

Student Management Funds Using ETFs and a Single Inverse ETF

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ABSTRACT

This paper explores the use of leveraged and inverse ETFs to reduce the risk level of a student managed investment fund portfolio.

INTRODUCTION

Imagine a group of students returning to school in September 2008 to manage an investment fund that is 50% international Exchange Traded Funds (ETF) and 50% domestic ETFs but consists solely of an S&P index ETF (SPY) and the EAFE international index ETF (EFA) because of the summertime cruise control decision by the previous (and departed) spring's class. In September, the S&P was down 15% from November of 2007 and would be down 40% by the end of December 2008. The EAFE was down 23% in September from the previous November and would be down 50% by the end of December 2008.

These students were shell-shocked to say the least. This paper is about their search for a way to significantly reduce the downside volatility of the fund and maintain some upside with the remaining value of the fund.

"...Second, though we have lagged the S&P in some years that were positive from the market, we have consistently done better than the S&P in the eleven years during which it delivered negative results. In other words, our defense has been better than our offense, and that's likely to continue."

Warren Buffett, 2010

Like Warren Buffet, we have consistently focused on downside risk of our portfolios. But with the markets dropping 40-50% during the year, we needed to do a better job. Attention quickly focused on some single and double inverse ETFs many of which had started in early 2007. These funds had been started to allow market participants to engage in short-term hedging or speculation across an array of market indices and sectors. The key term is "short-term hedging" as many people looked at these funds as "long-term" hedge strategies. We quickly caught on to the fact that the double leverage and double inverse versions did not perform very well so far in 2008 and concentrated solely on single inverse funds. This paper is a story of our research and experience with a single inverse fund used to reduce downside volatility of our investment fund.

INVERSE AND LEVERAGED FUNDS

Most inverse and leveraged funds are designed for a specific purpose – to reflect their benchmark index on a daily time frame. This design makes them substandard for longer periods. The funds target a constant daily leverage, therefore, they engage in daily rebalancing typically through total return swaps. The beneficial result of the daily rebalancing is that unlike an actual short, the maximum losses are capped at the amount invested in the fund. However, Cheng and Madhavan (2009) found that the greater the realized volatility and the longer the ETF is held, the more the funds will underperform their benchmarks. Trainor and Baryla(2008) find that Monte Carlo simulation using historic data for leveraged ETFs, over any appreciable length of time, the median and mean performance is well below the naïve benchmark. Trainor and Baryla (2008) also provide numerical examples to explain the causes of the underperformance. We find this result is more significant in the 200% (double leveraged or double inverse) funds and not as pronounced in the single inverse. The question is “while they do underperform will the negative correlation inherent in an inverse fund help to significantly reduce the overall risk of a portfolio?”

We start the study with 14 ETFs grouped around five indexes:

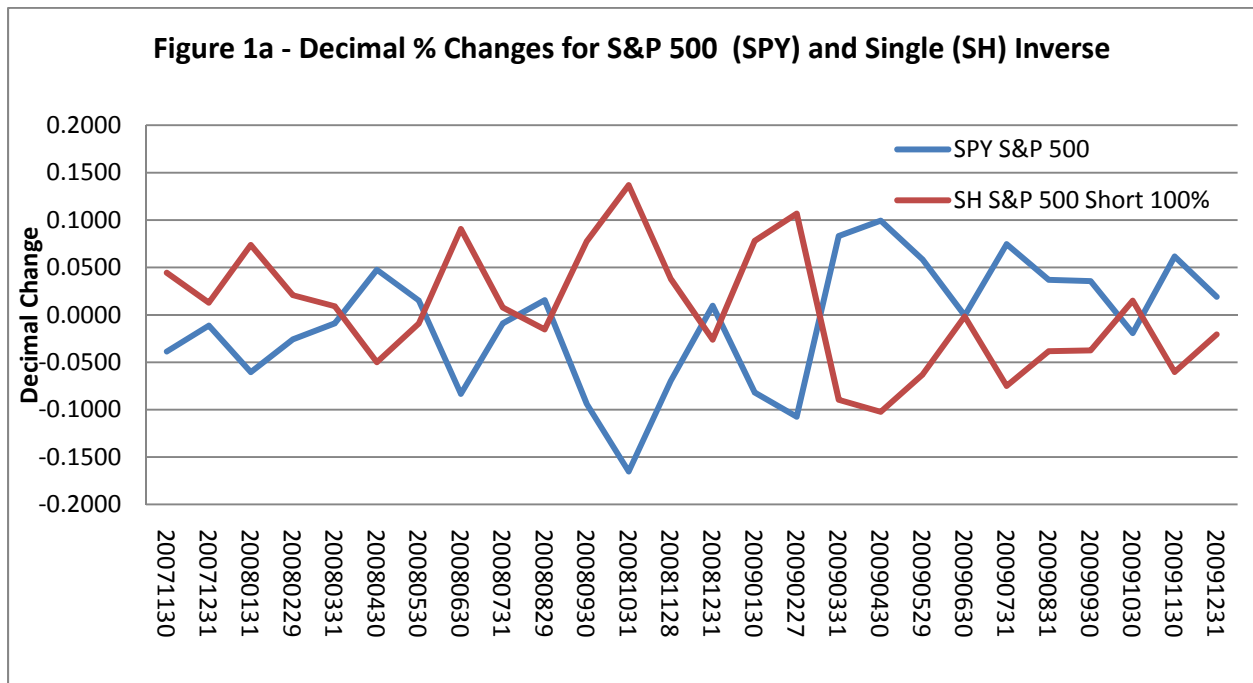
1. SPY – S&P 500 SPDR fund
SH - S&P 500 Short (Single Inverse) 100% fund
2. EFA – MSCI EAFE International Index fund
EFZ – MSCI EAFE Short (Single Inverse) 100% fund
EFU – MSCI EAFE Short (Double Inverse) 200% fund
3. EEM – MSCI Emerging Markets Index fund
EUM – MSCI Emerging Markets Short (Single Inverse) 100% fund
EEV - MSCI Emerging Markets Short (Double Inverse) 200% fund
4. IEO – Oil & Gas Exploration ETF
DUG – Oil & Gas Exploration Short (Double Inverse) 200% fund
DIG – Oil & Gas Exploration Long (Double Leveraged) 200% fund
5. QQQQ – Nasdaq 100 index QQQ
PSQ – Nasdaq 100 Short (Single Inverse) 100% fund
QID – Nasdaq 100 Short (Double Inverse) 200% fund

We downloaded monthly returns with dividends from CRSP for all of these funds for the period November 2007 to December 2009.

