An empirical study on optimal hedge ratio and hedging effectiveness of Nifty IT Index Stocks

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Abstract: *The hedging strategy is effective when the hedging Derivatives instruments prices are offsetting the volatile Spot prices. To reduce the risk produced in the volatile Spot prices, the present study has analysed the efficiency of NIFTY IT Stocks Futures. The Four econometrics models, two are constant hedge models and two are time-varying hedge models are employed for the Near, Next and Far month Futures contracts for the data span period from January 2011 to July 2017. From the selected model it has found that overall for hedge ratio and hedging effectiveness VECM (Vector Error Correction Model) constant hedge model has performed better over other constant and time varying hedge models. To hedge the risk the best IT Stock, Infosys Stock can be used by investors. To hedge the one unit of Spot position Infosys Stock has concluded with more than one unit of Futures value for Near, Next and Far month contract as compare to other Stocks. The hedging effectiveness of Infosys Stock under selected models is seen in most of the instances higher than other Stocks of NIFTY IT Index.*

Key Words: *spot prices, futures prices, OLS, VECM, GARCH, EGARCH, hedge ratio, hedging effectiveness*

1. INTRODUCTION:

The advancement in information and technology lead the financial and economic scenario to run at a very drastic speed. This speed has made an un-capable to the both financial and economic field to handle the financial risk exposures. The unstable speed has also produced the unanticipated fluctuations in the Stock prices. Thus to cap-up and to protect the investors from such risk exposure in terms of reckless movement in the Spot prices, the birth of hedging took place. Earlier there was only one role to play to the hedging which is Naïve Hedging (which states the hedge ratio is 1:1 position i.e. to hedge effectively one unit of Spot position required to hold one unit of Futures contract). In today's scenario investors can use various types of Derivatives instruments including Futures, Forwards and Options to the various purposes along with hedging of reckless movement in Spot prices.

Hedging is the strategy of equalising the two markets i.e. risk exposing Spot market and returns generating derivatives markets. More specifically from the context of Futures trading, hedging is the practise of use of Futures transactions to minimise price risk in the Spot market. (Gupta, 2011).The underlying objectives of hedging are to minimise the risk and to protect the value of cash holdings against a decline in cash price in Spot market.

To get the hedging to be effective and to have an optimal hedge ratio an investor should have one unit of Futures contract (Short or Long) against the one unit of Spot transaction. Further for hedging to be effective, a Futures price need to be efficient as inefficient market would result in higher cost of hedging effectiveness of the Futures market (N, et al., 2014). It can be said that hedge ratio is smaller when there is a minor movement in market, where it extends when there is a broader movement in Spot market. (Kenourgious & Samitas, 2006), also stated that hedge ratio and hedging effectiveness becomes suitable only when there is a significant changed in the value of hedged items.

Many studies have used the econometrics models including constant hedge model OLS, VAR model, VECM model and varying time model like GARCH and EGARCH models to determine the hedge ratio and hedging effectiveness. In terms of OLS model although it has proved that it is viable constant estimator of hedge ratio and hedging effectiveness, but many authors have also criticized its results. It is insulted that OLS model is unsuitable to estimate hedge ratio since it suffers from the problem of autocorrelation and it is also not taking into consideration the heteroskedasticity in Spot and Futures prices. Another obstacle while deriving the hedge ratio is the existence of Co-integration between the Cash and Futures prices. Further it is also criticised by indicating that the hedge ratios of OLS model are free from the time-varying nature in terms of Spot and Futures prices. As even after this one of the studies made by (Bhaduri & Duria, 2008) has reported that OLS constant strategy performs better at shorter time horizon and GARCH model performs better at time varying zone.

The calculation of hedge ratio and hedging effectiveness with constant hedge OLS and Vector Error correction model (VECM) and time-varying hedge models such as GARCH and EGARCH models has been made in the present Study.

