Payoff Diversification

February 10th, 2020

Summary

- At Newfound, we adopt a holistic view of diversification that encompasses not only what we invest in, but also how and when we make those investment decisions.
- In this three-dimensional perspective, *what* is correlation-based, *how* is payoff-based, and *when* is opportunity-based.
- In this piece, we provide an example of what we mean by payoff-based diversification, using a simple strategically rebalanced portfolio and a naïve momentum strategy.
- We find that the strategically rebalanced portfolio exhibits a payoff structure that is concave in nature whereas the momentum-based approach exhibits a convex profile.
- By combining the two approaches – being careful in how we size positions – we can develop a portfolio that is less sensitive to the co-movement of underlying assets.

NEWFOUND RESEARCH

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About Newfound Research

While other asset managers focus on alpha, our first focus is on managing risk. We know investors care deeply about protecting the capital they have worked hard to accumulate. And as investors approach and enter retirement, managing "sequence risk" becomes even more important.

How? We believe in systematic, disciplined, and repeatable decision-making powered by the evidence-based insights of consistent, thoughtful research. Specifically, we focus on the high conviction application of the major quantitative investment "styles" – i.e. value, momentum, carry, defensive, and trend – within tactical asset allocation.

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Custom Index Solutions	• We offer custom tailored investment solutions that are built with and powered by our research and insights.

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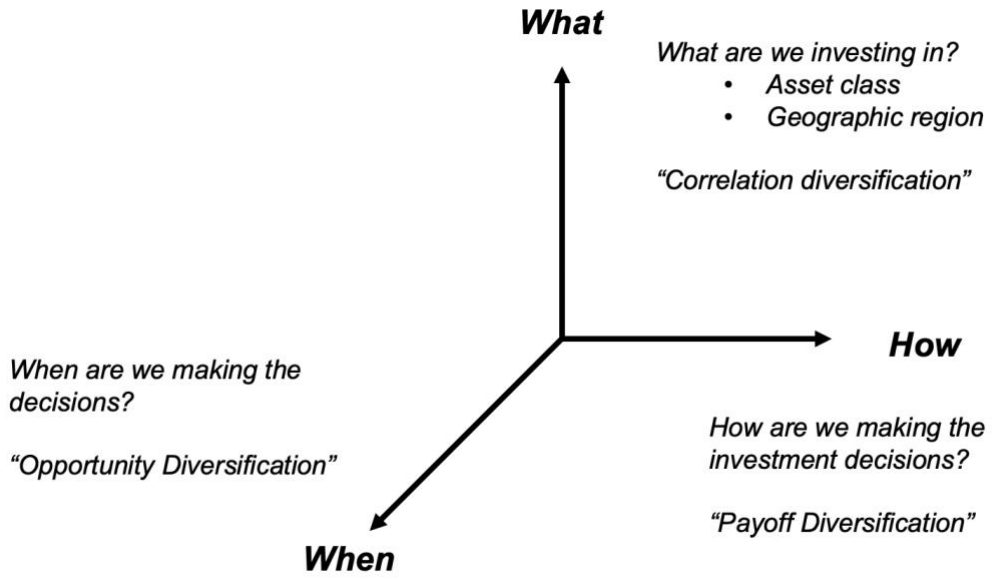
Case #9509006

At Newfound, we embrace a holistic view of diversification that covers not just *what* we invest in, but also *how* and *when* we make those decisions. *What* is the diversification most investors are well-versed in and covers traditional, correlation-based diversification between securities, assets, macroeconomic factors, and geographic regions.

We identify *when* as "opportunity diversification" because it captures the opportunities that are available when we make investment decisions. This often goes overlooked in public markets (which is why we spend so much time writing about rebalance timing luck) but is well acknowledged in private markets where investors often allocate to multiple fund "vintages" to create diversification.

How is generally easy to understand, but sometimes difficult to visualize. We call it "payoff diversification" to acknowledge that when viewed through he appropriate lens, every investment style creates a particular shape. For example, when the return of a call option is plotted against the return of the underlying security, it generates a hockey-stick-like payoff profile.



In this short research note, we are going to demonstrate the payoff profiles of a strategically allocated portfolio and a naïve momentum strategy. We will then show that by combining these two approaches we can create a portfolio that exhibits significantly less sensitivity to the co-movement of underlying assets.