EMPIRICAL RESULTS

Starting with Figures 1a and 1b and Table 1, we see that the S&P 500 index fund has a strong negative correlation (-0.989) with its single inverse fund (SH). The time period starts in November 2007 and ends in December 2009 so it gives us a very good idea how these funds performed during a particularly nasty market period, the 2007-08 market crisis. The charts indicate the negative relationship between SPY and SH. However, the returns do not provide

much evidence of a perfect inverse relationship to the core index. The SPY lost almost 12% a year while the short position gained only 3.5% per year (A perfect inverse would have earned a positive 12% a year.) It was also a “quit while you are ahead” situation because if you market timed the bottom in March 2009, the inverse was up around 90% while the long position was down about 50%. After March 2009, the long position recovered to being down about 24% but the inverse return plunged to up almost 8%.



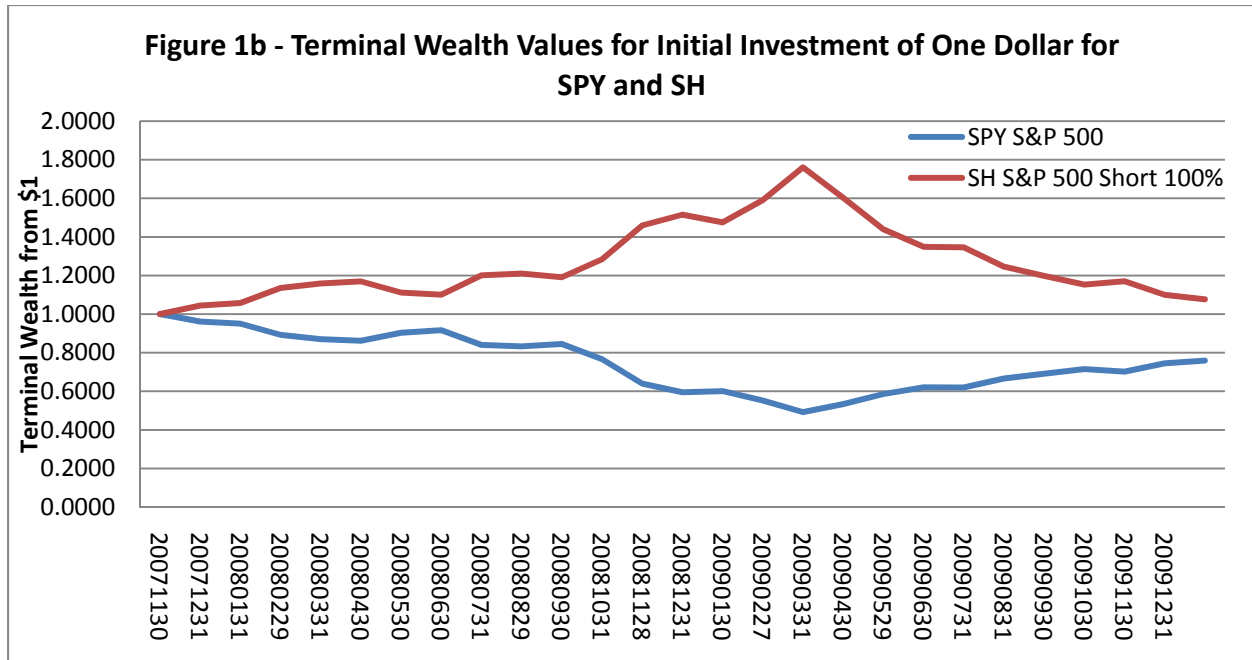


Table 1 – Performance Statistics	Annualized Return	Terminal Wealth	Standard Deviation	Semi-Deviation	Correlation Coefficient	R/SV Ratio
SPY S&P 500	-11.95%	0.7590	6.5187%	5.3346%	1.0000	-0.2133
SH S&P Short 100%	3.48	1.0768	6.2681	3.8974	-0.9890	0.0519
50%-50% S&P/SH	-4.52	0.9524	0.4904	0.5360		-0.8724

In Figures 2a and 2b and Table 2, we again see a strong negative relationship between the MSCI EAFE (EFA) index and its inverse funds (EFU the double inverse and EFZ the single inverse) with correlations around -0.94 to -0.98. Looking at the terminal wealth graph in Figure 2b, we see if we can market time, the double inverse (EFU) is great up to March 2009 where it peaks at over \$2.50 per dollar invested. After that, it tanks to about 76 cents on the dollar. We see that the single inverse does maintain a positive terminal wealth (\$1.04) but it still is not a pure inverse to the EAFE index which lost over 15% per year. However, the single inverse could be used to reduce downside risk even though it is not a perfect inverse. We see that a 50-50 allocation between EFA and EFZ reduces the standard deviation of EFA from 8.27% to 0.84% for the combination. The important factor is that the double inverse, which fails to provide a positive return that inverse to the market, does not provide the performance that we would expect from an inverse position.

