

# The enduring case for high-yield bonds

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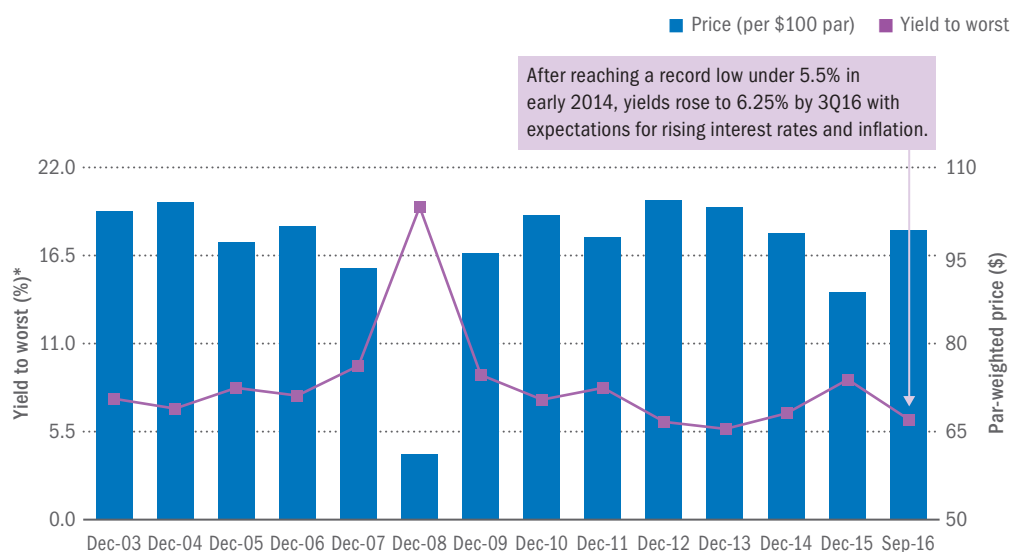
## Executive summary

- High-yield bonds as an asset class offer attractive value, given economic fundamentals and relatively low default rates, and higher long-term total return potential than other fixed-income sectors.
- Our research makes the case for a long-term, strategic allocation to high yield as a distinct asset class. High-yield bonds are effective diversifiers for stock and bond portfolios, helping to reduce volatility and enhance returns. Attractive characteristics include: (i) low correlations to higher-grade bonds and to equities; (ii) lower sensitivity to rising interest rates than Treasuries and other high-grade bonds; and (iii) potential for attractive relative and risk-adjusted returns.
- High-yield bonds are particularly effective in mitigating the risk of rising interest rates versus other fixed-income assets, a potential concern as the Fed implements additional rate increases and the economy continues to improve albeit at a subnormal pace. High-yield bonds are negatively correlated with Treasuries and often generate positive returns despite rising rates, due to their higher spreads and improving credit conditions.
- Despite higher spreads relative to Ba/B-rated bonds, bonds rated Caa or lower have lower risk-adjusted returns than Ba/B-rated bonds over multiyear periods. Although Caa-C bonds may outperform in the short run, historical credit loss rates will likely eliminate this tactical advantage in the long run.

## The diversification merits of high-yield bonds

With interest rates near historic lows, capital has flowed into the U.S. high-yield bond market, raising prices and reducing yields to near-record lows. After dipping below 5.27% in August 2014 and reaching a high over 9.16% in February 2016, yields decreased to 6.25% by September 2016. The recent rise in high-yield bond prices and decline in yields reflected strong global demand for higher-yielding assets and a reduction in energy- and commodity-related default concerns (Exhibit 1).

Exhibit 1. High-yield bond yields have declined alongside an increase in price



Yields and prices of the BofA Merrill Lynch US High Yield Index (December 31, 2003 through September 30, 2016).

\* “Yield to worst” is the lowest yield a buyer can expect among reasonable alternatives, such as yield-to-maturity or yield-to-first-call-date. It assumes the borrower’s ability to repay, but it also makes worst-case scenario assumptions by calculating the returns received if the borrower exercised certain provisions (such as a call or prepayment) prior to the stated maturity date. Source: Bank of America Merrill Lynch.

Yet after a progressive 30-year decline in interest rates, there is little room for bond prices to continue rising. The Federal Reserve has begun a new rate increase cycle, raising rates in December 2015 for the first time since 2006, with additional moves expected.

The prospect of rising interest rates—along with high bond valuations, a slowing global economy and potential volatility—is prompting investors to reconsider their fixed-income allocations. Our research demonstrates that a long-term, strategic allocation to high-yield bonds offers value, including significant diversification benefits. Incorporating high-yield bonds offers the potential to enhance portfolio returns and reduce volatility.

To begin with, consider correlations: Over the past 24 years (1993–2016), high-yield bond returns have exhibited negative correlation to Treasuries (-0.08), low correlation to high-grade corporate bonds (0.57), and relatively low correlation to equities (0.62), as shown in Exhibit 2.

