Strategy Brief (No. 1)

A Carry-Trend-Hedge Approach to Timing Duration

October 15, 2018

SUMMARY

- In this paper we discuss simple rules for timing exposure to 10-year U.S. Treasuries.
- We explore signals based upon the slope of the yield curve ("carry"), prior returns ("trend"), and prior equity returns ("hedge").
- We implement long/short implementations of each strategy covering the time period of 1962-2018.
- We find that all three methods improve both total and risk-adjusted returns when compared to long-only exposure to excess bond returns.
- Naïve combination of both strategies and signals appears to improve realized risk-adjusted returns, promoting the benefits of process diversification.

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1. Introduction

In this strategy brief, we discuss three trading rules for timing exposure to duration. Specifically, we seek to time the excess returns generated from owning 10-year U.S. Treasury bonds over short rates. This piece is meant as a companion to our prior, longer-form explorations *Duration Timing with Style Premia* and *Timing Bonds with Value, Momentum, and Carry*. In contrast, the trading rules herein are simplistic by design in effort to highlight the efficacy of the signals.

We explore three different signals in this piece:

- The slope of the yield curve ("term spread");
- Prior realized excess bond returns; and
- Prior realized equity market returns.

In contrast to prior studies, we do not consider traditional value measures, such as real yields, or explicit estimates of the bond risk premium, as they are less easily calculated. Nevertheless, the signals studied herein capture a variety of potential influences upon bond markets, including inflation shocks, economic shocks, policy shocks, marginal utility shocks, and behavioral anomalies.

The strategies based upon our signals are implemented as dollar-neutral long/short portfolios that go long a constant maturity 10-year U.S. Treasury bond index and short a short-term U.S. Treasury index (assumed to be a 1-year index prior to 1982 and a 3-month index thereafter). We compare these strategies to a "long-only" implementation that is long the 10-year U.S. Treasury bond index and short the short-term U.S. Treasury index in order to capture the excess realized return associated with duration.

Implementing our strategies as dollar-neutral long/short portfolios allows them to be interpreted in a variety of useful manners. For example, one obvious interpretation is an overlay implemented on an existing bond portfolio using Treasury futures. However, another interpretation may simply be to guide investors as to whether to extend or contract their duration exposure around a more intermediate-term bond portfolio (e.g. a 5-year duration).

At the end of the piece, we explore the potential diversification benefits achieved by combining these strategies in both an integrated (i.e. signal combination) and composite (i.e. strategy combination) fashion.

2. Slope of the Yield Curve

In past research on timing duration, we considered explicit measures of the bond risk premium as well as valuation. In *Duration Timing with Style Premia* we used a simple signal based upon real yield, which had the problem of being predominately long over the last several decades. In *Timing Bonds with Value, Momentum, and Carry* we compared a de-trended real yield against recent levels in an attempt to capture more short-term valuation fluctuations.

In both of these prior research pieces, we also explicitly considered the slope of the yield curve as a predictor of future excess bond returns. One complicating factor to carry signals is that rate steepness simultaneously captures both the expectation of rising short rates as well as an embedded risk premium. In particular, evidence suggests that mean-reverting rate expectations dominate steepness when short rates are exceptionally low or high. Anecdotally, this may be due to the fact that the front end of the curve is determined by central bank policy while the back end is determined by inflation expectations.

Thus, despite being a rather blunt measure, steepness may simultaneously be related to business cycles, credit cycles and monetary policy cycles. To quote Ilmanen (2011):

> "A steep [yield curve] coincides with high unemployment rate (correlation +0.45) and *predicts* fast economic growth. [Yield curve] countercyclicality may explain its ability to predict near-term bond and stock returns: high required premia near business cycle troughs result in a steep [yield curve], while low required premia near business cycle peaks result in an inverted [yield curve]."

Therefore, while estimates of real yield may seek to be explicit measures of value, we may consider carry to be an ancillary measure as well, as a high carry tends to be associated with a high term premium. In Figure 1 we plot the annualized next month excess bond return based upon the quartile (using the prior 10 years of information) that the term spread falls into. We can see a significant monotonic improvement from the 1st to the 4th quartiles, indicating that higher levels of carry, relative to the past, are positive indicators of future returns.

