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Creating Resilience in Portfolio Management by Effective Hedging with Derivatives

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Abstract
The quest for efficient portfolio management has baffled investors and fund managers alike. The fact that only 20% of the mutual fund schemes are able to beat the benchmark index, makes a case for passive investments through ETFs. However index funds or ETFs also have their own downsides. Hence risk management becomes imperative. In the stock market, if you protect yourself from losses, profit is a by-product. Risk management can be done through many instruments and methods. In this paperI discuss the impact of protecting the portfolio through Put options. The fun fact is that a long portfolio and a long put option can be a Synthetic Call option. Thus by using Options, one can take the advantage of risk management as well as leverage. In conclusion I have proved that risks can be eliminated by using long dated options. This method of investing can prove to be highly effective for a retail investor, who wishes for long term passive investments without much drawdowns.

Introduction:

In 1952, Harry Markowitz published an article "Portfolio Selection" in the Journal of Finance. His seminal work laid the groundwork for what is now generally referred as 'Modern Portfolio Theory (MPT)'. The model proposed by the theory mathematically calculates the optimal portfolio based on risk and return of individual assets in a portfolio. The theory proposes to consider all asset classes to be a part of the portfolio. The model can throw up zero allocation to some asset classes or can even show negative allocation which may mean short selling the asset. However, this can be eliminated by adding conditions in the calculations. The most important aspect of the theory is that it considers the risk and return of the aggregate portfolio and not just of individual components of the portfolio. It emphasises the importance of correlation between the components of the portfolio, as negatively correlated assets would lower the risk of the portfolio. This helps in creation of the optimal portfolio for a given risk.

On the other hand, it is statistically known that 'beating the index' is easier said than done. Globally, only 20% of fund managers have been able to beat their benchmark index. A stock index can also be considered as a portfolio of shares. The selection of the stocks in the portfolio is generally done based on the market capitalisation. The allocation of the weights is also done based on the market capitalisation. Generally a benchmark index is well diversified and has representation of many sectors. Hence this portfolio is also considered less risky as the risks are spread out across sectors. Only a secular fall based on macro-economic factors in the country, can really impact the index. These risks are also considered systemic risks. All micro or company level risks are temporary as the index portfolio is rebalanced from time to time. If any component company of the

index portfolio loses its market capitalisation, it will be replaced with a company with higher market cap. Thus the index portfolio is automatically churned and usually always buoyant. Although the indices have seen their share of value erosion periodically, they have always created value and grown exponentially over the years.

Risk Management in Portfolios can be done by diversification or by hedging with derivatives. Since we have seen that even the benchmark index, which is considered highly diversified, has seen its share of drawdowns. Hence it becomes imperative to hedge the downside risks with derivatives.

There are predominantly two instruments available in the Indian markets, Futures and Options. These instruments derive their value from the underlying asset. These derivatives are traded in stock lots. They are types of forward contracts with specific expiry dates.

Futures contracts are traded on the exchange. A buyer of futures promises to buy the underlying at the traded price but on a future expiry date. The buyer has can square off the contract by selling the contract even before expiry. However, if the contract is not squared off till the expiry date and time, it will be automatically settled by the exchange. The buyer of the contract has to take delivery of the underlying shares in case of stock futures and settle in cash in case of index futures.

Options are forward contracts with slightly different characteristics. These contract allow the buyer of the option to choose whether or not to exercise the contract on a future date. There are two types of options, Call and Put. The buyer pays an upfront premium to buy these contracts which is an additional cost.

Literature Review:

Many scholarly articles, reviews, criticisms and updations have been written about Markowitz's Modern Portfolio Theory. However, the MPT still remains fairly important while creating Portfolios. The MPT selects the assets based on its risk-return and its correlation to other assets in the portfolio. The quest for an optimal portfolio has been enduring and many models like Sharpe's, Markowitz and others have been developed. Using the Mean Variance (MV) efficient portfolio, the optimal holding period was investigated taking Istanbul stocks for the period January 2000 to November 2004. The results showed that MV efficient investment portfolio performed better for long term period (Ulucan, 2007).

Many studies have used risk and return, (based on past performance) as an important factor to construct optimal portfolios. Varadarajan (2011) constructed a portfolio covering 19 stocks from different sectors based on five years data. The resultant optimal portfolio consisted of only 5 stocks from the 19. Sharpe's single index model was used as it is considered simple and practical. Saravanan et al (2012) created an optimal portfolio with 4 stock from Nifty 50 stocks. Similarly Debashish et al (2012) created an optimal portfolio of 3 stocks from 14. KavithaLal and SubbaRao (2016) created an optimal portfolio using sector analysis and included 5 sectors out of 11 based on the historic risk and return in their optimal portfolio.

Looking at the trends of scholarly articles and papers, one can infer that the MPT or the Sharpe's single index model can help create an optimum portfolio. However, objective of beating the index and creating alpha in long and short run is unclear.