2. LITERATURE REVIEW:

Over a period of time due to continuity in the growth of integration of world economies, the interest of many researchers and academicians are continue to heavily focus on the study of Hedging applications of Derivatives instruments. From the Indian context most of the studies has done on hedging of Index Futures by employing constant and time varying hedge models. The present study is a new step taken to contribute hedging outcome in terms of Stocks of Nifty IT Index. In the Study of S&P 500 Stock Index Futures contract hedge ratio estimation and hedging effectiveness (Kenourgious & Samitas, 2006), gave a findings of better hedging performance of ECM model as compare to other used models. (Bhaduri & Duria, 2008), conducted a study to find the optimal hedge ratio and hedging effectiveness of Stock Index Futures. The study had used the four competing models namely simple OLS, VAR, VECM models to find the single point hedge ratio estimation and a class of multi-variates Generalized conditional heteroscedasticity model (GARCH) to estimate the time varying hedge ratio. Further two sets of data are used in the study, the daily data on NSE stock Index Futures and S&P CNX Nifty for the time period from 4th September 2000 to 4th August 2005 and for a sample validation daily data from 5th August 2005 to 19th September 2005. The result of the study specifies that there is a time varying hedge ratios which are derived from the multi-variates GARCH model with higher mean returns and higher average variance reduction across hedged and un-hedged position. Further simple OLS based strategy also succeeds to show shorter time horizons in terms of average variance reduction. (Srinivasan, 2011), in his paper concluded that conventional regression OLS Model had sum up with more variance reduction as compare to other models such as BVAR, VECM and DVEC-GARCH for in-sample hedging performance and for the out-of-sample VECM proved better for risk minimisation. (Aggarwal & Gupta, 2013), in their study concluded that in Hedging effectiveness and even in Mean-variance result beta hedging had performed better. (Anjali, 2013), in her study made an attempt to find whether the introduction of Index Futures trading in the NSE of India has been an effective risk management instrument for the Spot market of Nifty Portfolio. The daily return distributions are exhibited through a rigorous exploratory data analysis and risk management in Futures market is quantified by employing four alternatives Time series model OLS,VAR, VECM, GARCH with the objectives to bring out the model that provides the best fit to the returns series and the highest hedge performance. All models succeed to show significant reduction in the variance of the hedged portfolio. Further GARCH model failed in terms of showing highest hedging effectiveness and the best fit to the data generating process of the two return series whereas other models performed well. Overall the results indicate that hedging with Nifty Futures is effective for managing risk in the Spot market. By using a various models such as Conventional OLS model, VECM model, EGARCH and GARCH models (N, et al., 2014), assessed the hedging effectiveness of Malaysian and Singapore Stock Index Futures market. The study found that hedging effectiveness and hedge ratio are higher for KLFI Index as compare to STI Index in most of the occurrences. From the selected models for hedging study, the OLS model performed better as compare to other models. (Kumar & Supriya, 2014), has attempted to find hedging effectiveness for Bank Futures and CNX Nifty. The study has used 9569 daily observations of Index Futures. Further for assessment purpose OLS, Co-integrated OLS, Generalized autoregressive conditional Heteroscedaticity (1, 1) and constant correlation generalized auto-regression conditional heteroscedaticity (1, 1) hedging methods are estimated and compared. The result shown that constant correlation generalized auto regressive conditional heteroscedasticity (1, 1) is an efficient method that maximises investor's utility function considering transaction cost. Therefore it signifies that investor can rely on this constant correlation generalized autoregressive conditional heteroscedasticity (1, 1) as a hedging method. To study the Impact of Financial crisis on hedging effectiveness of Futures Contracts (Gupta & Kaur, 2015) had used the data of Near, Next and Far month Futures contract from the period January 2000 to June 2014. Eight hedging models have been used as a methodological framework in the study and it has found that hedging effectiveness has been improved in the post crisis period. It has also found that as compare to Next and Far month Futures contract, Near month contract are proved to be more effective hedging tool. The study has also reported the superiority of time-invariant hedge ratio over time-variant hedging. (T & T, n.d.), has focused on a study of price risk management and hedging effectiveness. The study has employed constant and time varying hedging models including OLS, VECM and GARCH model to the NSE NIFTY Spot and its Futures to determine the hedge ratios and hedging effectiveness. In the study it has concluded that among the constant hedge ratio VECM has portrayed highest hedging ratio i.e. 0.8824 and 82% hedging effectiveness. In terms of GARCH it has produced highest hedging effectiveness and lowest hedge ratio i.e. 0.8537 as compare to constant hedge models. Finally, it has concluded in the study that time-varying hedge models (GARCH) are preferable over constant hedge models.