Therefore, we construct our carry strategy as follows:

- At the end of each month, calculate the term spread between 10- and 1-year U.S. Treasuries.
- Calculate the realized percentile of this spread by comparing it against the prior 10-years of daily term spread measures.
- If the carry score is in the top two thirds, go long excess bond returns. If the carry score is in the bottom third, go short excess bond returns.
- Trade at the close of the 1st trading day of the month.

Returns for this strategy are plotted in Figure 2. Our research suggests that the backtested results of this model can be significantly improved through the use of longer holding periods and portfolio tranching. Another potential improvement is to scale exposure linearly to the current percentile. We will leave these implementations as exercises to readers.

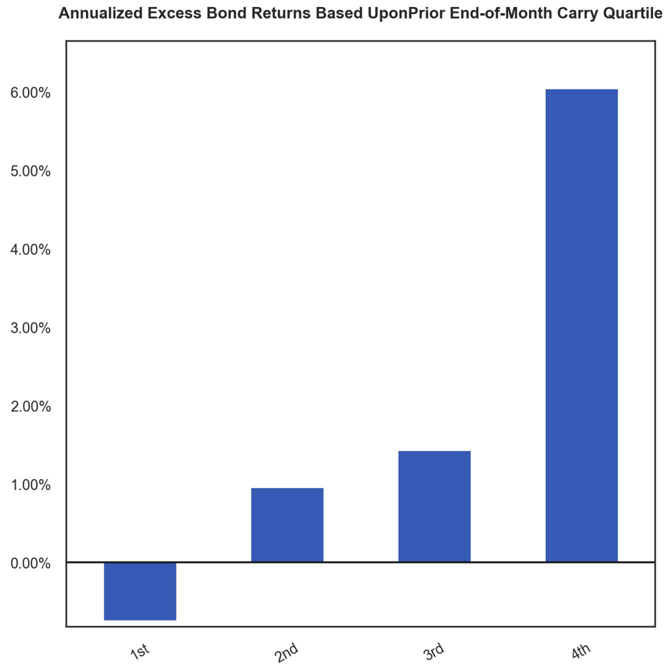

Figure 1

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. The Carry Long/Short strategy does not reflect any strategy offered or managed by Newfound Research and was constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

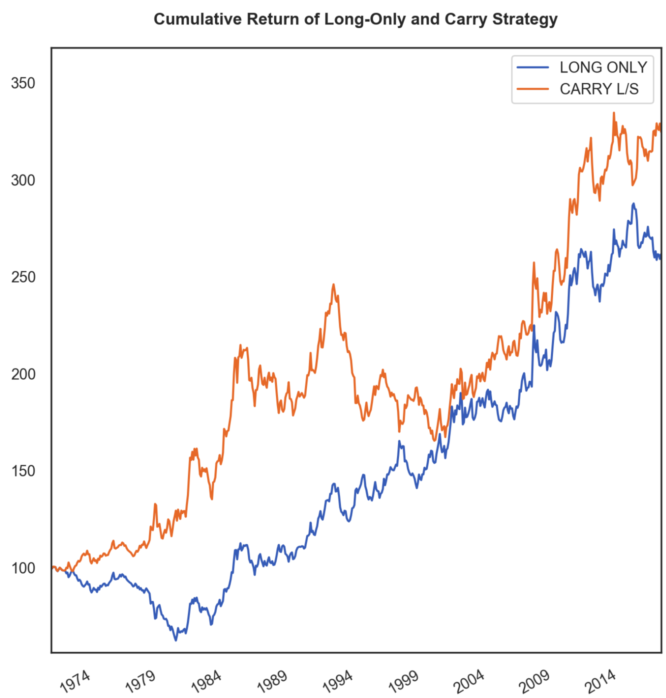

Figure 2

Data from 1972-2018

	Annualized Return	Annualized Volatility	Sharpe Ratio
Long Only	2.1%	7.6%	0.27
CARRY L/S	2.6%	7.7%	0.33

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. The Carry Long/Short strategy does not reflect any strategy offered or managed by Newfound Research and was constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

3. Trend in Bond Returns

Momentum, in both its relative and absolute (i.e. "trend") forms, has a long history among both practitioners and academics (see our summary piece Two Centuries of Momentum).

