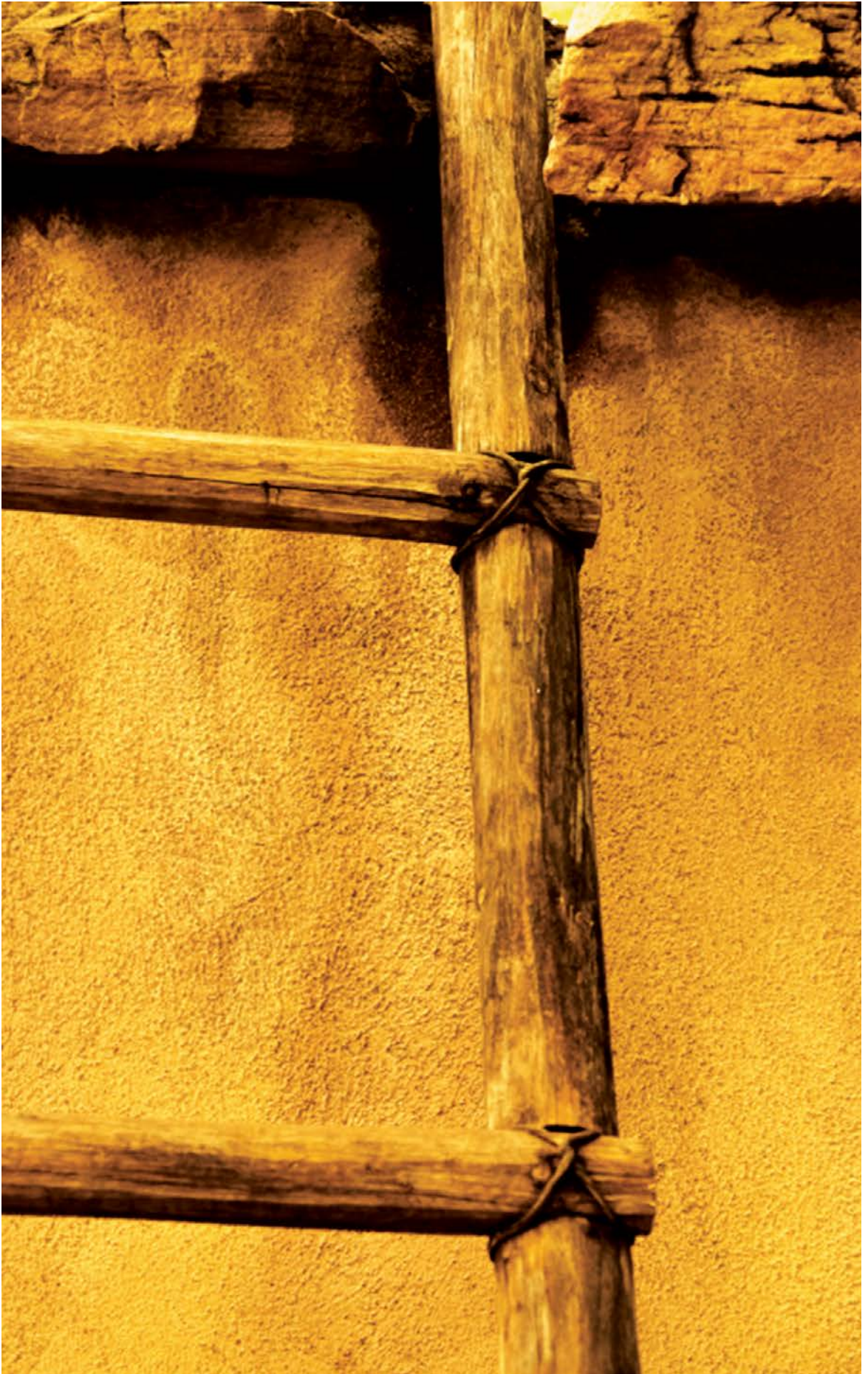

A Bond Strategy for
Balancing Risk and Return

THE LADDERED BOND PORTFOLIO



Southwestern Kiva or Pueblo Ladders were used by New Mexico's Pueblo Natives to access multi-level adobe buildings, kivas and dwellings carved into sandstone.

Many financial advisors recommend bonds and bond funds as a part of their clients' investment portfolios, both for their perceived safety and yield. However, not all bonds and bond funds are the same, and investors are often lured by higher yields into high-risk bond strategies, only to expose themselves to increased losses.