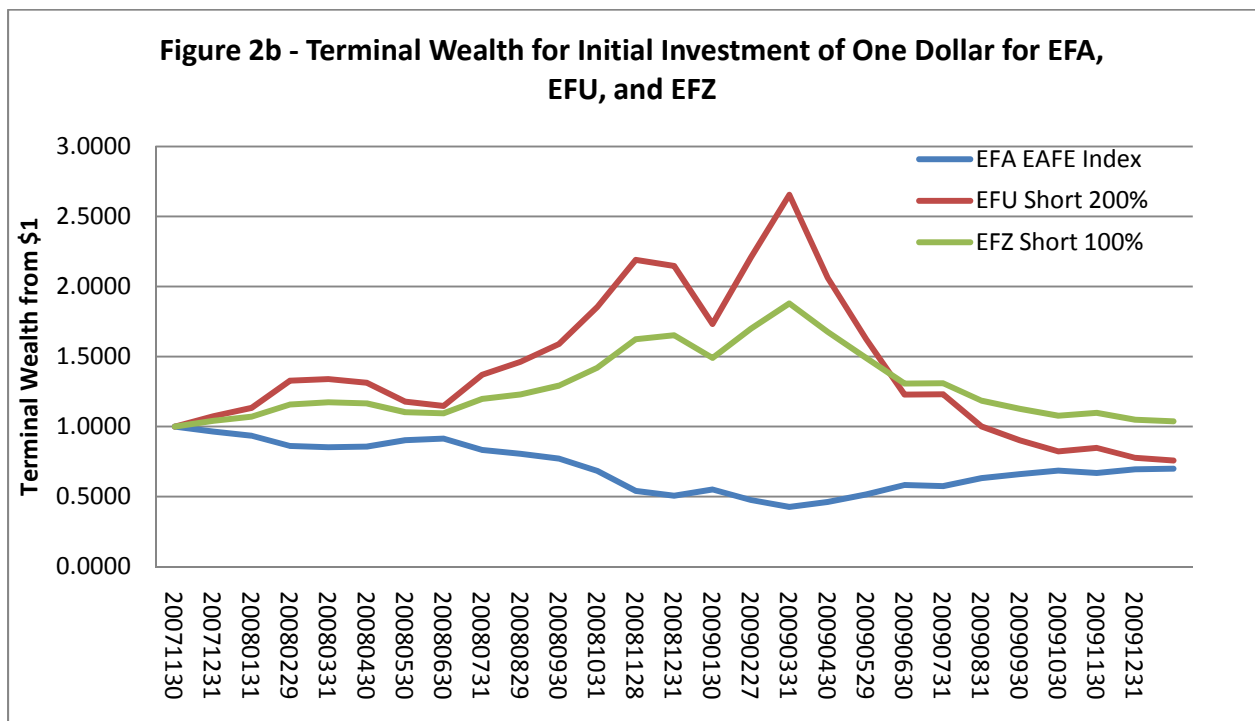
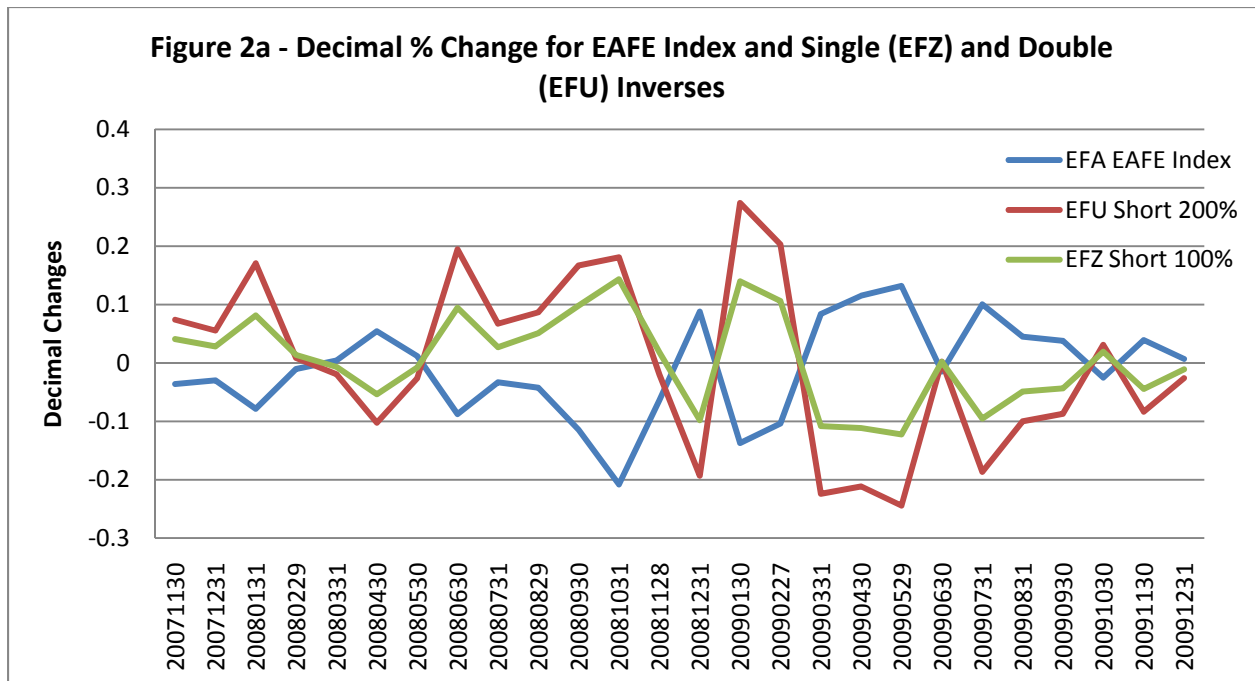
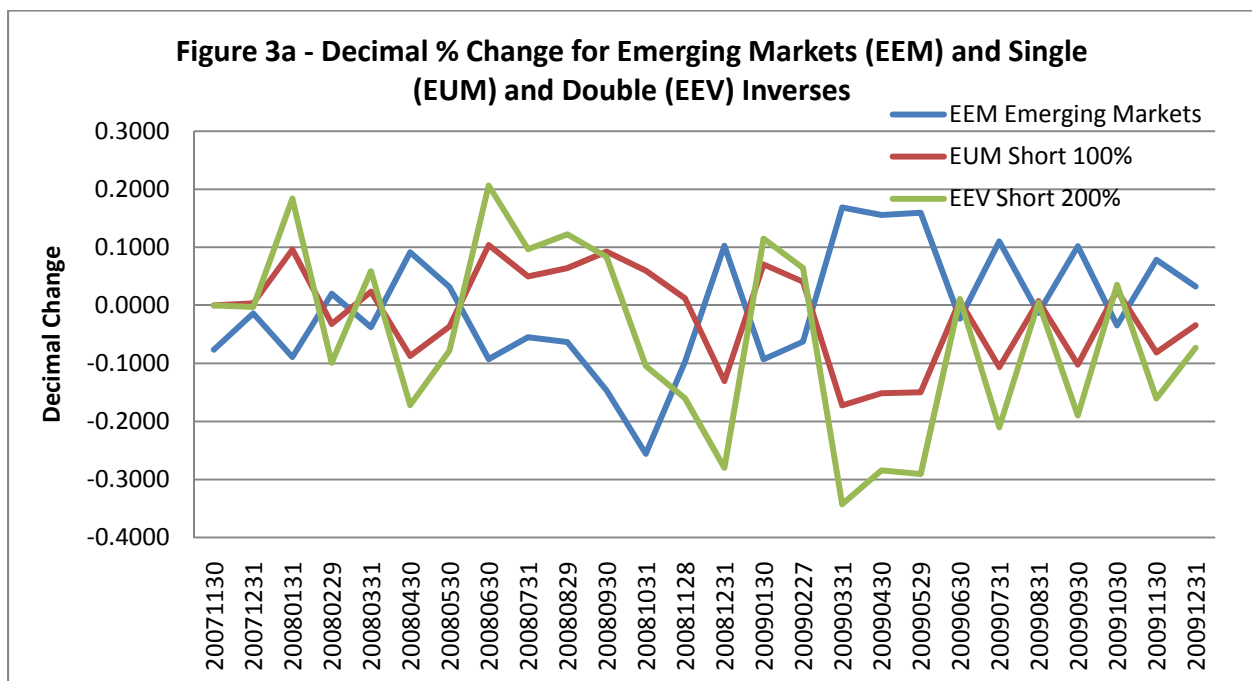


