5-2016

Outperforming the S&P 500 Using Top-Down Asset Allocation

Benjamin Lanier
University of Arkansas, Fayetteville

Outperforming the S&P 500 Using Top-Down Asset Allocation

An honors thesis submitted in partial fulfillment of the requirement for the degree of Bachelor of Science in Business Administration, Finance

By

Benjamin Lanier

Advisor: Craig G. Rennie, Ph.D., ERP

May 2016

University of Arkansas

Summary:

This paper investigates whether portfolio managers can outperform the S&P 500 index through top-down asset allocation using historical returns, standard deviations, and correlations of different asset classes. Efficient diversification between asset classes reduces the idiosyncratic risk by selecting assets from a wide variety of different classes of assets in different parts of the world. Through this diversification the goal is to make it possible for a portfolio manager to generate higher expected returns, while taking risk equal to that of the S&P 500, or incur lower risk while generating the same expected return of the S&P 500.

I: Introduction

Motivation and Background:

A portfolio manager has two main goals when managing the money of the investors. One goal is to provide investors with the highest possible returns. The other is to protect the capital of the investors by taking on the least amount of risk possible to achieve these returns. To achieve these two goals, a portfolio manager tries to provide an investor with the highest possible risk adjusted returns at the investor's risk tolerance. The S&P 500 index was used as the benchmark for this study, because it includes 500 United States large cap stocks and is the most broadly used benchmark for portfolio performance. Isbitts (2014) said if a portfolio manager can consistently outperform the S&P 500 it is a major accomplishment, because the S&P 500 outperforms approximately 60% of mutual funds each year. Even more astounding than less than half of mutual funds outperforming the market in any given year, is the year to year performance. Bodie, Kane, & Marcus (2013) stated that the returns of mutual funds in a given year, except the top 10% of performers and bottom 10% of performers, are almost independent of earlier year returns. This means that a maximum of 10% of funds outperform the S&P 500 on a regular basis. This leads people to speculate whether having a portfolio manager manage your money is worthwhile, considering fees they have to pay to professional money managers.

Portfolio managers' inability to consistently outperform the market is important because if a portfolio manager could consistently outperform the market their investors could have more money. In addition to this it would give portfolio managers' jobs more validity and provide them with greater job security. The S&P 500 has averaged an annual return of approximately 6% for the past 20 years. If a portfolio manager could outperform that by just 1% per year that would make a huge difference in the long run. If an investor invested $100,000 with an annual return of 6% for 40 years they would retire with $1,028,572. If an investor could get an annual return of 7% on that same $100,000 they would retire with $1,497,446. That is almost a $500,000 difference in returns over a 40 year period from just a 1% increase in average annual return. If the portfolio manager outperforms the S&P by 2% annually the end amount is more than double the amount for a 6% annual return over 40 years. This example makes it easy to see how big an impact outperforming the market by a small amount can have. The power of compounding is a huge benefit for investors. With slightly better annual returns, an investor's long term realized gains can grow exponentially.

If a portfolio manager could consistently outperform the market on an annual basis by only 1-2%, this would make a huge difference in the amount an investor could gain over the long term. However, there is another aspect of a portfolio manager's job to consider. That is to protect the money of investors from major losses, and to do this one cannot take excessive risk.

The risk-return tradeoff is one of the most important things for a portfolio manager to consider. If you take on higher investment risk without diversification, massive variations in annual returns are more likely. The last thing a portfolio manager or investor wants is a substantial loss in any one calendar year, let alone multiple years. It can be seen from crashes in the U.S. stock market in 1987, 2000, and 2008 that major losses in a single year are a very real possibility, even in the most stable stock market in the world. This is why diversification is important in a portfolio. If diversification is properly used a portfolio manager can mitigate risk by utilizing asset classes with low correlations. This minimizes the chance of the massive fluctuations in returns from one year to the next mentioned above.

A portfolio manager needs to balance higher returns with protecting an investor's money. Top-down allocation in different asset classes is one way to accomplish this. By allocating portions of the portfolio to different asset classes, a portfolio should be able to achieve higher returns and minimize common sources of risk more effectively than by investing in only one asset class. This is why top-down asset allocation is an important topic to consider when deciding the allotment of holdings in a portfolio. The scope of assets that are at your disposal when taking this approach gives a portfolio manager the ability to diversify more effectively. This is because all assets in a certain asset class share common sources of risk. If a portfolio can find asset classes that do not share many common sources of risk, more risk can be taken in individual assets while maintaining a lower level of risk in the portfolio as a whole.

This paper examines the use of a top-down asset allocation approach to achieve higher returns while minimizing portfolio risk through diversification. It examines how correlation and covariance are historically related among different asset classes, and how a portfolio would theoretically perform using these metrics along with historical data of expected return and standard deviation. This approach is based on the statements above: if you want higher returns you must accept higher risk, and that portfolio risk falls with diversification (limited by common sources of risk). The goal is to use this information to allocate a portfolio more effectively to meet the goals of a portfolio manager, and provide more consistent returns for investors.