The Payoff Profile of a Strategic Portfolio

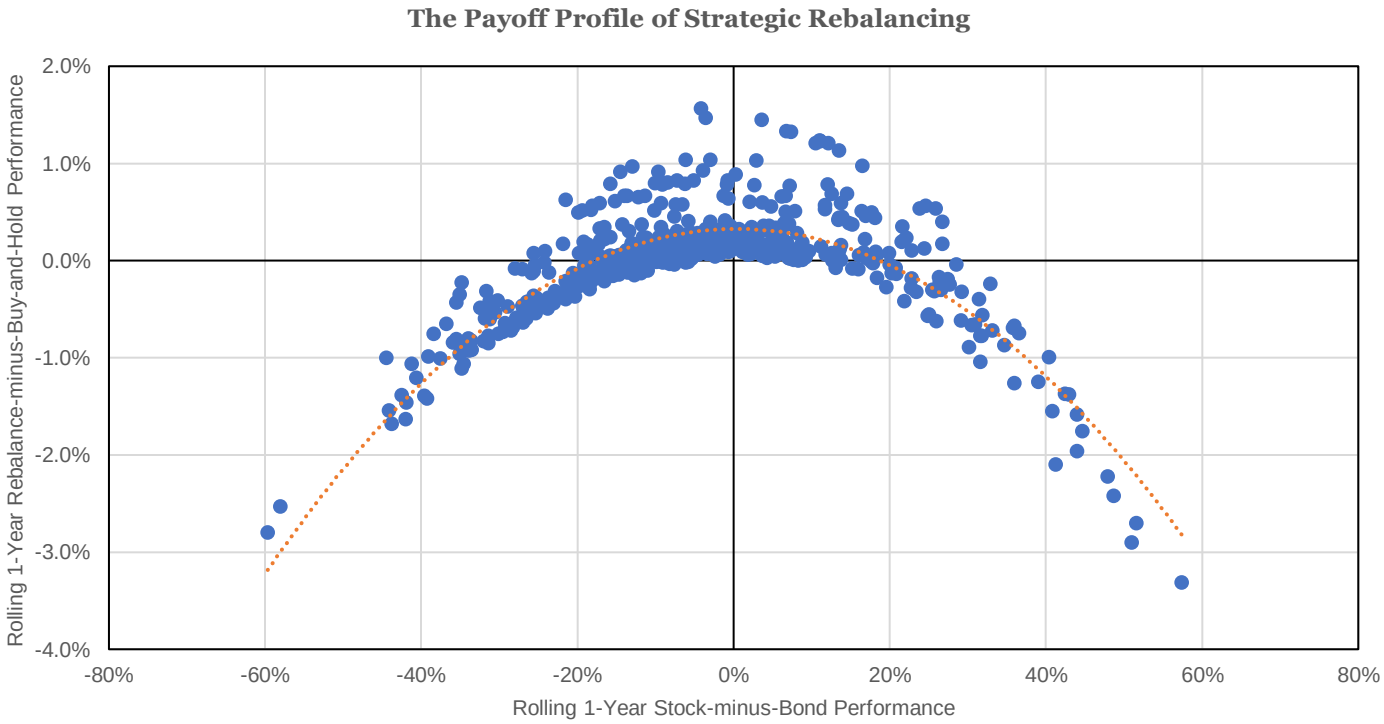
Few investors consider a strategically allocated portfolio to be an active strategy. And it isn't; at least not until we introduce rebalancing. Once we institute a process to systematically returning our drifted weights back to their original fixed mix, we create a strategy and a corresponding payoff profile.

But what does this payoff profile look like? As an example, consider a U.S. 60/40 portfolio comprised of broad U.S. equities and a constant maturity 10-year U.S. Treasury index. If equities out-perform bonds, our equity allocation will increase and our bond allocation will decrease. If equities continue to out-perform bonds, we will benefit relative to our original policy weights. Similarly, if equities under-perform bonds, then our relative equity allocation will decrease. Again, should they continue to underperform, we are well positioned.

However, if we were to rebalance back to our original 60/40 allocation, we would eliminate the opportunity to benefit from the continuation of the relative performance.

On the other hand, consider the case where equities out-perform, our relative allocation to equities increases due to drift, and then equities subsequently *under-perform.* Now allowing drift has hurt us and we would have been better off rebalancing.

We can visualize this relationship by plotting the return spread between stocks and bonds (x-axis) versus the return spread between a monthly-rebalanced portfolio and a buy-and-hold (drifted) approach (y-axis) over rolling 1-year periods.



