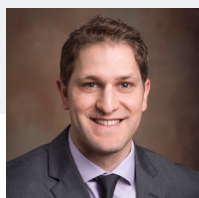




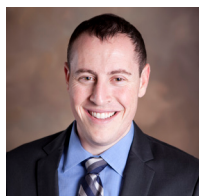
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Fixed Income

WHAT'S THE SIMPLEST WAY TO FORECAST BOND RETURNS?

EXECUTIVE SUMMARY

- Investors commonly use the current yield to maturity or yield to worst (YTW) of a bond index to inform their future total return expectations. This approach assumes that all the bonds within an index pay their coupon and maturing principal as expected and that all cash flows can be reinvested at the same yield. We use historical yields, returns, and durations of various indexes to determine the accuracy of this approach.
- Others have researched this topic, but they primarily focused on Treasury, corporate, and other high-grade bond indices. Our analysis validates and extends this research by examining the correlations between initial yield and subsequent returns of four Bloomberg Barclays indices: U.S. Aggregate, U.S. High Yield, Global Aggregate, and Emerging Markets Aggregate.
- We analyze how correlations between historical index yields and subsequent total returns evolve over time. Investors would expect to see the highest correlation over a time horizon approximately equal to the index's starting duration, since duration and maturity are related.
- We show that current yields are most highly correlated with future returns for higher-quality and hedged bond indices. As these indices follow stricter maturity, duration, and quality rules, they present a more stable risk/return profile than unhedged and lower-quality indices.
- We expand the correlation analysis by looking at increasing, decreasing, and stable rate environments. Ultimately, the relationship between index yields and subsequent returns remains largely intact for higher-quality and hedged indices, even as the rate environment evolves.

ANALYSIS—HIGH- VERSUS LOW- QUALITY INDICES

While much research has been dedicated to examining the predictive power of index yields on future returns for Treasury and investment-grade credit indexes, we examine this relationship more closely by extending this research to the “plus” fixed income sectors. Our analysis uses historical yields, index returns, and initial index

duration to perform a correlation study and determine at what time horizon(s) correlation between yields and subsequent returns is highest.

HIGH-QUALITY AND USD- HEDGED INDICES

We start with two common benchmarks many investors utilize, the Bloomberg Barclays U.S. Aggregate Index and the USD-hedged version

of the Bloomberg Barclays Global Aggregate (ex-U.S.) Index. Because they are based in/hedged to USD and high quality in nature, both indices provide a pure environment to show the historical relationship between yields and subsequent returns.

The initial index yield is significantly correlated with future returns and reaches a maximum correlation at a time horizon that is similar to the index's starting duration. For the U.S. Aggregate, peak correlation reaches 0.97 at a time period of 1.08 times the initial duration (Figure 1). For the hedged version of the Global Aggregate, peak correlation reaches 0.96, but at a much later time horizon (1.98 times initial duration (Figure 2)). In both cases, this predictive effect, marked by high positive correlation, remains intact for a long period of time.

LOWER-QUALITY AND UNHEDGED INDICES

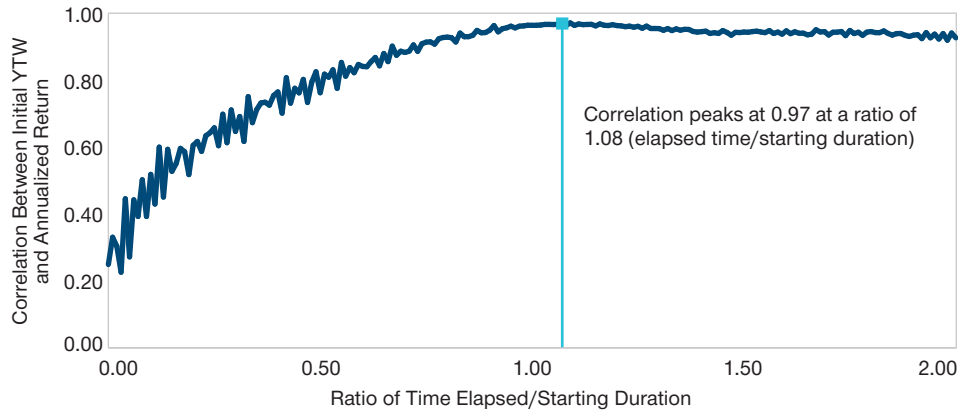
Extending this analysis to below investment-grade bonds and those retaining currency exposure gives an insightful result—namely, introducing currency exposure and lower-quality securities reduces the correlation between yields and subsequent returns.