High-yield bonds have exhibited negative or low correlations to Treasuries, high-grade corporate bonds and equities over the past 24 years.

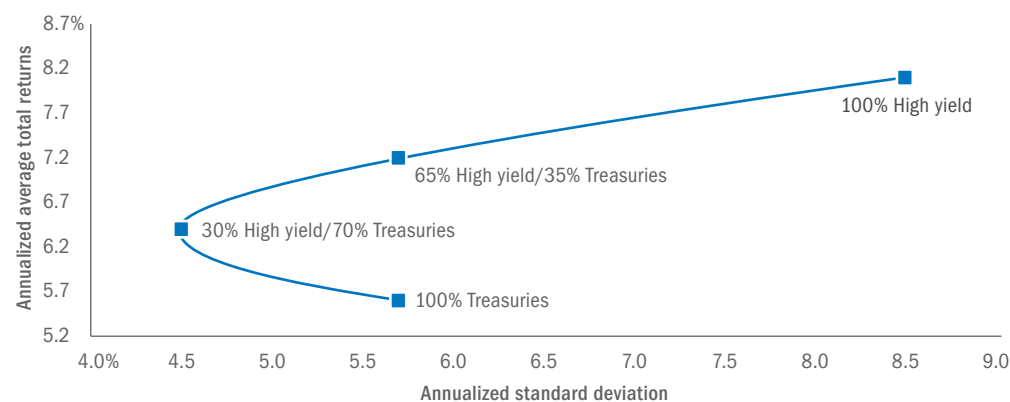
**Exhibit 2. High-yield bonds have exhibited low correlations to other bonds and to equities\***

|                       | High yield <sup>1</sup> | Leveraged loans <sup>2</sup> | Mortgage backed <sup>3</sup> | 10-year Treasuries <sup>4</sup> | 3-month Treasuries <sup>5</sup> | High-grade corporates <sup>6</sup> | Large stocks <sup>7</sup> | Small stocks <sup>8</sup> |
|-----------------------|-------------------------|------------------------------|------------------------------|---------------------------------|---------------------------------|------------------------------------|---------------------------|---------------------------|
| High yield            | 1.00                    |                              |                              |                                 |                                 |                                    |                           |                           |
| Leveraged loans       | 0.76                    | 1.00                         |                              |                                 |                                 |                                    |                           |                           |
| Mortgage backed       | 0.13                    | -0.12                        | 1.00                         |                                 |                                 |                                    |                           |                           |
| 10-year Treasuries    | -0.08                   | -0.32                        | 0.81                         | 1.00                            |                                 |                                    |                           |                           |
| 3-month Treasuries    | -0.08                   | -0.10                        | 0.21                         | 0.09                            | 1.00                            |                                    |                           |                           |
| High-grade corporates | 0.57                    | 0.34                         | 0.70                         | 0.67                            | 0.03                            | 1.00                               |                           |                           |
| Large stocks          | 0.62                    | 0.41                         | 0.00                         | -0.18                           | 0.02                            | 0.27                               | 1.00                      |                           |
| Small stocks          | 0.62                    | 0.42                         | -0.09                        | -0.24                           | -0.03                           | 0.18                               | 0.81                      | 1.00                      |

\* January 1, 1993–September 30, 2016; <sup>1</sup> BofA Merrill Lynch US Cash Pay High Yield Index; <sup>2</sup> S&P/LSTA Leveraged Loans Index; <sup>3</sup> BofA Merrill Lynch US Mortgage Backed Securities Index; <sup>4</sup> BofA Merrill Lynch 10-year US Treasury Index; <sup>5</sup> BofA Merrill Lynch US 3-month Treasury Bill Index; <sup>6</sup> BofA Merrill Lynch US Corporate Index; <sup>7</sup> S&P 500® Index; <sup>8</sup> Russell 2000™ Index; Source: Bank of America Merrill Lynch.

High-yield bonds can serve as powerful diversifiers in several other important respects. First, results from the past two decades spanning multiple market cycles have showed that adding high-yield bonds to a pure Treasury portfolio actually decreased risk and improved returns, significantly increasing risk-adjusted returns. The efficient frontier in Exhibit 3 provides a clear illustration: An allocation of 30% to high yield increased the annualized returns of a 100% Treasury portfolio by 80 basis points, while reducing annualized volatility by 120 basis points; a high-yield allocation of 65% added 160 basis points in annualized return to a 100% Treasury portfolio, with only a slight increase in risk.

**Exhibit 3. Adding high-yield bonds to a Treasury portfolio increased risk-adjusted returns\***



\* According to The BofA Merrill Lynch US High Yield Index, and BofA Merrill Lynch Current 5-year and 10-year US Treasury Index, as measured from January 1, 1993, through September 30, 2016. Based solely on historical returns and standard deviations. Source: Bank of America Merrill Lynch.