Nageswari et al (2013) determined future risk and return of securities to form an optimal portfolio which significantly reduces the variability of returns. Anangnostopoulos et al (2010) formulated the portfolio optimization problem by optimizing the objectives involving tradeoffs between risk, return

and the number of securities for inclusion in an optimum portfolio. Limits are set regarding the proportion of the investments in assets, so that the chances of having smaller proportions of holdings or investments in assets having similar characteristics is avoided.

Merton, Scholes and Gladstein (1978) concluded that certain option strategies like fully covered writing strategy have been successful in changing the patterns of returns and are not reproducible by any simple strategy of combining stocks with fixed income securities. Covered strategy is a combination of the stock with its respective option. The strategy can give good returns in the long run compared to the traditional approach of long term investing in stocks.

The literature survey broadly indicates that the portfolio optimization models are more used for asset selection rather than solving the asset allocation problem. Although the models show the weights assigned to each asset, it is not considered as a major challenge. Impact of churning of portfolio and the duration for rebalancing the portfolio is also not widely discussed. Moreover, the performance of these optimal portfolios have not been compared over any time period to confirm the actual risk and returns.

Risk mitigation techniques in portfolio management has conventionally been through diversification. Hedging with derivatives for risk management has never been explored. Derivatives are generally considered short term instruments and not long term hedging instruments.

Objective of the study:

The objective of the study is to find if Options can provide a suitable hedge in portfolio management. Put options do not have a linear payoff and the prices of put options do not have a linear change for longer expiry periods. This gives room for creating effective cost structures for options and thereby hedging a portfolio in a cost effective manner. The study will try to see if Put options can be used as a suitable hedge for a Long Stock Portfolio.

Methodology:

The methodology used will be based on finding prices with help of financial engineering and option calculators. Option structures comprising of different calls and puts with different expiries and different quantities will be created to find the optimum costs. Once the structures are ready, they will be back tested on different timelines from the past 10 years.

Portfolios will be subjected to stress tests and scenarios will be created for analysing the impact of the option strategy along with the portfolio.

If the results are favourable, it will rejig the way fund managers use options in portfolios. These findings may help retail investors to use leverage in an optimum way to create long term wealth. This will also encourage retail participation in the financial markets. Structured products which are currently available to only ultra-HNIs, can be created by an investor himself.

A stock portfolio is comprised of companies from diversified sectors. Historically very few portfolios have been able to even beat the benchmark index consistently in the long run. Hence we consider the Benchmark portfolio of NIFTY 50 itself. Nifty 50 portfolio can be created by replicating the composition of the index on the basis of market capitalisation.

To hedge the downside, we choose At The Money yearly put options. The put options will safeguard the entire downside of the overall portfolio and at the same time will have limited impact

on the upside of the portfolio. However, the premium of the put option is an important but sunk cost.

Since the NIFTY 50 future contracts are traded, it is always better to trade future contracts. The pricing of the futures contract is based on cost of carry less dividends. This does not increase the cost of long term futures significantly.

Since Nifty Portfolio + ATM NIFTY Put option of yearly expiry can be replaced with;

Nifty Futures + ATM Put of yearly expiry;

Which in turn can be replaced as it is a synthetic ATM Call option with yearly expiry.

Buying an ATM Call of yearly expiry costs just about 6-7% of the total exposure. Thus the balance 92-93% amount can be invested in debt instruments to earn about 8% per annum.

Thus at the end of the year, when the option expires, the cost of the call option is nullified from the interest income from the debt instrument. Hence the call option basically comes at a zero cost. This will give the entire upside of the Nifty50 portfolio, and no downside as the loss of a call option is limited to the premium paid, which in this case becomes eventually zero. Yearly call option data can be extracted from nseindia.com and back testing on that data will be done for 10 years from Jan, 2011 to Dec, 2020.

Data Analysis:

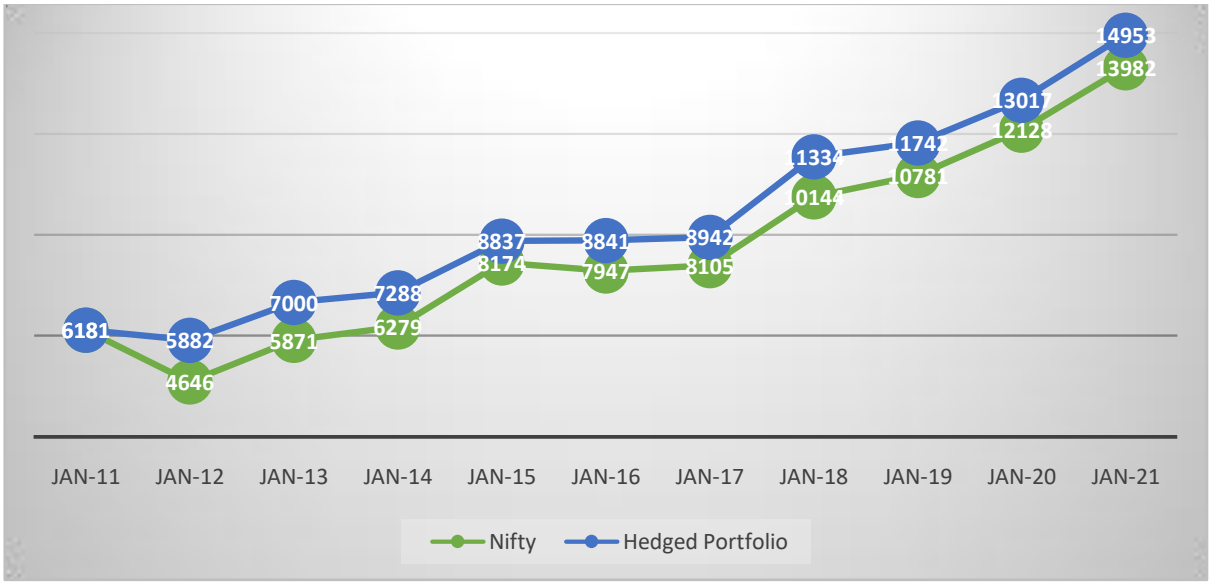
Table 1.1: Back Testing of derivatives portfolio from Jan 2011 to Jan 2021.

Date	Future Open	Date	Future Close	Differences	Strike price	Call Open	Call close	P/L	Cash balance at Start	Interest @8%	Net P/L	Cash Balance at end
3-Jan-11	**6,181.00**	29/12/2011	4,646.30	-1,534.70	6,000.00	735.00	0	-735.00	5,446.00	435.68	-299.32	5,881.68
29-Dec-11	4,670.00	27/12/2012	5,871.00	1,201.00	4,500.00	670.00	1,371.00	701.00	5,211.68	416.93	1,117.93	6,999.61
27-Dec-12	5,935.00	26/12/2013	6,279.00	344.00	6,000.00	506.00	275.00	-231.00	6,493.61	519.49	288.49	7,288.10
26-Dec-13	6,343.00	24/12/2014	8,173.55	1,830.55	6,500.00	645.00	1,662.00	1,017.00	6,643.10	531.45	1,548.45	8,836.55
24-Dec-	8,269.00	31/12/2015	7,946.80	-322.20	8,500.00	650.00	0	-650.00	8,186.55	654.92	4.92	8,841.48

14												
31-Dec-15	7,954.70	29/12/2016	8,104.85	150.15	8,000.00	655.10	100.95	-554.15	8,186.38	654.91	100.76	8,942.24
29-Dec-16	8,120.20	28/12/2017	10,143.75	2,023.55	8,000.00	747.00	2,483.35	1,736.35	8,195.24	655.62	2,391.97	11,334.20
28-Dec-17	10,512.00	27/12/2018	10,780.65	268.65	10,500.00	721.00	280.00	-441.00	10,613.20	849.06	408.06	11,742.26
27-Dec-18	10,805.00	26/12/2019	12,127.80	1,322.80	11,000.00	735.00	1,129.60	394.60	11,007.26	880.58	1,275.18	13,017.44
26-Dec-19	12,195.00	31/12/2020	**13,982.00**	1,787.00	12,000.00	1,010.00	1,985.00	975.00	12,007.44	960.60	1,935.60	**14,953.04**

Source: nseindia.com

Graph 1.1: Yearly performance of the hedged portfolio v/s Nifty 50



Findings:

The data shows that the derivative strategy along with a fixed income instrument can replace a Nifty50 portfolio as well as create efficiency in performance. The new portfolio has outperformed the Nifty50 returns for all 10 years. The Nifty index gave negative returns for two years out of 10

years. The call option has given negative returns for 5 years out of 10 years, however, the portfolio has given negative returns just once.

Conclusion:

The study shows that derivatives can help create long term portfolios with minimum risk and a decent alpha. The notion that derivatives are speculative instruments and hence are not recommended for retail and small investors has been proved wrong. The challenge with derivatives is that they are leveraged instruments. Appropriate use of leveragecan help create resilience in portfolio management. However misuse of leverage can be damaging. The study also proved that small investors can replicate capital protectedNifty structured products with very less or no negative returns which are currently available to only customers with ticket size of Rs. 1 crore or more. SEBI, the regulator in Indian capital markets does not allow small investors to invest in such products. However, retail investors are the ones with a very low appetite for risks, but wish to participate in the upside of the stock markets. The structure is easy to create and execute.

Scope of the study:

The study is important from the point of view of retail investors and the financial economics of a country at large. The study will also help the regulator (SEBI) device policies for investor awareness and protection.

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