The currency exposure within the unhedged Global Aggregate index introduces an additional source of return, which may be driven by different macroeconomic factors than those impacting bond price returns. Thus, we see a significantly weaker relationship between yields and subsequent returns. Correlation peaks at 0.57 compared with 0.96 for the hedged version of the Global Aggregate (Figure 3). Meanwhile, lower-quality issues in the U.S. High Yield index exhibit a relatively weak correlation (0.79) compared with that of higher-quality indices (Figure 4).

While yields of the Emerging Markets (EM) Aggregate maintain a useful explanatory relationship with future

FIGURE 1: Correlation Between Initial YTW and Subsequent Total Returns—U.S. Aggregate

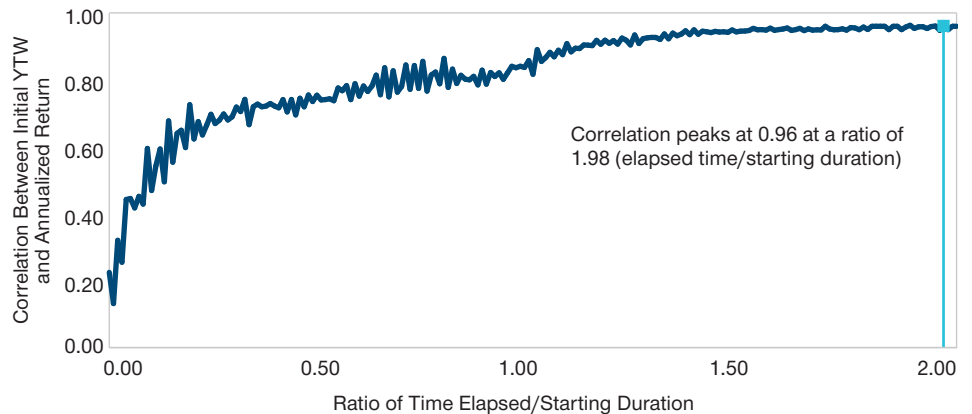
January 1, 1976, Through March 30, 2018



Source for underlying data: Barclays POINT.

FIGURE 2: Correlation Between Initial YTW and Subsequent Total Returns—Global Aggregate ex-U.S. Hedged

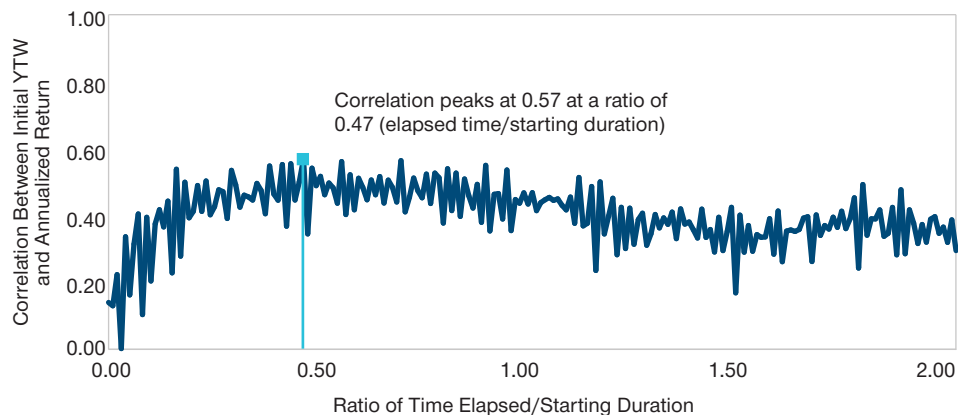
January 1, 1990, Through March 30, 2018



Source for underlying data: Barclays POINT.