Bonds and bond funds are subject to certain risks including interest-rate risk, credit risk, and inflation risk. The value of a bond will fluctuate relative to changes in interest rates; as interest rates rise, the overall price of bonds fall. Unlike individual bonds, bond funds have ongoing fees and expenses.

The laddering strategy does not assure or guarantee better performance than a non-laddered portfolio and cannot eliminate the risk of investment losses.

The bond-market turmoil that began in late 2008 served as a stark reminder to fixed-income investors that various forms of risk, if denied, unacknowledged, or left poorly managed, can wreak havoc on portfolio values. Contrast what happened to bond investors (many of whose portfolios contained far more credit-related risk than they or even their advisors were aware of) to the experience of equity market investors since 2008, and it becomes clear that the risks of fixed-income investing are very real, and that bond portfolio values can fluctuate dramatically.

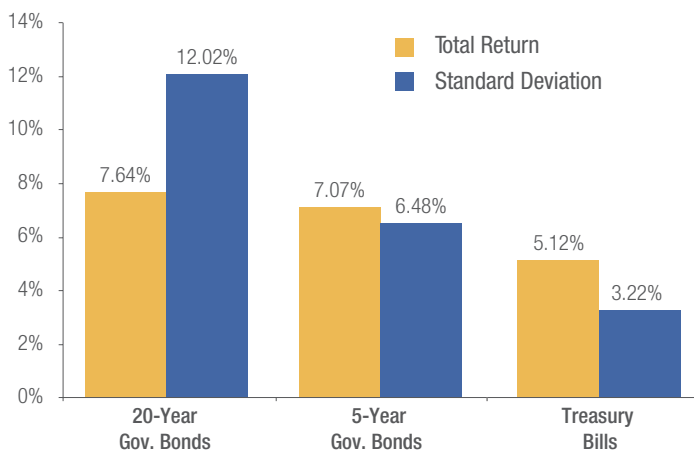
The stock market crash of 1987 provides a more distant illustration of the risks of fixed-income investing. The crash was highly dramatized in the media, but more money was lost in long-term bonds and bond funds that year than in stocks. Rates fluctuated wildly and rose dramatically by year end, causing bond portfolios to lose significant value. Why? When interest rates rise, market values of bonds go down, because bond interest rates are fixed and the present value of a bond's stream of interest payments drops. These factors caused investors to panic and sell their bond funds, leaving fund managers with no choice but to sell long-term bonds at a loss to generate cash for redemptions.

At Thornburg, we believe that the slightly higher nominal yield of long-term bonds must be carefully considered in relation to their volatility.

Higher Historical Volatility of Long-Term Bonds

Long-term bond investors enjoyed their best decade in

Figure 1: Summary Statistics of Annual Returns (1963-2015)



Intermediate bonds, defined as those with a maturity of five years, had comparable total returns with a significantly lower standard deviation compared to long-term bonds.

Past performance does not guarantee future results.

Government bonds and Treasury bills are negotiable debt obligations of the U.S. government backed by the "full faith and credit" of the government. Income from government securities is exempt from state and local, but not federal, taxes. Government bonds are issued at various schedules and maturities. Treasury bills are short-term instruments with maturities of no more than one year.

Standard deviation is a statistical measurement of dispersion about an average which, for an investment portfolio, depicts how widely the returns varied over a certain period of time. Investors use the standard deviation of historical performance to try to gauge the range of returns that are most likely for a given investment. When an investment has a high standard deviation, the predicted range of performance is wide, implying greater volatility.

Source: Ibbotson Associates.

history between the late 1980s and early 1990s, with gains averaging 12.7% per year. The worst decade for long-term bond investors was the 1950s. During that time, annual losses averaged -0.1% (with reinvested income; substantially lower otherwise). The recent interval that followed the credit crisis has awakened investors to long-term bonds' volatility, and more investors are aware of the risks — many of them acutely.

Over the past 50 years, as **figure 1** illustrates, longer-term bonds have returned slightly more (7.64% versus 7.07%) than intermediate-term bonds, but their volatility of returns, as measured by standard deviation, has been markedly higher. **Figure 2** depicts the greater-than-12% price change of a 30-year U.S. Treasury over the span of less than one month in late 2011. Even when compared to short-term U.S.

Figure 2: Market Price Risk

	High (10/3/11)	Low (10/29/11)
U.S. Treasury 3.75%, Maturity 8/15/41	120.83	105.44
Change in Price = 12.74%		

Source: Bloomberg.

