Project Dissertation

On

"TO FIND THE OPTIMAL HEDGE RATIO OF NIFTY 50 AND BANK NIFTY FUTURES USING OLS METHOD"

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CERTIFICATE FROM THE INSTITUTE

This is to certify that the project dissertation report titled “To find the optimal hedge ratio of NIFTY 50 and BANK NIFTY futures using OLS method” is a bona fide work carried out by Mr. Bhuvanesh Gupta of MBA 2015-17 and submitted to Delhi School of Management, Delhi Technological University, Bawana Road, New Delhi-110042 in partial fulfilment of the requirement for the award of the Degree of Masters of Business Administration.

Signature of Guide:	Signature of HOD:
Place:	Place:
Date:	Date:

DECLARATION

I, Bhuvanesh Gupta, student of MBA 2015-17 of Delhi School of Management, Delhi Technological University, Bawana Road, Delhi-110042, declare that the project dissertation report on "To find the optimal hedge ratio of NIFTY 50 and BANK NIFTY futures using OLS method", submitted in partial fulfilment of Degree of Masters of Business Administration is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge. This Report is not being submitted to any other University for award of any other Degree, Diploma and Fellowship.

Name of the student:

Place:

Date:

ACKNOWLEDGEMENT

I would like to extend my gratitude to my guide Dr. Archana Gupta, Assistant Professor, Delhi School of Management, DTU for her continuous support and guidance to make me learn and complete my dissertation work. I would also like to thank Ms. Varuna Kharbanda, PhD Scholar, Delhi School of Management for guiding me throughout my work by suggesting the necessary steps to be followed for doing the dissertation work.

I would also like to extend my gratitude to the other faculty members of DSM, my family and friends for their support and cooperation during this project.

Bhuvanesh Gupta
DSM, 2015-2017

EXECUTIVE SUMMARY

The report titled "To find the optimal hedge ratio of NIFTY 50 and BANK NIFTY futures using OLS method" is a report based on the study carried out by me of the futures market in India with respect to index futures traded in NSE. It is a part of the course work of 4^{th} semester, to be submitted as a requirement of the MBA program of Delhi School of Management, Delhi Technological University. The objectives of the report are to find the optimal hedge ratio of index futures and their hedging effectiveness using the OLS method. It is the study of index futures of NIFTY and BANK NIFTY indices, traded at NSE.

This Report is divided into six chapters. The first chapter of this study deals with introduction that presents the financial markets in general and Indian stock futures market in particular. It talks about the various derivative products that are traded in NSE. Futures are discussed in detail with emphasis on its functions and importance. The second chapter of the report presents the literature review. This talks about the various studies that have been conducted in the past with respect to hedging and calculation of hedge ratios. Few papers are based on the Indian scenario and helps in understanding how emerging market like India are doing with respect to futures trading. Literature also tells us about the various econometrics techniques to be followed in order to test the objectives of the study. The third chapter is about the research methodology. The fourth chapter gives the test results and their analysis. Daily spot and futures returns are calculated in lognormal form and regression line is fitted on them. The slope of the regression line gives the hedge ratio. The hedge effectiveness is calculated using the value of R^2. The fifth chapter summarizes the findings and concludes the discussion. The results show that index futures can provide an effective hedge against market movements and a simple OLS technique can be used to calculate the optimal hedge ratio. The report is winded up with the sixth chapter on bibliography.

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CHAPTER 1

INTRODUCTION

1.1 Financial Markets

Financial markets are provisions that facilitates for buying and selling of financial products and services. The enterprises, financial establishments, people and governments trade in financial products in these markets either straightforwardly or through dealers or brokers on stock markets. The stock markets or organized exchanges are primarily involved in attracting new investible resources into the corporate sector and their allocation among alternative uses and users. The securities exchanges by empowering the transforming of proprietorships in the product market into financial assets, to be specific shares, uniting buyers with sellers of partial holding of companies. It empowers organizations to raise long term financing essential for business by issuing securities.

The primary functions of the financial market are enabling companies to raise essential long term financing by issuing securities, and providing a market in which these securities can be valued and easily traded. Thus the financial markets are playing a very important role as far as the determination of the equilibrium price is concerned. Since both undervaluation and overvaluation of securities are financially and economically undesirable, the discovery of the right price has been given a significant place in finance literature. The precondition for right price discovery is the existence of an efficient market. A market is said to be efficient if the current prices fully and instantaneously reflects all available information and leads to right price discovery. If the market is not efficient, excess profit opportunities would arise making the market volatile. Since market volatility seriously handicaps the efficient price discovery process, market participants have long been worked and their efforts came into lime light in the form of the introduction of innovative financial instruments, commonly well known as derivatives. The derivatives help to reduce risk associated with the price volatility of underlying securities.

According to Weber (2008), the concept of derivative securities can be traced back to the Mesopotamia to Hellenistic Egypt and the Roman world civilization. Derivatives were based on commodities only during the earlier years, but the scope of derivatives trading has broadened now-a-days. NSE and BSE started off trading in equity derivatives in India in the year 2000. Index futures was the financial derivative

instruments to be introduced in the Indian capital markets. Subsequently index options were launched in June 2001. Options in individual stocks were introduced in July 2001 whereas single stock derivative futures are the latest ones, introduced in November 2001. Equity derivatives instruments have evolved a long way since then. New and innovative products have continuously come to the market with continuously expanding list of eligible traders. Trade volumes have also increased. India's involvement with the derivatives market has been to a great degree positive. The derivatives turnover of F&O segment on the NSE has already crossed the market turnover of equity. The total turnover of F&O segment on the NSE has increased from Rs. 23,654 Cr. in 2000-01 to Rs. 9168326.74 Cr. in 2017-18. Whereas, the average daily turnover in the F&O segment of the market has risen from mere Rs. 11 Cr. during 2000-01 to an astounding figure of Rs. 539313.34 Cr. in 2010-11.

1.2 Derivatives

Derivatives are contracts between two parties whose price is dependent upon the price of one or more underlying assets. Common underlying assets are stocks, commodities, currency, interest rates and bonds etc. Derivatives are the instruments used for hedging of systematic risk

A derivative can be:

- A security derived from a secured or unsecured loan, share, debt instrument or any other form of security.
- A contract whose value is derived from index of prices or prices of underlying securities.

Example: Farmer growing wheat can sell his crop before harvesting at a negotiated price on a future date so that the risk of price changes by that date can be eliminated. The physical delivery of wheat and exchange of cash will take place on the due date of the contract but the price has been determined in advance. Here the underlying asset is the crop of wheat, the current price of which will govern the price for the future.

One of the prominent characteristic of an efficient market is that the data accessible in the market is instantly reflected in the spot and futures prices. As a result, there will be perfect positive co-movement between the prices of future & spot markets. In other words, there won't be any systematic lead lag response and arbitrage opportunity in the market. In efficient market, smart investors have no advantage because every bit of superior information has already been captured in actual asset prices. In perfectly efficient future and spot market, informed investors are indifferent in respect of trading in futures and spot market.