3. RESEARCH GAP:

In the existing Literature body many studies on Hedging has been carried out by a researcher and academician. In the Indian context Derivatives Market is a recent origin which incorporated in Indian landmark only in 21st century. Having a look towards this, in the existing well of literature it has been seen that the gap of hedging study on Nifty IT Index Stocks Futures are unfilled. The present study moved to contribute this untapped result of

hedging. The outcome of the analysis will be significance implications to the various interesting parties to hedge the risk and to reap the other benefits of hedging.

4. OBJECTIVES OF THE STUDY:

- To estimate and assess the hedge ratio of Near, Next, and Far month Futures Contracts of Nifty IT Index Stocks under each model.
- To examine the hedging effectiveness of Near, Next and Far Month Futures Contract of Nifty IT Index Stocks under each model.
- To compare the hedge ratio and hedging effectiveness of selected models under each IT Stock.
- To lead the investors in the selection of Stock of IT Index with highest hedge ratio under selected Hedging models to hedge their risk.

5. RESEARCH HYPOTHESIS:

The formulated Null Hypothesis are as follows:

1. The hedge ratios of all the IT Index Stocks are not consistent under each model.
2. The hedging effectiveness of all the IT Index Stocks is not same under each model.

6. METHODOLOGY:

ANALYTICAL PROCEDURE

To arrive at the result of the formulated objectives, the study had assembled the Spot and Futures data (Near, Next and Far Month Futures Contract data) of the Nifty IT Index Stocks. Further the data of the Stocks are transformed into natural logarithm series by using following equation: $\boldsymbol{R_{St}= \ln (S_t/ S_{t-1})}$ $\boldsymbol{R_{Ft}= \ln (F_t/ F_{t-1})}$

Where,

R_S – Spot daily returns

R_F – Futures daily returns

S_t – Closing Spot prices of Stocks

F_t – Closing Futures prices of Stocks

S_{t-1} – Previous day's Spot closing prices of Stocks

F_{t-1} – Previous day's Futures closing price of Stocks

t- Corresponding time period

The analyses are carried ahead by checking the Stationarity property of the collected Nifty IT Index Stock's Spot and Futures data.

Unit Root Test

To observe the Stationarity behaviour of the data under Unit root, the widely accepted test propounded by Augmented Dickey-Fuller (ADF) has been used.

The optimal hedge ratio explains the coverage of Futures position to the adversity of Spot position and it facilitates the reduction of total risk of the portfolio. In the Study four econometrics models namely constant hedge Models like OLS Model and VECM Model and time varying hedge Models such as GARCH and EGARCH has been used to determine the hedge ratio and hedging effectiveness of Near Month, Next Month and Far Month Contracts of Nifty IT Index Stocks.

Constant Hedge Models

Ordinary Least Square (OLS) Regression Model

The OLS Regression model is a simple linear regression estimator, which helps to derive risk minimization hedging ratio. It helps to depict a linear impact result of changes in Futures prices as a result of changes in Spot prices. The estimation of OLS Regression model to derive a minimum variance constant hedge ratio are;

$\Delta S_{t=} \alpha + B*\Delta F_t + \varepsilon_t$

Where,

ΔS_t and ΔF_t denotes changes in Futures and Spot prices

'B' denotes Slope Coefficient which provides an estimate of minimum hedge ratio and ε_t and 'α' represent random error term with zero mean and Constant factor in OLS Model. The hedging effectiveness has been checked from (R^2) R-Squared Value of OLS model.