Figure 3: Reinvestment Risk

Hypothetical \$100,000 Invested in Average Taxable Money Market Fund



Reinvestment risk as depicted by the declining return from a hypothetical \$100,000 money market fund purchase.

Past performance does not guarantee future results.

Source: Morningstar Principia Pro. Hypothetical assumes dividends were not reinvested.

Treasury bills, the increased total return of long-term bonds (in this case, 20-year U.S. Treasuries) versus their heightened price volatility is, at minimum, a tradeoff that must be carefully considered.

The short- and intermediate-term laddered portfolios managed by Thornburg seek to mitigate the various forms of risk and smooth the price volatility typical of longer-term bonds.

The Risks

There are four main risks inherent in every bond and bond fund: credit risk, income tax risk, market price risk, and

reinvestment risk. It is possible to mitigate credit risk by researching and monitoring a bond, and income tax risk can be minimized by investing in tax-free bonds or using a tax-deferred account, but it is impossible to simultaneously master market price risk and reinvestment risk.

So, while it's true that some investments do alleviate some of the above factors, no single investment can fully manage all of them. Market price risk (see *figure 2*), for example, can best be curtailed by owning a limited-term certificate of deposit (CD) or a money market fund, because the mar-

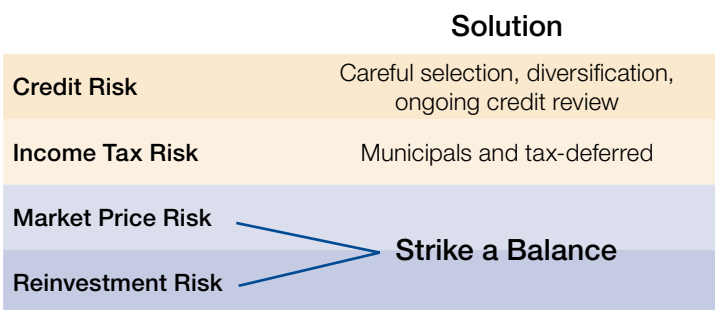
ket price is always constant. But reinvestment risk is, as a result, comparatively larger when investing in a CD or money market fund (see *figure 3*). Reinvestment risk can be diminished through investing in zero-coupon bonds (bonds that are not contracted to make periodic coupon payments) because reinvestment is fixed until maturity, but a zero-coupon bond is subject to market risk. All other bonds are subject to both market and reinvestment risk.

At best, an investor in a fixed-income vehicle other than the above instruments can hope only for a compromise solution that minimizes and manages market price and reinvestment risk, while achieving an attractive total return (see *figure 4*).

Striking a Balance: Laddering the Portfolio

How do fixed-income investors achieve a respectable rate of return without experiencing the higher risk associated with the fluctuation of interest rates?

Figure 4: Risk Management Strategies



Further, what is an adequate trade-off of higher risk for higher return?

Laddering involves building a portfolio of bonds with staggered maturities so that

a portion of the portfolio will mature each year (see *figure 5*). To maintain the ladder, money that comes in from currently maturing bonds is typically invested in bonds with longer maturities

within the range of the bond ladder.

Laddering tends to perform very well against other bond strategies over the long term because it can simultaneously accomplish two goals:

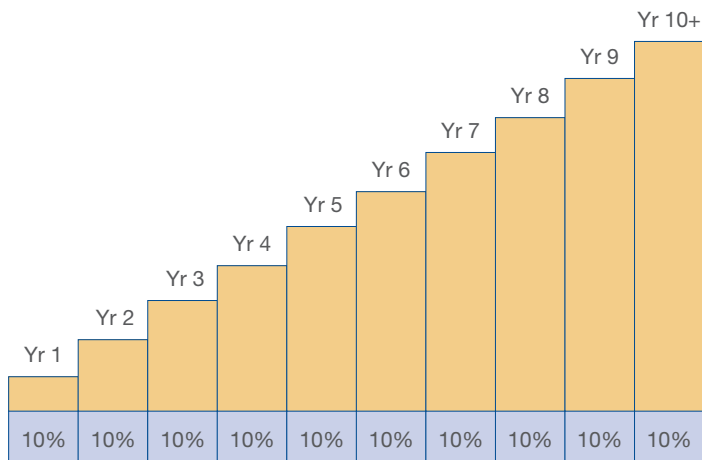
- Capture price appreciation as the bonds age and their remaining life shortens.
- Reinvest principal from maturing bonds (low-yielding bonds) into new longer-term bonds (higher-yielding bonds).