The research done in this thesis finds that the correlation and covariance between different asset classes has historically been almost zero or even negative in some cases. There are exceptions. In some bear markets, correlation among most asset classes approached 1. In normal market conditions, a combination of these assets in a portfolio creates effective diversification, but in a bear market this might not be the case. These low correlations in normal markets can be explained by a minimal number of common sources of risks among asset classes. Since this is the case, it is possible to invest in riskier asset classes and maintain a standard deviation of returns equal to or lower than the S&P 500 while having an expected return greater than that of the S&P 500. It is also possible to match the expected return of the S&P 500 with a standard deviation of returns lower than the S&P 500. It is only theoretical, because historical data is not a perfect predictor of future returns, and correlations change over time.

II: Literature Review

Markowitz (1970) discusses how assets should be allocated in a portfolio. He talks about how investors should seek broad diversification. This broad diversification is necessary, because both equities and corporate bonds involve idiosyncratic and systematic risk. Since they both are risky assets, the markets for both will fluctuate. An investor will always have systematic risk in their portfolio, but idiosyncratic risk can be reduced through effective diversification. If their portfolios are effectively diversified, investors should be able to ride out the bad as well as the good times. You cannot reduce the risk of a portfolio through assets that are highly correlated. If a portfolio contains hundreds of securities that rise and fall in unison they offer no more protection than one single security. A good portfolio is more than a list of good stocks and bonds. It is a balanced whole that provides the investor with a wide range of opportunities and protections.

Elton & Gruber (2009) discovered effective diversification can be illustrated using an efficient frontier. It includes risky assets and the expected return at the risk-free rate. The efficient frontier plots the risk-return relationship of a portfolio in terms of expected return and standard deviation. The expected return is represented by the y-axis and the standard deviation is represented by the x-axis. Investors that want higher returns will have to take on higher levels of risk to achieve those returns. Investors will want to be in the northwest portion of the efficient frontier. The northwest (or upper left) portion of the efficient frontier is where investors want to be, because it offers them higher returns with lower standard deviations. Diversification allows investors to get closer to the northwest portion of the efficient frontier. This is attributable to risky assets that have low correlations reducing overall portfolio risk.

Bodie, Kane, & Marcus (2013) discussed covariance and correlation that I used in the construction of my model. They said to construct the optimal portfolio from risky assets the investor needs to understand how the uncertainties of asset returns interact. A key determinant of the risk of the overall portfolio is the degree to which assets move in tandem or in opposition. Covariance allows investors to determine this. Correlation is the covariance divided by the product of the standard deviation for the return of each fund. Correlation ranges from -1 to +1. A correlation of +1 indicates two assets that move in perfect unison. A correlation of -1 indicates two assets that have returns that are perfectly inversely related. If there are two assets with a correlation of -1 in a portfolio with 50% weight in each, all idiosyncratic risk can be eliminated in the portfolio. This makes low correlations attractive to investors when allocating their portfolios. More detailed analysis shows that the performance of stocks follows the broad economy. In contrast, bonds have better performance in a mild recession. Since equities and fixed income investments perform better during different parts of the business cycle combining these in a portfolio creates effective diversification. Another difference in asset classes discussed is US compared to international investments. While US Equities have historically offered the highest risk-adjusted returns, there are still benefits to investing in international markets. Emerging markets have offered higher average returns, with a higher standard deviation in recent history. When added to a diversified portfolio, international countries with higher standard deviations can benefit the expected return and standard deviation of the overall portfolio.

III: Methodology

The first step in this study was to find the monthly historical data (July 1997 – December 2015) for each of the different asset classes and indexes using Yahoo Finance. This data was then translated from monthly to annual data using the geometric mean return for each 12 month period. After the annual data was calculated this data was used to calculate the standard deviation and expected return of each different asset. The next step was to generate a correlation matrix, variance matrix, and variance covariance matrix. These matrices were then used along with the standard deviation and expected return of each asset to optimize the portfolio. Using the solver add-in in excel this data was analyzed and the best asset allocation was calculated using different constraints. The goal of these calculations was to see which allocation would offer the greatest expected return with a standard deviation less than or equal to the S&P 500, or to see which allocation minimized standard deviation while offering a return greater than or equal to the S&P 500.

Table 1: Data Sample

I select the following sample with an emphasis on scope of asset classes from equities to fixed income, developed to emerging markets, small cap to large cap, short maturity to long maturity, etc. Specific reasons why I selected each asset in Table 1 are as follows: I selected the S&P 500, S&P 400, and Russell 2000 because I wanted a representative sample of all U.S. equities and this combination of large, mid, and small cap gives me that representation of all industries and sizes of firms. I chose the Nikkei 225 and the KOSPI because I wanted exposure to the two most developed economies in Asia. The Shanghai Composite and S&P BSE Sensex were chosen, because China and India are the two BRIC countries (Brazil, Russia, India, and China) perceived to have the best economic conditions going forward. These two countries had shown great growth potential in the past, and have potential with their large populations to do the same in the future. The DAX, FTSE 100, and SMI were chosen, because I wanted European securities to be included. Germany, England, and Switzerland are historically some of the best economies in Europe. The AS51 was included based off of Australia's contribution of natural resources to Asian economies, specifically China. WTI and AMZ were selected, because I wanted exposure to crude oil. Gold was chosen, because the precious metal offers something with intrinsic value and is viewed as a natural hedge. I included the VIX, because I wanted to include an asset class with a direct correlation to volatility of the US market. The VIX is also a natural hedge, because volatility increases when markets decline in value. US corporate high yield, intermediate, and long term bonds are included, because it offers the portfolio with a variety of US debt. Global high yield was selected, because I wanted exposure to fixed income outside the US to offer diversification of fixed incomes included in the sample. The US government bonds were included, because they offer the highest security and lowest standard deviation of any of the assets included. Finally, the REIT assets give exposure to US real estate to further diversify the portfolio. This sample has assets offers exposure across various asset classes and countries, and includes most of the major markets used by US investors.