Second, high-yield bonds behave differently than high-grade bonds and over most scenarios outperform the latter. Their risk-adjusted returns over the long term place them as a separate asset class between equities and high-grade bonds. Between 1993 and September 2016, high-yield bonds (represented in the BofA Merrill Lynch US Cash Pay High Yield Index) earned an average annual return of 8.15% versus 6.71% for high-grade issues (represented in the BofA Merrill Lynch US Corporate Index). Volatility was greater for high yield with a standard deviation of 8.26 vs. 5.23 for high grade, but returns per unit of risk (Sharpe ratio) were similar at 0.18 and 0.21, respectively.

Finally, high-yield bonds can help offset the volatility of stocks, reducing overall portfolio volatility and making the case for long-term, strategic allocations to high yield as an asset class. This is evident not only in their low correlations to equities (Exhibit 2)—but also in their lower volatility compared to equities: From 1993 through September 2016, high yield standard deviations were 8.26, versus 14.46 and 18.87 for large-cap and small-cap stocks, respectively (Exhibit 4). Although large-cap stocks earned a higher average annual return of 8.41%, their higher volatility resulted in a lower Sharpe ratio of 0.11, compared to 0.18 for high-yield bonds.

### Exhibit 4. High-yield bonds can help offset the volatility of stocks

|                                  | Index returns 1/1/1993-9/30/2016 |                        |              |
|----------------------------------|----------------------------------|------------------------|--------------|
|                                  | Returns (%)                      | Standard deviation (%) | Sharpe ratio |
| High-Yield Bonds                 | 8.15                             | 8.26                   | 0.18         |
| Investment-grade corporate bonds | 6.71                             | 5.23                   | 0.21         |
| Large-cap stocks                 | 8.41                             | 14.46                  | 0.11         |
| Small-cap stocks                 | 9.50                             | 18.87                  | 0.10         |

It is not possible to invest in an index. Performance for indices does not reflect investment fees or transactions costs. Performance data reflect the following indexes: BofA Merrill Lynch US Cash Pay High Yield Index, BofA Merrill Lynch US Corporate Index, S&P 500 Index, Russell 2000 Index. Sources: BofA Merrill Lynch, Bloomberg.

The effect of interest-rate increases on high-yield bonds has been lower than on Treasuries and high-grade corporate bonds.

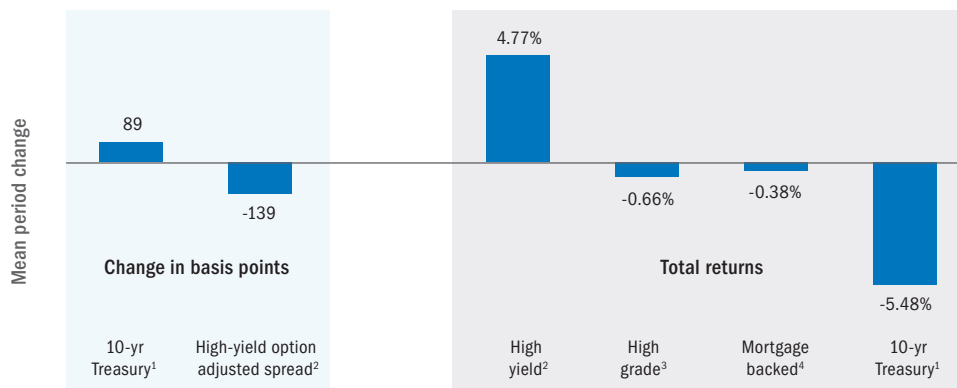
### Mitigating interest-rate risk

While the global growth slowdown may cause yields to remain lower for longer than expected, rising interest rates remains a concern for fixed-income investors considering the potential negative effect on bond prices over the long term. Here, too, high-yield bonds have an advantage: Compared to fixed-income alternatives, high-yield bonds have been less sensitive to interest-rate fluctuations, as reflected in their negative correlation with Treasuries. In contrast, high-grade corporate bonds and mortgage-backed securities had much higher correlations with Treasuries, at 0.67 and 0.81, respectively (Exhibit 2).

More importantly, in prior periods of relatively moderate and steady rate increases such as we may now be facing, high-yield bonds actually outperformed. Between 1998 and September 2016, there were 15 different periods of increases in the 10-year Treasury yield of 50 basis points or more. The effect of these increases on high-yield bonds was remarkably lower than on Treasuries and high-grade corporate bonds, based on a comparison of average total returns. During these periods, an average increase of 89 basis points in the 10-year Treasury yield resulted in losses for high-grade corporate bonds (-0.66%), mortgage-backed securities (-0.38%) and 10-year Treasury (-5.48%)—whereas high-yield bonds actually posted a positive return of 4.77% (Exhibit 5). [For returns and prevailing conditions for each of the 15 individual time periods, see Appendix A.]

