

Hedging Effectiveness Analysis of High Market Cap Indian Stocks Using OLS and GARCH Hedge Ratios

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Abstract

Managing portfolios is a daunting task in the current environment of complex integrated financial markets. Fund managers are always facing the question of whether to Hedge or not. Though hedging is done for minimizing the value erosion of the portfolio, there have been times where hedging has proved to be a wrong decision. In this context, this research is done to find out the impact of dynamic hedging of a portfolio comprising of high market cap stocks using Nifty index futures during the period from Jan 2007 to Dec 2012. As the study focused on the practical aspects of trading, hedge ratio required to hedge the portfolio was determined with two important econometric methods OLS (Ordinary least squares) and GARCH (Generalized autoregressive conditional heteroscedasticity) using Eviews software. The research proves that the equity risk of a portfolio can be offset by hedging the portfolio with nifty index futures. The study concludes that during periods of uncertainty an investor holding a portfolio containing high market cap stocks can do hedging. The traditional simple OLS model is preferred to complex GARCH model in calculating hedge ratio.

Index terms— hedging, high market capitalization, index futures, OLS, GARCH.

1 Introduction

economic development of a country to a large extent is dependent on the smooth functioning of its financial markets. A financial market that is robust is expected to foster economic growth and social welfare (Singh, 1991). Financial markets pose a great risk to the investor's in spite of its high returns. The market risk can be reduced by portfolio insurance (Wikipedia). Derivative markets help in increasing the trading volume in financial markets because the objective of trading is not only for investment purposes but also for risk management objectives of market participants (Madhumathi & Ranganatham, 2012). Adams and Montesi, (1995) found that corporate managers prefer futures to options by virtue of the large transaction costs in option trading. Investors recognize that there is a close relationship between changes in the index and changes in the values of their portfolios. This makes index futures contract is used as a tool to show how movements in the market affects the value of a portfolio (Grant, 1982). Forecasting hedge ratio is important for hedgers in derivative market, as forecasting is an important tool in decision making. (Koenker & Bassett, 1978).

Hedge ratio can be determined with different models derived by econometrics -OLS, ARCH, GARCH and VECM models to name a few. (Derington (1979) and Johnson (1960) employed portfolio theory to derive the minimum variance hedge ratio (HR) as the "average relationship between the changes in the cash price and the changes in the futures price". Engle (1982) suggested ARCH model. If an autoregressive moving average model (ARMA model) is assumed for the error variance, then the model is known as generalized autoregressive conditional heteroskedasticity GARCH model (Bollerslev 1986).

Individual and institutional investors are exposed to equity risk. Predicting the movement of market is not an easy task as rightly proved by the Nobel laureate (Eugene Fama, 2013 Fama, & 1966)). Stock prices are extremely difficult to predict in the short run, and that new information is very quickly incorporated into prices. In order to minimize the risk due to the adverse movement in the market there is a need for the investors to protect their portfolio value. For investors in India it is even more challenging as the volatility in Indian market

is not constant and it varies over time (Securities and Exchange Board of India, 1998). Mary & Vishwanath, (2013) proved that in high PE stock portfolios, capital can be protected by hedging. With this background, this research examines whether hedging the portfolio with Index futures gives economic benefit to the investors.

II.

2 Research Methodology a) Data collection

The research is done with only secondary data obtained from periodicals, journals, website and magazines. Period of study is from January 2008 -December 2012 and daily stock and nifty index futures closing prices were taken. 2007 data is used for determining the hedge ratio.

3 Year ()

4 C c) Sampling Framework

Based on prefixed parameter ten High Market cap stocks are drawn from the population using a non probability sampling technique, judgement sampling method. The sample consists of 10 stocks constituting a portfolio worth 1 crore (10 million) rupees. Each stock is given an equal weightage of rupees 10 lakhs (1 million) worth.

Hedging Effectiveness Analysis of High Market Cap Indian Stocks Using OLS and GARCH Hedge Ratios As on 1/1/2008 the portfolio was constructed for 1 crore rupees by giving equal weightage of 10 lakhs (1 million) rupees to each stock. Number of shares bought for a value of 10 lakhs for each stock is as follows:

ii. Hedged Portfolio return

The number of nifty futures contract required to hedge the portfolio worth Rupees 1 crore is determined by calculating the hedge ratio. In this study hedge ratio is obtained using two different econometric methods i) Ordinary Least squares -OLS ii) GARCH , and the results are compared to find out the method which gives better returns.