Source: Kenneth French Data Library; Federal Reserve Bank of St. Louis. Calculations by Newfound Research. Returns are hypothetical and assume the reinvestment of all distributions. Returns are gross of all fees, including, but not limited to, management fees, transaction fees, and taxes. The 60/40 portfolio is comprised of a 60% allocation to broad U.S. equities and a 40% allocation to a constant maturity 10-Year U.S. Treasury index. The rebalanced variation is rebalanced at the end of each month whereas the buy-and-hold variation is allowed to drift over the 1-year period. The 10-Year U.S. Treasuries index is a constant maturity index calculated by assuming a 10-year bond is purchased at the beginning of every month and sold at the end of that month

to purchase a new bond at par at the beginning of the next month. You cannot invest directly in an index and unmanaged index returns do not reflect any fees, expenses or sales charges. Past performance is not indicative of future results.

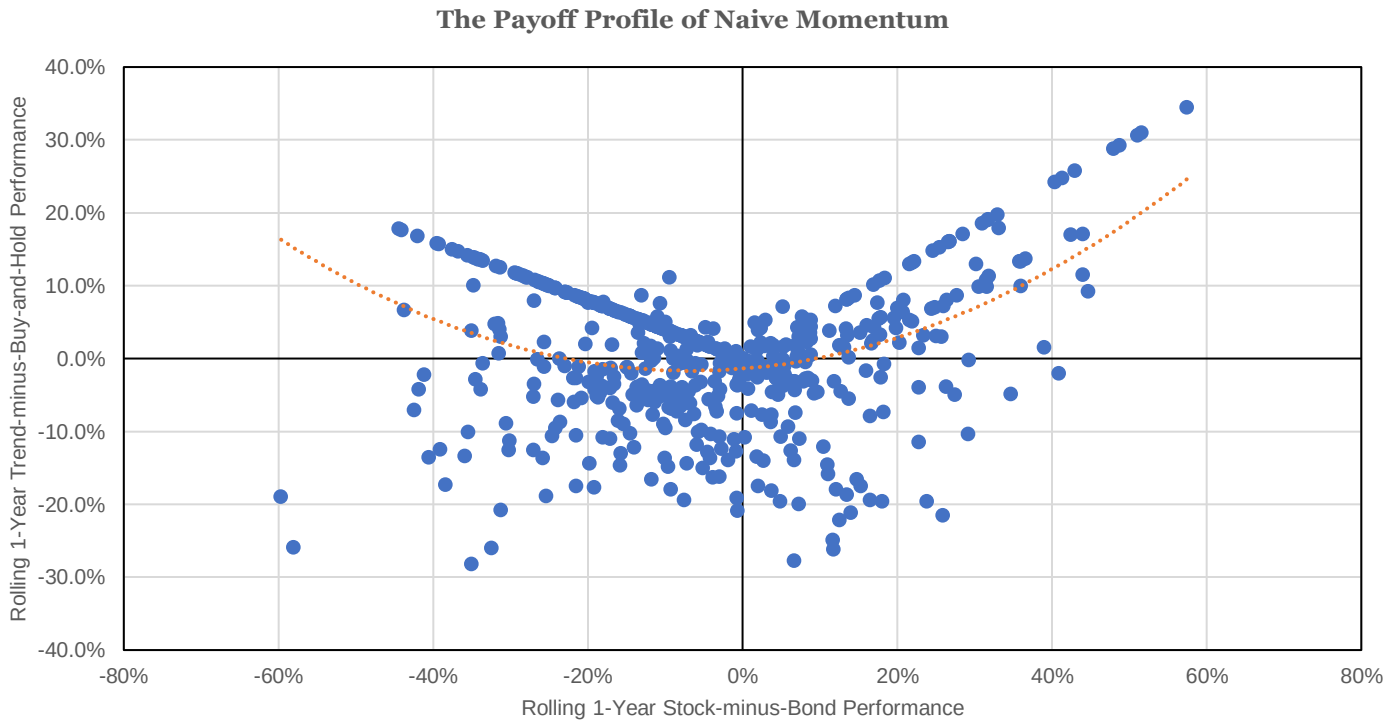
What we can see is a concave payoff function. When equities significantly out-perform bonds (far right side of the graph), the rebalanced portfolio under-performs the drifted portfolio. Similarly, when bonds significantly out-perform equities (far left side of the graph), the rebalanced portfolio under-performs the drifted portfolio. When the return spread between stocks and bonds is small– a case likely to be more indicative of mean-reversion than positive autocorrelation in the spread – we can see that rebalancing actually generates a positive return versus the drifted portfolio.