The Vector Error Correction Model (VECM)

When the Spot and Futures prices of Nifty IT Stocks are non-stationary at their level and when it follows integrated order we make the use of VECM to get a minimum hedge ratio.

Time Varying Hedge Models

To take into consideration the time varying factor, we had employed the models such as GARCH and EGARCH to the data.

GARCH Model

A generalised model of ARCH, which holds the volatility and unpredictable information shocks from the market.

EGARCH Model

EGARCH is the improved model of GARCH, coined by Nelson in the year 1991. This model was developed to improve and to remove the restrictions of GARCH model on the parameters.

Hedge Ratio

The following formula has been used to derive the value of hedge ratio.

$h = \sigma_{S,F} / \sigma_F$

Where,

h, denotes minimum hedge ratio

$\sigma_{S,F}$, denotes Covariance of Spot and Futures

σ_F, denotes Standard deviation of Futures.

Similarly, Variance of Hedged and Un-hedged Portfolio are;

Var_U is σ_S^2

Var_H is $\sigma_s^2 + h^2 \sigma_F^2 - 2 h \sigma_{S,F}$

Lastly, Hedging Effectiveness = $\frac{Var_U - Var_H}{Var_U}$

Where,

Var_U and Var_H are Variance of Unhedged and hedged Portfolio

σ_S^2 and σ_F^2, are variances of Spot and Futures prices

$\sigma_{S,F}$, Covariance of Spot and Futures

Hedging effectiveness is the ratio of variance of Un-hedged portfolio minus Hedged portfolio divided by Un-hedged portfolio. Hedging effectiveness states the usefulness and the role of Futures contract to reduce the risk (Bhaduri & Duria, 2008).

Variables	Data Sources	Period of Study
NSE NIFTY IT Index Stocks	NSE website (www.nseindia.com).	The daily closing Spot and Futures data ranging from January 2011 to July 2017.
HCL Technologies Ltd.		
Infosys Ltd.(INFY)		
Oracle Financial Services Software Ltd.(OFSS)		
Tata Consultancy Services Ltd. (TCS)		
Tech Mahindra Ltd.(TECHM)		
Wipro Ltd.		
Note: Out of ten stocks included in the NSE Nifty IT Index, Only the Futures Contracts trading Stocks has been used as variables in the study.		

EMPIRICAL ANALYSIS

The analysis of the study had begun with Stationarity test to examine the Stationarity property of the data. This test is the support to avoid the spurious results of the econometrics models especially OLS model. The use of ADF (Augmented Dickey Fuller Test) under the Unit Root test has been runned for level data and for 1st Difference log series data.

Table 1 Unit Root Test for Near, Next and Far Month Contract

CONTRACT		NIFTY IT STOCKS											
		HCL TECH LTD.		INFY		OFSS		TCS		TECHM		WIPRO	
		Level	1st Diff.	Level	1st Diff.	Level	1st Diff.	Level	1st Diff.	Level	1st Diff.	Level	1st Diff.
NEAR MONTH CONTRACT	Futures ADF t-stat	-1.782	-17.193	-1.547	-18.676	-1.748	-18.095	-1.219	-17.094	-1.574	-17.855	-1.792	-17.869
	Critical Values	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863
	Spot ADF t-stat	-1.809	-17.249	-1.582	-18.587	-1.699	-18.114	-1.251	-16.808	-1.589	-17.862	-1.819	-17.936
	Critical Values	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863	-2.863
NEXT MONTH CONTRACT	Futures ADF t-stat	-1.478	-25.28	-1.091	-22.370	-1.684	-22.849	-1.075	-23.146	-1.369	-25.858	-1.413	-24.888
	Critical Values	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862
	Spot ADF t-stat	-1.487	-25.24	-1.085	-22.364	-1.338	-22.541	-1.076	-23.121	-1.846	-24.181	-1.433	-25.016
	Critical Values	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862

FAR MONTH CONTRACT	Futures ADF t-stat	-1.826	-21.39	-1.663	-25.462	-3.670	-29.987	-2.148	-27.009	-1.577	-18.444	-4.555	-20.378
	Critical Values	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862
	Spot ADF t-stat	-1.787	-21.59	-1.667	-25.478	-3.393	-25.679	-2.194	-27.045	-1.572	-18.462	-4.583	-20.544
	Critical Values	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862	-2.862

Note: Critical Values indicates at @5% significant level.