The hedge ratio for 2/1/2008 is calculated using previous one year data i.e daily closing price of stock and closing price of nifty index futures from 1/1/2007 to 31/12/2007. Hedge ratio is calculated for every 3 months. So, for each stock every year hedge ratio is determined 4 times and for the total period of study it was determined 20 times for rebalancing of the portfolio. Likewise, hedge ratios were calculated for all the stocks in each sample set based on two methods OLS and GARCH with the help of Eviews software.

Hedge ratio calculation: $h = \frac{S}{F} \cdot \rho$

where S is the standard deviation of S , the change in the spot price during the hedging period, standard deviation of F , the change in the futures price during the hedging period, ρ is the coefficient of correlation between S and F .

Rebalancing is done every three months to adjust the number of contracts to be hedged and the trading profit is calculated. Number of contracts to be hedged: $V_p \times h^* / V_i$ V_p -Value of the portfolio. h^* -Hedge ratio. V_i -Value of one index future.

The portfolio value without hedging and the hedged portfolio value is compared to prove the hedging effectiveness. For proving this statistical tests are done with the help of SPSS software.

5 ρ is the

6 T-Test -Mcap OLS hedged return and Mcap GARCH hedged return

H_0 : There is no significant difference between the Mcap OLS hedged portfolio returns and GARCH hedged portfolio returns. H_1 : There is a significant difference between the Mcap OLS hedged portfolio returns and GARCH hedged portfolio returns.

7 Findings and Discussion

Indian equity investors can hedge their portfolio with nifty index futures as hedging reduces loss to a great extent based on this study. Even during the worst of times hedged portfolio value remains unscathed compared to the unhedged open portfolio. Use of complex heteroscedastic models are discouraged as simple OLS model is giving better results than complex heteroscedasticity GARCH models as observed. Even when there are differences in performance, they are very minimal which can be ignored. It can be noticed that when a portfolio is hedged it can withstand harsh bearish conditions like that of 2008 crash.

Though we have ignored the transaction cost it can affect the portfolio performance if more churning is done or if the transaction costs are prohibitive. However in the current low cost (brokerage) scenario the impact of transaction cost will be minimal in the Indian context. Fund managers can use either fundamental factors or technical tools to decide when to hedge the portfolio. This study is useful for Investors in selecting the right kind of stocks for the portfolio. In this study it is proved that high Mcap stocks can be hedged effectively using index hedging. Investors can invest in high Mcap stocks as they provide the best appreciation even during uncertain periods and hedging is very effective.

8 IV.

9 Conclusion

The research proves that the equity risk of a portfolio can be offset by hedging the portfolio with nifty index futures. The hedged value determined based on OLS (Ordinary least squares) method is high for Market Cap stock portfolios than GARCH (Generalized autoregressive conditional heteroscedasticity) model. So, the traditional simple OLS model is preferable to complex GARCH model in calculating hedge ratio/beta. During periods of financial crisis like 2008-2009 maximum loss covered by hedging the portfolio is up to 68%. The protection of a portfolio through hedging should not encourage investors to use it indiscriminately for unwarranted situations. Only Unhedged portfolio can fulfill the objective of the portfolio by giving good returns. Hedging should be used as an anchor in a sailing ship charting risky waters. Hence use of hedging should be restricted to special situations where there is an inherent risk of market crash and the portfolio should be unhedged under normal circumstances. This spring's another question; when to hedge or whether to hedge or not?. This situation is a tricky one as further research is needed to find out the suitability of stop loss or other models to initiate hedging. Both fundamental and technical analysis tools may be employed to arrive at the decision.

10 Mean

1

1	Reliance
2	Infosys
3	HUL -Hindustan Unilever Ltd
4	HDFC
5	HDFC Bank
6	ONGC-Oil and Natural Gas Corporation
7	NTPC
8	Tata Consultancy Services
9	ITC
10	SBI -State Bank of India
Source: www.nse.com	

d) Financial
Analysis

Figure 1: Table 1 :

2

Source: Authors compilation.