Managing Market Price Risk

The primary goal of a laddered bond portfolio is to achieve a total return over all interest rate cycles that compares favorably to the total return of a long-term bond, but with less market price and reinvestment risk. This goal is pursued by maintaining an investment of approximately equal amounts of a bond portfolio in each year of the selected maturity range.

A bond's sensitivity to interest rates is measured by its duration. The shorter the duration, the less volatile the bond's price. When interest rates shift, a bond with a one-year maturity barely budges in price, while the price of a 30-year bond moves dramatically (as shown in *figure 6*). Long-term bond funds pay a heavy price for their marginally higher yields. As limited- and intermediate-term bonds age, their durations shorten at an increasing rate, in a telescoping effect. A single year of aging will shorten the duration of a five-year bond more than it does a 10-year bond and will

Figure 5: A Hypothetical Limited Term Bond Ladder

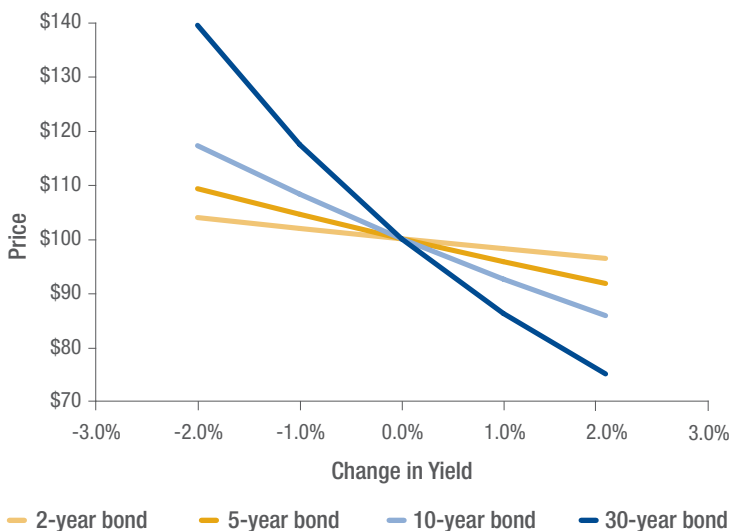


Laddering involves building a portfolio of bonds with staggered maturities so that a portion of the portfolio will mature each year.

For illustration purposes only. Not representative of an actual investment.

Figure 6: Duration Effect

Change in Price for a Given Change in Yield



A change in interest rate moves the price of a 30-year bond much more than that of a shorter-term bond.

Rising interest rates means falling bond prices, while declining interest rates means rising bond prices. Duration quantifies how much a bond's price changes in response to a 1% change in interest rates. For example, if interest rates rise 1%, a bond with a 5-year duration will decrease in value by 5%, and if interest rates fall 1%, that bond will increase in value by 5%. Bonds with higher durations carry more risk and have higher price volatility than bonds with lower durations.

Source: Thornburg.

Figure 7: How Does Aging Affect Duration?

Term of Bond	Initial Duration	Duration After Five Years	Change in Duration	Percent Change in Duration
30-year	15.5	14.2	-1.3	-8%
20-year	12.6	10.5	-2.1	-17%
10-year	7.8	4.4	-3.4	-44%

For illustration purposes only. Not representative of an actual investment.

Figure 8: Pricing a Bond as it Approaches Maturity

Composite AAA Yield Curve (as of 10/31/16)

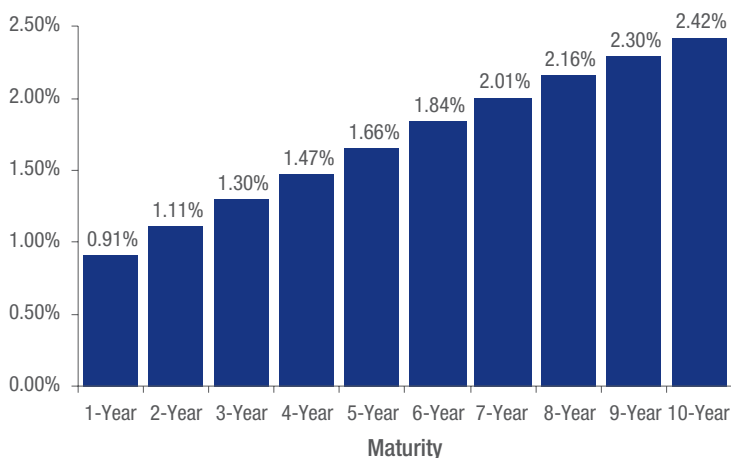


Illustration of a Bond Due in Ten Years Priced at Various Intervals Over its Term

