

## Improving Stock Portfolio Returns Through Asset Allocation Analysis

*This article analyzes the returns of stock portfolios with different asset class allocations and finds that an investor can obtain significantly better expected returns than the S&P 500 coupled with slightly increased risk. Investors who can tolerate tracking error to the S&P 500 can achieve this better risk/reward ratio.*

**Abstract:** This paper analyzes portfolios constructed of different proportions of four US stock asset classes and examines their behavior from 1927 through 2003. The stock asset classes considered are: US large-company capitalization-weighted (S&P 500), US large-company value, US small-company capitalization-weighted, and US small-company value. We find that an equal weighting of these asset classes rebalanced annually has provided an annualized return of 12.92% per year compared to 10.41% per year for the S&P 500.

### Understanding the Research

The data for this research was provided by Dimensional Fund Advisors (DFA). DFA is a major provider of passively managed stock and bond funds including the asset classes we study in this paper. Because these funds are passively managed according to simple size and value rules, accurate simulated performance of the funds before their inception can be developed by applying the size and value rules to historical stock market data. For this study, we use the longest running available data which is composed of actual fund data to the respective fund's inception, and simulated fund performance from that point back to 1927\*.

As a starting point for this analysis, we use DFA's "equity strategy" which includes these funds as a part of a sample diversified stock portfolio. The asset classes we study here compose 60% of this broadly diversified equity strategy. The remaining 40% is allocated with:

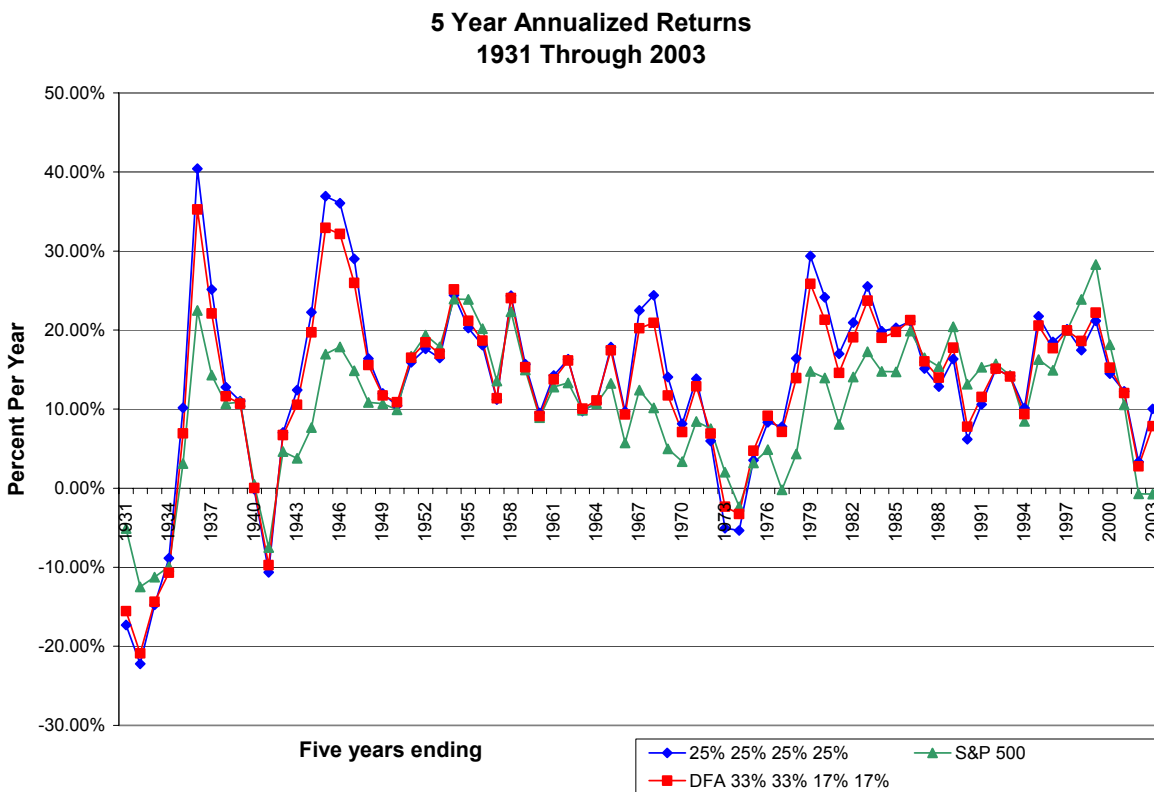
- 10% real estate investment trusts
- 10% foreign large-company value
- 5% foreign small-company capitalization-weighted
- 5% foreign small-company value
- 4% emerging-markets large-company
- 3% emerging-markets value-company
- 3% emerging-markets small-company

In essence, we analyze the best way to divide and allocate the domestic stock portion (which is 60% of the global stock portfolio). The remaining 40% of equity asset classes are not included in this study because there is no reliable data available going back that far in time. A diversified portfolio will also have cash and bond holdings in addition to the equity holdings discussed here.