Asset	Classification
1. S&P 500	U.S. Large Cap
2. S&P 400	U.S. Mid Cap
3. Russell 2000	U.S. Small Cap
4. Nikkei 225	Japanese Equities
5. Shanghai Composite	Chinese Equities
6. KOSPI	S. Korean Equities
7. S&P BSE Sensex	Indian Equities
8. DAX	German Equities
9. FTSE 100	English Equities
10. SMI	Swiss Equities
11. AS51	Australian Equities
12. WTI	Crude Oil
13. AMZ	MLPs
14. Gold	Gold
15. VIX	Volatility Index
16. Barclays US Corporate High Yield	High Yield Bonds
17. Barclays Capital Global High Yield Index	Global High Yield
18. Barclays US Government/Mortgage Bond Index	Govt. Mort. Bonds
19. Barclays US Government Intermediate Bond Index	Govt. IT. Bonds
20. Barclays US Government Long Bond Index	Govt. LT Bonds
21. Barclays US Short-term Corporate Bond Index	Corp. ST Bonds
22. Barclays US Long-term Corporate Bond Index	Corp. LT Bonds
23. REIT Equity	REIT Equity
24. REIT Mortgage	REIT Mortgage

IV: Analysis

Primary Case:

Table 2: Primary Case Allocation

Table 2 uses the historic data of each asset class July 1997-December 2015. Using expected returns, standard deviations, and correlations, the excel solver add-in is used to generate the data in Table 2. In this base case optimization model there are no constraints on the portfolio other than the sum of the assets has to equal 100% and only long positions can be taken. To generate the results at different risk levels a constraint was added to specify ERP level while minimizing the STDEV. Table 2 shows the standard deviation of the S&P 500 is approximately .17 and the expected annual return is 5.6%. If you use the optimized portfolio and take the same amount of risk (standard deviation) as the S&P 500 the expected annual return would be 11.2%, or double that of the S&P. With that said, 49.23% of the maximized ERP portfolio is allocated to REIT equity. This is a very high percentage and some investors may not be comfortable with this much exposure to a single asset class.

Benchmark: S&P 500	
ERP	0.056
STDEV	0.170

	Max ERP							Min STDEV
ERP	0.112	0.100	0.090	0.080	0.070	0.060	0.056	0.050
STDEV	0.17	0.11	0.07	0.05	0.03	0.02	0.02	0.02
	Weight							
S&P 500	-	-	-	-	-	-	-	-
S&P 400	-	0.38%	1.68%	18.08%	12.47%	7.53%	3.97%	-
Russell 2000	-	-	-	-	-	-	-	1.75%
Nikkei 225	-	-	-	-	2.82%	6.36%	7.95%	9.84%
Shanghai Comp.	10.85%	6.68%	2.78%	0.77%	0.22%	-	-	-
KOSPI	11.27%	10.35%	8.49%	5.00%	3.60%	1.87%	1.55%	0.63%
S&P BSE SENSEX	-	-	2.49%	0.10%	0.10%	-	0.10%	-
DAX	-	-	-	-	-	-	-	-
FTSE 100	-	-	-	-	-	-	-	-
SMI	-	-	-	-	-	-	-	-
AS51	-	-	-	-	-	-	-	-
WTI	18.05%	11.68%	5.95%	1.44%	1.05%	0.23%	0.67%	0.21%
MLP (AMZ)	-	-	-	-	-	-	-	-
Gold (USD)	-	-	0.55%	3.91%	2.46%	1.86%	0.62%	-
VIX	-	-	-	-	-	0.44%	0.35%	1.04%
High Yield	-	-	-	-	-	-	-	-
Glob High Yield	-	-	0.11%	0.16%	0.16%	-	0.17%	-
Gov Mort	-	-	-	21.93%	46.45%	67.46%	75.86%	86.53%
Treas IT	-	-	-	-	-	-	-	-
Treas LT	10.60%	41.41%	66.54%	48.62%	30.68%	14.26%	8.77%	-
Corp ST	-	-	-	-	-	-	-	-
Corp LT	-	-	-	-	-	-	-	-
REIT Eq	49.23%	29.50%	11.41%	-	-	-	-	-
REIT Mort	-	-	-	-	-	-	-	-
Sum	100%	100%	100%	100%	100%	100%	100%	100%

Figure 1: Primary Case Efficient Frontier

Figure 1 shows a graphical representation of the optimized portfolio's expected geometric return and standard deviation and compares that to the S&P 500. The expected return is graphed on the y-axis. The standard deviation is graphed on the x-axis. Data was taken from Table 2 and converted into an efficient frontier to make the optimized portfolio's outperformance more visible. The optimized portfolio is closer to the northwest corner of the graph, and it appears that it would be a better investment at any level of risk. Figure 2 shows the significance of this improved performance for a long-term investor. (The risk free rate is not included in Figure 1).