In the above table it can be seen that in all the Stocks of IT under Near, Next and Far month Contract at the level the data are non- Stationary (ADF t-stat values are less than @5% critical values. Further at 1st Difference the data has depicted Stationarity property for all the Stocks and under all three contracts (ADF t-stat values are more than @5% critical values). This follows the first order I (1) of integration in data.

Hedge Ratio and Hedging Effectiveness Estimation

The hedge ratio indicates the number of Futures contracts and their observations taken to the related Spot observations which facilitate the offsetting of minimum risk of the portfolio.

Table 2 Ordinary Least Square Model Estimate for Near, Next and Far Month Contract

CONTRACT	NIFTY IT STOCKS						
	Hedging Tools	HCL TECH LTD.	INFY	OFSS	TCS	TECHM	WIPRO
NEAR MONTH CONTRACT	Hedge Ratio	0.978854	0.974244	0.994134*	0.960368	0.991922	0.990758
	Hedging Effectiveness(R^2)	0.989008	0.983837	0.942702	0.960368	0.991892*	0.987805
	Durbin-Watson stat	2.606313	2.280813	2.484867	2.551677	2.595276	2.519816
NEXT MONTH CONTRACT	Hedge Ratio	0.980941	0.982973	0.926699	0.964311	1.177964*	0.989912
	Hedging Effectiveness(R^2)	0.989279	0.995118*	0.504778	0.975657	0.653458	0.987597
	Durbin-Watson stat	2.644239	2.459503	2.224496	2.485150	2.226460	2.525639
FAR MONTH CONTRACT	Hedge Ratio	0.928604	0.980309*	0.748241	0.924537	0.961561	0.931773
	Hedging Effectiveness(R^2)	0.890965	0.980719*	0.517230	0.871750	0.935624	0.862555
	Durbin-Watson stat	2.254084	2.602295	2.134771	2.563776	2.245697	2.330540

Note: * is the indication of higher value in the table.

The **table 2** has depicted a hedge ratio and hedging effectiveness for Near, Next and Far Month contract under OLS model. The highest hedge ratio under this model has been seen in OFSS (0.994134) for Near month contract followed by TECHM (1.177964) for Next month contract and INFY (0.980309) for Far month contract. It means that in the case of OFSS for Near month contract, the values of '1' unit Spot position can be hedge with 0.994134 Futures contracts values. The same applies for other two contracts. The impression i.e. hedging effectiveness of this model for all the Stocks has been indicated with R^2 values which is higher in TECHM (99.1892%) for Near month contract followed by INFY (99.5118%) for Next month contract and INFY (98.0719%) for Far month contract. The absence of auto-correlation in the residuals has been supported by Durbin-Watson Stat by indicating a value higher than '2' for all Stocks under all three contracts.

Table 3 Vector Error Correction Model Estimate for Near, Next and Far Month Contract

CONTRACT	NIFTY IT STOCKS						
	Hedging Tools	HCL TECH LTD.	INFY	OFSS	TCS	TECHM	WIPRO
NEAR MONTH CONTRACT	Covariance(Spot and Futures	6.287448	8.941242	2.501075	2.43809	15.582418	5.517382
	Variance(Futures)	6.226716	8.859508	2.639148	2.41215	15.59247	5.53728
	Variance(Spot)	6.427225	9.183258	2.517381	2.54026	15.71897	5.572271
	Variance(Hedged)	14.27455	35.41093	1.071678	0.829862	135.54851	10.14071
	Variance(Un-hedged)	6.4272252	9.183258	2.517381	2.540264	15.718971	5.572271
	Hedge Ratio	2.5196771	3.003952*	1.539554	1.569812	3.9461849	2.344687
	Hedging Effectiveness(R^2)	4.2062745	5.327226	2.091669	2.21358	7.0957279*	3.752418