1.3 Derivative market in India

India is one of the most successful developing countries in terms of a vibrant market for derivatives. This reiterates the strengths of the modern development of India's securities markets, which are based on nationwide market access, anonymous electronic trading, and a predominantly retail market. There is an increasing sense that the equity derivatives market is playing a major role in shaping price discovery. India's experience with launch of equity derivatives market has been extremely positive, by world standards. NSE is now one of the prominent exchanges amongst all emerging markets, in terms of equity derivatives turnover. There is an increasing sense that the derivatives market is playing a major role in shaping price discovery. Equity derivatives trading started at NSE June 2000, after regulatory process which stretched over more than four years. In July 2001, the equity spot market moved to rolling settlement. Thus, in 2000 and 2001, the Indian equity market reached the logical conclusion of the reforms program which began in 1994. India's experience with launch of equity derivatives market has been extremely positive, by world standards. NSE is now one of the prominent exchanges amongst all emerging markets, in terms of equity derivatives turnover. There is an increasing sense that the derivatives market is playing a major role in shaping price discovery. The Equity futures and options contracts are traded on the NSE's F&O Segment. The F&O Segment of NSE is a very liquid market clocking high turnover daily.

Table 1.1 shows the trading value in different market segments at NSE. The table 1.2 shows the number of contracts traded, annual turnover and average daily turnover from the year 2001-02 to 2015-16.

Table 1.1 Trading value in different market segments

Segment/Year	2011-12	2012-13	2013-14	2014-15	2015-16
Capital Market	28,10,893	27,08,279	28,08,488	43,29,655	42,36,983
Equity Futures & Options	313,49,732	315,33,004	382,11,408	556,06,453	648,25,834
Wholesale Debt Market	6,33,179	7,92,214	8,51,434	7,72,369	5,69,495
Currency F&O	46,74,990	52,74,465	40,12,513	30,23,908	45,01,886
Interest Rate Futures	3,959	0.22	30,173	4,21,558	5,26,425
Total	**394,72,753**	**403,07,962**	**459,14,017**	**641,53,943**	**746,60,622**

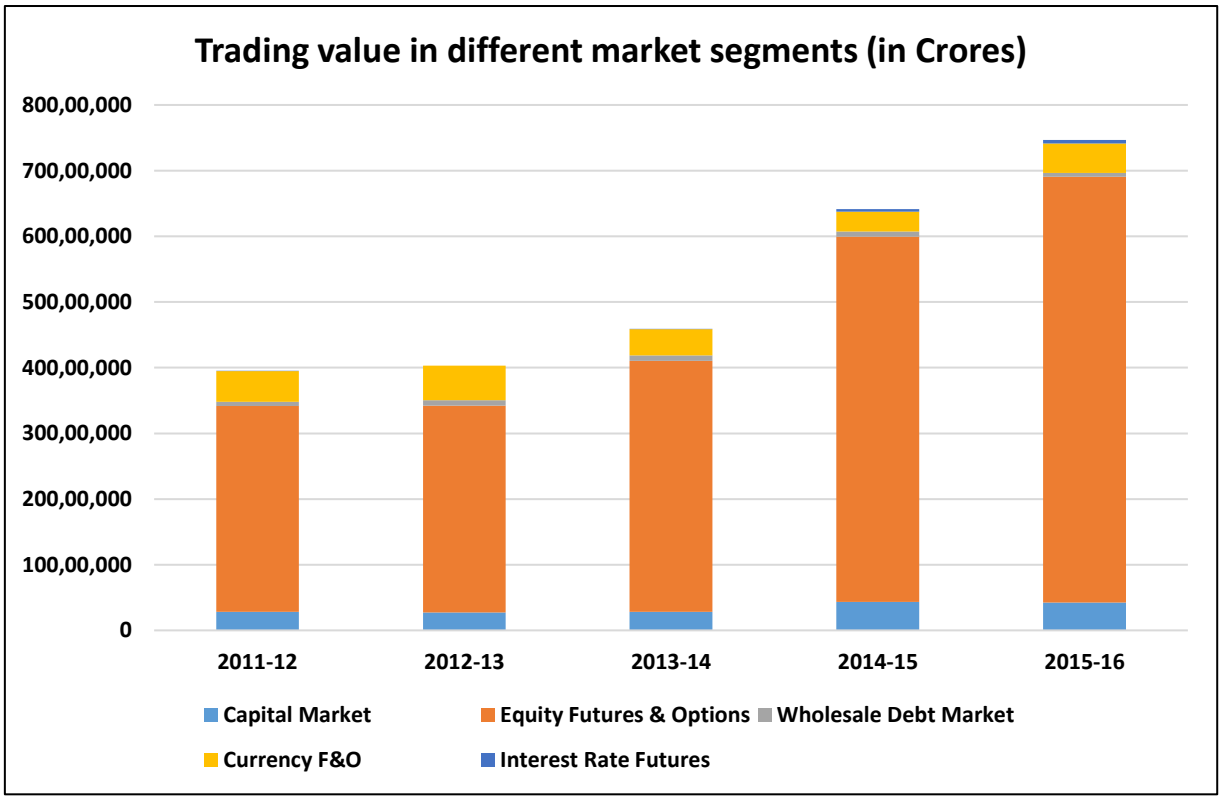

Fig 1.1

Table 1.2 Growth in F&O segment

Year	No. of contracts	Turnover (in crores)	Average daily turnover (in crores)
2000-01	90580	2365	11
2001-02	4196873	101926	410
2002-03	16768909	439862	1752
2003-04	56886776	2130610	8388
2004-05	77017185	2546982	10107
2005-06	157619271	4824174	19220
2006-07	216883573	7356242	29543
2007-08	425013200	13090477.75	52153.3
2008-09	657390497	11010482.2	45310.63
2009-10	679293922	17663664.57	72392.07
2010-11	1034212062	29248221.09	115150.48
2011-12	1205045464	31349731.74	125902.54
2012-13	1131467418	31533003.96	126638.57
2013-14	1284424321	38211408.05	152236.69
2014-15	1837041131	55606453.39	228833.14
2015-16	2098610395	64825834.3	262452.77