The literature covering momentum in bond returns, however, varies in precisely *what* prior returns matter. There are three primary categories: (1) change in bond yields (e.g. Ilmanen (1997)), (2) total return of individual bonds (e.g. Kolanovic and Wei (2015) and Brooks and Moskowitz (2017)), and (3) total return of bond indices (or futures) (e.g. Asness, Moskowitz, and Pedersen (2013), Durham (2013), and Hurst, Ooi, Pedersen (2014))

In our view, the approaches have varying trade-offs:

- While empirical evidence suggests that nominal interest rates can exhibit secular trends, rate evolution is most frequently modeled as mean-reversionary. Our research suggests that very short-term momentum can be effective, but leads to a significant amount of turnover.
- The total return of individual bonds makes sense if we plan on running a cross-sectional bond model (i.e. identifying individual bonds), but is less applicable if we want to implement with a constant maturity index.
- The total return of a bond index may capture past returns that are attributable to securities that have been recently removed.

We think it is worth noting that the latter two methods can capture yield curve effects beyond shift, including roll return, steepening and curvature changes. In fact, momentum in general may even be able to capture other effects such as flight-to-safety and liquidity (supply-demand) factors.

In this piece, we elect to measure momentum as an exponentially-weighting average of prior log returns of the total return excess between long and short bond indices. We measure this average at the end of each month and go long duration when it is positive and short duration when it is negative. In Figure 4 we plot the results of this method based upon a variety of lookback periods that approximate 1-, 3-, 6-, and 12-month formation periods.

Figure 3

	MOM 21	MOM 63	MOM 126	MOM 252
MOM 21	1.00	0.87	0.65	0.42
MOM 63	0.87	1.00	0.77	0.53
MOM 126	0.65	0.77	1.00	0.76
MOM 252	0.42	0.53	0.76	1.00

We see varying success in the methods, with only MOM 63 and MOM 256 exhibiting better risk-adjusted return profiles. Despite this long-term success, we can see that MOM 63 remains in a drawdown that began in the early 2000s, highlighting the potential risk of relying too heavily on a specific measure or formation period. In Figure 3 we calculate the correlation between the different momentum strategies. As we found in *Measuring Process Diversification in Trend Following*, diversification opportunities appear to be available by mixing both short- and long-term formation periods.

With this in mind, we elect for the following momentum implementation:

- At the end of each month, calculate both a 21- and 252-day exponentially-weighted moving average of realized daily excess log returns.
- When both signals are positive, go long duration; when both signals are negative, go short duration; when signals are mixed, stay flat.
- Rebalance at the close of the next trading day.

The backtested results of this strategy are displayed in Figure 5.

As with carry, we find that there are potential craftsmanship improvements that can be made with this strategy. For example, implementing with four tranches, weekly rebalances appears to significantly improve backtested risk-adjusted returns. Furthermore, there may be benefits that can be achieved by incorporating other means of measuring trends as well as other lookback periods (see *Diversifying the What, When, and How of Trend Following* and *Measuring Process Diversification in Trend Following*).

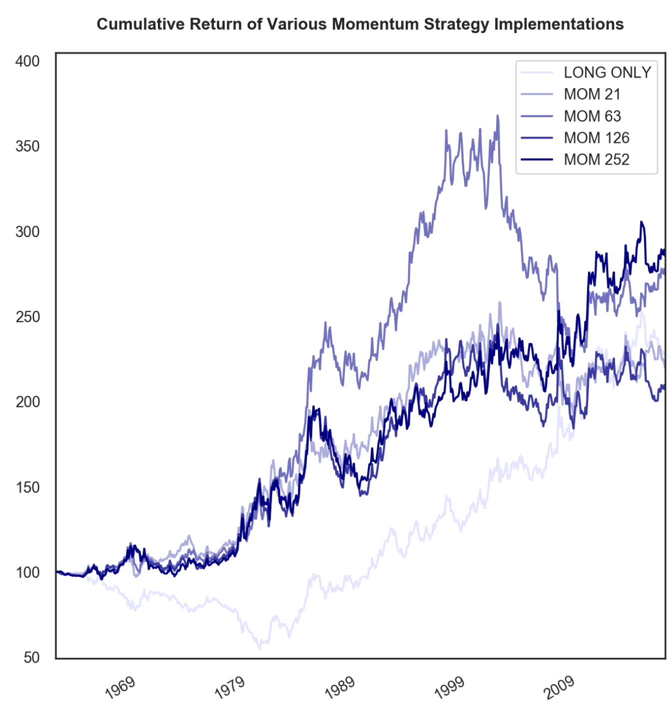

Figure 4

Data from 1963-2018

	Annualized Return	Annualized Volatility	Sharpe Ratio
Long Only	1.5%	7.3%	0.21
MOM 21	1.4%	7.5%	0.19
MOM 63	1.8%	7.4%	0.25
MOM 128	1.3%	7.4%	0.18
MOM 252	1.9%	7.4%	0.26