NEXT MONTH CONTRACT	Covariance(Spot and Futures	9.028108	14.2068	3.179055	3.402187	14.315722	8.381245
	Variance(Futures)	8.954756	14.03772	5.838068	3.363657	25.81437	8.403464
	Variance(Spot)	9.206345	14.45732	3.431571	3.529183	12.15667	8.469256
	Variance(Hedged)	36.238156	108.5512	5.172469	2.4817	136.42402	30.25067
	Variance(Un-hedged)	9.2063446	14.45732	3.431571	3.529183	12.156667	8.469256
	Hedge Ratio	3.0169623	3.791823*	1.31572	1.855036	2.8176206	2.891208
	Hedging Effectiveness(R^2)	5.270129	6.948939*	1.924252	2.825989	0.9345109	4.897434
FAR MONTH CONTRACT	Covariance(Spot and Futures	9.671763	13.1696	3.096546	3.183214	25.95526	6.647807
	Variance(Futures)	10.08244	13.16683	4.480475	3.376658	26.68024	7.18273
	Variance(Spot)	10.41754	13.43692	4.139278	3.443741	26.99835	7.136027
	Variance(Hedged)	45.04112	91.28039	4.667983	2.54805	439.827	18.35002
	Variance(Un-hedged)	10.41754	13.43692	4.139278	3.443741	26.99835	7.136027
	Hedge Ratio	3.04595	3.629374*	1.462903	1.732297	5.024937	2.480468
	Hedging Effectiveness(R^2)	6.093953	6.643668*	3.011549	2.703833	10.70746	4.564565

Note: * is the indication of higher value in the table.

The VECM model reports the long-run relationship between Spot and Futures prices. Thus it has used to find the hedge ratio and hedging effectiveness of Stocks. Based on the result derived from this model, for all three contracts hedge Ratio and hedging effectiveness (except hedging effectiveness for Near Month contract) the significant high results has shown in INFY IT Stock indicating a better Stock for Investors to hedge their risk.

Table 4 GARCH Model Estimate for Near, Next and Far Month Contract

CONTRACT	**NIFTY IT STOCKS**						
	Hedging Tools	**HCL TECH LTD.**	**INFY**	**OFSS**	**TCS**	**TECHM**	**WIPRO**
NEAR MONTH CONTRACT	Hedge Ratio	0.974535	0.977752	1.001026*	0.961389	0.986700	0.985855
	Hedging Effectiveness(R^2)	0.988988	0.983819	0.942626	0.971291	0.991864*	0.987780
NEXT MONTH CONTRACT	Hedge Ratio	0.980610	0.983029	0.960617	0.964433	0.911876	0.990405*
	Hedging Effectiveness(R^2)	0.989278	0.995117*	0.504059	0.975656	0.620019	0.987592
FAR MONTH CONTRACT	Hedge Ratio	0.955657	0.980389	0.932949	0.946952	0.987555*	0.981689
	Hedging Effectiveness(R^2)	0.890206	0.980716*	0.485431	0.871215	0.934890	0.859963

Note: * is the indication of higher value in the table.

To capture the varying time and volatility trend, the GARCH model has been employed and the result of highest hedge ratio has seen in OFSS (1.001026) for Near month contract, WIPRO (0.990405) for Next month contract and for Far month contract TECHM (0.987555). It means that the Near month OFSS Futures value 1.001026 have a strength to hedge a '1' unit portion of Spot value. The highest hedging effectiveness of this model has seen in TECHM (99.1864%) for Near Month, INFY (99.5117%) for Next Month and INFY (98.0716) for Far month contract.