Table 2 – Performance Statistics	Annualized Return	Terminal Wealth	Standard Deviation	Semi-Deviation	Correlation Coefficient	R/SV Ratio
EFA EAFE	-15.22%	0.6993	8.2726%	6.5564%	1.0000	-0.2211
EFU Short 200%	-12.06	0.7570	14.5564	10.1224	-0.9445	-0.1134
EFZ Short 100%	1.73	1.0379	7.7474	5.1324	-0.9803	0.0117
50%-50% EFA/EFZ	-7.10	0.9246	0.8370	0.8950		-0.7762

In Figures 3a and 3b and Table 3, we see that the MSCI Emerging Markets has a strong negative correlation with its single inverse (EUM) and double inverse (EEV) funds. The correlations are not as strong as seen the previous two cases as they are only -0.74 and -0.92. In Figure 3b, we see that the double inverse (EEV) barely keeps up with the single inverse (EUM) through the end of 2008 and then tanks catastrophically to almost 16 cents on a dollar. Again, market timing by selling the inverses by March 2009 provides some good profits but even the single inverse (EUM) is below the EEM index at the end of 2009. The major problem is that EEM is down to less than 80 cents on a dollar. So even though the market is down for the two years, the inverses are unable to maintain a positive return. Again, we see the standard deviation for the EEM-EUM 50-50 combination is much lower (2.16%) than the standard deviation of the EEM index (10.39%). However, we don't see the positive performance that we would like to see from an inverse. EEV simply has too much risk involved when it tanks that badly as the market turns back up.