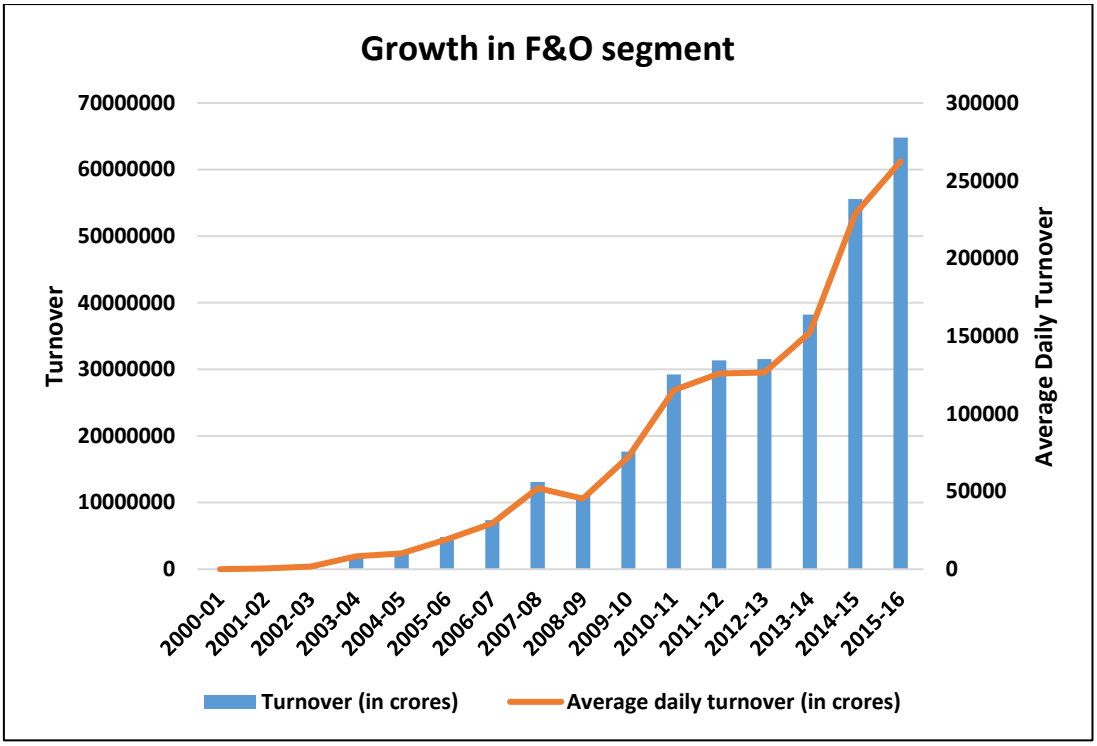

Fig 1.2

The data shows that the total turnover on the F&O segment has increased to Rs. 64825834.3 crore during 2015-16 as compared with Rs.2,365 crore during 2000-01. The average daily turnover during 2015-16 was Rs.262452.77 crore as compared to Rs 12 crore in 2000-01 which shows CAGR of 89.39% in terms of turnover and CAGR of 87.76% in terms of average daily turnover. This clearly shows that the Derivative market in India has grown substantially and now forms the major part of the stock market as a whole.

1.4 Functions of Futures Market

Ekta (2016) discusses that the importance of futures markets arises from their ability to forecast cash prices at a specified future date. This provides traders with a means of managing the risk associated with the trading in underlying asset. Burns (1983) stated that futures market provide both direct and indirect economic benefits. Direct benefits imply lower hedging costs, expansion of output, functional specialization and

economies of scale which come from futures market ability to execute transactions more efficiently. While indirect benefits are related to improvement in information about cash prices and improvement in the efficiency and integration of related markets which come from the publically available information about futures prices.

The main functions of the futures market are given below:

- Price Discovery: Active and timely participation by large number of sellers and buyers ensure fair price. Futures market increase the competitiveness of the market as it encourages large number of participants with objectives of hedging, speculation and arbitraging. As a result, futures market facilitates price discovery due to increased participants, increased volumes, increased sensitivity of participants to react to smallest price change and smooth dissemination of information among different participants.
- Risk Management: A buyer is always willing to obtain at the lowest possible price while the seller is interested in the highest price. But prices in a free market move freely up and down according to changes in the supply and demand of the underlying asset. In free market information about the future trend of the prices do not exist and this may be both favourable and unfavourable to buyer and seller. This creates price risk for both buyer and seller. Futures market enables to manage this risk through hedging. Hedging involves taking a position in the futures market opposite to an exposure in the cash market. It reduces the exposure of risk by shifting that risk to others with opposite risk profile or to investors who will acknowledge the risks in lieu of profit opportunities.
- Provide Leveraging: Futures market involves only fractional outlay of capital as compared to the spot market. An investor just needs a small amount of the price to trade or buy in the derivatives market than he would need for trading in the same stock in the cash market. Therefore, leveraged positions are potentially more profitable, but at the same time are extensively risky. In the event that leveraged positions do fail to meet expectations, a lot of cash would be wiped out. But on the contrary, if these positions work in favour, a lot of money can be made. Thus futures market helps in increasing volumes of trade which further enhance the price discovery efficiency of futures market.

- Transactional Efficiency: Futures market attempts to further down transaction costs and bring in liquidity. This market's reduced costs of trading and liquidity enhances their transactional efficiency, risk management and price discovery functions

1.5 Importance of Futures

Primarily, there are three reasons for using futures contract –

- Hedging against a price risk
- Speculating in the changing price
- To take arbitrage opportunities

A hedger is one who wishes to reduce risk associated with the ownership of an inventory of a commodity. Hedgers buys or deals exclusively with the end goal of setting up a known value level ahead of time for something they later expect to purchase or sell in the spot market. They do this by taking an equivalent and inverse position in the future market than they have in the spot market. As the cost of the commodity changes, the hedger is ensured in light of the fact that gain in one market are counterbalanced by misfortunes in the other market, paying little mind to which direction the price moves. Hedgers enthusiastically surrender the chance to profit by favourable price changes keeping in mind the end goal to accomplish assurance against unfavourable price changes.

Speculators, on the other hand, accepts the risk relinquished by the hedger. Speculators take stands on their desires of future price movement frequently with no expectation of making or taking delivery of the commodity. They purchase when they envision rising costs and sell when they expect declining prices. Without the speculator, the market would not be liquid and it would be a costly affair of price protection sought by the hedger.

Arbitrageurs are those traders who exploit price disparities between spot and future markets by entering into trades in two or more markets. When the opportunity

emerges, an arbitrageur tries to exploit it by purchasing in one market at a specific 'cost and at the same time offering in the other market at a higher cost. Be that as it may, these value disparities must be transitory since they can without much of a stretch be disposed of by the arbitrage procedure itself. This is done, in light of the fact that the buy in one market will drive costs up for that market, while the deal in the other will drive costs down. Consequently, arbitrage is vital for keeping future and cash market prices in line.

1.6 Hedging

A hedge is an investment that is undertaken to offset any possible loses or gains that may incur by an accompanying investment. In simple terms, a hedge is employed to minimize the risk of unfavourable price movement of an asset. Hence, the hedging activity is regarded as exchanging the price risk for a basis risk. The basis is defined as the difference between cash and future prices.

