Center for International Securities and Derivatives Markets

Hedging Mutual Fund Returns Using Futures Markets and ETFs

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Abstract

The purpose of this study is to examine the effectiveness of hedging mutual fund returns using Index Futures Contracts and ETFs. We used historical daily Lipper Large Value Growth mutual fund index returns to represent a mutual fund portfolio. The mutual fund returns are hedged using index futures as well as exchange traded funds contracts on the S&P500, the NASDAQ, the Dow Jones, the Russell 1000 and the Russell 2000. To obtain the Optimal Hedge Ratios (OHR), we regressed a two-month period of the Lipper Index returns with the returns of above contracts. The OHR so obtained were used to create an ex-ante hedged Lipper portfolio for the following month. The standard deviation of hedged returns and unhedged returns were computed and the hedging effectiveness was calculated using the formula:

$$HE = 1 - \frac{\sigma^2_{\text{Hedged Returns}}}{\sigma^2_{\text{Unhedged Returns}}}$$

Results show that S&P500, the NASDAQ, the Russell 1000 Growth as well as the Russell 2000 Growth futures and ETFs prove to be efficient hedging instruments and therefore an efficient risk management tool for these specific mutual funds.

Hedging Mutual Fund Returns Using Futures Markets and ETFs

I. Introduction

Mutual funds remain the principal means by which many investors access equity and fixed income investments. Mutual funds provide both, direct investment in the asset as well as exposure to manager style. The fund managers may provide their investors with excess returns due to exceptional stock selection and asset allocation capability, and thereby retain investors who would be committed to mutual funds as their primary investment vehicle. If mutual funds do provide excess returns through successful stock selection and asset allocation, investors can access these unique returns.

In general, mutual funds are required to manage assets in line with their style and persistent with existing benchmarks with limited hedged positions. Since market risk is a major component of the total risk of any stock portfolio, futures and ETFs based on the "market" could be used to hedge the systematic risk of any stock position. If mutual fund returns are positively correlated to a futures contract or an ETF, then it is possible to hedge the underlying assets of one or more of these market indices. Futures contracts are standardized forward contracts with an inherent obligation to take delivery of or to deliver a set quantity of a specific (financial) instrument at an agreed price on a specified date. Index futures are settled in cash position upon maturity since the index is an abstract of underlying asset and physical delivery of all index shares is not practically feasible. This cash payment corresponds to the variation in margin at maturity. The purpose of this study is to test the success of a strategy to hedge the Lipper Large Value Growth Index with S&P500, the NASDAQ, the Dow Jones, the Russell 1000 as well as the Russell 2000.

Previous research has analyzed the potential effectiveness of hedging REIT fund returns using futures contracts. Oppenheimer (1996) examined the effect of hedging REITs returns with stock and Treasury futures contracts. He used historical REITs market data and created a synthetic portfolio consisting of ten REITs stocks traded on the NYSE during the period 1993. He was able to identify futures contracts bearing significant correlation with the REIT returns. The regression betas provided the Optimal Hedge Ratios (OHR), which identified the positions to take in the futures market in order to reduce the variance of the portfolio's return series. His results showed that ex-post models successfully reduced risk while ex-ante hedges produced unpredictable results. Liang, Seiler and Chatrath (1998) further extended his work by employing a similar procedure for a set of widely used REITs indices and a set of more comprehensive futures contracts. While Oppenheimer study was limited to the year 1993, Liang, Seiler and Chatrath study was carried out for a twelve year period starting from July 1986 to December 1994.The wider range was used to explore the effectiveness of the ex-ante and other hedging strategies. They concluded that existing futures contracts, written on financial instruments and commodities were limited in their ability to hedge REITs returns on an ex-ante basis. They recommended that investors and REITs fund managers would benefit more from futures contracts written specifically on REITs stocks.

Our study is base on the research of Oppenheimer (1996), but using mutual fund equity index returns. The purpose of this study is to try to hedge a mutual fund portfolio using index futures contracts and exchange traded funds.