Pricing Date	Coupon	Yield to Maturity	Dollar Price
Issuance	2.42%	2.42%	100.000
2017	2.42%	2.30%	101.027
2018	2.42%	2.16%	101.930
2019	2.42%	2.01%	102.704
2020	2.42%	1.84%	103.298
2021	2.42%	1.66%	103.661
2022	2.42%	1.47%	103.673
2023	2.42%	1.30%	103.288
2024	2.42%	1.11%	102.584
2025	2.42%	0.91%	101.501
2026	2.42%	Matures	100.000

In this illustration, note that five years after its issuance, the 2.42% bond due in 2026 has approximately five years to maturity. Assuming constant interest rates, we price the 2.42% bond using a 1.66% yield to maturity to obtain a dollar price of 103.661, when five years remain to maturity.

Source: Barclays Bloomberg USD AAA Composite.

benefit a 10-year bond more than a 20-year bond. A 30-year bond's duration, on the other hand, hardly responds to a single year's passing.

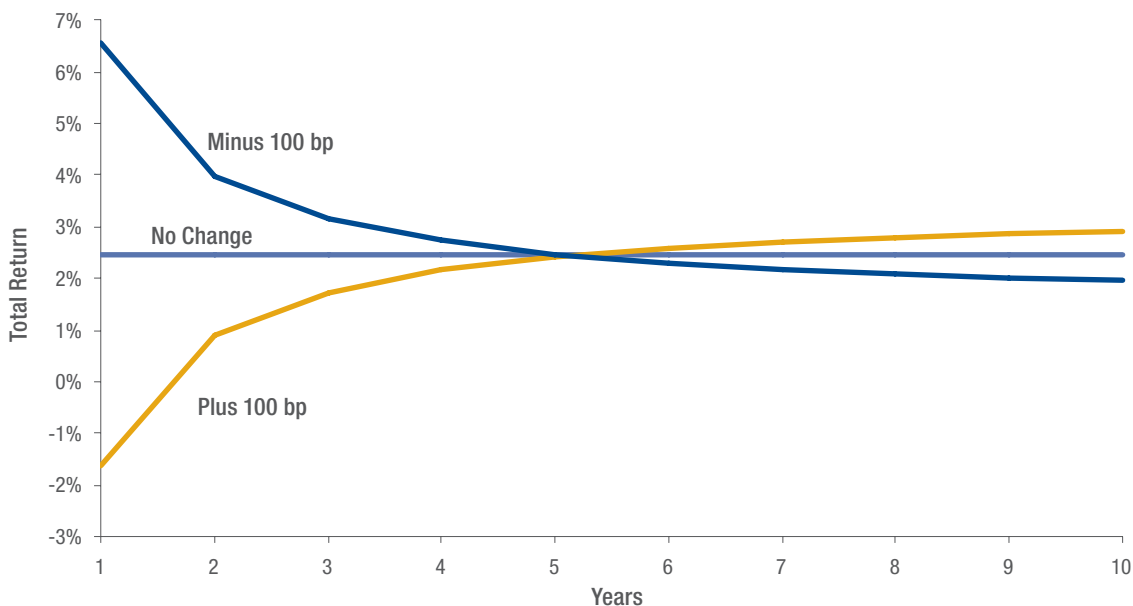
More Examples

Figure 7 compares three identical bonds with five percent coupons. The first bond has 30 years to maturity, the second 20 years, and the third 10 years. Observe the effect on duration after five years of aging.

The shorter-duration bond carries less risk, so a potential buyer will demand less yield. If interest rates remain constant, the bond will rise in value over most of its life, as its duration shortens. If interest rates rise, the bond will recover much (if not all) of its lost value as duration shortens, and is priced to the lower yield of a shortened bond.

Figure 8 shows the price of an intermediate bond from issuance until maturity (assuming that bond yields are held constant during the investment period). Note how the price rises over most of its life. This scenario, when applied to a laddered-maturity portfolio, reduces market price risk because there are generally more bonds rising in price than falling in price.

Figure 9: Effect of Interest Rate Changes on a Hypothetical Laddered Bond Portfolio



Basis Point (bp) – A unit equal to 1/100th of 1%. 1% = 100 basis points (bps)
 For illustration purposes only, not representative of an actual investment.
 Source: Standard & Poor’s and Thornburg.