1.7 Hedge Ratio

Hedge Ratio (h^*) can be defined as ratio of the size of portfolio taken in the futures contract to the size of exposure. There are three basic hedge strategies: the one to one hedge, the minimum variance hedge and the beta hedge. The one to one hedge is the simplest and the traditional method of hedge. Here, the futures position that is entered into is equal in magnitude, but opposite to that of spot position, that is h=-1. The beta hedge is also very similar. However, it is used when the spot portfolio does not exactly match the futures portfolio. Therefore, the optimal hedge ratio is taken as the negative of the beta of spot portfolio. In minimum variance approach, the aim is to minimize the basis risk. Hence, the optimal hedge ratio is calculated by minimizing the variance of spot-future prices. The optimal hedge ratio differs significantly based on the techniques used and the time horizon. Moreover, the effectiveness of hedge is relevant only when the value of hedged portfolio changes significantly.

1.8 Motivation for the study

The motivation for finding out hedge ratios with respect to index futures can be summarized as:

- Index futures are highly liquid instruments widely used for short term trading and portfolio adjustments
- The usefulness of these contracts for minimizing risk and hedging depends on the effectiveness of the hedge which, in turn, depends on the hedge ratio
- To study the effectiveness of hedge using futures especially in an emerging market economy like India.

CHAPTER 2

LITERATURE REVIEW

Derivative market in its form today, has emerged from the fact that the risk averse market participants are willing to protect themselves from the fluctuations and uncertainties of the associated prices of market. Derivatives are tools that provide the market participants the opportunities to hedge the associate risks, speculate the price movement and take arbitrage opportunities. It also provides high leverage to the investors who can take large position with less capital. Since world markets for trade and finance have turned out to be more incorporated, derivatives have given strength to the interoperability and linkages between worldwide markets, which in turn have increased the efficiency and market liquidity, and have encouraged the flow of trade and finance.

L. L. Jhonson (1960) was first to propose a model for effective hedge. He proposes that a commodities trader should enter into a one to one if he wants an insurance against relative price changes. However, the hedge may not be absolute as it may still have some speculative element in it. He argues that they is a trade-off between expectation of gain and reduction in volatility or risk. If a trader wants to maximize his returns, he may not enter into a hedging position. If he wants an insurance against price risk, then he may hedge his positions but his upside will be limited.

J. L. Stein (1961) stated that there exists a linear relationship in spot and future price of a commodity. The prices in spot and future market will depend on the demand and supply equilibrium and are linked to each other. If the demand in spot market increases, the spread between spot and future prices increases. These leads to an excess supply of future contracts in the market, which in turn reduces the price and hence the spread. This way the prices reach a new equilibrium.

David M. Modest and Mahadevan Sundaresan (1983) showed that at the point when transaction costs are perceived, the futures price can vary inside a limited interim without offering ascend to any arbitrage benefits. They demonstrated that in an arbitrage-free economy, the index futures might sell at a reduced rate relative to the spot index at equilibrium. When dividends were introduced to the analysis, it showed greater wedge between the futures and spot price.

According to A. R. Chowdhury (1991), a futures market is efficient with respect to an information set where only new and unforeseen information leads to a price change. Raghavendra RH et. al (2016) reveals that both the spot and future markets price of Indian agricultural commodities plays the leading role in the price discovery process. Indian commodity future market is informationally efficient and reacts quickly to each other in context of Indian agricultural future market.

A. Casillo (2004) used the OLS regression method, the vector error correction model (VECM), the multivariate GARCH model and the bivariate autoregressive model (BVAR) to calculate the optimal hedge ratio in Italian derivative market for index futures and compared the results. His finding showed that the results arrived at by OLS method were similar to that of other empirical models.

S. Raja Sethu Durai and Saumitra N Bhaduri (2007) used various empirical models to find the optimal hedge ratio and hedge effectiveness of Index futures in Indian stock markets. Their research shows that the OLS method is an effective hedging tool for short term horizons and provide better results than other models in short duration. On the other hand, DVEC-GARCH is a better model for finding optimal hedge ratio for long term horizons. However due to high cost of computation involved with DVEC-GARCH, the OLS method is also a viable strategy for long term.

From the empirical literature cited above, it is clear that most of the studies published till date provide evidence that the OLS method is simple and effective tool to calculate the optimal hedge ratio. However, majority of research is done outside India and that too in commodities market. There is a dearth of literature pertaining to Indian stock market context.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Objective of the Study

- To understand the concept of futures in stock market.
- To calculate the optimum hedge ratio of Bank Nifty futures contract.
- To calculate the optimum hedge ratio of Nifty index futures contract.
- To study effectives of hedge using OLS method.
- To study the hedging effectiveness of the equity futures market of an emerging economy like India.

3.2 Scope of the Study

This study is focused on estimating optimal hedge ratio for index futures in India and their hedging effectiveness. The study uses two most traded index future contracts in India that is, Nifty 50 futures contarct and Bank Nifty futures contract.

3.3 Sample

The focus is on a 36-month data of NIFTY 50 index, BANK NIFTY index, NIFTY 50 futures contract and BANK NIFTY futures contract. The rationale for taking a three year horizon is to include atleast one market cycle (one bull run and one bear run) in our analysis for better results. The rationale for taking NIFTY 50 is that the Index represents around 62.9% of the free float market capitalization of the stocks that are listed on NSE as on March 31, 2017.The total traded value of NIFTY 50 index constituents is approximately 43.8% of the traded value of all stocks on the NSE. For a portfolio size of Rs.50 lakhs, the impact cost of the NIFTY 50 is around 0.02% for the month of March 2017 which shows that the stocks comprising the index have very high liquidity. The BANK NIFTY is taken because it has 12 stocks from the banking sector which are traded on NSE. As on March 2017, The NIFTY Bank Index represents around 93% of the free float market capitalization and 17% of the free float market capitalization of the stocks that form part of the Banking sector.

3.3 Data Collection

The research work is based on analytical research design. The research deals with the closing price and daily settlement price of Indices and Index futures respectively over a period of 36 months from 1st January 2014 to 31st December 2016.

3.3.1 Primary Data:

- Discussions with supervisor for better understanding of the concepts and working.

3.3.2 Secondary Data:

- Historical data from NSE website
- Review of Previous research papers related to study
- Textbook references for interpretation and understanding
- Internet Resources

The data for 36 month data of NIFTY 50 and BANK NIFTY is downloaded from NSE website. The data series consist of the following columns:

- Symbol
- Date
- Open
- High
- Low
- Close
- Share traded
- Turnover in Crores

The data in "close" is taken to calculate daily spot returns. This data consists of 739 data points. Similarly, data of NIFTY 50 futures and BANK NIFTY futures consists of following columns:

- Symbol
- Date
- Expiry
- Open

- High
- Close
- LTP
- Settlement price
- Turnover in lakhs
- OI
- Change in OI

The data in “Settlement price” is taken to calculate daily futures returns. This data consists of 739 data points.