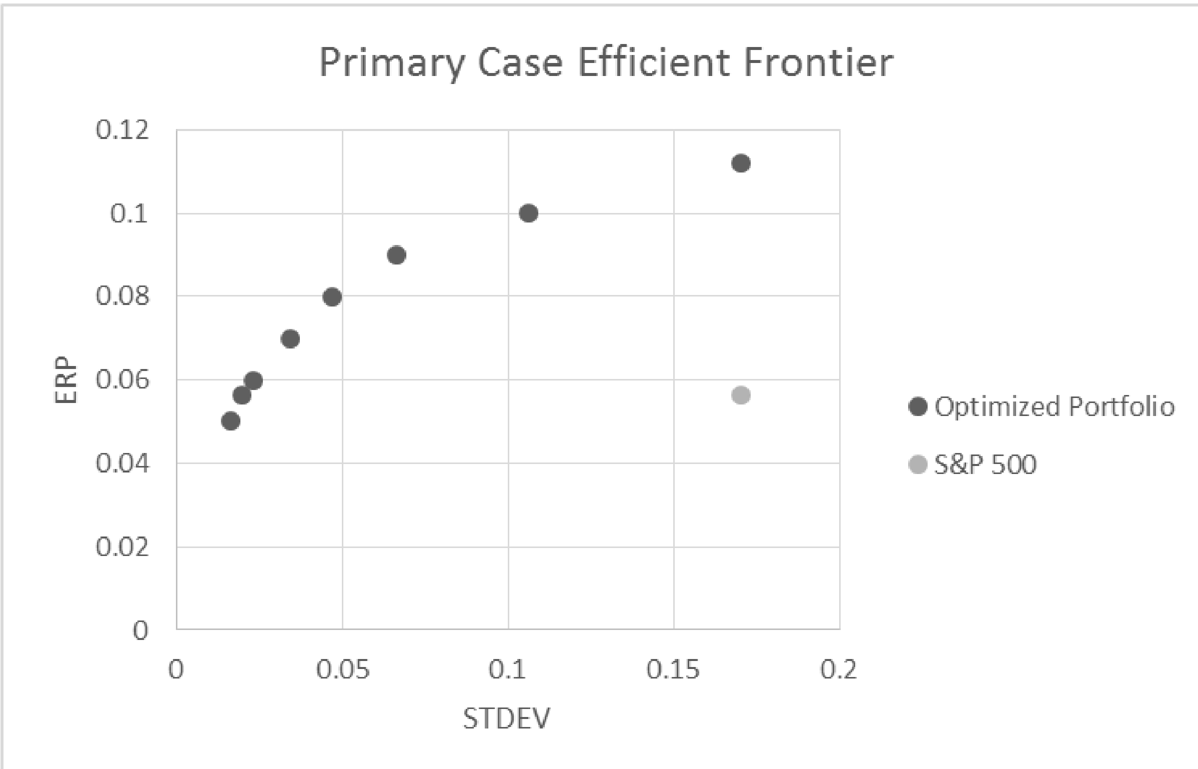

Figure 2: Primary Case Compound Returns

This table shows 40 years of compound returns of $100,000 invested the base case maximum ERP optimized portfolio (11.2%) and the S&P 500 (5.6%). To generate the line for the optimal portfolio the formula 100,000*(1.112)^40 was used, and broken down to annual values. To generate the line for the S&P 500 100,000*(1.056)^40 was used, and broken down to annual values. If these results could be achieved this would allow people to gain approximately seven times as much money. Once again this is only theoretical, because correlations between asset classes change. This is illustrated in the Table 3.