Managing Reinvestment Risk

In a laddered portfolio, bonds mature every year. As this occurs, the principal proceeds are reinvested at the longer end of the ladder, often at higher interest rates. The income stream will stay relatively constant because only a small portion of the portfolio will mature and be replaced each year. Over time, the portfolio should include bonds purchased in periods of both high and low interest rates. *Figure 9* demonstrates how a laddered portfolio can be expected to react to three interest rate scenarios:

UNCHANGED INTEREST RATES
 (The center line in the graph in *figure 9* represents a scenario of unchanging interest rates.)

In this scenario, a very steady return is generated each year in the laddered portfolio. The return will be fairly close

to the highest-yielding bond in the portfolio.

RISING INTEREST RATES (The gold line in the graph in *figure 9* represents a scenario of rising interest rates.)

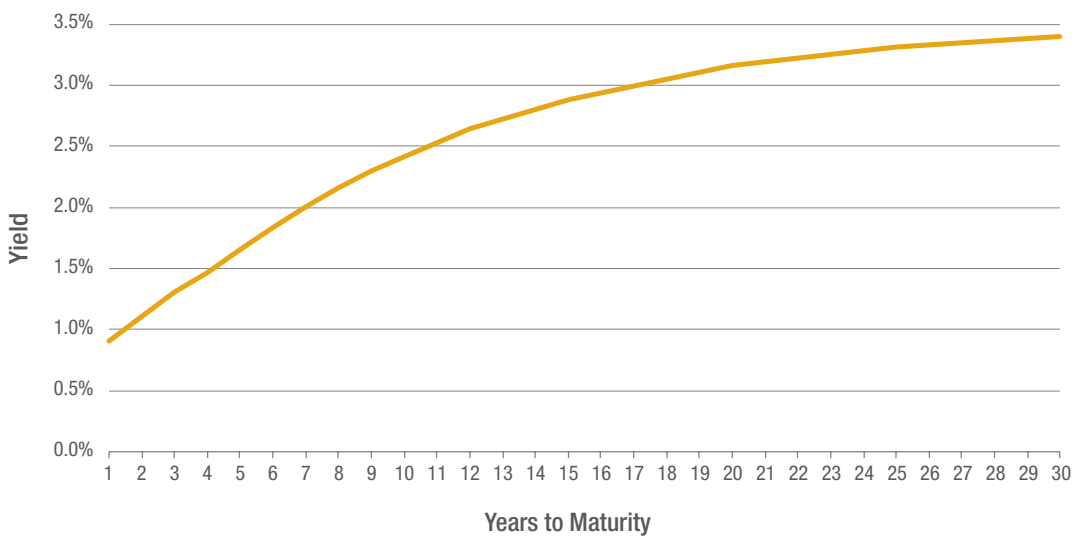
Bond values initially drop, but recover value as they move toward their maturity at par. Unlike owning an individual bond, the ladder has maturing bonds each year, which gives the portfolio a stream of cash flow to reinvest in new, higher-yielding bonds. This creates a consistent pattern of investment, much as dollar cost averaging does for the equity market. Without maturing bonds, the manager could only sell bonds at depressed prices in order to generate cash for reinvestment. As proceeds from maturing bonds are reinvested in higher-yielding bonds at the far end of the ladder, the portfolio’s yield gradually increases. This built-in reinvestment feature works

to offset some of the price depreciation that occurred throughout the ladder when interest rates rose. It also results in a rising income stream. As can be seen, after a few years, the portfolio’s total return first equals its original return — then surpasses it.

WHAT IF INTEREST RATES FALL?
 (The dark blue line in the graph in *figure 9* represents a scenario of falling interest rates.)

In this scenario, the portfolio’s return rises as bond prices are marked up. Ultimately, as those bonds mature and proceeds are reinvested in lower-yielding bonds, the portfolio’s long-term return is lower than it would have been under the first two scenarios. The income stream also decreases, but only gradually, because the longer-term higher-yielding bonds continue to be held in the portfolio and the income generated continues to be the average of all the bonds.

Figure 10: US Composite AAA Yield Curve (as of 10/31/16)



This chart depicts the AAA non-callable S&P composite yield curve over three years, average yields as of 10/31/16.
Source: S&P Capital IQ

Why Does this Tactic Work?

Let's look at an average bond yield curve (shown in *figure 10*). The horizontal axis represents years to maturity and the vertical axis the expected yield. A normal (positively sloped) yield curve means that the shortest investments generate the lowest yields. As years to maturity increase, yield levels rise. Yields rose substantially every year for the first 10 years of the curve.