II. Data and Methodology

This study uses a hedging methodology similar to those conducted the previous studies. We use daily returns, starting from June 2000 until September 2002.

Index Fund: The Lipper Large Value Growth Index is used to mimic mutual fund returns. Daily NAV data was obtained from Lipper Index Service for the purpose of this study. We computed daily returns from this data using the formula:

$$R = \frac{Nav_t - Nav_{t-1}}{Nav_t} \cdot 100$$

Where R is Daily Return Series,
NAV is Net Asset Value and
t is time period (daily)

Index Futures Contracts: Financial futures provide institutional investors with the opportunity to hedge their financial risk. These futures are low-cost flexible instruments, which can be used as a risk management tool. Similarly, index futures can be used as a hedge for a wide range of stock, which forms its underlying stock base. The idea of an index future is to provide a mechanism for fixing returns on the market portfolio. The key to hedging with stock index futures is that the futures position combined with the existing cash (asset) market position yields a desired exposure to risk on the overall investment in the underlying asset. This in effect helps the portfolio manager to alter the market risk on his portfolio without changing the portfolio composition.

We used S&P500, NASDAQ and Dow Jones futures contracts as hedging instruments for our study. These contracts were selected based on the concept that the most suitable hedgers for Lipper would be the index futures which were written on same or similar underlying assets. All the futures contract selected for this study were first confirmed to be liquid. Futures contract prices were obtained from Datastream. Futures contracts mature during four months: March, June, September, and December. Shortly before each contract ended the prices from the next available contract were taken to derive a price series for a period starting from June 2000 until September 2002. Daily return for the index futures were then computed by employing formula[1]:

$$R_f = \frac{P_t - P_{t-1}}{P_t} \cdot 100$$

Where R_f is Daily Return of index futures contract,
P is futures contract price and
T is time interval

[1] The interest income on the margin account and the dividends of the underlying assets are neglected because we assumed an overlay position. Also, the volatility of the price returns is many times greater than any of these returns.

Exchange Traded Funds: ETFs are mutual funds that trade like stock on the exchange. The main purpose of an ETF is to achieve a return similar to a particular market by investing in a limited amount of stocks that are included in that market index. ETFs are able to afford liquidity, low cost structure, reliable tracking, flexibility (they are traded on exchange like any other stock) and tax efficiency (since they are less likely to incur capital gains) for its investors.

We used ETFs on S&P500, the NASDAQ, the Dow Jones, the Russell 1000 as well as the Russell 2000 including sub-indices to hedge the Lipper portfolio. The return for the ETFs was calculated by using the same formula used to calculate returns for the futures contracts and the Lipper index.

The hedging methodology used in this study is similar to that employed by Liang, Seiler, Chatrath (1998) with some modifications. Using a rolling regression of 2 months of the Lipper Large Value Growth Index with futures and ETFs on S&P500, the NASDAQ, the Dow Jones, the Russell 2000 as well as the Russell 1000 we generated betas that were used as the OHR for the next month. Single regression provided the following model:

$$R_{i,t} = \alpha_i + \beta \cdot X_{1,t} + e_{i,t} \qquad (1)$$

Where, t represents the rolling tenure in months.

Lipper returns were then hedged using the betas obtained from rolling regressions. Beta coefficients obtained from the rolling regression are the Optimal Hedge Ratios (OHR) proposed by Figlewski (1985). They represent the ratio of futures contracts and ETFs (hedge used) to be bought or sold to hedge the Lipper portfolio. The hedge ratios or beta values were derived from linearly regressing the futures and ETFs returns on the Lipper returns to produce the estimates of the optimal number of contracts required for hedging the portfolio. They were then used to compute the hedged returns by employing an ex ante hedging strategy where:

$$R_{Hedged,t+1} = R_{Unhedged,t+1} - \beta_t \cdot X_{t+1} \qquad (3)$$

Where $R_{Hedgedt+1}$ are the hedged Lipper returns and
$R_{Unhedgedt+1}$ are the unhedged Lipper returns.