3.5 Data transformation

The daily spot and future returns are calculated in lognormal for using the following formula:

$\Delta S_t = \ln (C_t / C_{t-1})$

$\Delta F_t = \ln (F_t / F_{t-1})$

Where,

ΔS_t = Daily spot return on day t in lognormal form

C_t = Closing price of index on day t

C_{t-1} = Closing price of index on day t-1

ΔF_t = Daily future return on day t in lognormal form

F_t = Settlement price of futures contract on day t

F_{t-1} = Settlement price of futures contract on day t-1

3.6 Tools for Analysis

- OLS regression method

  Using Ordinary Least Squares (OLS) regression method hedge ratio and hedge effectiveness can be analysed by studying the regression coefficient and R-square. In OLS method, the slope coefficient (h*) gives the optimal hedge ratio in the regression:

$$\Delta S_t = \alpha + h^* \Delta F_t + \varepsilon_t$$

  Here ε_t represents the error term of the OLS estimation, ΔS_t is the spot price changes, ΔF_t is the futures price changes and α is the intercept of the regression line. The optimal hedge ratio h* is the slop of equation. Hedging effectiveness is determined by the R-Square of this model.

- Charts
- Graphs
- Statistical measures

3.7 Limitations

- Historical data of up to only three years is used.
- There is a gap between theoretical and practical models for calculating hedge ratio.
- The study is limited to the scope of data provided publically.
- The interpretation has been made according to my limited knowledge and experience.

CHAPTER 4

ANALYSIS AND DISCUSSION

In the first step, daily returns of the indices and the futures contract is calculated using the closing value and daily settlement price respectively. Then the returns are converted to lognormal form as per theories of econometrics. Then simple linear regression is applied taking the futures return as the independent variable and the spot returns as the dependent variable. The slope of the regression line gives the hedge ratio. The hedging effectiveness is calculated using the value of R-square. A value of R-square above 0.75 signifies a effective hedge.

Fig. 4.1 graphs the data on NIFTY 50 and NIFTY 50 Futures.

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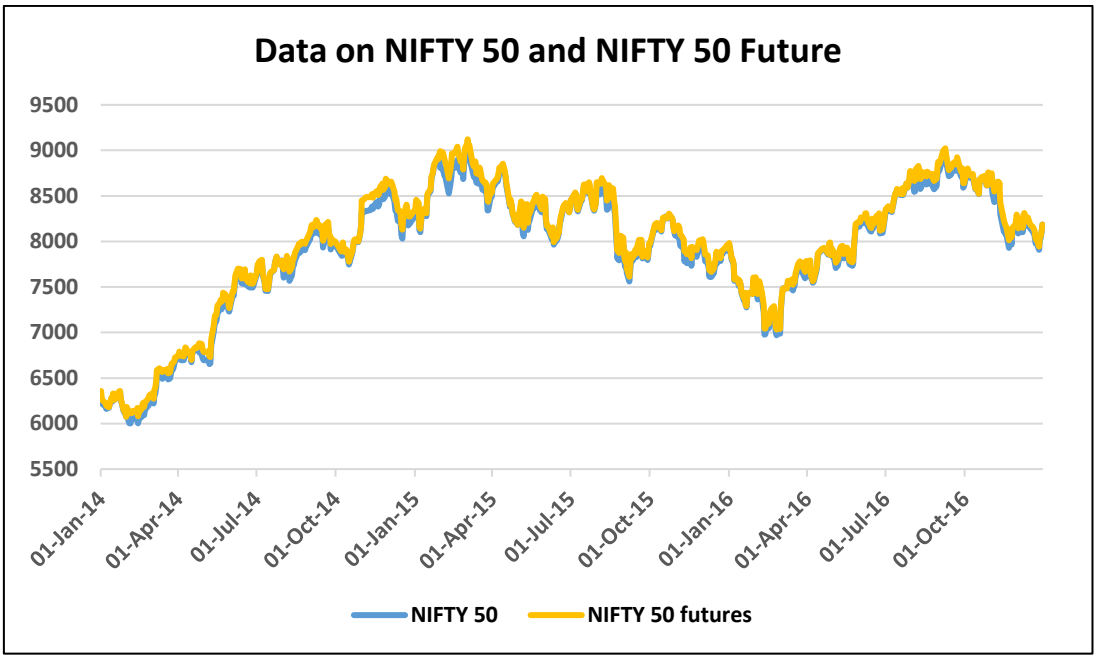

Fig 4.1

Fig 4.2 graphs the data on BANK NIFTY and BANK NIFTY futures.

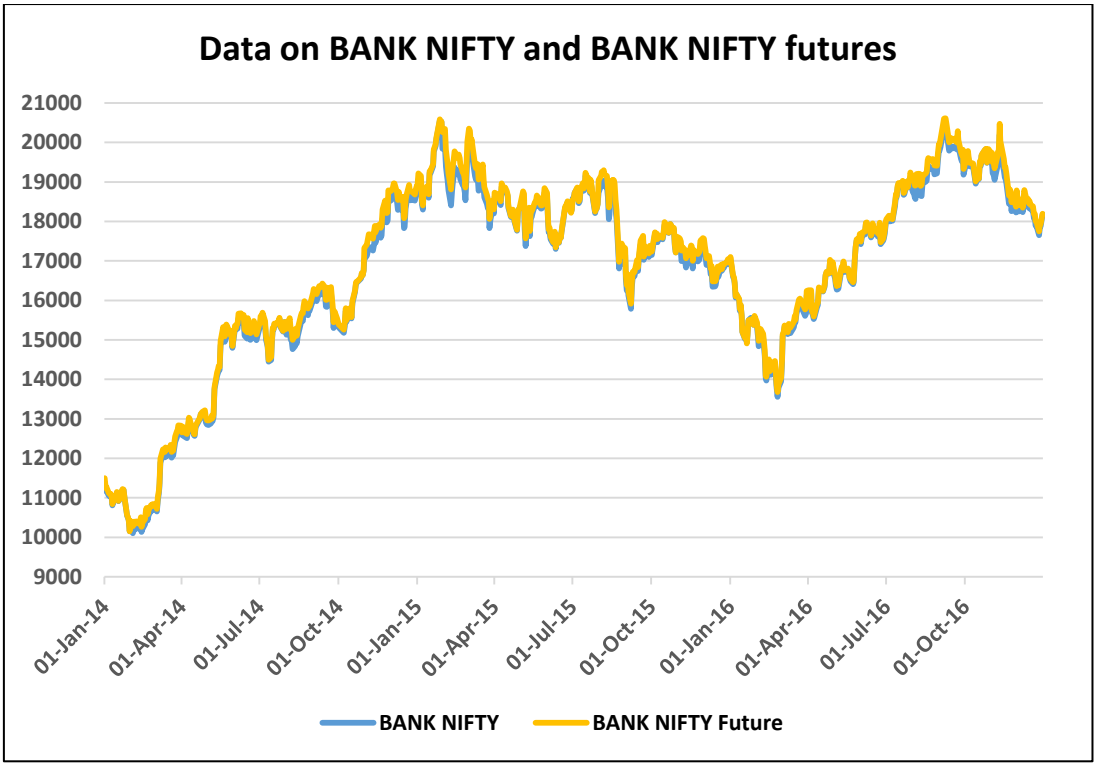

Fig. 4.2

There has been a significant growth in both NIFTY 50 and BANK NIFTY since 1st January, 2014. This can be attributed to the improvement in overall macroeconomic parameters of the economy and the positive economic outlook due to favourable economic policies. The NIFTY 50 are risen close to 1500 points in three years and the BANK NIFTY has risen close to 7000 points during the same period. The data also showed that the market experienced a bull run from February 2014 to March 2015 and a bear run from April 2015 to March 2016. This shows that the represents atleast one complete market cycle.