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. The Momentum strategies do not reflect any strategies offered or managed by Newfound Research and were constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

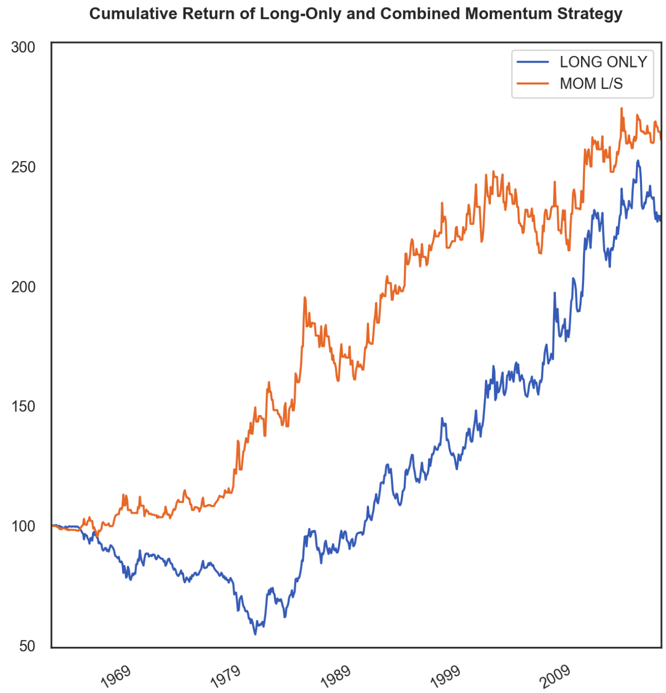

Figure 5

Data from 1963-2018

	Annualized Return	Annualized Volatility	Sharpe Ratio
Long Only	1.5%	7.2%	0.21
MOM L/S	1.7%	6.3%	0.28

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. The Momentum Long/Short strategy does not reflect any strategy offered or managed by Newfound Research and was constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

4. Safe-Haven Premium

Stocks and bonds generally exhibit a positive correlation over time. One thesis for this long-term relationship is the present value model, which argues that declining yields, and hence increasing bond prices, increase the value of future discounted cash flows and therefore the fair value of equities. Despite this long-term relationship, shocks in economic growth, inflation, and even monetary policy can overwhelm the discount rate thesis and create a regime-varying correlation structure.

For example, empirical evidence suggests that high quality bonds can exhibit a safe haven premium during periods of economic stress. Using real equity prices as a proxy for wealth, Ilmanen (1995) finds that "wealth-dependent relative risk aversion appears to be an important source of bond return predictability." Specifically, *inverse* wealth is a significant positive predictor of future excess bond returns at both world and local (U.S., Canada, Japan, Germany, France, and United Kingdom) levels. Ilmanen (2003) finds that, "stock-bond correlations are more likely to be negative when inflation is low, growth is slow, equities are weak, and volatility is high."

To capitalize on this safe-haven premium, we derive a signal based upon prior equity returns. Specifically, we utilize an exponentially weighted average of prior log returns to estimate the underlying trend of equities. We then compare this estimate to a 10-year rolling window of prior estimates, calculating the current percentile.

In Figure 6 we plot the annualized excess bond return for the month following, assuming signals are generated at the close of each month and trades are placed at the close of the following trading day. We can see several effects. First, next month returns for 1st quartile equity momentum – i.e. very poor equity returns – tends to be significantly higher than other quartiles. Second, excess bond returns in the month following very strong equity returns tend to be poor. We would posit that these two effects are two sides of the same coin: the safe-haven premium during 1st quartile periods and an unwind of the premium in 4th quartile periods. Finally, we can see that 2nd and 3rd quartile returns tend to be positive, in line with the generally positive excess bond return over the measured period.