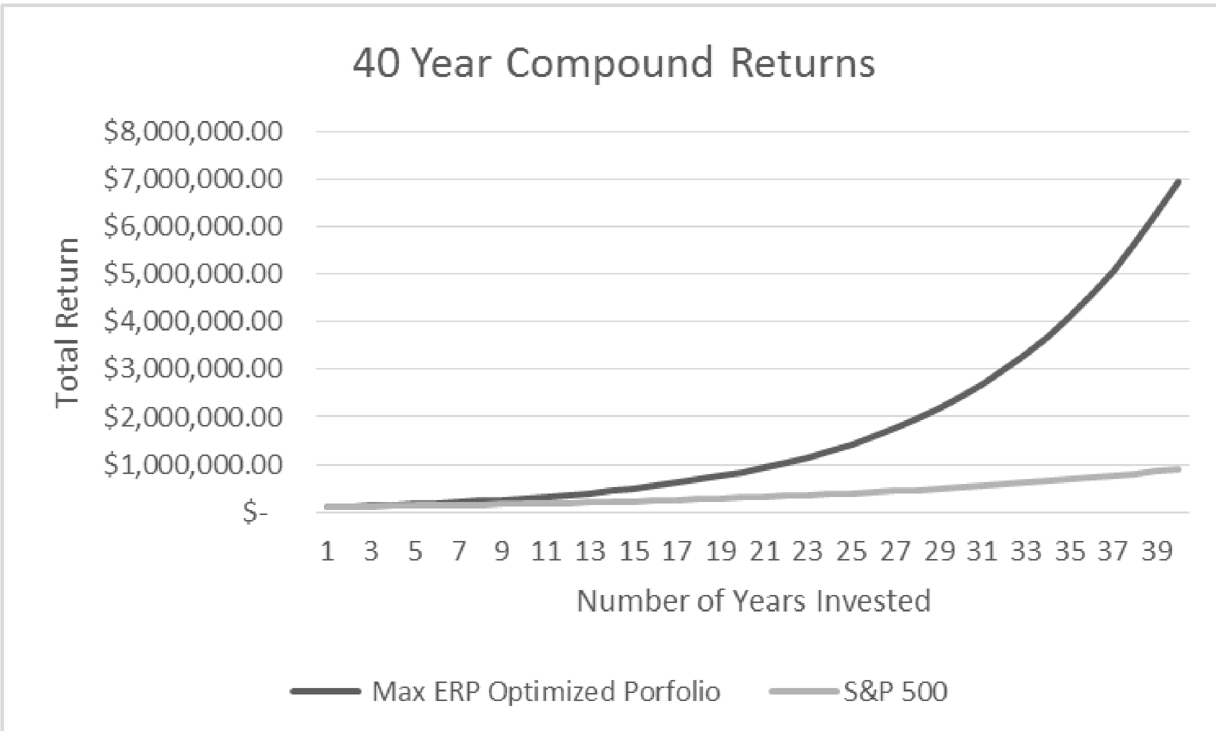

Table 3: Annual Base Case Max ERP

This table shows the geometric returns of the maximized ERP optimized portfolio and the S&P 500 for each year used to pull historic data. The weight of each asset class is multiplied by its actual return in each year and all asset classes are added together. Then the S&P 500's performance is subtracted from the optimized portfolio's performance in each year to find the annual difference between the two portfolios. You can see from the annual data in Table 3 that the maximum ERP optimized portfolio does outperform the S&P in most years. This should be a given, considering the annual return is projected to be twice as much as the S&P's. Even though this is the case, the S&P has outperformed the optimized portfolio three out of the last four years. This could mean the historical data will not hold true in the future, since correlation between asset classes is always changing. This could be because the portfolio is too concentrated in certain asset classes. With more constraints added to the solver, the portfolio could be allocated much differently. This will be analyzed in the secondary case.

Base Case Max ERP				
	Optimized Portfolio	S&P 500	Difference	Better Performer
2015	-4%	-1%	-3%	*S&P 500
2014	13%	12%	1%	Optimized Portfolio
2013	0%	28%	-29%	*S&P 500
2012	10%	13%	-4%	*S&P 500
2011	4%	-1%	4%	Optimized Portfolio
2010	18%	11%	7%	Optimized Portfolio
2009	38%	24%	14%	Optimized Portfolio
2008	-37%	-38%	1%	Optimized Portfolio
2007	16%	4%	13%	Optimized Portfolio
2006	30%	13%	18%	Optimized Portfolio
2005	17%	3%	14%	Optimized Portfolio
2004	21%	9%	12%	Optimized Portfolio
2003	23%	26%	-3%	S&P 500
2002	12%	-23%	35%	Optimized Portfolio
2001	4%	-13%	17%	Optimized Portfolio
2000	17%	-10%	27%	Optimized Portfolio
1999	26%	20%	7%	Optimized Portfolio

**Recent outperformance by the S&P 500*

Secondary Case: Constrained

Table 4: Secondary Case Allocation

Table 4 uses the historic data of each asset class July 1997-December 2015. Using expected returns, standard deviations, and correlations, the excel solver add-in is used to generate the data in Table 4. In the secondary case optimization model the original constraints still apply (the sum of the assets has to equal 100% and only long positions can be taken). In addition to these there is one added constraint that no one asset class can make up more than 15% of the portfolio. This constraint is used to further diversify the portfolio. The ERP of the optimized portfolio is still well above that of the S&P 500 at the same risk level. It is not quite as high as the base case, but the assets are not as concentrated in just one or two asset classes. Looking at Table 4 this is especially evident in the Max ERP case. When there was no constraint on the amount of the portfolio that could be concentrated in one asset, there was 49% of the portfolio in REIT equity. Now there is much more balance among different asset classes that are included in the portfolio.