## Five-Year Returns

Figure 1 shows the five-year annualized returns of three different portfolios. The blue trace (also marked with diamonds) is an equal weighting of the four asset classes. It is designated on the chart as 25% 25% 25% 25%. This is because it is 25% US large-company capitalization-weighted (S&P 500), 25% US large-company value, 25% US small-company capitalization-weighted, and 25% US small-company value. The green trace (marked with triangles) is 100% S&P 500, and the red trace (marked with squares) is DFA's sample equity strategy weighting of 33%, 33%, 17%, and 17% (hereafter referred to as 33-33-17-17). Since our data starts at 1927, the first point with five-years of data that we can plot on the graph is 1931. This first period includes the Great Depression, which began with the 1929 stock market crash. The worst annualized five-years for the stock market on our chart shows up at 1932.

One thing we can see from this graph is that there is a lot of variability in five-year annualized returns. We can also see that the diversified strategies are better than the S&P 500 during *most* of the five-year periods.

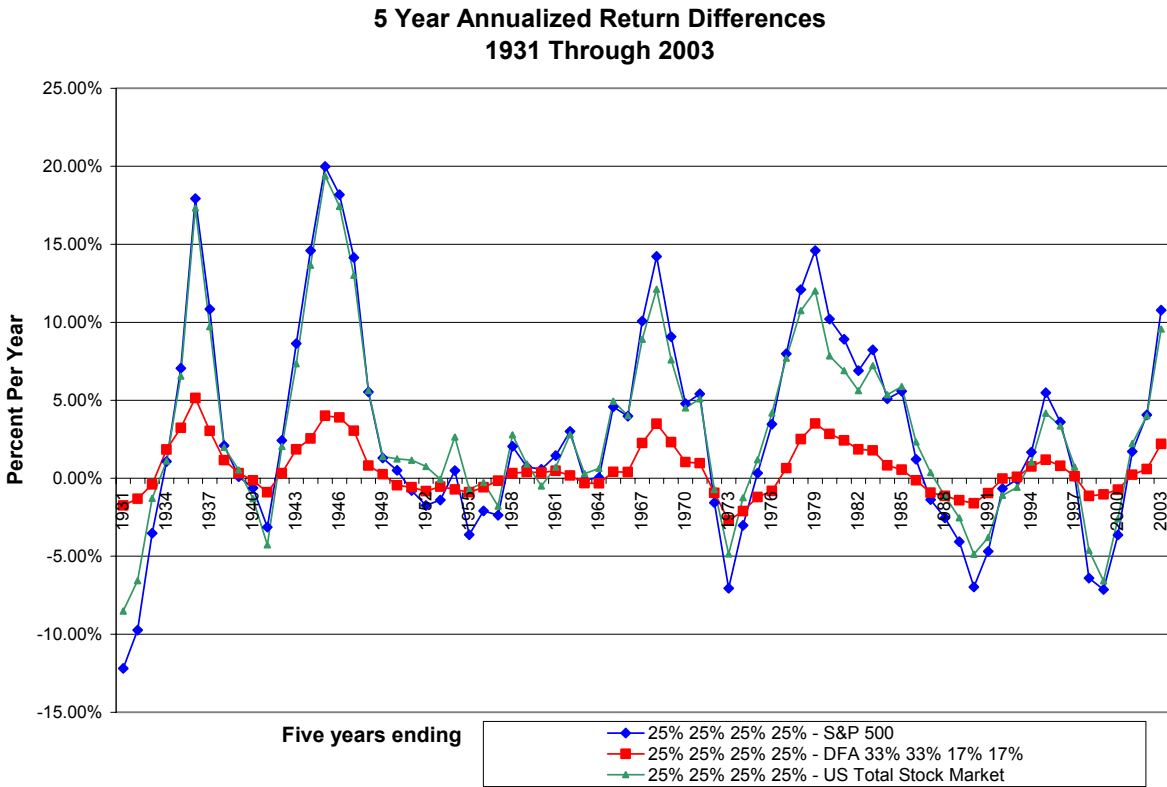


**Figure 1**

In Figure 2 we look just at the differences between the traces. The blue trace (marked with diamonds) is the *difference* between the 25% 25% 25% 25% (equally balanced) strategy and the S&P 500 and the red trace (marked with squares) is the difference between the equally balanced strategy and the 33-33-17-17 strategy. A green trace (marked with triangles) has been added and represents the difference between the equally balanced strategy and the US total stock market (CRSP 1-10).

In Figure 2, it is much easier to see that the equally balanced strategy has outperformed the S&P 500 and the US total stock market by a significant margin over a significant majority five-year periods. It has also

outperformed the 33-33-17-17 strategy over a majority of five-year periods and has provided 0.5% per year better annualized portfolio return.



**Figure 2**

While the equally balanced strategy has provided an annualized return that is 2.5% per year more than the S&P 500 strategy since 1927 (10.41% versus 12.92% annualized return), it has done so with more risk. The annual standard deviation (a measure of volatility) of the equally balanced strategy has been 28.7% per year compared to 20.6% for the S&P 500 strategy and 26.5% for the 33-33-17-17 strategy.