The daily returns from spot and futures are converted to lognormal form which limits the overall trends of exponential growth.

The transformed data series is shown in Fig. 4.3 and 4.4

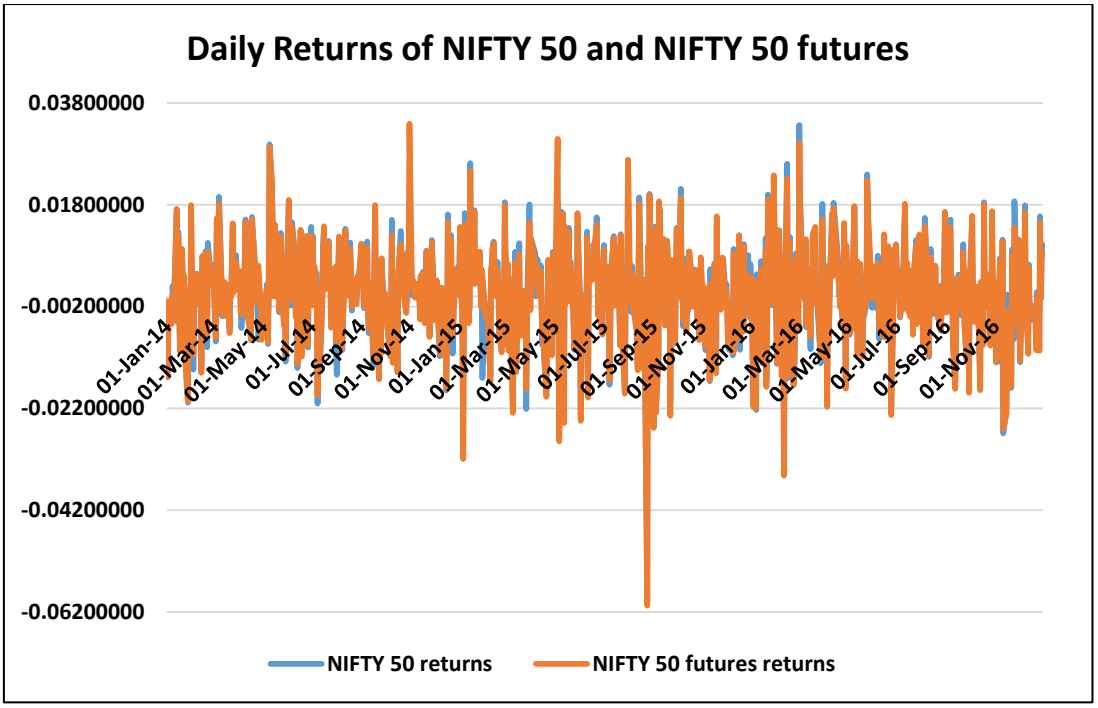
Daily Returns of NIFTY 50 and NIFTY 50 futures
0.03800000
0.01800000
-0.00200000
-0.02200000
-0.04200000
-0.06200000
01-Jan-14
01-Mar-14
01-May-14
01-Jul-14
01-Sep-14
01-Nov-14
01-Jan-15
01-Mar-15
01-May-15
01-Jul-15
01-Sep-15
01-Nov-15
01-Jan-16
01-Mar-16
01-May-16
01-Jul-16
01-Sep-16
01-Nov-16
NIFTY 50 returns
NIFTY 50 futures returns

Fig 4.3

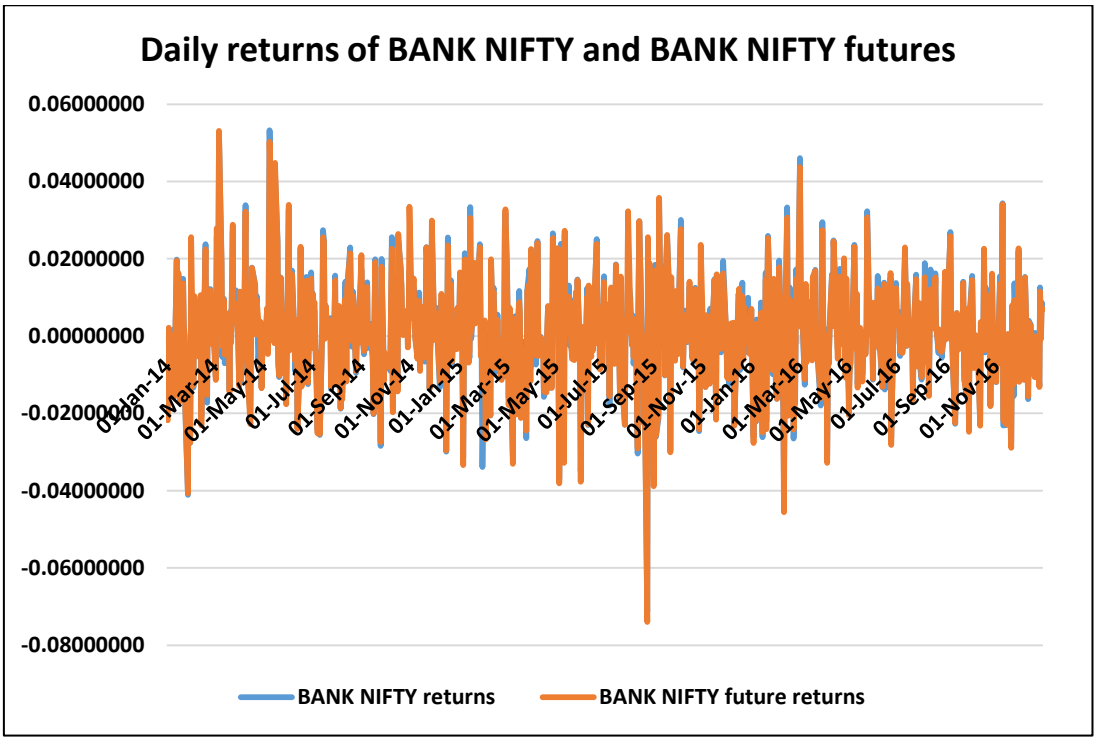
Daily returns of BANK NIFTY and BANK NIFTY futures
0.06000000
0.04000000
0.02000000
0.00000000
-0.02000000
-0.04000000
-0.06000000
-0.08000000
01-Jan-14
01-Mar-14
01-May-14
01-Jul-14
01-Sep-14
01-Nov-14
01-Jan-15
01-Mar-15
01-May-15
01-Jul-15
01-Sep-15
01-Nov-15
01-Jan-16
01-Mar-16
01-May-16
01-Jul-16
01-Sep-16
01-Nov-16
BANK NIFTY returns
BANK NIFTY future returns

Fig 4.4

The data shows that the returns of both NIFTY 50 and BANK NIFTY have been fairly volatile during the period under consideration and this necessitated the need of Hedging.