FIGURE 3: Correlation Between Initial YTW and Subsequent Total Returns—Global Aggregate ex-U.S. Unhedged

January 1, 1990, Through March 30, 2018



Source for underlying data: Barclays POINT.

returns, the absolute correlation values are notably delayed when comparing results with the Global and U.S. Aggregate indices. EM Aggregate correlations reach 0.89, higher than that of the U.S. High Yield and unhedged Global Aggregate, but this correlation is not reached until a much later period (1.88 times the initial duration (Figure 5)).

ANALYSIS—DIFFERING RATE ENVIRONMENTS

Taking the correlation analysis one step further, we examine the relationship between index yields and future returns in different rate environments. Using the U.S. Aggregate as the underlying index, we defined each data point as “increasing,” “decreasing,” or “stable” based on the directional move between the beginning and ending period YTW. Since the period between 1980 and today featured mostly declining rates, most observations fell into the “decreasing” category. Please see Figure 7 to see how each category was defined.

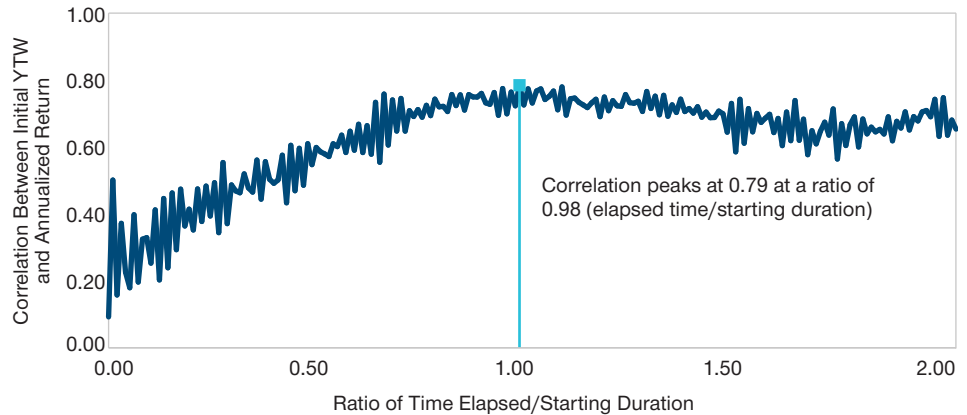
Despite differing rate regimes, the relationship between initial YTW and subsequent returns remains largely intact. Expectedly, there is significant noise in the “increasing” category due to lack of observations. However, the correlations across all categories follow a similar pattern—reaching a maximum at a time horizon that is consistent with the initial duration. Only in the “stable” rate environment does peak correlation occur moderately sooner than the rest (0.71 times initial duration (Figure 8)).

CONCLUSIONS

- For certain indices and time horizons, investors are well-supported in using current bond index yields to forecast future returns. Historical data confirm this to be a useful and largely accurate expectation.
- However, this estimation methodology is less reliable when applied to lower-quality and currency-exposed bond indices.

FIGURE 4: Correlation Between Initial YTW and Subsequent Total Returns—U.S. High Yield