We also computed the actual (achieved standard deviation) of the hedged and unhedged returns. These were used to compute the hedging effectiveness using the formula:

$$HE = 1 - \frac{\sigma^2_{achieved,hedged}}{\sigma^2_{actual,unhedged}}$$

Furthermore, we calculated the information ratio. The daily unhedged Lipper returns were subtracted from hedged returns and were annualized. The final annualized return was divided by the standard deviation of difference returns:

$$IR = \left[\prod_{1}^{n} (R_{\text{Lipper hedged,t}} - R_{\text{Lipper unhedged,t}}) \right]^{\frac{1}{n}} \cdot \frac{1}{\sigma_{\text{annualized,hedged}}}$$

III. Results:

Our study showed that the actual standard deviation of unhedged Lipper returns was always more than the standard deviation of hedged Lipper. Thus the hedging was effective for all cases.

Exhibit 1 shows the results of two month rolling hedge and lists the unhedged Lipper Index returns, hedged Lipper Index returns, standard deviation of both, unhedged and hedged Lipper returns. Besides this it lists the OHR (average hedge ratio), R^2 and the extent of variance of the unhedged returns controllable by the hedge used in terms of hedging effectiveness and information ratio.

Exhibit 1

Hedging Lipper Portfolio using Index Futures and ETFs

	Asset	Annualized Return	Standard Deviation	Average Hedge Ratio (β)	Average R^2	Hedging Effectiveness	Information Ratio
	3 month T-Bill	3.69%	0.07%				
	Lipper Large Value Growth	-26.42%	33.47%				
Lipper hedged by	S&P 500 Futures	-6.88%	11.30%	1.11	0.89	88.61%	1.05
Lipper hedged by	S&P 500 ETF	-7.59%	10.66%	1.13	0.91	89.85%	0.99
Lipper hedged by	NASDAQ Futures	-9.46%	14.90%	0.46	0.80	80.18%	1.02
Lipper hedged by	NASDAQ ETF	-9.73%	15.79%	0.43	0.78	77.74%	1.03
Lipper hedged by	Russell 2000 ETF*	-21.11%	16.36%	0.90	0.75	76.12%	0.33
Lipper hedged by	Russell 2000 Growth ETF*	-14.33%	14.94%	0.73	0.78	80.08%	0.76
Lipper hedged by	Russell 2000 Value ETF*	-30.73%	19.61%	1.13	0.65	65.68%	(0.32)
Lipper hedged by	Russell 1000 ETF	-8.31%	10.62%	1.12	0.90	89.94%	1.08
Lipper hedged by	Russell 1000 Growth ETF	-6.03%	8.65%	0.85	0.93	93.32%	1.22
Lipper hedged by	Russell 1000 Value ETF	-17.25%	19.83%	1.25	0.70	64.90%	0.65
Lipper hedged by	DJ Futures	-17.31%	18.49%	1.02	0.70	69.47%	0.50
Lipper hedged by	DJ ETF	-17.48%	18.99%	1.00	0.69	67.82%	0.49

**only 23 month Return History available*

As observed, the best hedging results for the Lipper Large Value Growth Index was achieved with Russell 1000 Growth ETFs. It provided the highest Hedging Effectiveness (a reduction of the variance by 93.32%) as well as the highest Information Ratio (1.22). Hedging with the S&P500, the NASDAQ and the Russell 2000 Growth also showed good results. The Russell 1000 Value and 2000, the Russell 2000 Value ETFs and the Dow Jones vehicles did not prove to be as efficient. The research shows that the composition of a good hedge matches the assets to be hedged.

Where ETFs and Futures are available for hedging, both vehicles prove to be as efficient. Slight deviations are noticeable. This can be attributed to tracking errors of the futures and the ETFs.