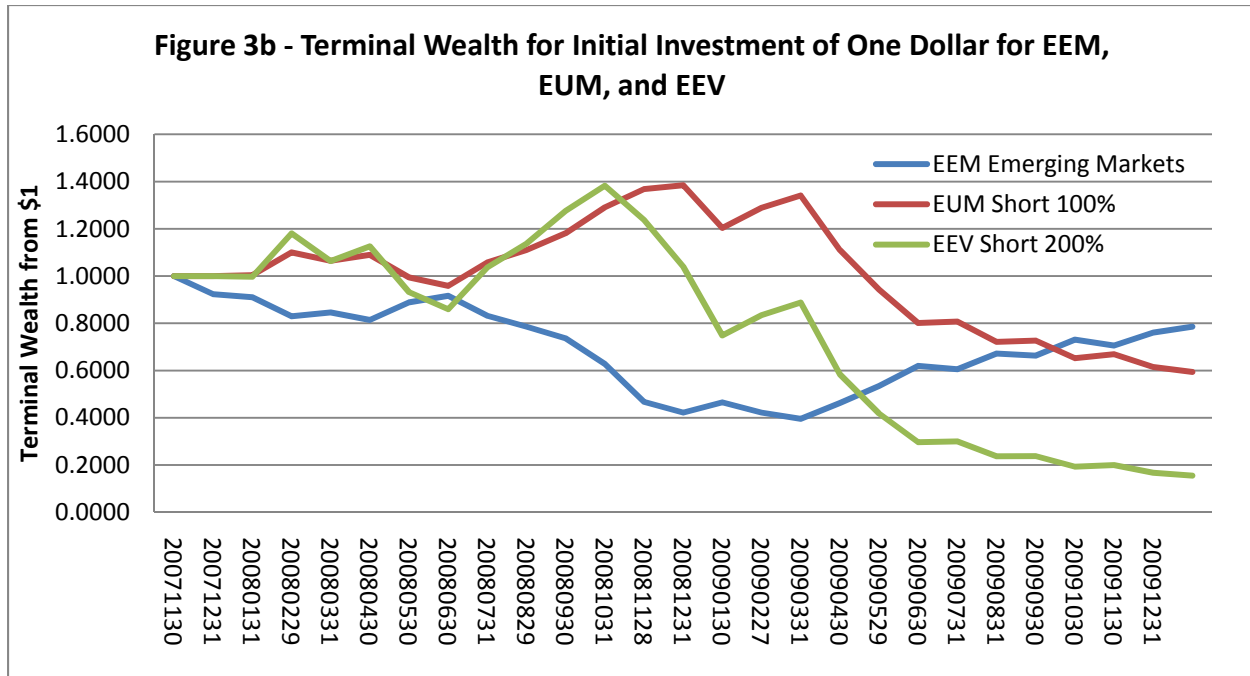


Table 3 – Performance Statistics	Annualized Return	Terminal Wealth	Standard Deviation	Semi-Deviation	Correlation Coefficient	R/SV Ratio
EEM Emerging Markets	-10.54%	0.7856	10.3864%	7.7439%	1.0000	-0.1354
EUM Short 100%	-21.38	0.5938	8.2793	7.1608	-0.9171	-0.2887
EEV Short 200%	-57.67	0.1553	15.5152	14.6584	-0.7381	-0.4773
50%-50% EEM-EUM	-16.12	0.7620	2.1618	2.3840		-0.6447

In Figures 4a and 4b and Table 4, the Oil and Gas Exploration (IEO) is interesting because we have a double leveraged long fund (DIG) and a double inverse (DUG). (The single inverse did not have enough data.) Again, DUG’s correlation to IEO is strong (-0.77) while DIG has a strong positive correlation with IEO (0.94). In Figure 4b, the double leveraged fund (DIG) never did keep up with the index (IEO) falling behind early in 2008. Once IEO started to go down, then DIG followed its double leveraged roots down to 34 cents on the dollar. DUG did provide a negative correlation to IEO but it never provided the positive return we would expect from an inverse in a down market and it too tanked to 43 cents on a dollar. The lesson seems to be to avoid the double leveraged (200%) funds for any appreciable time horizon.