Figure 2: Table 2 :

4

Source: Authors research output using data from www.nse.com

Figure 3: Table 4 :

1 2

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In similar way unhedged portfolio return is calculated every month for 5 years

					2017
					Year
Date Portfolio Value in Rs. Hedge ratio	1-Jan-08	1-Feb-08	3-Mar-08		Volume
Nifty Value of nifties to be hedged	9998896.1	8778964.8	7977702.3		XVII
in Rs. Profit/ Loss in Rs. Date	0.6802	0.6802	0.6802	4953	Issue
Portfolio Value in Rs. Hedge ratio	6144.35	5317.25	5562387		III
Nifty Value of nifties to be hedged	6801249	5885506	409065.1		Ver-
in Profit/ Loss in Rs. Value of extra	0	1-	429521	3-Mar-08	sion I
nifties hedged in Rs. tot hedge in Rs.	Jan-08	1-Feb-08	7977702.3		Global
Un hedged value in Rs. Trading profit	9998896.1	8778964.8	0.7015	4953	Jour-
in Rs. Hedged value in Rs. Rs.	0.7015	0.7015	421874.68		nal of
	6144.35	5317.25	-140211		Man-
	0	0	429521		age-
	9998896.1	88637.4	7977702.3		ment
	9998896.05	6158444	1366053.6		and
	7014226	8778964.8	9343755.82		Busi-
		944178.89	5736569		ness
		9723143.69			Re-
		6069806			search
					() C
Value of extra nifties hedged in Rs.	0	85946.06	-135954		
tot hedge in Rs.		5971452	5426433		
Unhedged value in Rs.	9998896.1	8778964.8	7977702.3		
Trading profit in Rs.	0	915510.3	1324575		
Hedged value in Rs.	9998896.05	9694475	9302278		

[Note: Source: Authors research output using data from www.nse.com]

Figure 4: Table 5 :

	Date	Unhedged portfolio value	OLS Hedged value in Rs.	GARCH Hedged value in Rs.
	1-Jan-08	9998896	9998896	9998896
	1-Feb-08	8778965	9723144	9694475
	3-Mar-08	7977702	9343756	9302278
	1-Apr-08	7555383	9162612	9113811
	2-May-08	8424073	9480263	9419544
	2-Jun-08	7651525	9264630	9215956
	1-Jul-08	6433563	9009214	8981359
Year	1-Aug-08	7296548	9167081	9227024
16	1-Sep-08 1-Oct-08	7178987 6620391	9138187 9122432	9187090 9103742
Volume	3-Nov-08 1-Dec-08	5387486 4918888	9218522 9308613	9101810 9150694
XVII	1-Jan-09 2-Feb-09	5374288 4993423	9201967 9170367	9085503 9027243
Issue	2-Mar-09 1-Apr-09	4824524 5377937	9124227 9163493	8971733 9050244
III	4-May-09 1-Jun-09	6449779 7717239	9534188 9762530	9398719 9594129
Ver-				
sion				
I				
() C	1-Jul-09	7550233	9811931	9650388
Global	3-Aug-09 1-Sep-09	8241071 8105053	10034082 10007535	9895867 9863872
Jour-	1-Oct-09 3-Nov-09	8979411 7907787	10298128 9932823	10183521 9787841
nal	1-Dec-09 4-Jan-10	8633103 9051016	9913832 10188779	9800858 10081953
of	1-Feb-10 2-Mar-10	8590524 8642354	10134538 10041111	10060727
Man-	1-Apr-10 3-May-10	8948289 8866261	10014283 10002144	9955496 9901625
age-	1-Jun-10 1-Jul-10	8520929 8926718	9918298 10030060	9887423 9795859
ment	2-Aug-10 1-Sep-10	9392359 9543286	10358432 10478217	9916299 10193533
and				10301716
Busi-				
ness				
Re-				
search				
	1-Oct-10	10563767	10974948	10603327
	1/11/2010	10524647	10964823	10564207
	1/12/2010	10258371	10874342	10329223
	14-Jan-11	9945800	10905671	10202263
	1-Feb-11	9802455	11055185	10642861

[Note: Source: Authors research output using data from www.nse.co.in e) Statistical Analysis]

Figure 5: Table 6 :