Exhibit 2

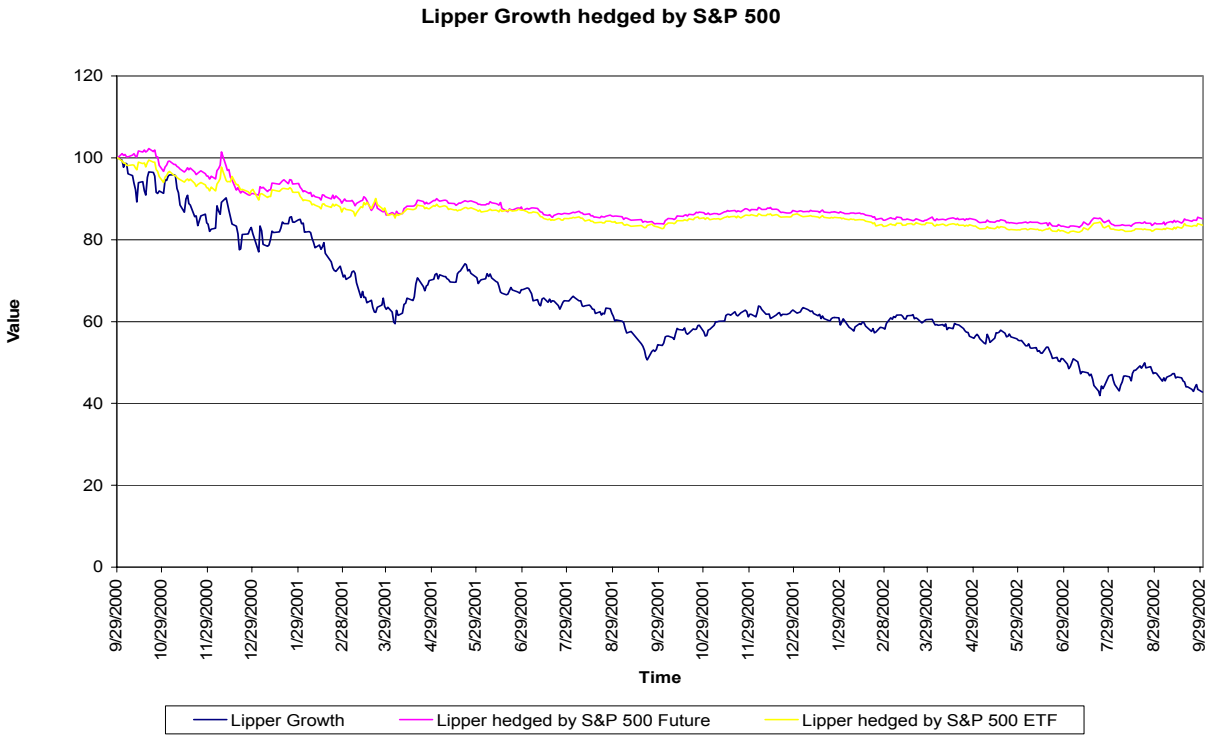


Exhibit 3

