

Bond Correlations and Interest Rates, Not Always a Straight Line

Josh Yafa | Director, Client Portfolio Management

October 2016 (updated July 2017)

The popular wisdom regarding interest-rate risk, or duration, tends to be oversimplified and ultimately misleading.

Featured Inside

- Not all bonds are intrinsically linked to the same interest-rate risk inherent in U.S. Treasuries.
- Bonds are generally exposed to multiple forms of risk at any given time, primarily interest rate risk or credit risk.
- Even when U.S. Treasury yields are increasing, oftentimes duration losses are partially offset by credit-related bond price improvements.
- While managing fixed income strategies, Thornburg attempts to avoid marrying portfolios to any singular exposure or risk.

When discussing investing, a standard rule applies: bring up bond correlations if your audience needs a nap. That axiom, however, suddenly becomes less tiresome when investors begin to worry about rising interest rates. Not surprisingly, the thought of losing significant principal from bonds—an inexplicable combination of terms for investors accustomed to fixed income’s ballast—tends to pique the attention of even the most seasoned and skeptical. Unfortunately, the popular wisdom regarding interest-rate risk, or duration, tends to be oversimplified and ultimately misleading.

Challenging the Duration Paradigm

Bond fund investors are taught that in order to calculate their portfolio’s potential price sensitivity to a change in bond yields, you only need to multiply the portfolio’s duration by the expected change in yield. Note that it is the change in U.S. Treasury yields (i.e., risk-free rates) not the change in the Federal funds policy rate, that ultimately matters when calculating duration. While U.S. Treasury yields and Fed rates are highly correlated, they do not move one-for-one. So, if a hypothetical portfolio has a duration of 3.0 years and bond yields are expected to increase by 1.5%, it should cause the portfolio to decrease in value by approximately 4.5% (when yields increase bond prices decrease, and vice versa).

This back of the envelope equation, however, misses two central themes: one, the “yields” in that scenario are U.S. Treasury yields and two, not all bonds are intrinsically linked to the same interest-rate risk inherent in U.S. Treasuries. Simply stated, bonds are generally exposed to multiple forms of risk at any given time, which can largely be broken down along the lines of interest-rate risk or credit risk.

Interest-rate risk, as described by the previous example, is often the only risk investors consider when buying U.S. Treasuries. The reason for this is that U.S. Treasuries have long been considered the world’s risk-free investment. Broach the subject of credit risk with respect to

Table 1 | Duration Not Always a Telling Sign of Interest-Rate Risk

Fixed income investors often swear by duration to gauge, even predict, interest-rate risk. Duration isn’t always the best measure, however, and can be misleading. A snapshot of three Thornburg strategies—all with relatively close average effective durations—shows that the more diversified the mandate, the lower the actual exhibited duration and, as importantly, correlation to risk-free rates (3-Year Treasury).

Strategy	Avg. Effective Duration (yrs)	Avg. Exhibited Duration (yrs)	R ² (vs. risk-free rates)
Thornburg Limited Term U.S. Government Fund	2.56	2.48	0.93
Thornburg Limited Term Income Fund	2.66	2.03	0.71
Thornburg Strategic Income Fund	2.99	2.01	0.02

Average durations are for the 2-year period from 12/31/2015 through 12/31/2017 (based on monthly data) as of 12/31/2017.

U.S. Treasuries and the response usually sounds something like “if the U.S. Treasury defaults we have much bigger problems to worry about.” Probably true, but we will leave that topic for another time.

Meantime, corporate bonds, asset-backed securities, foreign sovereigns, etc., are all subject to a broad definition of credit risk. Here we review “credit risk” as essentially all risks not encompassed by the change in risk-free rates. It is not uncommon to hear of corporations going bankrupt, individuals defaulting on their mortgages, or foreign governments missing interest payment obligations. Therefore, investors in the everything-but-U.S. Treasuries camp consider multiple dimensions of risk when assessing opportunities. Moreover, within the catch-all of credit risk there are many nuanced varieties of factor exposure that can affect each company, consumer, or government differently.

Fixed Income Needs a Wide Lens

At Thornburg Investment Management, we take the view that relative value and diversification are paramount to creating the best outcomes for investors. Depending upon the mandate, we consistently attempt to diversify the sources of potential risk and return so that performance is not

entirely predicated upon a singular event, outcome, or factor exposure. To that end, our investment team is comprised of portfolio managers and analysts with deep backgrounds in specific asset classes, but with a flexible perspective. The team structure helps ensure that each investment professional is aware of relative valuations and opportunities across the entire fixed income landscape, not just their preferred habitat. It is with this basis of understanding that portfolio managers and analysts can constantly assess and trade off various types of risk and return for one another. Within this philosophy of balancing risks, our fixed income strategies often temper their interest-rate exposure through the introduction of other opportunities.