Benchmark S&P 500	
ERP	0.056
STDEV	0.17

	Max ERP							Min STDEV
ERP	0.109	0.105	0.100	0.090	0.080	0.070	0.060	0.052
STDEV	0.17	0.14	0.12	0.09	0.06	0.04	0.03	0.03
	Weight							
S&P 500	-	-	-	-	-	-	-	-
S&P 400	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	8.21%	-
Russell 2000	-	0.00%	-	-	-	-	-	2.34%
Nikkei 225	-	-	-	-	-	-	6.60%	8.16%
Shanghai Comp.	11.86%	10.03%	8.05%	4.41%	2.54%	0.73%	-	-
KOSPI	12.82%	10.96%	9.61%	6.10%	4.86%	3.99%	2.79%	2.27%
S&P BSE SENSEX	13.95%	3.79%	-	-	-	-	-	-
DAX	-	-	-	-	-	-	0.15%	-
FTSE 100	-	-	-	-	-	-	-	-
SMI	-	-	-	-	-	-	-	2.59%
AS51	-	-	-	-	-	-	-	0.07%
WTI	15.00%	15.00%	10.74%	4.39%	2.30%	0.66%	0.50%	0.58%
MLP (AMZ)	-	-	-	-	-	-	-	-
Gold (USD)	4.23%	15.00%	15.00%	15.00%	11.42%	6.27%	3.29%	0.28%
VIX	-	-	-	-	-	1.59%	3.87%	5.64%
High Yield	-	-	-	-	-	-	-	8.93%
Glob High Yield	-	-	-	-	-	-	-	-
Gov Mort	-	-	-	13.01%	15.00%	15.00%	15.00%	15.00%
Treas IT	-	-	-	-	15.00%	15.00%	15.00%	15.00%
Treas LT	12.14%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
Corp ST	-	-	-	-	-	12.37%	15.00%	15.00%
Corp LT	-	0.23%	11.60%	15.00%	15.00%	14.39%	14.59%	9.13%
REIT Eq	15.00%	15.00%	15.00%	12.09%	3.88%	-	-	-
REIT Mort	-	-	-	-	-	-	-	-
Sum	100%	100%	100%	100%	100%	100%	100%	100%

Figure 3: Secondary Case Efficient Frontier

Figure 3 shows a graphical representation of the optimized portfolio's expected geometric return and standard deviation and compares that to the S&P 500. The expected return is graphed on the y-axis. The standard deviation is graphed on the x-axis. Data was taken from Table 4 and converted into an efficient frontier to make the optimized portfolio's outperformance more visible. Once again, the optimized portfolio is closer to the northwest corner of the graph, and it appears that it would be a better investment at any level of risk. (The risk free rate is not included in Figure 3).

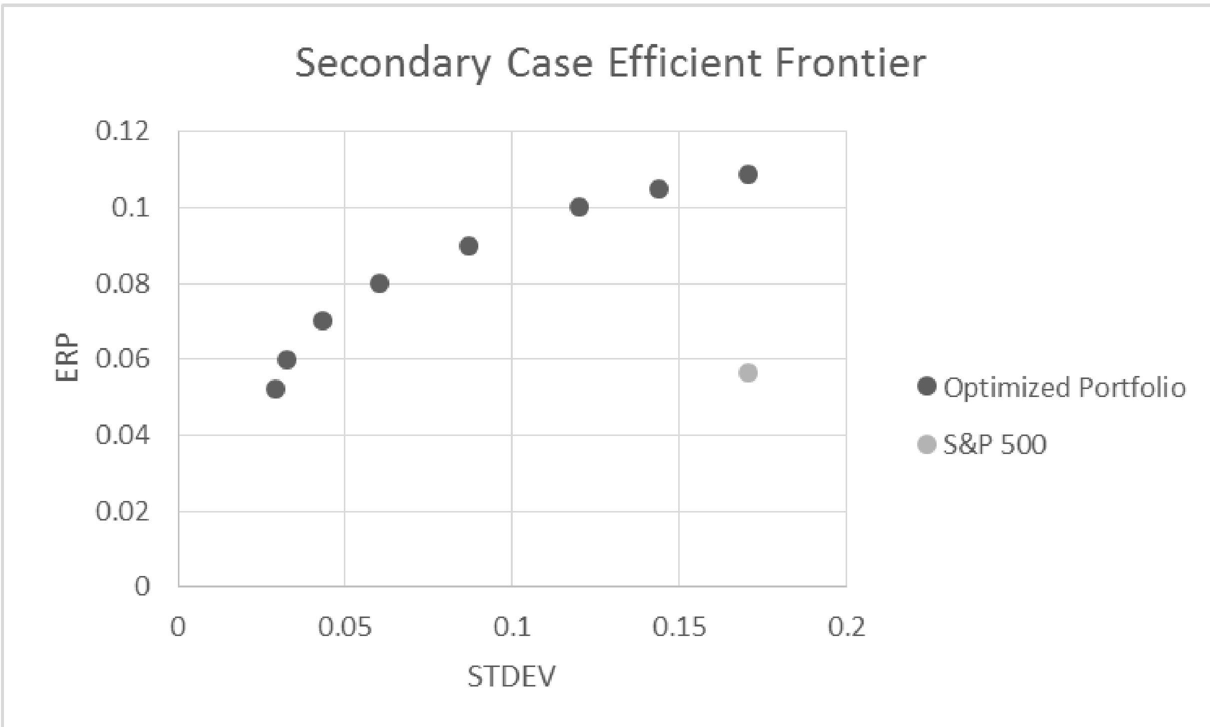

Figure 4: Secondary Case Compound Returns

This table shows 40 years of compound returns of $100,000 invested the secondary case maximum ERP optimized portfolio (10.9%) and the S&P 500 (5.6%). To generate the line for the optimal portfolio the formula 100,000*(1.109)^40 was used, and broken down to annual values. To generate the line for the S&P 500 100,000*(1.056)^40 was used, and broken down to annual values. In the secondary case, with more diversification, there is still a massive difference in the amount invested after 40 years between the two portfolios. Although this is the case, the same evidence of changing correlations and returns of asset classes can be observed Table 5.