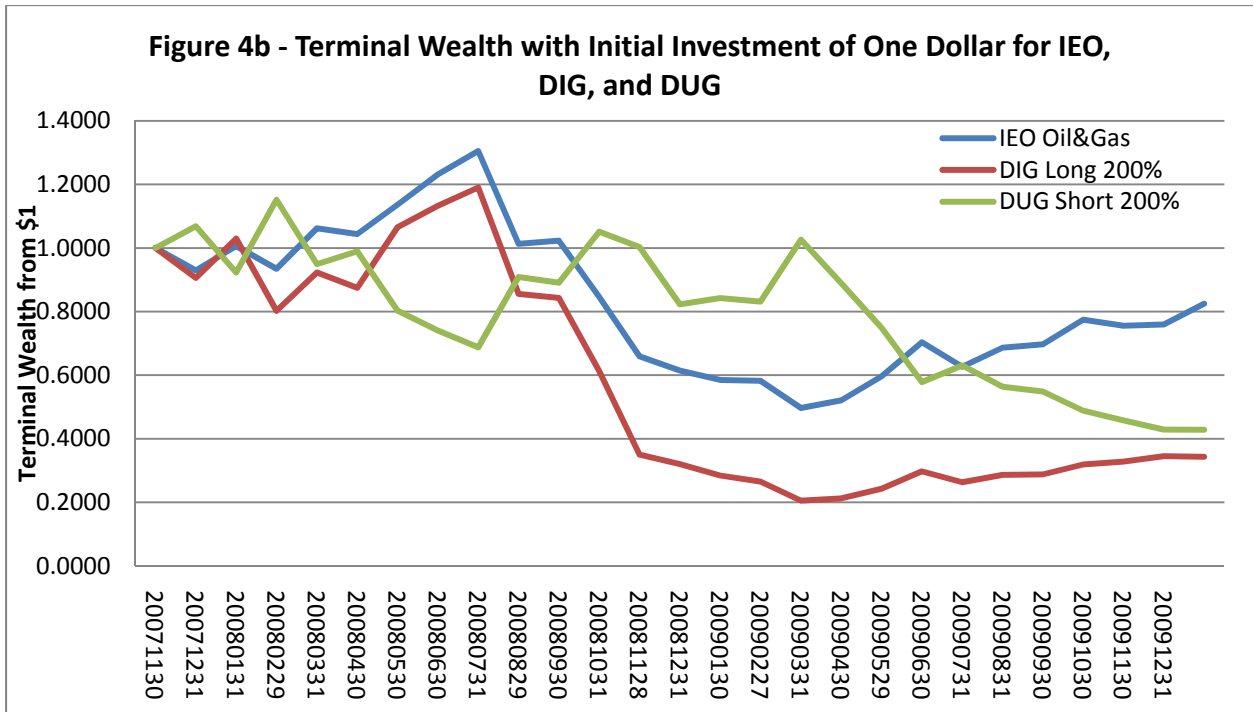
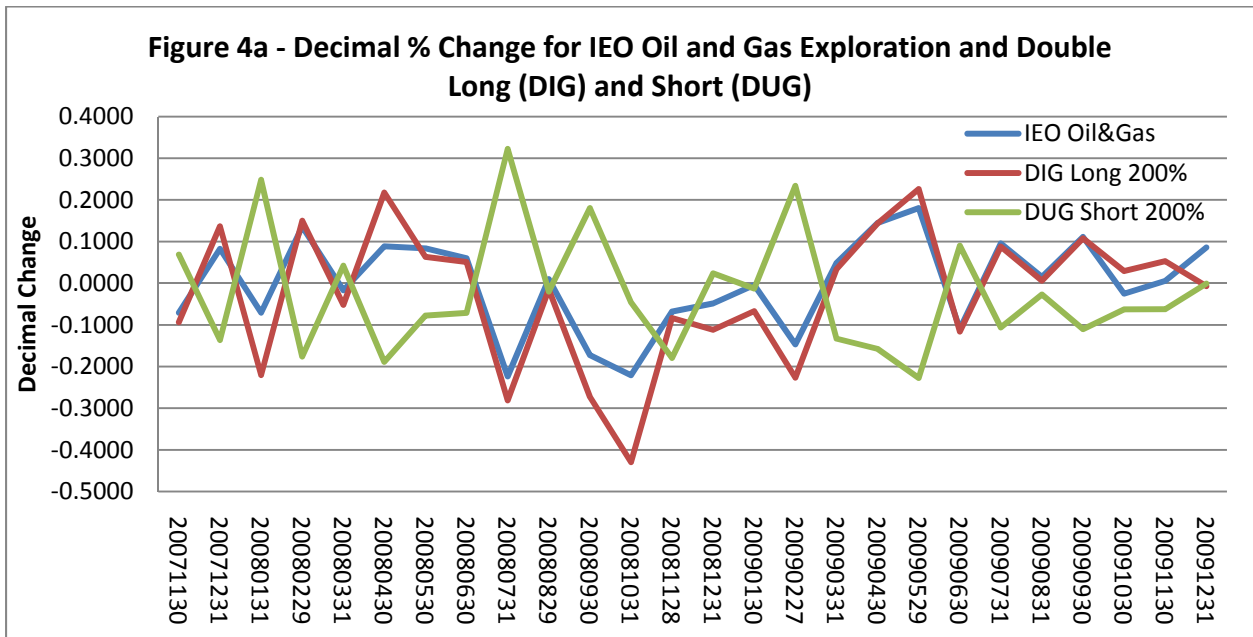
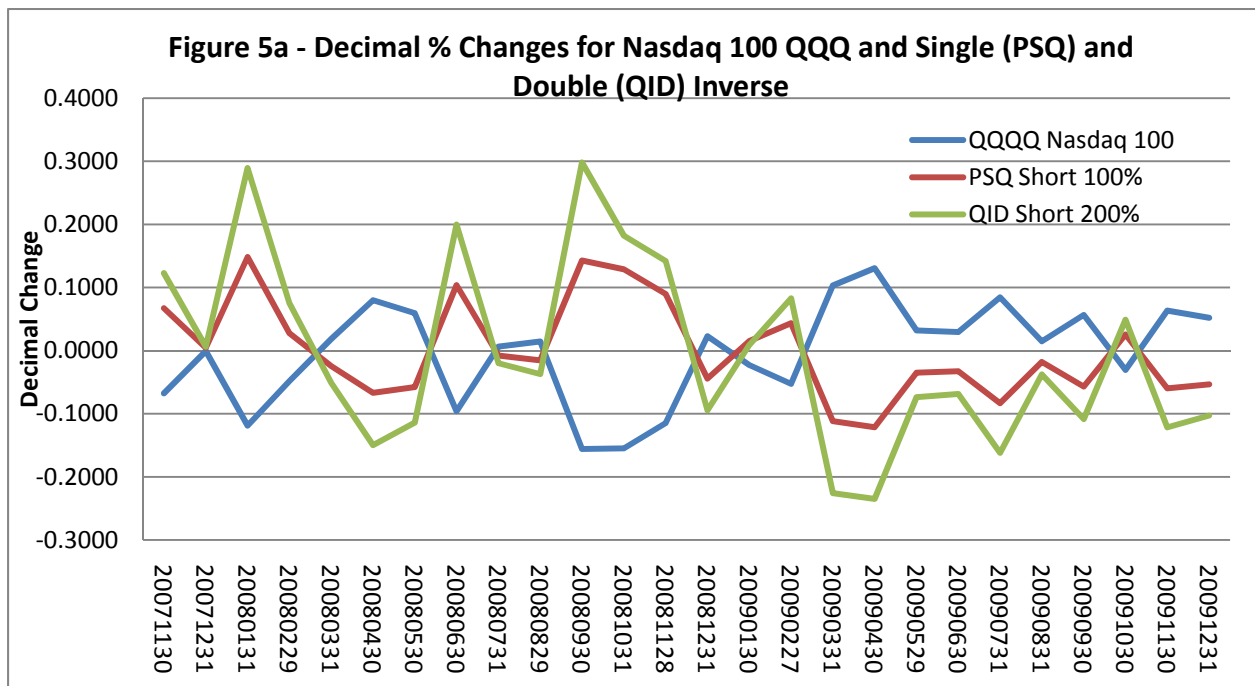


Table 4 – Performance Statistics	Annualized Return	Terminal Wealth	Standard Deviation	Semi-Deviation	Correlation Coefficient	R/SV Ratio
IEO Oil&Gas	-8.51%	0.8248	11.1140%	8.3664%	1.0000	-0.0981
DIG Long 200%	-38.96	0.3432	16.2619	13.7385	0.9439	-0.2994
DUG Short 200%	-32.37	0.4285	14.3186	10.0147	-0.7660	-0.3285
50%/50% IEO-DUG	-21.26	0.7129	4.6024	4.0828		-0.5034

In Figures 5a and 5b and Table 5, we see the results for the QQQ Nasdaq 100 Index. Again, we are looking at strong negative correlations (around -0.98) with its single (PSQ) and double (QID) inverses. Again, you have to market time the double inverse because as the market (QQQQ) recovers in 2009 to a final wealth of 83 cents on a dollar, the double inverse (QID) has crashed to a final wealth of 67 cents. The single inverse does a much better job finishing with a final wealth of 94 cents. This is much better than the index but it still doesn't represent an inverse positive return to the market index. So again, the inverses do not provide very good results over longer investment horizons.



