0.35868	0.20011	0.35711	0.20027	0.00062
BPCL	0.522272	-1.149003	-0.494847	0.498513	0.515497	2.76E-05
	1.84414	-1.34701	-0.39361	0.66469	0.19983	2.23E-05
	0.33804	0.20166	0.17584	0.26692	0.17195	0.00062
CIPLA	-0.424307	-0.342017	-0.016126	-0.374872	-0.347349	1.52E-05

	1.500291	-0.921354	-0.24126	0.208208	0.117495	1.44E-05
	0.2543	0.18755	0.11795	0.18701	0.11696	0.0004
DABUR	1.256127	-1.390119	-0.766592	1.09421	0.419454	1.49E+05
	3.008222	-1.99444	-0.873348	1.334181	0.535268	1.13E+05
	0.3747	0.26828	0.15439	0.26963	0.15611	0.00035
DRREDDY	1.915929	-2.190862	-1.209817	1.57816	0.887865	-2.62E-06
	3.562087	-2.445382	-1.267011	1.854763	0.9577	-5.28E-06
	0.38728	0.2953	0.17909	0.17882	0.17882	0.00039
GRASIM	1.375878	-1.704971	-0.703988	1.049295	0.334505	1.91E-05
	2.915797	-1.82895	-0.767894	1.296665	0.415695	1.61E-05
	0.38352	0.29516	0.1818	0.29759	0.18213	0.00043
HDFCBANK	0.319088	-1.123383	0.445293	1.189716	0.440355	0.000442
	0.321373	0.196483	0.019431	0.279165	0.029084	1.45E-06
	0.01088	0.17985	0.11609	0.12017	0.11667	0.00037
HEROMOTCO	-0.065923	-0.328016	-0.055872	0.323689	-0.291603	9.05E-06
	0.864757	-	-0.13499	-0.134794	-0.214036	7.09E-06

		0.516015				
	0.30549	0.23321	0.14744	0.2341	0.14548	0.00042
HINDPETRO	-0.107869	-0.8079	-0.190821	0.156897	-0.14298	2.32E-05
	1.37821	-1.0797	-0.318308	0.406074	-0.011222	2.21E-05
	0.34874	-27259	0.17898	0.27374	0.179	0.00072
HINDULIVR	1.104519	-1.515581	-0.542313	0.820496	0.185502	-2.21E-06
	2.505615	-1.764191	-0.564216	0.993644	0.212285	-8.24E-06
	0.27052	0.18359	0.07516	0.18356	0.07199	0.00035
INFY	2.231517	-2.176824	-1.143788	1.15717	0.809835	7.05E-05
	3.695511	-2.382981	-1.20844	1.729616	0.879317	5.40E-06
	0.48455	0.37556	0.24243	0.75553	0.24054	0.0006
ITC	1.029533	-1.447662	-0.621934	0.81096	0.329107	1.35E-05
	2.450248	-1.638621	-0.666227	1.016646	0.383542	1.08E-05
	0.31046	0.24064	0.15515	0.24158	0.15392	0.00042
TATA MOTORS	1.14034	-1.051992	0.029156	0.374055	-0.356481	3.01E-06
	2.91865	-	-0.083638	0.710846	-0.268448	2.85E-05

		1.377446				
	0.6469	0.49287	0.28399	0.49244	0.28144	0.00064
TATA STEEL	-1.552962	0.398599	0.337276	-1.097717	0.670381	2.27E-05
	0.026346	0.294573	0.305643	-0.99078	0.638133	1.92E-05
	0.45027	0.35076	0.21947	0.34781	0.22017	0.00075
Nifty50	-1.028599	-0.04718	0.09566	-0.4887	-0.052442	9.73E-07
	0.187681	-0.018868	-0.05724	-0.066585	-0.307345	-0.000738
	0.08358	0.06876	-0.04674	0.03785	0.3771	0.00052

Source: complied by Author

It is observed that in the short run relationship results from the error correction co-integrating term C(1) indicates the long run relationship and C(2) to C(6) this shows the the short run relationship among the dependent and independent variables. It is being reflected that there exist a short run relationship among the variables for the majority of stocks. In all these cases where the co-integrating term is negative and significant it is indicated that the errors are going back to the equilibrium and the error is getting corrected whereas the positive and significant co-integrating term indicates that the errors are getting exploded