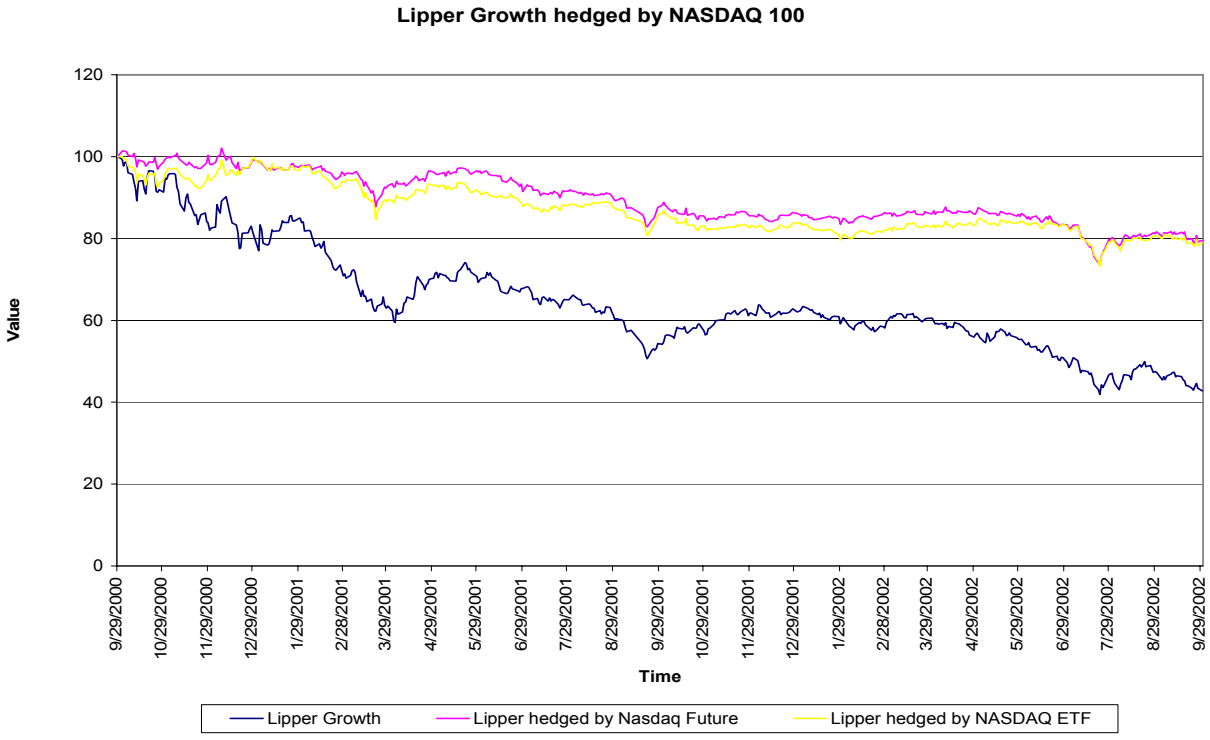
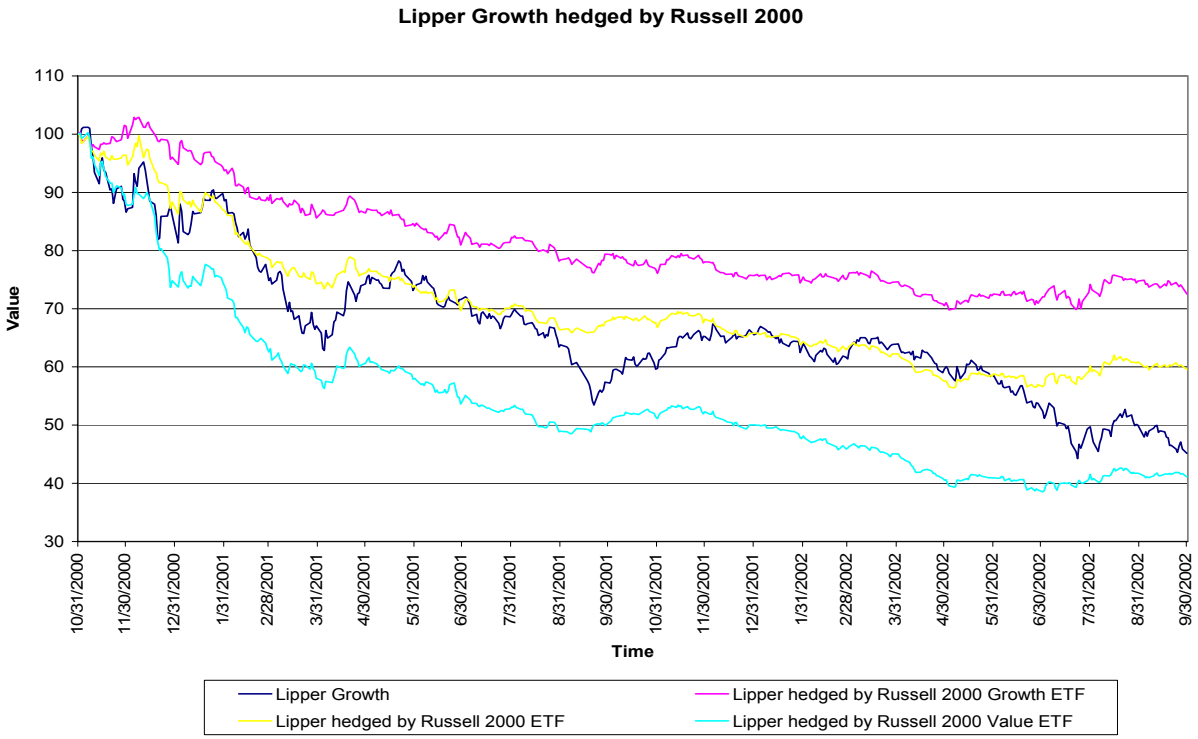