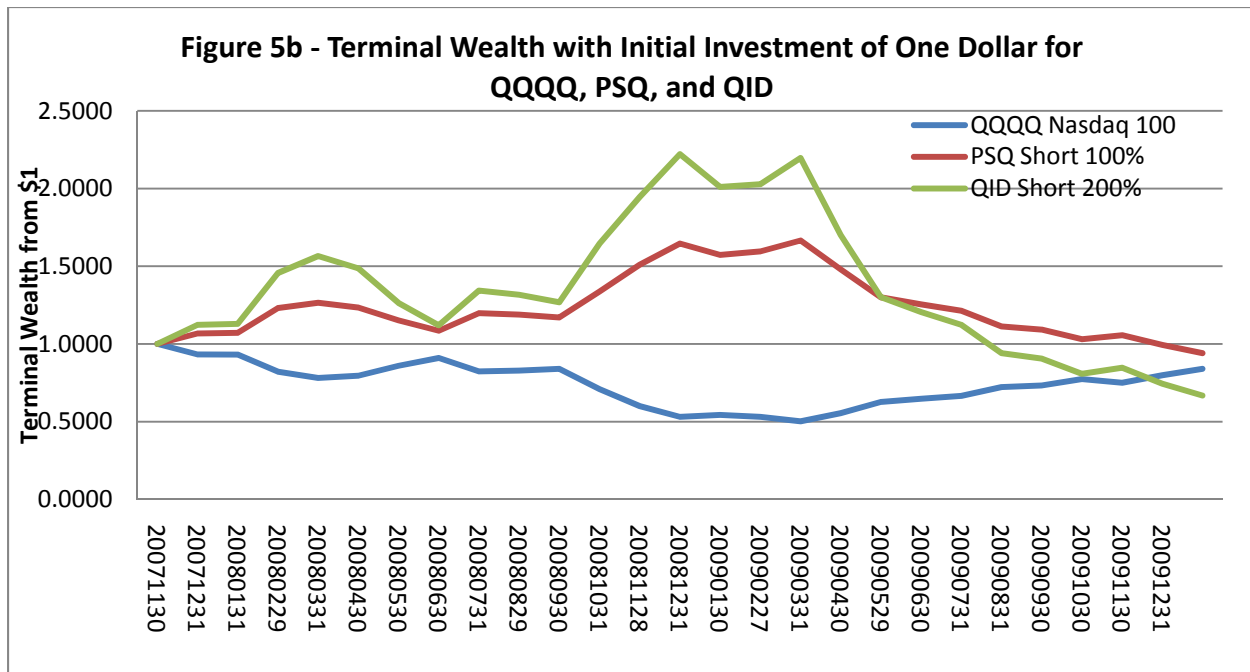


Table 5 – Performance Statistics	Annualized Return	Terminal Wealth	Standard Deviation	Semi-Deviation	Correlation Coefficient	R/SV Ratio
QQQQ Nasdaq 100	-7.74%	0.8300	7.8320%	6.1164%	1.0000	-0.1229
PSQ QQQ Short 100%	-2.80	0.9404	7.5631	4.7391	-0.9885	-0.0673
QID QQQ Short 200%	-17.02	0.6676	14.4903	9.4553	-0.9770	-0.1719
50%-50% QQQQ-PSQ	-5.29	0.9574	0.5978	0.5556		-0.9626

THE FINAL ANSWER

Given the results of our research in the fall of 2008, the students decided to avoid the double inverses (or any 200% fund for that matter). They finally decided on a 22% allocation to the single inverse EAFE index (EFZ) starting in November 2008 and holding the portfolio until early December 2009 (although we did drop our allocation in EFZ to 9% in May 2009). Instead of developed countries, we purchased long ETF positions in emerging countries such as Turkey, Israel, South Africa, Malaysia, and Singapore as we wanted to stay away from EAFE countries and an inverse position. We also had a 50% allocation in U.S. domestic sectors. In Figure 6 below, we see that our student fund (the Coleman ETF fund) denoted by the blue line provided the performance that would please Warren Buffet, i.e. outperform on the downside and try to keep up on the upside. The graph clearly shows that in a very volatile market, we were able to reduce our overall risk.