Table 5 EGARCH Model Estimate for Near, Next and Far Month Contract

CONTRACT	NIFTY IT STOCKS						
	Hedging Tools	HCL TECH LTD.	INFY	OFSS	TCS	TECHM	WIPRO
NEAR MONTH CONTRACT	Hedge Ratio	0.982548	0.981276	0.987067	0.965123	0.993169*	0.980666
	Hedging Effectiveness(R^2)	0.988840	0.983717	0.941098	0.970655	0.991752*	0.987693
NEXT MONTH CONTRACT	Hedge Ratio	0.979708	0.979637	0.985228	0.960571	0.864967	0.988876*
	Hedging Effectiveness(R^2)	0.989240	0.995057*	0.502451	0.975275	0.605946	0.987588
FAR MONTH CONTRACT	Hedge Ratio	0.955793	0.977800	0.918304	0.941820	0.985402*	0.982746
	Hedging Effectiveness(R^2)	0.890201	0.980712*	0.490334	0.871392	0.934955	0.859910

Note: * is the indication of higher value in the table.

The EGARCH Model is an improved time varying model over GARCH. The **table 5** has stated highest hedge ratio in TECHM (0.993169) for Near month, WIPRO (0.988876) for Next month and TECHM (0.985408) for Far month contract. The result of leading hedging effectiveness in the case of TECHM (99.1752%) for Near month, INFY (99.5057%) for Next month and INFY (98.0712%) for Far month contact.

Comparison of Hedge Ratios and hedging Effectiveness Estimates for Different Models

Table 6 Hedge Ratio Estimation through Different models to the Near, Next and Far month contract.

Contract	OLS Model	VECM Model	GARCH Model	EGARCH Model
Near Month Contract	0.994134 (OFSS)	3.003952 (INFY)	1.001026 (OFSS)	0.993169 (TECHM
Next Month Contract	1.177964 (TECHM)	3.791823 (INFY)	0.990405 (WIPRO)	0.988876 (WIPRO)
Far Month Contract	0.980309 (INFY)	3.629374 (INFY)	0.987555 (TECHM)	0.985402 (TECHM)

The **table 6** depicts the comparative hedge ratios result from OLS model, VECM model GARCH Model and

EGARCH model for Near month, Next month and Far month contract. For all three contracts VECM model has depicted a better hedge ratio over other three models indicating a preferable model for constant hedge ratio estimate. Further it can be also said that overall INFY Stock with leading hedging values under VECM model proved a better Stock in IT index which can be used by investors to hedge their Stock price risk.

Table 7 Hedging Effectiveness Estimate through Different model to the Near, Next and Far month contract.

Contract	OLS Model	VECM Model	GARCH Model	EGARCH Model
Near Month Contract	0.991892 (TECHM)	7.0957279 (TECHM)	0.991864 (OFSS)	0.991752 (TECHM)
Next Month Contract	0.995118 (INFY)	6.948939 (INFY)	0.995117 (INFY)	0.995057 (INFY)
Far Month Contract	0.980719 (INFY)	6.643668 (INFY)	0.980716 (INFY)	0.980712 (INFY)

Note: All the computation in the paper is Author's Source.

The hedging effectiveness and variance reduction in investment result has been reported in the **table 7**. The table has shown that VECM model has produced a better hedging effectiveness result for all three contracts as compare to OLS, GARCH and EGARCH models. In fact again hedging effectiveness of INFY IT Stock is higher except in Near month contract under VECM model. Thus overall to hedge ratios and for Hedging effectiveness VECM model is preferable to the Investors for hedging strategies.

7. CONCLUSION:

Hedging strategies are very important to the investors who are tends to face several global challenges in terms of Stock price volatility. This paper worked on the hedge ratio and hedging effectiveness of NSE NIFTY IT Index Futures trading Stocks by using two constant and two time-varying hedge models. The daily closing Spot and Futures observations (from January 2011 to July 2017) of all Stocks trading for Near, Next and Far month contract has been used in the study. The hedging performance of all Stocks under each model has been reported in the body of the present paper. The result of the paper has concluded that out of the selected hedging models VECM model has succeeded to show better hedge ratio and hedging effectiveness performance for all the Stocks. In terms of Stocks of NIFTY IT Index hedging performance of Infosys Stock is higher as compare to other Stocks. So, overall Infosys Futures trading Stock is preferable to the investors for hedging the Stock price volatility risk.

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