7

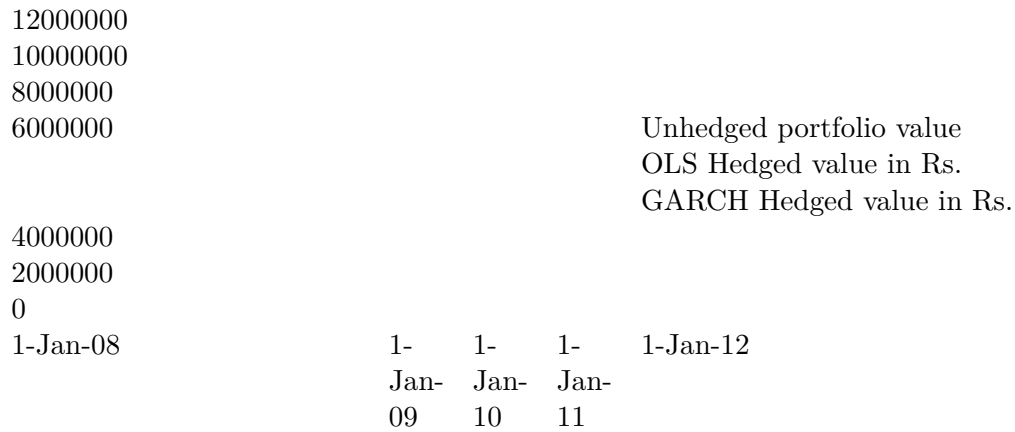


Figure 6: Table 7 :

8

Year	
18	
Volume XVII Issue III	
Version I	
()	
Global Journal of Management and Business Research	Differences Std. Deviation Mean MCAPOLS Mean 1.01E7 MCAPGARCH 9.84723
	2.8910411E5 2.2931995E5
	Source: Authors research output using data from www.nse.

[Note: C 2017 © 2017 Global Journals Inc. (US) 1Figure 1: Comparison chart of unhedged portfolio value with OLS/GARCH hedged portfolio values.]

Figure 7: Table 8 :

8

Mean	Differences	Std. Deviation	t	df
-1.64282E6		9.76155E5	- 62	13.35

Result: The table 8 & 9 shows that Market Cap un hedged portfolio value is Rs.84,93,523 while that of Market Cap hedged portfolio(OLS) value is Rs.1,01,00,000. The null hypothesis H 0 is rejected and alternate hypothesis H 1 is accepted as sigma value is 0. Inference: The objective of hedging the portfolio and effectiveness is achieved as the Market Cap hedged portfolio (OLS) return is around the expected value which is proved by the rejection of null hypothesis. There is 16% gain over the unhedged value which is contributed by the hedge.

III.

Figure 8: Table 8 :

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N	Std. Deviation
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Figure 9: Table 9 :

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- 116 [Mary et al. ()] 'A comparative study on beta hedging og high PE and Low PE stocks using Index futures with
117 reference to NSE'. A Mary , Vishwanath , Panneerselvam . *Indian Journal of Finance* 2013. 7 (8) p. .
- 118 [Ramadorai ()] *An excellent choice of Nobel laureates*, Tarun Ramadorai . Retrieved from [www.voxeu.org/](http://www.voxeu.org/article/fama-hansen-and-shiller-nobelists-2013)
119 [article/fama-hansen-and-shiller-nobelists-2013](http://www.voxeu.org/article/fama-hansen-and-shiller-nobelists-2013) 2013.
- 120 [Engle ()] 'Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom
121 Inflation'. R Engle . *Econometrica* 1982. 50 (9) p. .
- 122 [Madhumathi. R Ranganatham ()] *Derivatives and Risk Management*, Madhumathi. R & Ranganatham . 2012.
123 p. . (Pearson publication)
- 124 [Singh ()] 'Financial Liberalisation, Stockmarkets and Economic development'. A Singh . *The Economic Journal*
125 1997. 107 (442) p. .
- 126 [Bollerslev ()] 'Generalized Autoregressive Conditional Heteroskedasticity'. T Bollerslev . *Journal of Economet-*
127 *rics* 1986. 31 (1) p. .
- 128 [Figlewski ()] 'Hedging Performance and Basis Risk in Stock Index Futures'. S Figlewski . *The Journal of Finance*
129 1984. 39 (3) p. .
- 130 [Adams and Montesi ()] 'Major Issues Related to Hedge Accounts'. J Adams , C J Montesi . *Financial Accounting*
131 *Standard Board -Business & Economics* 1995.
- 132 [Grant ()] 'Market Index Futures Contract and Portfolio Selection'. D Grant . *Journal of Economics and Business*
133 1982. 34 (14) p. .
- 134 [Koenker and Bassett ()] 'Securities and Exchange Board of India'. Roger Koenker , Gilbert Bassett . [http:](http://www.sebiindia.com)
135 [//www.sebiindia.com](http://www.sebiindia.com) L. C. Gupta Committee Report 1978. 1998. 46 (1) p. . (Econometrica)
- 136 [Fama et al. ()] 'The Adjustment of stock prices to New Information'. Eugene F Fama , Lawrence Fisher , C
137 Michael , Richard Jensen , Roll . *International Economic Review* 1969. 10 (1) p. .