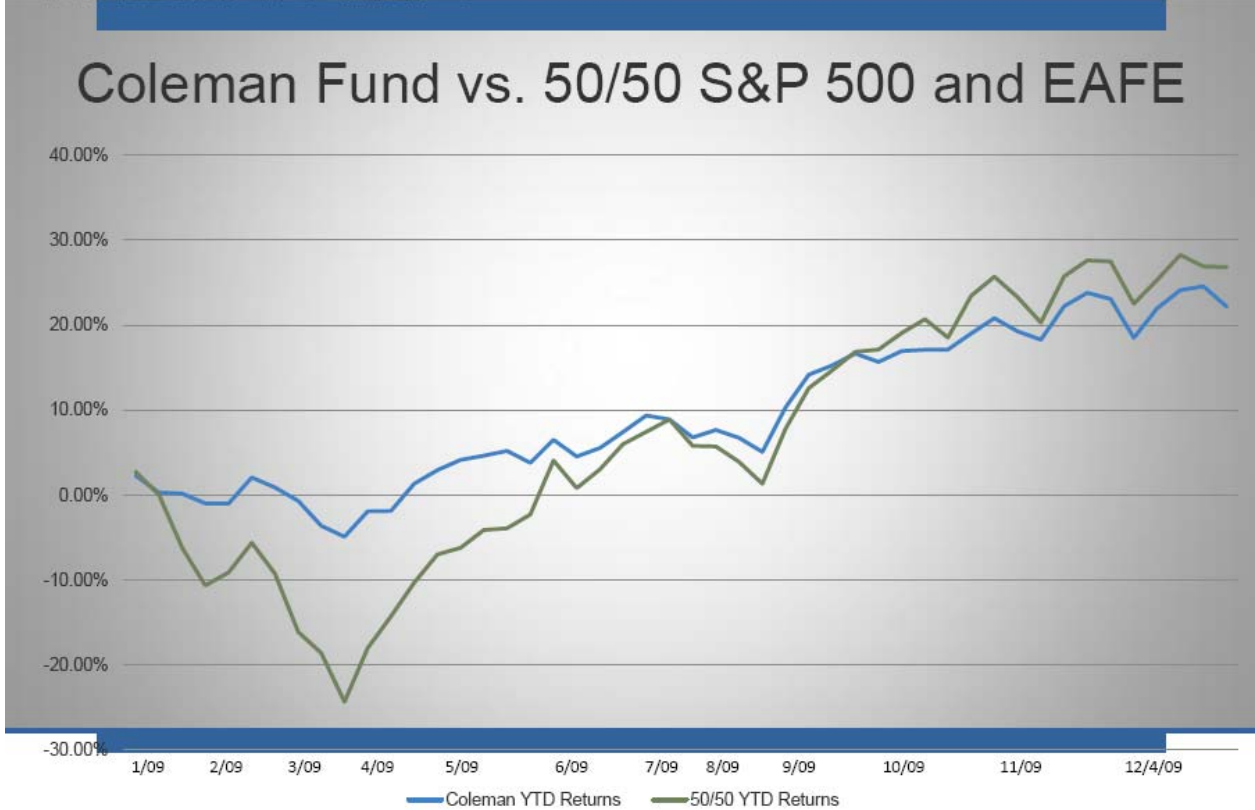


Figure 6 – Performance of Coleman fund with EFZ and a 50/50 allocation into EAFE and the S&P 500 (EFA and SPY).

The performance metrics are provided in the Table 6. The actual correlation using weekly returns between the single inverse (EFZ) and the EAFE (EFA) was -0.1533. Not that impressive, but still enough to provide important diversification. Looking at the statistics, the Coleman fund with the single inverse had lower returns than the Coleman without the inverse and the 50/50 benchmark of the EAFE and S&P but it also had lower risk statistics. The Coleman without the inverse had pretty good individual fund selection as it had a higher return and lower risk statistics than the benchmark 50/50. The single inverse itself (EFZ) seems to have been a disaster for the year with a -35% loss for the year. However, it is its diversification properties that save the day.

While the Coleman with the single inverse had a lower return than the two alternative portfolios, it had the lowest risk as measured by the standard deviation and downside risk measure (the semideviation). The final answer may be seen in the risk-return results. The Sharpe ratio (return per unit of standard deviation) is higher than the 50/50 benchmark. The reward to semivariance ratio (R/SV) is the return per unit of downside deviation (semideviation) and is more than twice as high as the 50/50 benchmark. While by itself, the single inverse for the EAFE is a pretty poor investment, it does a good job of diversifying the portfolio.

Coleman Fund Portfolio Metrics

Fund/Benchmark	Annualized Return	Standard Deviation	Semivariance	Reward to Variance	Reward to Semivariance
Coleman Fund	27.9%	1.8591%	1.0232%	.2347	.4624
Coleman Fund without the EFZ	35.63%	2.9554%	1.6542%	.1860	.3323
50/50 S&P 500 and EAFE Mix	31.06%	3.4929%	2.2965%	.1384	.2105
EFZ – Single Inverse EAFE	-35.1%	3.9357%	3.1327%	-.2200	-.2764

Table 6 – Performance Metrics for various strategies with and without the EAFE single inverse (EFZ) from December 2008 to December 2009.

CONCLUSION

The warnings about using these inverse and leveraged ETFs should be heeded. They are designed for very short-term hedging such as daily or weekly investment horizons. Both Trainor and Baryla (2008) and Cheng and Madhavan (2009) have demonstrated that these funds will severely underperform their core index over longer periods of time. As such, they have drawn some scrutiny for this reason from the SEC (Spence, 2010).

With our examples for five indices, we have shown the same results and recommend that any investor (including student managed funds) should avoid the double leveraged and double inverse funds. The inverses simply do not do a very good job at providing an inverse performance. However, this doesn't mean they are useless. One of the single inverses (EFZ) did a very good job of diversifying the risk for one of our student managed funds during 2009 even though as a single investment it was not very attractive. This is what Harry Markowitz meant almost 60 years ago when he talked about true diversification.

It should be pointed out that there are alternative methods of controlling downside risk including exchange traded notes (ETNs), futures contracts, and option contracts. Students can also build synthetic puts through limit orders such as trailing stop loss orders and OCO orders. This paper simply addresses one of the alternatives.

REFERENCES

Cheng, Minder and Ananth Madhavan, 2009. “The Dynamics of Leveraged and Inverse Exchange-Traded Funds,” Journal of Investment Management, 7, 4.

Trainor, Jr., William J. and Edward A. Baryla, Jr., 2008. “Leveraged ETFs: A Risky Double That Doesn’t Multiply by Two,” Journal of Financial Planning, 21, 5: 48-55.

Spence, John, 2010. “Leveraged ETFs Are Under SEC Scrutiny,” Wall Street Journal, (Online), April 12, 2010.