In effort to isolate the safe-haven premium, we construct the following strategy:

- At the end of each month, calculate an equity momentum measure by taking a 63-day exponentially weighted average of prior daily log-returns.
- Calculate the realized percentile of this momentum measure by comparing it against the prior 10-years of daily momentum measures.
- If the momentum score is in the bottom quartile, go long excess bond returns. If the momentum score is in the top quartile, go short excess bond returns. Otherwise, remain flat.
- Trade at the close of the 1st trading day of the month.

Returns for this strategy are plotted in Figure 7. As expected based upon the quartile design, the strategy only spends 24% of its time long, 23% of its time short, and the remainder of its time flat. Despite this even split in time, approximately 2/3rds of the strategy's return comes from the periods when the strategy is long.

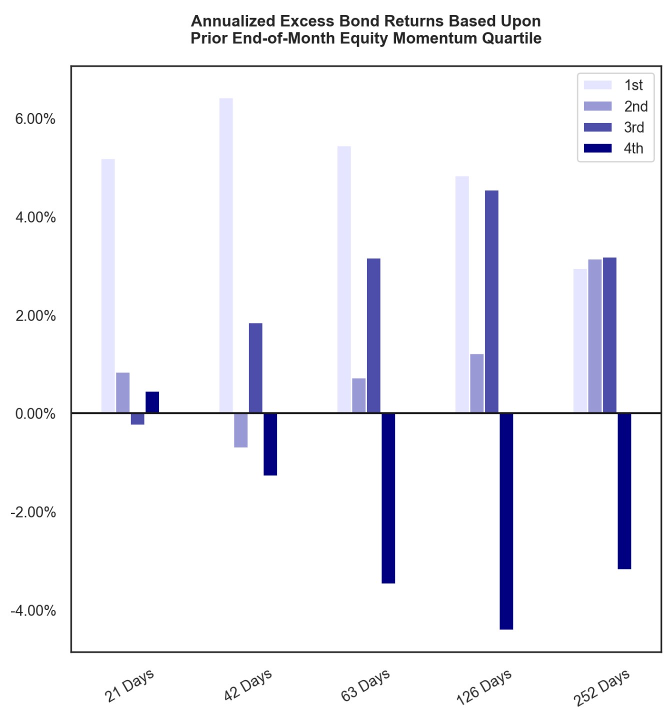

Figure 6

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. The Equity Momentum Long/Short strategy does not reflect any strategy offered or managed by Newfound Research and was constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

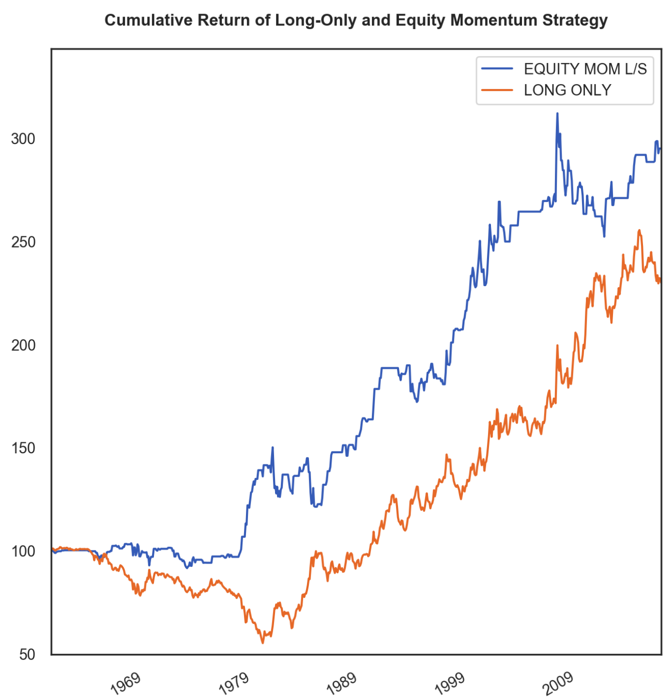

Figure 7

Data from 1962-2018

	Annualized Return	Annualized Volatility	Sharpe Ratio
Long Only	1.5%	7.2%	0.21
Equity Mom L/S	1.9%	5.7%	0.34

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. The Equity Momentum Long/Short strategy does not reflect any strategy offered or managed by Newfound Research and was constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

5. Combining Signals

Despite trading the same underlying instrument, variation in strategy construction means that we can likely benefit from process diversification in constructing a combined strategy. Figure 8 quantifies the available diversification by measuring full-period correlations among the strategies from joint inception (1972). We can also see that the strategies exhibit low correlation to the Long Only implementation, suggesting that they may introduce diversification benefits to a strategic duration allocation as well.