Those versed in options will note that this payoff looks incredibly similar to a 1-year strangle sold on the spread between stocks and bonds and struck at 0%. The seller captures the premium when the realized spread remains small but loses money when the spread is more extreme.

The Payoff Profile of Naïve Momentum Following

We can now take the exact same approach to evaluating the payoff profile of a naïve momentum strategy. Each month, the strategy will simply invest in either stocks or bonds based upon whichever had the highest trailing 12-month return

As this approach is explicitly trying to capture autocorrelation in the return spread between stocks and bonds, we would expect to see almost mirror behavior to the payoff profile we saw with strategic rebalancing.



Source: Kenneth French Data Library; Federal Reserve Bank of St. Louis. Calculations by Newfound Research. Returns are hypothetical and assume the reinvestment of all distributions. Returns are gross of all fees, including, but not limited to, management fees, transaction fees, and taxes. The 60/40 portfolio is comprised of a 60% allocation to broad U.S. equities and a 40% allocation to a constant maturity 10-Year U.S. Treasury index. The momentum portfolio is rebalanced monthly and selects the asset with the highest prior 12-month returns whereas the buy-and-hold variation is allowed to drift over

the 1-year period. The 10-Year U.S. Treasuries index is a constant maturity index calculated by assuming a 10-year bond is purchased at the beginning of every month and sold at the end of that month to purchase a new bond at par at the beginning of the next month. You cannot invest directly in an index and unmanaged index returns do not reflect any fees, expenses or sales charges. Past performance is not indicative of future results.

While the profile may not be as tidy as before, we can see a convex payoff profile that tends to profit when the return spread is more extreme and lose money when the spread is narrow. Again, those familiar with options will recognize this as similar to the payoff of a 1-year straddle based upon the return spread between stocks and bonds. The buyer pays a premium but captures the spread when it is extreme.

Note, however, the scale of the y-axis. Whereas the payoff profile for the rebalanced portfolio was between -3.0% and +2.0%, the payoff profile for this momentum approach is much larger, ranging between -30.0% and 40.0%.