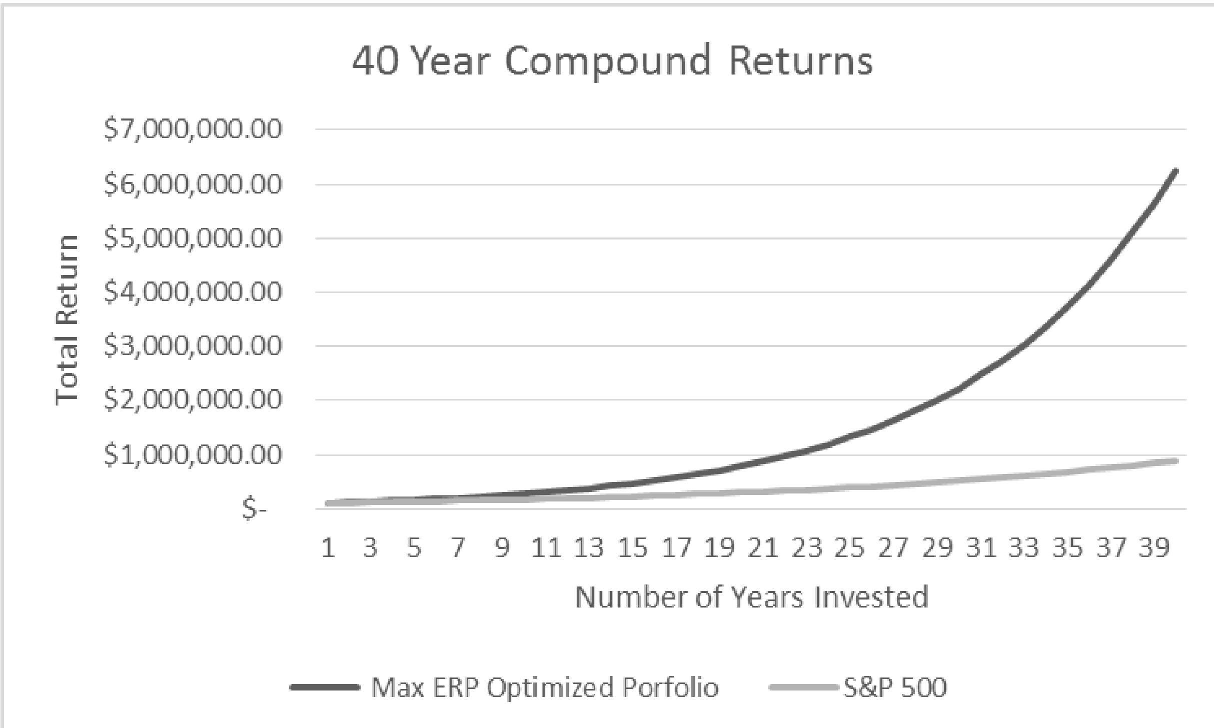

Table 5: Annual Secondary Case Max ERP

This table shows the geometric returns of the secondary maximized ERP optimized portfolio and the S&P 500 for each year used to pull historic data. The weight of each asset class is multiplied by its actual return in each year and all asset classes are added together. Then the S&P 500's performance is subtracted from the optimized portfolio's performance in each year to find the annual difference between the two portfolios. Even though the secondary portfolio is allocated into more asset classes than in the primary case, it outperforms the S&P in fewer years than the primary case. The optimized portfolio also still underperformed the S&P in recent years. This time the S&P has outperformed the optimized portfolio for the past five years. This is consistent with the observation in the base case that the historical data may not hold true in the future. If this is the case and the historical data used does not correlate with the data going forward, there is no validity to the solver output of a portfolio with a higher ERP and an equal STDEV as the S&P 500.