4.2 To estimate the Optimal Hedge Ratios and Hedging Effectiveness of Index Futures and Stock Futures in India

4.2.1 OLS Regression Model

In the second objective Hedge Ratios and Hedging Effectiveness is estimated from OLS regression .In order to determine if time-varying hedge ratios offer more variance reduction in

terms of hedging effectiveness, this study aims to evaluate the optimal hedge ratio and the effectiveness of hedging index and stock futures in India. This study looks at the closing prices of 23 stock futures, the spot closing price, and the future closing price of the Nifty 50 index. For all 23 Stock Futures and Nifty 50 Index data points, from April 1, 2014, to March 31, 2023, there are a total of 2284 observations

Table 8 : OLS Regression Results

Stocks &Index	Optimal Hedge Ratio	Hedging effectiveness
ACC	0.753426	0.752331
	0.00995	
AMBUJACEM	0.981033	0.981025
	0.002867	
ADANIENT	0.848491	0.809594
	0.00214	
APOLLOHOSP	0.978248	0.978239
	0.003025	
APOLLOTYRE	0.977498	0.977488
	0.003178	
ASHKLEY	0.981150	0.0981142
	0.002883	
ASAINPAINT	0.979146	0.979138
	0.002168	
AUROPHARMA	0.991546	0.991542

	0.001934	
BATAINDIA	0.983875	0.983868
	0.002672	
BHARATFORG	0.981418	0.981473
	0.002857	
BPCL	0.980505	0.980497
	0.002887	
CIPLA	0.953056	0.953035
	0.004522	
DABUR	0.972337	0.972325
	0.003386	
DRREDDY	0.981934	0.981927
	0.002661	
GRASIM	0.980446	0.980438
	0.002912	
HDFCBANK	0.392748	0.392418
	0.02515	
HEROMOTCO	0.970209	0.970196
	0.003557	
HINDPETRO	0.980873	0.980864
	0.002876	
HINDULIVR	0.896996	0.896951
	0.00621	

INFY	0.989612	0.989608
	0.002102	
ITC	0.974344	0.974333
	0.003726	
TATAMOTORS	0.991384	0.991380
	0.001949	
TATASTEEL	0.987062	0.987056
	0.002387	
Nifty50	0.932092	0.940551
	0.00257	

Source: complied by Author

The results of the OLS model for the 23 stocks and nifty 50 index is presented. Out of all the 23 stocks and nifty 50 index, AUROPHARMA has the highest hedge ratio of 0.991546 . the results also shows the hedging effectivness of the stocks and index.Therefore, it is evident from the results that is strong and stable comovement between Indian equity futures and cash markets has helped traders to significantly reduce portfolio variance(Gupta and Singh 2009). who suggested that hedge ratio based upon OLS will outperform the time-varying hedge ratio, except when major structural changes take place in the market.

4.3 Findings & Conclusions

The study aimed at analysis the cause and effect relationship between spot and futures and estimate the optimal hedge ratio and hedging effectiveness for Index and Stock futures in India. The spot market will lead the future market if the benefits of both create a significant number of speculative traders from the spot market, lower the informational gap earlier by lowering trading

noise,aid in price discovery, strenghten the overall company, boost market efficiency and boost liquidity. As a result the spot and future markets are considered to be more informationally efficient and respond to each other faster.(pooja kerker n.d.). The analysis tells that there is uni-directional as well as bi-direction causality between the variables and that there is a long term and short term equilibrium link between the future price and the spot price. Also it suggests that one of the two previous prices might be used to predict the other,providing evidence against the market efficiency theory between these two markets. The second objective of this study was to estimate the optimal hedge ratio and hedging effectiveness of index and stock futures in India by using OLS method. Study was conducted on daily data from April 2014 to March 2023.the study also tells that variance reduction is achieved by the OLS model. The study leads to conclusion that OLS model can be used to compute risk reduction and benefit hedgers in comparing and benefiting from their present position with respect to other future positions. The results in the paper suggests that NSE 23 stocks and index futures contract is an effective tool for hedging risk.

4.4.Reference

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