If we could predict in advance which time periods the S&P 500 strategy would excel and which it wouldn't, we would of course adjust our investment portfolios accordingly in advance. Unfortunately, all of the best studies on this conclude that there is no reliable way to predict in advance when to overweight or underweight a particular asset class.

Another consideration is *tracking error*. Tracking error is the difference in performance between an investment strategy and a widely followed benchmark such as the S&P 500. Although the equally balanced strategy has performed far better over time, there were a significant number of five-year time periods when the performance of the S&P 500 was superior. If an investor had abandoned the equally balanced strategy during one of those times, he or she would have missed out on the rebound that has always followed. In the future, we expect the equally balanced strategy to under-perform during some time periods just as it has in the past. This periodic under-performance is expected and will not be a rational reason to abandon a strategy based on long-term performance data.

Because the 33-33-17-17 strategy is closer to the S&P 500 than the equally balanced strategy, it will have less tracking error. If an investor is sensitive to tracking error, then he or she may be better off investing in that weighting, even with it's 0.5% per year lower long-run expected annualized return.

## Other Asset Allocations

Other asset allocation percentages were studied but omitted from this report for brevity. None of the alternate asset allocations provided a significantly better risk/return option than the equally balanced strategy or the 33-33-17-17 strategy.

For any specific time period in the past an exact optimum mix can be found which would have provided the best return for a given level of risk. Unfortunately, the ideal mix is different for different time periods and we don't know in advance what that ideal mix will be for the future. Finding a pattern in past data that applies only to a period of time and isn't repeatable is *called mining the data*. Accusing an academic of mining the data is considered a serious insult. If we attempt to select the optimum future portfolio with any greater precision than discussed here, we would be guilty.

What is nice about either the equally balanced strategy or the 33-33-17-17 strategy is that they each have a significant portion of the four major US equity classes. Whichever does best in the future, we will have a significant piece of it. Of course we will also have a piece of the worst, but that's the double-edged reality of diversification.

## Equally Balanced With Cash Portfolio

We have determined that the equally balanced strategy has provided better returns than the total US stock market, but at greater risk. Is the greater reward enough to justify the increased risk? One way to study this issue is to compare a US total stock market strategy with an equally balanced strategy that is mixed with cash to reduce its volatility. We find that from 1927 through 2003, a 30% 1 month T-bill (cash) and 70% equally balanced strategy has had a greater annualized return (10.95% versus 10.09%) than a 100% US total stock market strategy along with lower risk (20% versus 20.6% standard deviation). This indicates that the increased return is more than enough to justify the greater risk.

## Conclusions

Over the time period of 1927 through 2003 we found that an equal portfolio weighting of US large-company stocks, US large-company value stocks, US small-company stocks, and US small-company value stocks has provided an annualized return of 12.92% per year compared to 10.41% per year for the S&P 500 and 12.46% for the 33-33-17-17 strategy.

We found that the equally balanced strategy has outperformed the S&P 500 and the US total stock market by a significant margin over a significant majority of five-year periods, and that it has also outperformed the 33-33-17-17 strategy over a majority of five-year periods.

The return improvement for the equally balanced strategy more than compensates for the amount of increased risk. The approach is only appropriate for investors who can tolerate "tracking error" to major market indexes such as the S&P 500.

*Cypress Asset Management provides clients with intelligent investment portfolio construction and management on a fee-only (no commission) basis through DFA and other investment vehicles at less than half the cost of the average investment advisor.*

\* More information on Dimensional Fund Advisors can be found at their web site [www.dfaus.com](http://www.dfaus.com).

## **Appendix A – Why a Capitalization-weighted Index is Like a Growth Index**

Although we don't specifically discuss growth-company stocks in our study, the capitalization-weighted mutual funds are primarily growth-weighted stock funds. In order to understand this, we will first examine the construction and composition of a capitalization-weighted index such as the S&P 500.

In a capitalization-weighted index, the individual company weightings in the index are determined by market capitalization (number of shares outstanding multiplied by price per share) of the companies. This means that very large companies such as General Electric will represent a much larger percentage of the index than smaller companies such as American Greetings.

One beauty of constructing an index this way is that as a company's share price changes, its market capitalization changes along with its representation in the index. No adjustment to the holdings in a stock index fund is required, and the fund tracks the index perfectly.

Growth companies are the current darlings of Wall Street. These companies tend to have high earnings, high forecasted future earnings, all-around bright company prospects, and correspondingly high stock prices. Value companies on the other hand are the current dogs of Wall Street. They tend to have depressed stock prices due to poor earnings, poor forecasted future earnings, and all-around dim prospects. Why would anyone want to buy value stocks? They wouldn't unless the stock prices had fallen enough that the future expected return looked attractive. Historically, value stocks have provided higher returns to investors due to their more risky nature.

Because growth companies tend to have high stock prices and stock market values, they will command a larger percentage share of a capitalization-weighted index. This is why capitalization-weighted stock indexes in general tend to be growth-weighted indexes.