The descriptive statistics of the spots and future returns are shown in table 4.1 and 4.2

Table 4.1 Descriptive statistics of BANK NIFTY and BANK NIFTY futures

	Mean	Std. Deviation	N
BANK NIFTY	.0006339006	.01338982258	738
BANK NIFTY Futures	.0006216561	.01353887215	738

Table 4.2 Descriptive statistics of NIFTY 50 and NIFTY 50 futures

	Mean	Std. Deviation	N
NIFTY 50	.0003544572	.00932385510	738
NIFTY 50 Future	.0003426274	.00941803030	738

The data contains 738 data points. The BANK NIFTY returns have a standard deviation of 0.0133 from the mean and the NIFTY 50 returns have a standard deviation of 0.0093 from the mean, which are significant. This shows that NIFTY returns were volatile during the period under consideration and hence justified the use of hedging.

The daily returns are then fitted in a regression line using the OLS method. The future returns are taken as independent variable and spot returns are taken as dependent

variable. The value of coefficient beta that is, the slope of the regression line will give the optimal hedge ratio and the value of R-square will give the hedge effectiveness.

The result from the regression model of NIFTY 50 and NIFTY 50 future shown in table 4.3.

Table 4.3 Output of regression model on NIFTY 50 and NIFTY 50 future

	Coefficients	***Standard Error***	***t Stat***	***P-value***
α	-5.38524E-06	8.15775E-05	-0.066013851	0.947384725
β	0.98181807	0.008748932	112.2214774	0

Table 4.3 shows of the value of the coefficients of the regression equation and the standard error and t-ratios associated with them at 95% significance level. The result shows that the value of alpha is statistically insignificant. Similarly, the p-value is 0.947 which is far greater than 0.05. This signifies that the regression line obtained through the model significantly explains the relation between dependent and independent variable that is, the regression line obtained fits the data significantly.

The value of beta gives the value of hedge ratio. Hence in the above model hedge ratio (h) = 0.9818. The estimated regression line plots corresponding to the above model is shown in figure 4.4.

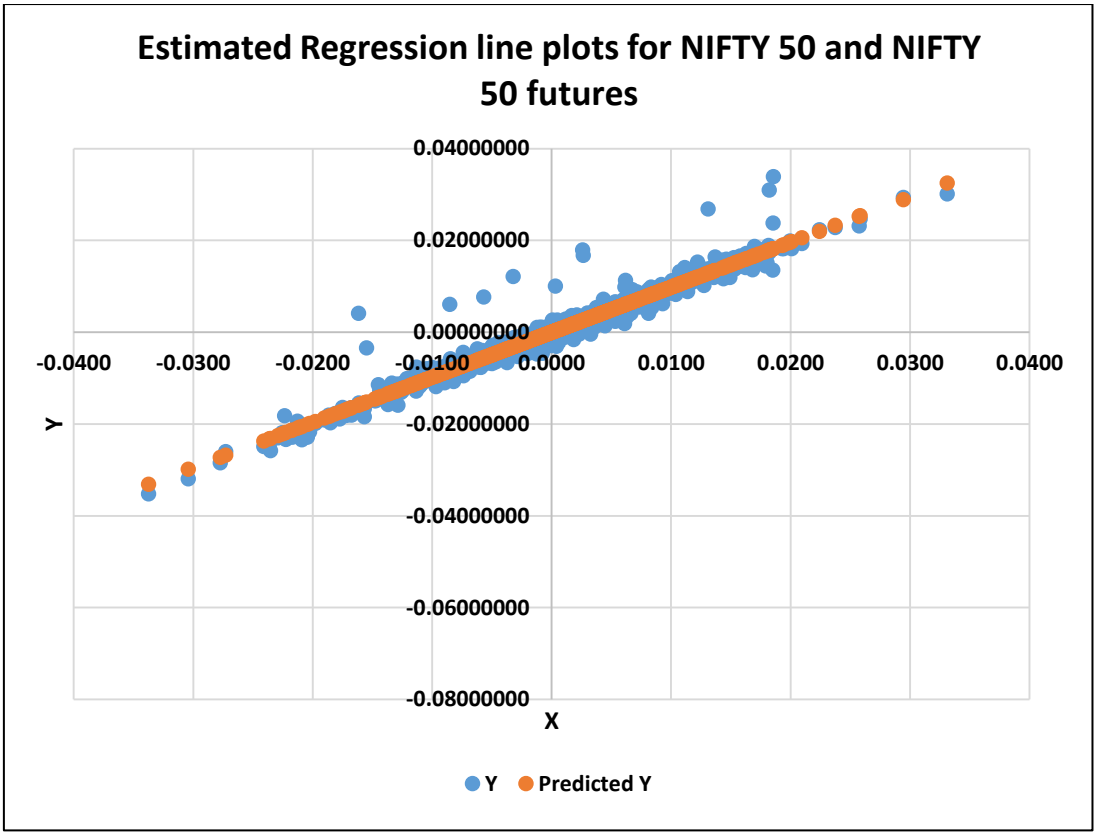

Fig 4.5

The figure shows that the regression line fits well with the data. The x-axis represents the NIFTY 50 returns and the y-axis represents NIFTY 50 futures returns. The hedge effectiveness is given by the value of R-square.

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Table 4.4 Values of R-square

Multiple R	0.972
R Square	0.944785
Adjusted R Square	0.94471
Standard Error	0.002215
Observations	738

Table 4.4 shows the values of R-square the regression model. The value of R2 in this model is 0.944 which is greater than 075. This shows that the hedge will be effective with a hedge ratio of 0.9818.

The results from regression model of BANK NIFTY and BANK NIFTY futures is shown in table 4.5

Table 4.5 Output of regression model on BANK NIFTY and BANK NIFTY future

	Coefficients	***Standard Error***	***t Stat***	***P-value***
α	-8.59668E-06	9.0864E-05	-0.094610344	0.924650084
β	0.994245386	0.006783047	146.5779865	0

Table 4.5 shows of the value of the coefficients of the regression equation and the standard error and t-ratios associated with them at 95% significance level. The result shows that the value of alpha is statistically insignificant. Similarly, the p-value is 0.924 which is far greater than 0.05. This signifies that the regression line obtained through the model significantly explains the relation between dependent and independent variable that is, the regression line obtained fits the data significantly.