Finding Value Even When Rates Increase

In essence, during periods when U.S. Treasury yields increase it is often in sympathy with improving economic conditions. This dynamic is frequently beneficial for corporations and by extension corporate bonds, which benefit as the broader economy improves. This can cause the average credit profile of a corporation to improve as its underlying business fundamentals catch the economic tailwind. Thus, even though U.S. Treasury yields are increasing, which theoretically should

cause duration-related losses to corporate bonds, it is often the case that duration losses are partially offset by credit-related bond price improvements. As a result of this dynamic, and where allowed by the specifics of each Thornburg fixed income mandate, the simple statistic of “duration” may not adequately encapsulate the interest-rate risk of our fixed income strategies.

Shown in *Table 1* are the average effective durations from 2015-2017 of three Thornburg fixed income strategies compared with their exhibited durations over the same time period. We compare the effective durations, as produced by a mathematical formula, to the actual (exhibited) behavior shown by each strategy. To arrive at exhibited durations, we compared monthly changes in the yield of the 3-year U.S. Treasury with the price return of each strategy. The 3-year U.S. Treasury was chosen because it most closely matches the average cash flows of the three strategies (i.e., the durations were similar).

The data shows that the broader the mandate and exposure to additional fixed income asset classes, the lower the actual correlation to U.S. Treasury rates. Furthermore, their respective R² metric shows the percentage of each strategy’s return that can be explained by the movement of risk-free rates. Again, as a strategy incorporates additional vectors of risk and return the explanatory power of risk-free rate movement decreases, from highly meaningful for Thornburg Limited Term U.S. Government Fund (93%) to insignificant for Thornburg Strategic Income Fund (2%).

Deconstructing Duration: Inside Three Mandates

Thornburg Limited Term U.S. Government Fund is as it sounds—a strategy that will buy and hold only U.S. government-backed securities. Thus, one could expect the strategy to exhibit sensitivity to yield rate changes on U.S. government securities (i.e., U.S. Treasuries). The strategy has some flexibility to vary risk exposures using a variety of U.S. government securities apart from Treasuries, and does

so with an eye towards capturing additional relative value. These include looking to U.S. agency-backed mortgages and U.S. agency bonds. Within the context of this mandate, we have made a decision to keep duration relatively low given our view that the risk-reward dynamic has not been attractive in terms of holding longer-dated maturities.

Moving further out on the credit risk spectrum, **Thornburg Limited Term Income Fund** is an investment-grade core bond strategy with the majority of the portfolio (69%) A rated or better.* The strategy can purchase a broader array of U.S. dollar denominated securities, expanding upon Thornburg Limited Term U.S. Government Fund’s mandate by adding investment-grade corporates, asset- and mortgage-backed securities, commercial mortgage-backed securities, etc. The introduction of these additional fixed income asset classes lowers the strategy’s correlation to U.S. Treasury yields and reflects our view that greater value has been present in corporate and asset-backed markets relative to U.S. government-backed securities. Over the recent past, U.S. government-backed securities have played a very small part in this portfolio’s asset allocation. Currently, the marginal added relative value has been sought in the asset-backed securities segment, given its sensitivity to improving consumer credit metrics.

Finally, **Thornburg Strategic Income Fund** allows for the greatest flexibility of the three shown strategies. The strategy can span the quality spectrum with respect to investment-grade or high-yield credit across a variety of sub-asset classes. Additionally, it can also invest in non-U.S. dollar-denominated securities. As could be expected, the inclusion of additional vectors of risk and return further dampen the strategy’s sensitivity to U.S. Treasury yields. Thornburg Strategic Income Fund exhibited very little correlation to U.S. Treasury yields during 2015-2017, due in large part to the investment team’s search for superior relative value in corporate credit, asset-backed securities (ABS), and bank loans. Given this strategy’s diverse asset allocation, the explanatory value of risk-free rates with

Thornburg Limited Term U.S. Government Fund Portfolio Composition, 12/31/17

Mortgage Pass Through	24.8%
Treasury	23.3%
Collateralized Mortgage Obligation	15.5%
Comm. Mortgage-Backed Securities	11.9%
Government Agency	11.9%
Asset-Backed Securities	5.3%
Cash & Cash Equivalents	7.4%

Thornburg Limited Term Income Fund Portfolio Composition, 12/31/17

Corporate Bonds	48.0%
Asset-Backed Securities	17.4%
Collateralized Mortgage Obligation	7.4%
Treasury	5.3%
Comm. Mortgage-Backed Securities	4.2%
Government Agency	3.3%
Municipal Bonds	2.8%
Mortgage Pass Through	2.8%
Foreign Treasury	0.2%
Cash & Cash Equivalents	8.7%

Thornburg Strategic Income Fund Portfolio Composition, 12/31/17

Corporate Bonds	58.1%
Asset-Backed Securities	15.7%
Bank Loans	3.5%
Collateralized Mortgage Obligation	3.2%
Comm. Mortgage-Backed Securities	1.9%
Preferred Stock	1.6%
Municipal Bonds	0.8%
Government Agency	0.4%
Foreign Treasury	0.4%
Mortgage Pass Through	0.3%
Common Stock	0.1%
Treasury	0.0%
Cash & Cash Equivalents	13.8%

*Includes cash and cash equivalents.

respect to return is likely to remain the lowest of the three strategies outlined.