Exhibit 4



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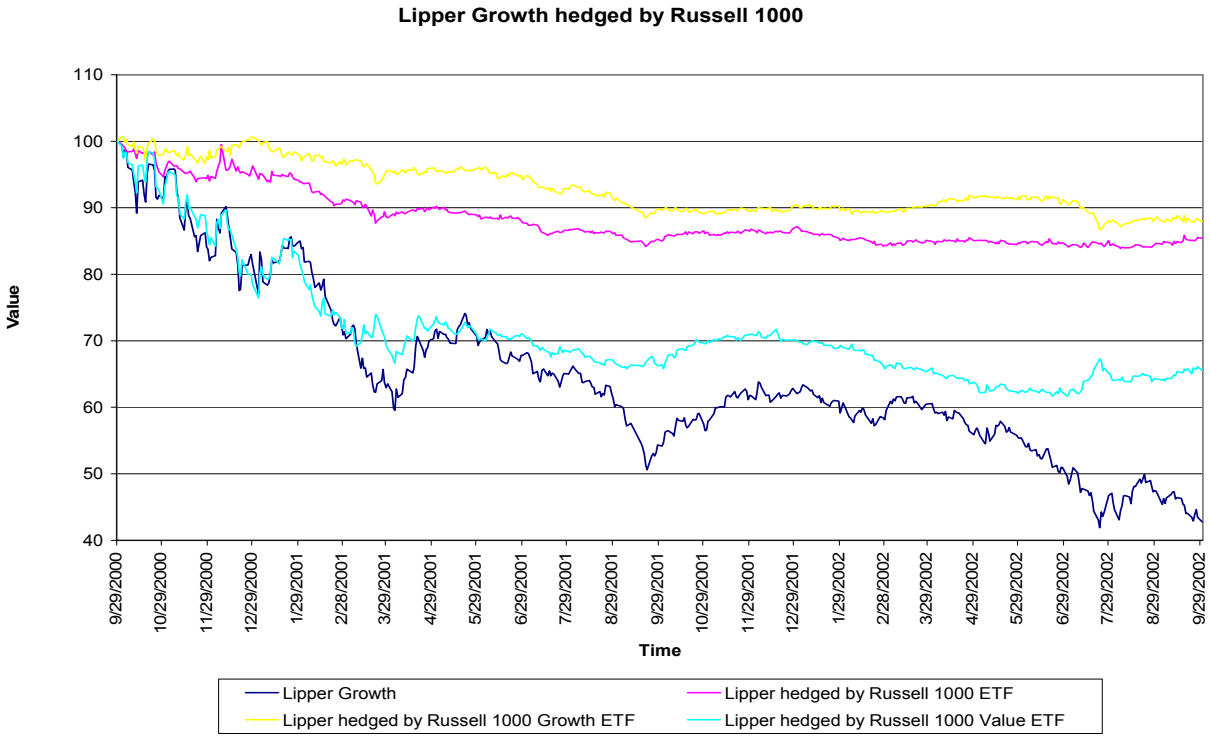
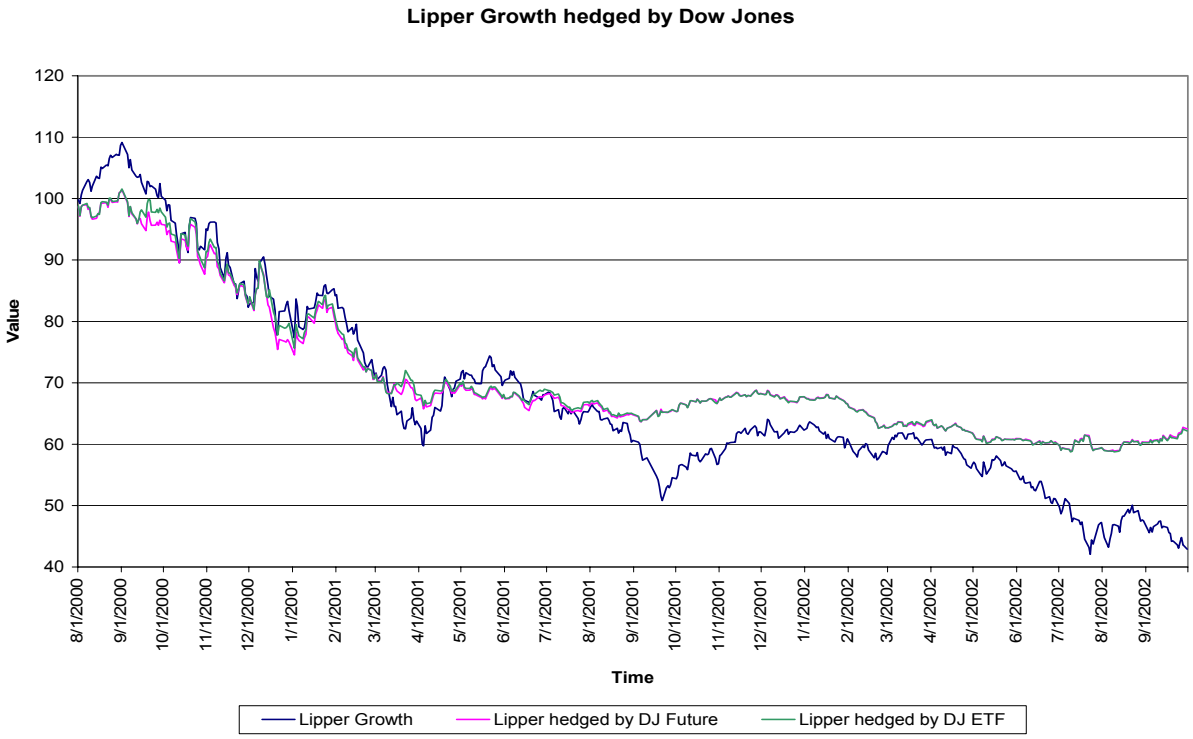