The value of beta gives the value of hedge ratio. Hence in the above model hedge ratio (h) = 0.9942. The estimated regression line plots corresponding to the above model is shown in figure 4.5.

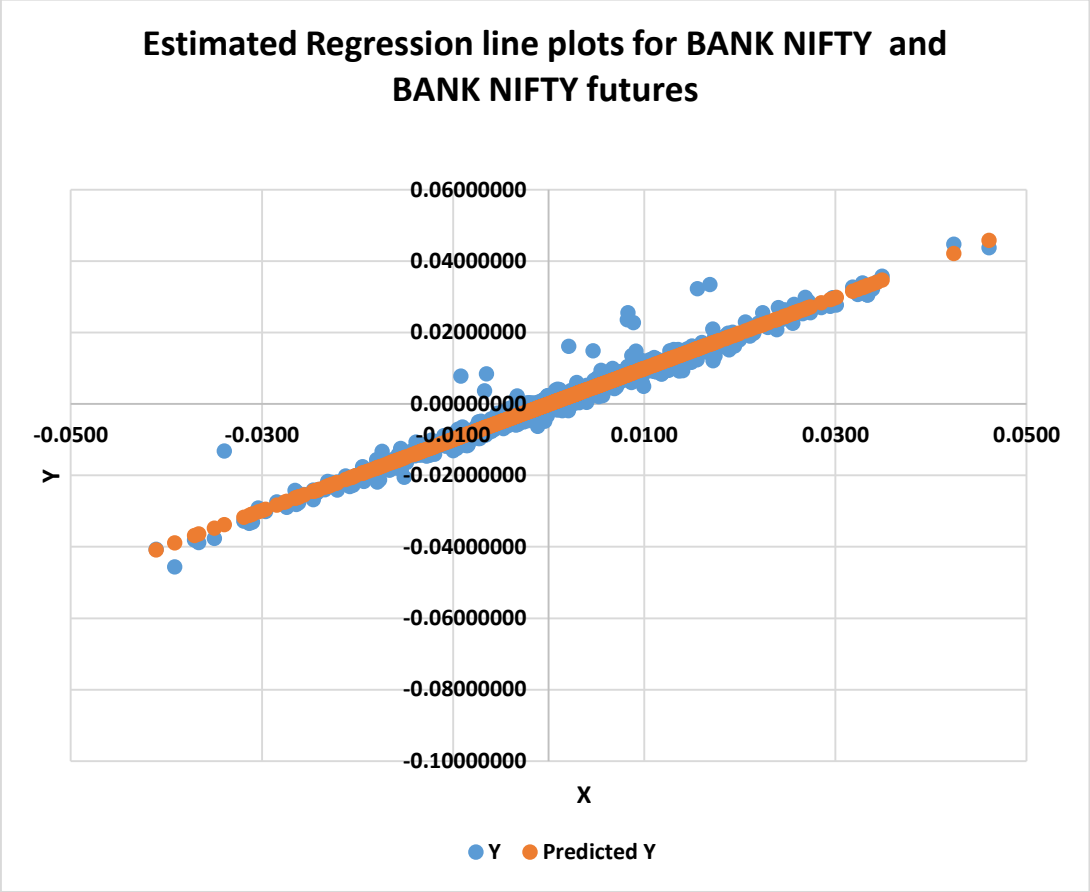

Fig 4.6

The figure shows that the regression line fits well with the data. The x-axis represents the BANK NIFTY returns and the y-axis represents BANK NIFTY futures returns. The hedge effectiveness is given by the value of R-square.

Table 4.6 Values of R-square

Multiple R	0.983299719
R Square	0.966878336
Adjusted R Square	0.966833334
Standard Error	0.002465661
Observations	738

Table 4.6 shows the values of R-square the regression model. The value of R^2 in this model is 0.966 which is greater than 075. This shows that the hedge will be effective with a hedge ratio of 0.994.

CHAPTER 5

CONCLUSION

5.1 Summary

In the present research work, the aim prime objective has been to find out the optimal hedge ratio for nifty futures as a general hedge against market movement as a whole. For this purpose, the NIFTY 50 and BANK NIFTY indices, two of the most popular and actives indices, and their futures contract has been used. The purpose of using NIFTY 50 is that it one of the most wide based and actively tracked available in the market which encompasses almost all the major sectors of the economy. Similarly BANK NIFTY has been used because banking sector plays a very crucial role in any economy and BANK NIFTY tracks the performance of all major banks in India. The for past three years has been considered for the study so that data for atleast one bull run and one bear run is taken into account to ensure that the results are accurate. The descriptive statistics of the data showed significant standard deviation in the spot markets, which shows that hedging is necessary to mitigate risk. The regression analysis shows that a significant linear relationship exists between the indices and their futures. The optimal hedge ratio for NIFTY futures is calculated as 0.9818 and the optimal hedge for BANK NIFTY futures comes out to be 0.9942. The estimated regression line is a good fit. The slope of the line gave the optimum hedge ratio for the futures contracts. The value R^2 showed that a effective hedge can be carried out using the hedge ratio derived from regression. It also signifies that the equity market is efficient to a large extent in India.

5.2 Conclusion

With time, as the economies are developing, financial systems too are becoming increasingly sophisticated, which means there is greater need of risk management techniques. Development and innovation of derivatives in risk management have reclassified and revolutionized the scene of financial system and it has earned suitable place among all the financial products available till date. Derivatives are an excellent choice of risk management tool that help in effective management of risk. They essentially transfer risks from the one who wishes to avoid it to the one who chooses to accept it. The motivation for studying the spot and index futures contracts came from the fact that firstly index futures are highly liquid instruments widely used for short term trading and portfolio adjustments. The usefulness of these contracts for

managing risk and in price discovery mechanism depends on the efficiency of pricing relative to the underlying. Secondly, to identify the hedge ratio required for an effective hedge in an emerging market economy like India. The effective use of futures contract in hedging decisions has become utmost important in the current scenario of increased volatility and interlinkages between global financial markets. The effectiveness of hedging depends primarily on finding the optimal hedge ratio. Both over-hedged and under-hedged position are undesirable. So, a simple OLS regression method can be used by traders or retail investor to hedge their portfolio effectively and not rely on conventional wisdom, which suggests a one to one hedge. However, this study shows that this is not the case practically as the hedge ratio of both the contracts came out be less than one. The study also shows that the use of a simple technique can also result in effective hedge.

5.3 Scope for Further Research

A number of areas for further research can be suggested from the analysis of this research work.

- India is an emerging market and volatility in such market is obvious. It may not suffice to use just one model for effective hedging. Similar study can be done using other models for finding optimal hedge ratio.
- The study can be extended to include stock futures with various maturities.
- Further extension can be done to include commodities futures like NCDEX.

CHAPTER 6

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ANNEXURE

PLAGIARISM REPORT

Project Report

ORIGINALITY REPORT

12%	4%	5%	11%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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