Mindful of Risk, Committed to Value

While managing fixed income strategies on behalf of clients, we attempt to avoid marrying portfolios to any singular exposure that would encompass a singular risk,

be it in the form of duration or credit. The degree to which these exposures are diversified depends largely upon the guidelines provided by each of the three mandates. Yet, in all circumstances, the Thornburg global fixed income investment team operates with the philosophy that constantly searching for relative value and diversification can lead to the best possible combination of outcomes. ■

Josh Yafa is director of client portfolio management. Before joining Thornburg,

he was a product manager covering global fixed income for Franklin Templeton Investments, and spent five years in the private investment management division at Barclays and Lehman Brothers in San Francisco. Josh holds an MBA from UCLA's Anderson School of Management and a BA with Honors in Business Economics from the University of California, Santa Barbara.

For more information about our active approach to fixed income visit www.thornburg.com.

Investments carry risks, including possible loss of principal. Portfolios investing in bonds have the same interest rate, inflation, and credit risks that are associated with the underlying bonds. The value of bonds will fluctuate relative to changes in interest rates, decreasing when interest rates rise. This effect is more pronounced for longer-term bonds. Unlike bonds, bond funds have ongoing fees and expenses. Investments in lower rated and unrated bonds may be more sensitive to default, downgrades, and market volatility; these investments may also be less liquid than higher rated bonds. Investments in derivatives are subject to the risks associated with the securities or other assets underlying the pool of securities, including illiquidity and difficulty in valuation. Investments in the Funds are not FDIC insured, nor are they bank deposits or guaranteed by a bank or any other entity.

There is no guarantee that the Funds will meet their investment objectives.

A bond credit rating assesses the financial ability of a debt issuer to make timely payments of principal and interest. Ratings of AAA (the highest), AA, A, and BBB are investment-grade quality. Ratings of BB, B, CCC, CC, C and D (the lowest) are considered below investment-grade, speculative grade, or junk bonds.

Credit quality ratings for Thornburg's global fixed income portfolios used ratings from Moody's Investors Service. Where Moody's ratings are not available, we have used S&P Global Ratings. Where neither rating is available, we have used ratings from other nationally recognized statistical rating organizations (NRSROs). "NR" = not rated.

Treasuries – U.S. Treasury securities, such as bills, notes and bonds, are negotiable debt obligations of the U.S. government. These debt obligations are backed by the "full faith and credit" of the government and issued at various schedules and maturities. Income from Treasury securities is exempt from state and local, but not federal, taxes.

Agency bond – A debt obligation issued by government corporations or government sponsored enterprises. They are exempt from state and local taxes and are not guaranteed by the U.S. government.

Asset-Backed Security (ABS) – A security whose value and income payments are derived from and collateralized (or "backed") by a specified pool of underlying assets. The pool of assets is typically a group of small and illiquid assets that are unable to be sold individually. Pooling the assets into financial instruments allows them to be sold to general investors, a process called securitization, and allows the risk of investing in the underlying assets to be diversified because each security will represent a fraction of the total value of the diverse pool of underlying assets.

Collateralized Mortgage Obligation (CMO) – A type of mortgage-backed security that creates separate pools of pass-through rates for different classes of bondholders with varying maturities, called tranches. The repayments from the pool of pass-through securities are used to retire the bonds in the order specified by the bonds' prospectus.

Effective Duration – A bond's sensitivity to interest rates, incorporating the embedded option features, such as call provisions. Bonds with longer durations experience greater price volatility than bonds with shorter durations.

Mortgage-Backed Security – A type of asset-backed security that is secured by a mortgage or collection of mortgages. These securities must be grouped in one of the top two ratings as determined by a accredited credit rating agency and usually pay periodic payments that are similar to coupon payments. The mortgage must have originated from a regulated and authorized financial institution.

Mortgage Pass-Through – A security consisting of a pool of residential mortgage loans. Payments of principal, interest and prepayments are "passed through" to investors each month.

R Squared (R²) – A statistical measure that represents the percentage of a fund's or security's movements that are explained by movements in a benchmark index.

Riskless (or risk-free) Interest Rate – The theoretical rate of return of an investment with zero risk. The risk-free rate represents the interest that an investor would expect from an absolutely risk-free investment over a given period of time. Though a truly risk-free asset exists only in theory, in practice most professionals and academics use short-dated government bonds, such as a three-month U.S. Treasury bill.

The views expressed are those of Thornburg Investment Management. These views are subject to change at anytime in response to changing circumstances in the markets and are not intended to predict or guarantee the future performance of any individual security or the markets generally, nor are they intended to predict the future performance of any Thornburg Investment Management account, strategy or fund.

Thornburg mutual funds are distributed by Thornburg Securities Corporation.

Past performance does not guarantee future results.

Before investing, carefully consider the Fund's investment goals, risks, charges, and expenses. For a prospectus or summary prospectus containing this and other information, contact your financial advisor or visit thornburg.com. Read them carefully before investing.