Secondary Case Max ERP				
	Optimized Portfolio	S&P 500	Difference	Better Performer
2015	-6%	-1%	-5%	*S&P 500
2014	11%	12%	-1%	*S&P 500
2013	3%	28%	-26%	*S&P 500
2012	9%	13%	-4%	*S&P 500
2011	-3%	-1%	-2%	*S&P 500
2010	15%	11%	5%	Optimized Portfolio
2009	44%	24%	19%	Optimized Portfolio
2008	-36%	-38%	2%	Optimized Portfolio
2007	31%	4%	27%	Optimized Portfolio
2006	28%	13%	15%	Optimized Portfolio
2005	22%	3%	19%	Optimized Portfolio
2004	13%	9%	4%	Optimized Portfolio
2003	26%	26%	-1%	S&P 500
2002	7%	-23%	31%	Optimized Portfolio
2001	-3%	-13%	10%	Optimized Portfolio
2000	5%	-10%	16%	Optimized Portfolio
1999	34%	20%	15%	Optimized Portfolio

**: Recent outperformance by the S&P 500*

Table 6: Annual Secondary Case .08 ERP

Table 6 shows the geometric returns of the secondary .08 ERP optimized portfolio and the S&P 500 for each year used to pull historic data. The weight of each asset class is multiplied by its actual return in each year and all asset classes are added together. Then the S&P 500's performance is subtracted from the optimized portfolio's performance in each year to find the annual difference between the two portfolios. Even with a higher ERP and substantially lower STDEV, in the last four years the S&P has outperformed the optimization model. In addition to that, with the portfolio optimized at .08 ERP the optimized portfolio has been outperformed by the S&P 500 over half the time. The average difference is greater in the years when the optimized portfolio performs better, but the historic data looks to be less accurate at predicting more recent years yet again. Even though the model predicts you can have an ERP of .08 with an STDEV of only .06, the most recent data suggests this might not be a viable prediction going forward.

Secondary Case .08 ERP				
	Optimized Portfolio	S&P 500	Difference	Better Performer
2015	-2%	-1%	-1%	*S&P 500
2014	9%	12%	-2%	*S&P 500
2013	-2%	28%	-30%	*S&P 500
2012	7%	13%	-6%	*S&P 500
2011	8%	-1%	8%	Optimized Portfolio
2010	13%	11%	2%	Optimized Portfolio
2009	16%	24%	-8%	S&P 500
2008	-7%	-38%	31%	Optimized Portfolio
2007	12%	4%	8%	Optimized Portfolio
2006	10%	13%	-3%	S&P 500
2005	9%	3%	6%	Optimized Portfolio
2004	8%	9%	-1%	S&P 500
2003	13%	26%	-14%	S&P 500
2002	7%	-23%	30%	Optimized Portfolio
2001	4%	-13%	17%	Optimized Portfolio
2000	8%	-10%	18%	Optimized Portfolio
1999	6%	20%	-14%	S&P 500

**: Recent outperformance by the S&P 500*

V: Conclusion

The optimized portfolio outputs suggest that outperforming the S&P 500 using top down asset allocation is possible. One case provides an allocation that would double an investor's returns on annual basis, while maintaining the same standard deviation of the S&P 500. Another offers a portfolio that has the same annual return as the S&P, but with .02 STDEV instead of .17 STDEV. Although this is the case, there is enough evidence in Table 3, Table 5, and Table 6 to be skeptical whether or not these portfolios offer an accurate expected return and standard deviation. The S&P 500's outperformance of the optimized portfolio in recent years makes a strong case for changes in correlations, standard deviations, expected returns, or any combination of the three.

If the optimized portfolio's return and standard deviation did hold true, using this model for top-down asset allocation would be a major benefit to portfolio managers and investors. Portfolio managers could outperform the market in the majority of years, and investors could gain substantially more money. The 40-year compounding chart exemplifies this perfectly. If the 11.2% annual return of the optimized portfolio held true, after 40 years investors would retire with approximately seven times more money than if they had invested in the S&P 500. This would improve the quality of life of investors, and that is why this is such an important topic. At the end of the day, the point of obtaining the best risk adjusted returns for a client is to give them more financial stability in the future.

Even if the returns do not hold true the analysis still provides a strong case that diversification is a crucial factor of any portfolio. That makes this an important topic to do more research on. There are variables that I did not account for in my study that could be included in a future study. One of these would be looking at the differences in correlation in bull, bear, and normal markets. Markets act differently in times of turmoil, and being able to weather the storm in the best possible way is important for investors. In addition to this, the changing correlations that make this analysis less viable could be more efficiently pinpointed. There could be 20 year, 10 year, and 5 year correlation tables. These tables could then be weighted to provide a more relevant current correlation. If these variables are examined and altered the analysis could be more relevant to the current correlations, standard deviations, and expected returns of asset classes included in the study. This could provide portfolio managers and investors with a top-down allocation that would outperform the S&P 500 in the future.

Works Cited

Isbitts, R. (2014, August 1). 'Index funds beat active 90% of the time.' Really? Retrieved April 1, 2016, from http://www.marketwatch.com/story/index-funds-beat-active-90-of-the-time-really-2014-08-01

Bodie, Z., Kane, A., & Marcus, A. J. (1998). *Essentials of Investments*. Boston, MA: Irwin/McGraw Hill.

Markowitz, H. M. (1970). *Portfolio Selection: Efficient Diversification of Investments*.

Elton, E. J., & Gruber, M. J. (1995). *Modern Portfolio Theory and Investment Analysis*. New York: Wiley.

^GSPC Historical Prices | S&P 500 Stock - Yahoo! Finance. (n.d.). Retrieved April 1, 2016, from https://finance.yahoo.com/q/hp?s=^GSPC Historical Prices