

# 1 Hedging Effectiveness Analysis of High Market Cap Indian 2 Stocks Using OLS and GARCH Hedge Ratios

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4 Received: 11 December 2016 Accepted: 31 December 2016 Published: 15 January 2017

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## 6 **Abstract**

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

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21 **Index terms**— hedging, high market capitalization, index futures, OLS, GARC.

## 22 **1 Introduction**

23 economic development of a country to a large extent is dependent on the smooth functioning of its financial  
24 markets. A financial market that is robust is expected to foster economic growth and social welfare ??Singh,  
25 1991). Financial markets pose a great risk to the investor's in spite of its high returns. The market risk can be  
26 reduced by portfolio insurance (Wikipedia). Derivative markets help in increasing the trading volume in financial  
27 markets because the objective of trading is not only for investment purposes but also for risk management  
28 objectives of market participants (Madhumathi & Ranganatham, 2012). Adams and Montesi, (1995) found that  
29 corporate managers prefer futures to options by virtue of the large transaction costs in option trading. Investors  
30 recognize that there is a close relationship between changes in the index and changes in the values of their  
31 portfolios. This makes index futures contract is used as a tool to show how movements in the market affects  
32 the value of a portfolio (Grant, 1982). Forecasting hedge ratio is important for hedgers in derivative market, as  
33 forecasting is an important tool in decision making. (Koenker & Bassett, 1978).

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

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

## 7 FINDINGS AND DISCUSSION

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45 is not constant and it varies over time (Securities and Exchange Board of India, 1998). Mary & Vishwanath,  
46 (2013) proved that in high PE stock portfolios, capital can be protected by hedging. With this background, this  
47 research examines whether hedging the portfolio with Index futures gives economic benefit to the investors.

48 II.

### 49 2 Research Methodology a) Data collection

50 The research is done with only secondary data obtained from periodicals, journals, website and magazines. Period  
51 of study is from January 2008 -December 2012 and daily stock and nifty index futures closing prices were taken.  
52 2007 data is used for determining the hedge ratio.

### 53 3 Year ( )

### 54 4 C c) Sampling Framework

55 Based on prefixed parameter ten High Market cap stocks are drawn from the population using a non probability  
56 sampling technique, judgement sampling method. The sample consists of 10 stocks constituting a portfolio worth  
57 1 crore (10 million) rupees. Each stock is given an equal weightage of rupees 10 lakhs (1 million) worth.

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

61 ii. Hedged Portfolio return

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

66 The hedge ratio for 2/1/2008 is calculated using previous one year data i.e daily closing price of stock and  
67 closing price of nifty index futures from 1/1/2007 to 31/12/2007. Hedge ratio is calculated for every 3 months.  
68 So, for each stock every year hedge ratio is determined 4 times and for the total period of study it was determined  
69 20 times for rebalancing of the portfolio. Likewise, hedge ratios were calculated for all the stocks in each sample  
70 set based on two methods OLS and GARCH with the help of Eviews software.

71 Hedge ratio calculation:  $\hat{\beta} = \frac{\text{Cov}(S, F)}{\text{Var}(F)}$

72 where  $\hat{\beta}$  is the standard deviation of  $S$ , the change in the spot price during the hedging period, standard  
73 deviation of  $F$ , the change in the futures price during the hedging period,  $\hat{\beta}$  is the coefficient of correlation  
74 between  $S$  and  $F$ .

75 Rebalancing is done every three months to adjust the number of contracts to be hedged and the trading profit  
76 is calculated. Number of contracts to be hedged:  $V_p \times \hat{\beta} / V_i$   $V_p$  -Value of the portfolio.  $\hat{\beta}$  -Hedge ratio.  $V_i$   
77 -Value of one index future.

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

### 80 5 ?F is the

### 81 6 T-Test -Mcap OLS hedged return and Mcap GARCH hedged 82 return

83 Ho : There is no significant difference between the Mcap OLS hedged portfolio returns and GARCH hedged  
84 portfolio returns. H1: There is a significant difference between the Mcap OLS hedged portfolio returns and  
85 GARCH hedged portfolio returns.

### 86 7 Findings and Discussion

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

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

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## 100 8 IV.

### 101 9 Conclusion

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

## 114 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](http://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](http://www.nse.com)

Figure 3: Table 4 :

5

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

				2017
				Year
Date Portfolio Value in Rs.	1-Jan-08	1-Feb-08	3-Mar-08	Volume
Hedge ratio Nifty Value of nifties to be hedged in Rs.	9998896.1	8778964.8	7977702.3	XVII
Profit/ Loss in Rs.	0.6802	0.6802	0.6802	Issue
Portfolio Value in Rs.	6144.35	5317.25	5562387	III
Hedge ratio Nifty Value of nifties to be hedged in Profit/ Loss in Rs.	6801249	5885506	409065.1	Ver-
Value of extra nifties hedged in Rs.	0	1-	429521	sion I
tot hedge in Rs.	Jan-08	1-Feb-08	7977702.3	Global
Un hedged value in Rs.	9998896.1	8778964.8	0.7015	Jour-
Trading profit in Rs.	0.7015	0.7015	421874.68	nal of
Hedged value in Rs.	6144.35	5317.25	-140211	Man-
	0	429521	5596358	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](http://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](http://www.nse.co.in) e) Statistical Analysis]

Figure 5: Table 6 :

7

12000000	Unhedged portfolio value
10000000	OLS Hedged value in Rs.
8000000	GARCH Hedged value in Rs.
6000000	
4000000	
2000000	
0	
1-Jan-08	1- Jan- 1- Jan- 1-Jan-12
	09 10 11

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.com](http://www.nse.com)

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

Figure 7: Table 8 :

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**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 :

**9**

N      Std. Deviation

Figure 9: Table 9 :



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