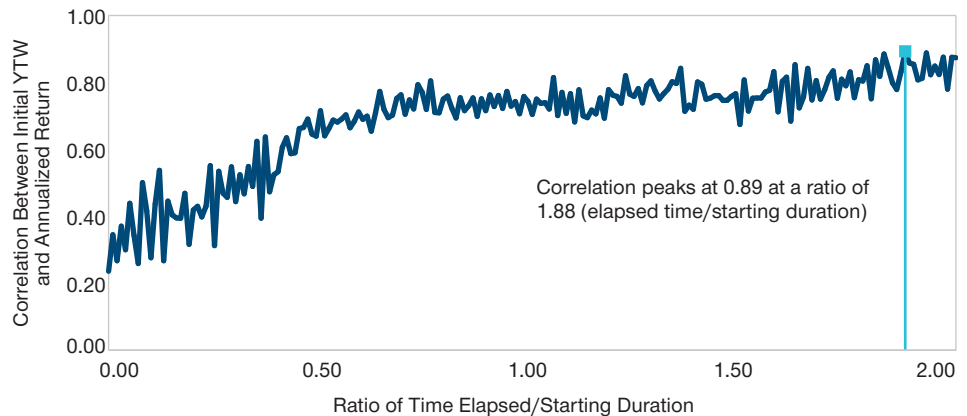
January 1, 1987, Through March 30, 2018



Source for underlying data: Barclays POINT.

FIGURE 5: Emerging Markets Aggregate

January 1, 1993, Through March 30, 2018



Source for underlying data: Barclays POINT.

FIGURE 6: Correlations Across Indexes

As of date ranges listed in Figures 1–5.

Index	U.S. Aggregate	Global Aggregate ex-U.S. Hedged	Global Aggregate ex-U.S. Unhedged	U.S. High Yield	Emerging Market Aggregate
Peak Correlation	0.97	0.96	0.57	0.79	0.89
Peak Correlation occurrence (elapsed time/starting duration)	1.08	1.98	0.47	0.98	1.88
Correlation at original index duration (i.e. elapsed time = starting duration)	0.96	0.86	0.43	0.77	0.74

Source: T. Rowe Price.

- While a given Treasury or investment-grade credit index may remain relatively stable in terms of issuer creditworthiness and sector composition, lower-quality and global indices may not. This difference has important implications for the ability to use an index's current yield as a forecasting mechanism. In the cases examined above, the index yield versus realized return relationship can be significantly weakened or may present itself in an unexpected time horizon.

- Overall, yields tend to do a poorer job of predicting future total returns for below investment-grade and unhedged bond indices, underscoring the difficulty facing investors in developing expected return estimates for those segments. Dynamic management and/or currency hedging may prove beneficial in these instances.

FIGURE 7: Data on Different Rate Regimes

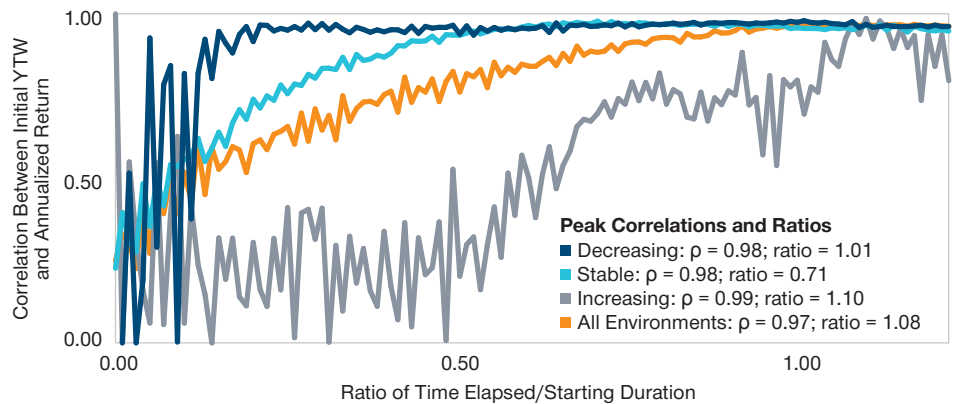
January 1, 1976, Through March 30, 2018

YTW % Change	# Observations	% of Total	Category
$x < -1.5\%$	90,601	71%	Decreasing
$-1.5\% < x < 1.5\%$	32,906	26	Stable
$x > 1.5\%$	4,764	4	Increasing

Source for underlying data: Barclays POINT.

FIGURE 8: Correlation Between Initial YTW and Subsequent Total Returns

January 1, 1976, Through March 30, 2018



Source for underlying data: Barclays POINT.

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