Figure 8

	LONG ONLY	CARRY L/S	MOM L/S	EQ MOM L/S
LONG ONLY	1.00	0.42	0.33	-0.09
CARRY L/S	0.42	1.00	0.40	-0.09
MOM L/S	0.33	0.40	1.00	-0.13
EQ MOM L/S	-0.10	-0.10	-0.19	1.00

We explore two different implementations of a diversified strategy. In the first, we simply combine the three strategies in equal-weight, rebalancing on a monthly basis. This implementation can be interpreted as three sleeves of a larger portfolio construction. In the second implementation, we combine underlying long/short signals. When the net signal is positive, the strategy goes 100% long duration and when the signal is negative, it goes 100% short. This can be thought of as an integrated approach that takes a majority-rules voting approach. Results for these strategies are plotted in Figure 9. We note the substantial increase in the backtested Sharpe Ratio of these diversified approaches in comparison to their underlying components outlined in prior sections.

It is important to note that despite strong total and risk-adjusted returns, the strategies spend only approximately 54% of their time net-long duration, with 19% of their time spent flat and 27% of their time spent short. While slightly biased long, this breakdown provides evidence that strategies are not simply the beneficiaries of a bull market in duration over the prior several decades.

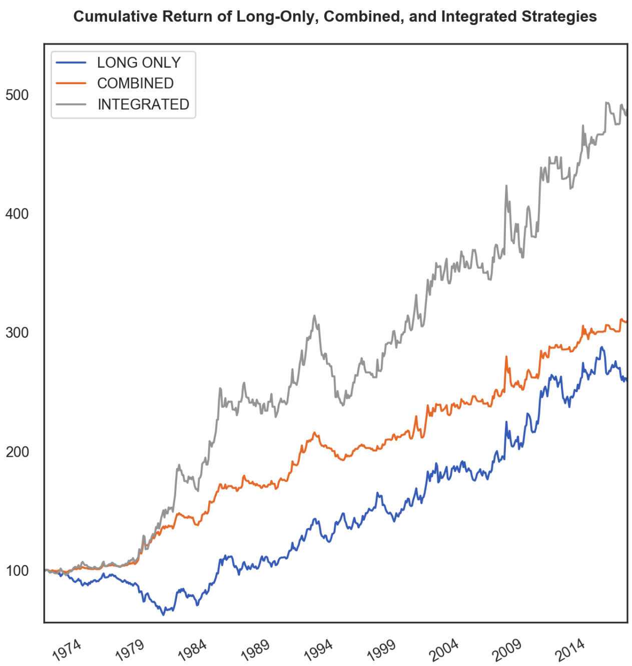

Figure 9

Data from 1972-2018

	Annualized Return	Annualized Volatility	Sharpe Ratio
Long Only	2.1%	7.6%	0.27
Combined L/S	2.5%	4.3%	0.58
Integrated L/S	3.5%	7.1%	0.49

Source: Kenneth French Data Library, Federal Reserve of St. Louis. Calculations by Newfound Research. Returns are backtested and hypothetical. Return data relies on hypothetical indices and is exclusive of all fees and expenses. Returns assume the reinvestment of all distributions. Neither the Combined Long/Short or Integrated Long/Short strategies reflect any strategy offered or managed by Newfound Research and were constructed exclusively for the purposes of this commentary. It is not possible to invest in an index. Past performance does not guarantee future results.

6. Conclusion

In this research brief, we continued our exploration of duration timing strategies. We aimed to implement several signals that were simple by construction. Specifically, we evaluated the impact of term spread, prior excess bond returns, and prior equity returns on next month's excess bond returns. Despite their simplicity, we find that all three signals can potentially offer investors insight for tactical timing decisions.

While we believe that significant craftsmanship improvements can be made in all three strategies, low hanging improvement may simply come from combining the approaches. We find a meaningful improvement in Sharpe Ratio by naively combining these strategies in both a sleeve-based and integrated signal fashion.

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