As *figure 10* shows, the first five to 10 years of the curve is the steepest segment; a steep curve is good for bond investors, because yields will increase rapidly over a short time frame. Beyond 15 years, the yield curve flattens a bit, and little increase in yield results even as maturities extend and more risk is assumed.

As maturing proceeds are reinvested at the end of the ladder, the yield of the portfolio is greater than what would be expected by the average

maturity of the bonds, because of the positive slope of the yield curve. As a result, over time, a laddered portfolio of bonds tends to produce a portfolio with the income of the longer-maturity bonds but with the price stability of the middle-maturity bonds in the ladder.

Strategies which help manage both price volatility and reinvestment rates are: laddering the portfolio, focusing on short-term and intermediate-term bonds, reinvesting proceeds at the end of the ladder rather than the front, and allowing bonds to naturally age down the yield curve. We believe that the practice of laddering a portfolio throughout all market environments provides the most attractive means of managing both market price and reinvestment risk.

Other Things You Should Know

Most bonds have a call provision, which means that the issuer of that bond can repay the bond early. Callability, and

its potential effects on returns, is a frequently misunderstood feature in bond portfolios. A goal of a properly structured laddered bond portfolio should be to buy only non-callable bonds, or bonds that are only callable within a few years of maturity (as opposed to having 10, 15, or 20 years between the call date and the maturity of the bond).

For example, consider a New York City bond with a call provision and assume that interest rates have gone down. In this case, the city will call the bond and issue new bonds at a lower interest rate. Obviously, if the new bonds were issued with a four percent yield, the investor would prefer to retain the old bonds that are paying six percent, but if the city has a call provision, the investor must surrender the higher-rate bonds.

More than 90 percent of long-term municipal bonds issued have a 10-year call provision. Therefore, a 20- or 30-year bond paying an above-market yield will probably be called

within 10 years. As such, the investor would not be compensated for assuming the greater risk, since the high-yielding bond gets called before its final maturity. Worse, if interest rates rise and the bond's yield is below market, the issuer is not likely to call the bonds and the investor would own the below-market bond all the way to its final maturity. With a laddering strategy, which uses only limited- or intermediate-range bonds, call risk tends to be lower.

Summary

Laddering short-term and intermediate-term bonds captures most of the return of longer-term bonds, with less volatility. For example, a 10-year ladder can produce the yield and return of 10-year bonds, but with lower risk because of its five-year average maturity. The strategy also smooths out reinvestment risk since money is being reinvested incrementally throughout a full interest rate cycle. The end result is a portfolio with returns close to

those of long-term bonds but with substantially less risk.

It really doesn't matter which way interest rates move. With a laddering strategy, it's possible to get consistent returns. This gives laddering investors a competitive advantage, knowing any time is a good time to build or buy into a ladder portfolio. It's the smart way to increase a portfolio's return while minimizing both market and reinvestment risk.

Fixed Income Portfolio Managers

JASON BRADY, CFA, is the President and Chief Executive Officer for Thornburg Investment Management. He is portfolio manager of the Thornburg global fixed income portfolios. Prior to joining Thornburg, he was a portfolio manager with Fortis Investments in Boston and has held various positions at Fidelity Investments and Lehman Brothers. He holds a BA with Honors in environmental biology and English from Dartmouth College and an MBA with concentrations in analytical finance and accounting from Northwestern's Kellogg Graduate School of Management.

LON ERICKSON, CFA, is a managing director for Thornburg Investment Management and portfolio manager of the Thornburg global fixed income portfolios. Prior to joining Thornburg, Lon spent almost 11 years as an analyst for State Farm Insurance in both the equity and corporate bond departments. Lon earned his BA in business administration with a minor in economics from Illinois Wesleyan University and his MBA