Exhibit 6



Exhibits 2 through 6 depict the growth over $100 investment in both hedged and unhedged Lipper portfolios.

IV. Further Research:

Further work could be done on hedging mutual funds return using stepwise multiple- regression to select from a group of hedging instruments, which show a significant correlation with the mutual fund returns. This would allow a mutual fund portfolio manager to hedge their portfolios by choosing the correct hedging instrument and hence control their losses to a certain extent. Though we have not discussed it in our study, the transaction costs which include margin accounts, brokerage fees and associated with the hedging strategy, form an important factor in the hedging process. Using a single instrument for hedging may reduce the transaction costs but it would also reduce the hedging effectiveness. Thus one also has to decide on a trade off between the number of instruments used for hedging and the desired hedging effectiveness. As suggested by Oppenheimer, transaction costs can be reduced by hedging near-term contracts with large trading volumes and placing trades in the middle of the day.

Our study used futures market and ETFs for hedging mutual fund returns. Positions in futures markets carry both upside and downside benefits. Thus, if Lipper returns were to increase, the opposite position in the futures market would create a loss for the portfolio leaving the hedge position intact. Thus it would help to solve the mutual funds problem of limiting the down-side, but at the same time it also restricts the upper-side gain.

One approach to solve this problem would be to use options. Options would help to control losses of the portfolio and at the same time the portfolio would profit from the increase in the portfolio's value. Options would also enable the portfolio manager to use strategies like straddle and strangles to better hedge their portfolio and take advantage of the extreme movements in an unpredictable market. But options would also have higher costs associated with it.

Recently the Eurex has started trading in futures on ETFs. These could prove to be more efficient in hedging the mutual fund returns at a lower transaction costs.

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