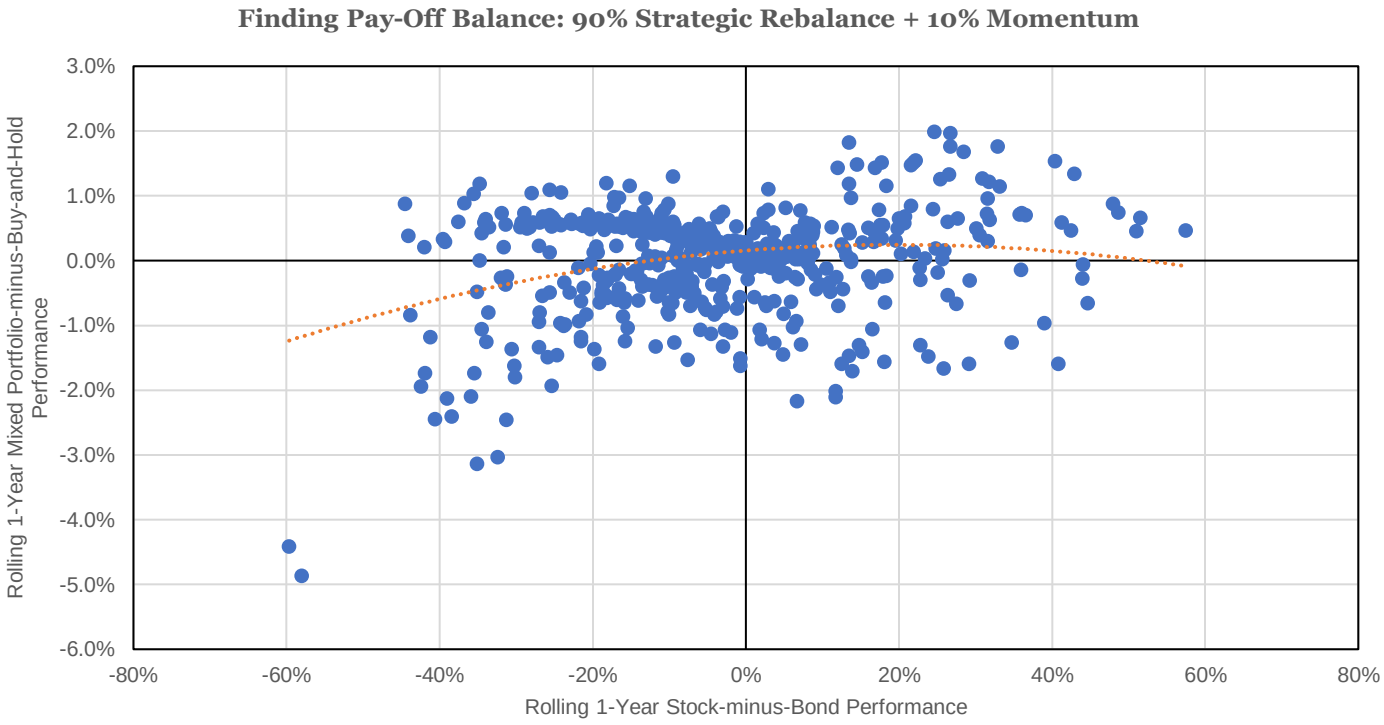
Creating Payoff Diversification

We have seen that whether we strategically rebalance or adopt a momentum-based approach, both approaches create a payoff profile that is sensitive to the return spread in underlying assets. But what if we do not want to take such a specific payoff bet? One simple answer is diversification.

If we allocate to both the strategically rebalanced portfolio and the naïve momentum portfolio, we will realize both their payoff profiles simultaneously. As their profiles are close mirrors of one another, we may be able to achieve a more neutral outcome.

We have to be careful, however, as to size the allocations appropriate. Recall that the payoff profile of the strategically rebalanced portfolio was approximately 1/10th the size of the naïve momentum strategy. For both profiles to contribute equally, we would want to allocate approximately 90% of our capital to the strategic rebalancing strategy and 10% of our capital to the momentum strategy.

Below we plot the payoff structure of such a mix.



Source: Kenneth French Data Library; Federal Reserve Bank of St. Louis. Calculations by Newfound Research. Returns are hypothetical and assume the reinvestment of all distributions. Returns are gross of all fees, including, but not limited to, management fees, transaction fees, and taxes. The 60/40 portfolio is comprised of a 60% allocation to broad U.S. equities and a 40% allocation to a constant maturity 10-Year U.S. Treasury index. The mixed portfolio is rebalanced monthly and is a 90% allocation to a rebalanced 60/40 and a 10% allocation to a naïve momentum strategy; whereas the buy-and-hold variation is allowed to drift over the 1-year period. The 10-Year U.S. Treasuries index is a constant maturity index calculated by assuming a 10-year bond is purchased at the beginning of every month and sold at the end of that month to purchase a new bond at par at the beginning of the next month. You cannot invest directly in an index and unmanaged index returns do not reflect any fees, expenses or sales charges. Past performance is not indicative of future results.

We can see that diversifying *how* we make decisions results in a payoff structure that is far more neutral to the co-movement of underlying securities in the portfolio. The holy grail, of course, is not just to find strategies whose combination neutralizes sensitivity to the spread in returns, but actually creates a higher likelihood of positive outcomes in all environments.

Conclusion

In this research note, we aimed to provide greater insight into the idea of payoff diversification, the *how* in our what-how-when diversification framework. To do so, we explored two simple examples: a strategically rebalanced 60/40 allocation and a naïve momentum strategy.

We found that the strategically rebalanced portfolio generates a payoff profile that is convex with respect to the spread in returns between stocks and bonds. In general, the larger the spread, the more likely that rebalancing generates a negative return versus a buy-and-hold approach. Conversely, the smaller the spread, the more likely that rebalancing generates a positive return.

The naïve momentum strategy – which simply bought the asset with the greatest prior 12-month returns – exhibited a convex profile. When the return spread between stocks and bonds was large, the naïve momentum strategy was more likely to out-perform buy-and-hold. Conversely, when the return spread was small, the naïve momentum strategy tended to under-perform.

Importantly, the magnitudes of the payoffs are significantly different, with the naïve momentum strategy generating returns nearly 10x larger than strategic rebalancing in the tails. This difference has important implications for strategy sizing, and we find a portfolio mixture of 90% strategic rebalancing and 10% naïve momentum does a reasonably good job of neutralizing portfolio payoff sensitivity to the spread in stock and bond returns.

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