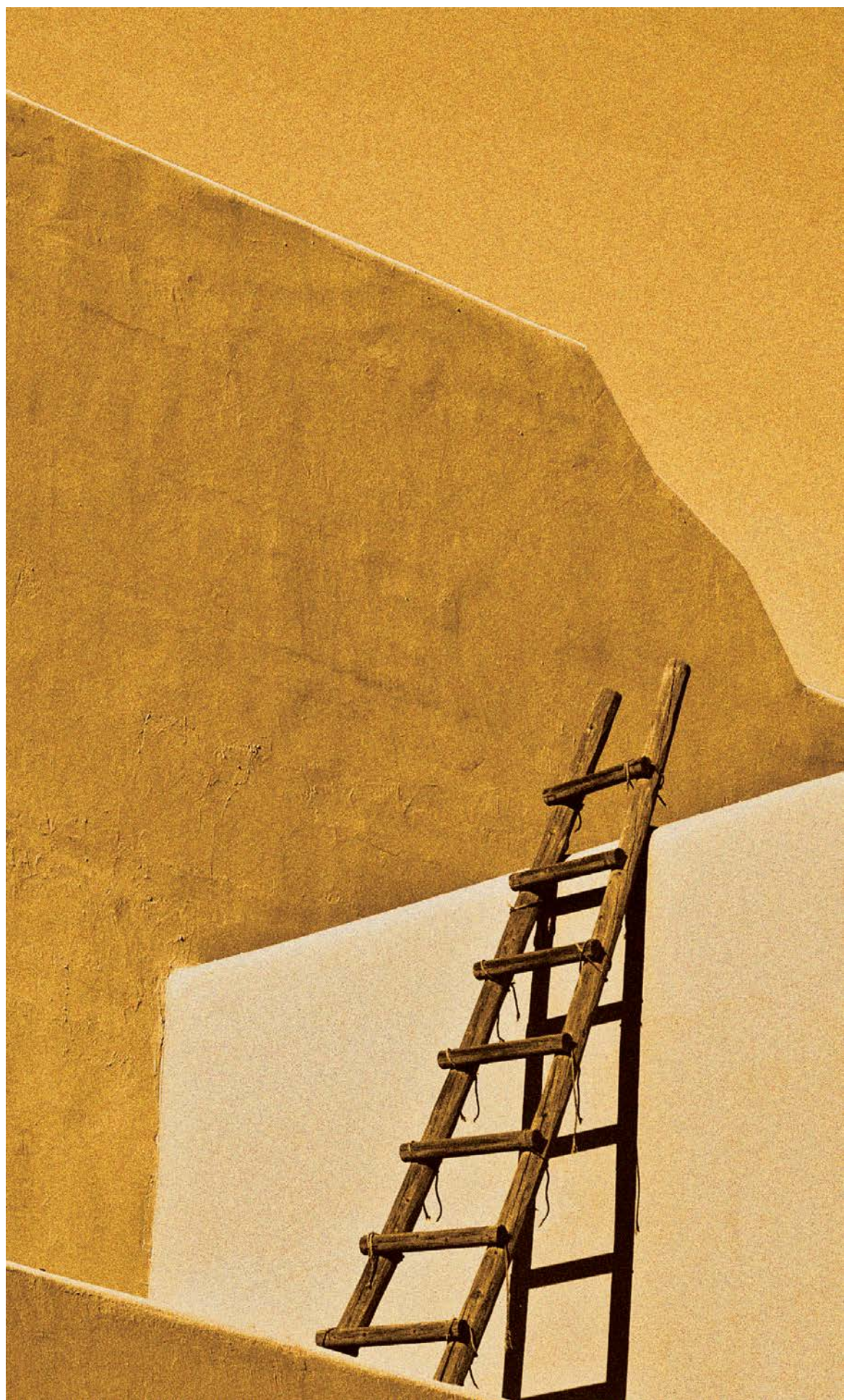
from the University of Chicago Graduate School of Business.

JEFF KLINGELHOFER, CFA, is a managing director for Thornburg Investment Management. He is portfolio manager of the Thornburg global fixed income portfolios. He joined the firm in 2010, then was promoted to associate portfolio manager in 2012. In 2015, Jeff was made portfolio manager and managing director. Jeff earned a BA in economics with a minor in business from The University of California at Irvine, and an MBA from The University of Chicago's Booth School of Business in 2010. Prior to joining Thornburg, Jeff spent four years with PIMCO, where he was responsible for monitoring portfolio leverage and risk tolerances.

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NICHOLOS VENDITTI, CFA, is a managing director for Thornburg Investment Management and portfolio manager of the Thornburg municipal bond portfolios. He joined Thornburg in 2010 as a fixed income research analyst, was promoted to associate portfolio manager of the Thornburg municipal bond portfolios in 2011, and then to portfolio manager and managing director in 2015. Nick earned an MS in finance from Syracuse University, an MA in applied economics from the University of North Carolina — Greensboro, and a BA from Trinity University. Prior to joining Thornburg, Nick spent three years as assistant vice president for bond insurer FSA (now merged with Assured Guaranty Corp).





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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.

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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.

Yield Curve – A line that plots the interest rates, at a set point in time, of bonds having equal credit quality, but differing maturity dates.

Yield to Maturity – The rate of return anticipated on a bond if it is held until maturity date.

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