### Exhibit 5. High-yield bonds' lower sensitivity to rising interest rates

Mean bond performance during 15 periods of rate increases: 1998–September 2016



<sup>1</sup> BofA Merrill Lynch 10-year US Treasury Index, <sup>2</sup> BofA Merrill Lynch US Cash Pay High Yield Index, <sup>3</sup> BofA Merrill Lynch US Corporate Index, <sup>4</sup> BofA Merrill Lynch US Mortgage Backed Securities Index.

Sources: TIAA-CREF, Bank of America Merrill Lynch, and Bloomberg.

In the current market environment, we believe the risks facing high-yield bonds from interest rates and credit have become more balanced. Notably, current spreads are narrower than in most periods included in Exhibit 5, indicating a lower level of protection against rising interest rates than during those periods. At the same time, expectations of additional Fed rate increases reflect continued economic growth and relatively positive credit conditions.

### Accounting for lower sensitivity to interest rates

High-yield bonds have been less sensitive to interest-rate increases for two reasons. First, their incremental yield—or spread—over Treasury and high-grade corporate yields serves as a cushion: it can narrow when rates rise without necessarily causing high-yield bond prices to erode and serves as a buffer to mitigate the effect of rising rates on a fixed-income portfolio. In the 1998–September 2016 data set summarized in Exhibit 5, 10-year Treasury rates rose an average 89 basis points, leading to a -5.48% return as the bonds declined. High-yield bonds did not fall proportionally, causing the spread over Treasury yields to fall 139 basis points, more than offsetting the impact of the rise in Treasury rates. High-yield bonds' higher coupons, combined with a compression of spread, accounted for the high-yield category's positive 4.77% return.

Perhaps more indicative of how high yield might perform if interest rates do rise materially is one specific period among the group summarized in Exhibit 5. During a five-month period in 2015, the spread started at 519 basis points, similar to the current spread of 514 basis points. Subsequently, high-yield bonds returned 1.79% during that time period, versus -3.11% for high-grade and -4.84% for Treasury bonds. While the absolute return for high yield wasn't high, the value of high yield was in its relative performance compared to high-quality corporate bonds and U.S. Treasuries.

The second reason why high-yield bonds are less sensitive to interest-rate increases is that rising rates typically correspond to an improving economic environment, rising corporate profits and stronger balance sheets—all of which tend to reduce default rates. Fewer defaults—actual or expected—feed into credit risk perceptions and the spread

versus Treasuries. In an environment where the economy is improving and rates are likely to rise, the positive contribution to high-yield returns from the cushion of credit-spread changes typically outweighs the negative impact from rising rates. This accounts for the negative correlation with Treasuries and the positive return shown in Exhibit 5.

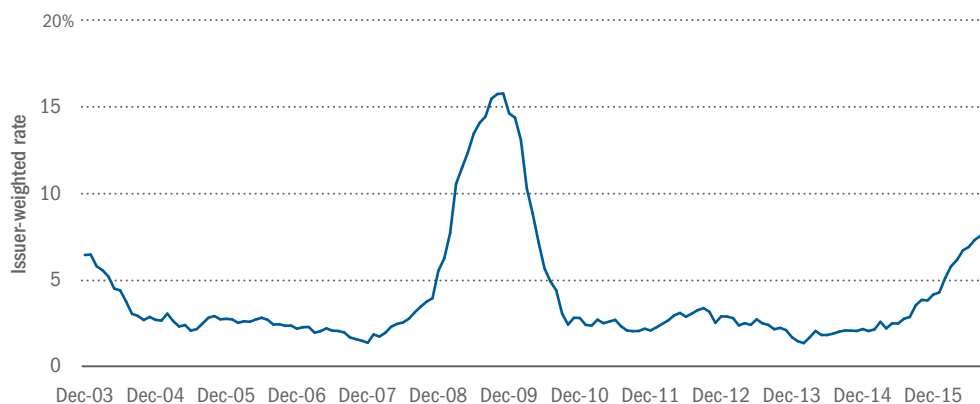
### The attractiveness of high-yield spreads

But even with their lower interest-rate sensitivity and effectiveness as diversifiers, are high-yield bonds still attractive, given yields are near record lows?

We believe the asset class remains attractive relative to higher-grade alternatives, provided the economy continues to expand in line with consensus forecasts. Despite low yields, the risk premium for high-yield was 465 basis points relative to 10-year Treasury bonds, as of September 30, 2016. Although the spread is 61 basis points lower than the long-term average of 526, we believe the risk premium is sufficient to cover default losses in a low economic growth scenario. If the U.S. economy slips into recession, we would expect high-yield performance to trail high-quality bonds, while outperforming equity market returns.

A big part of the risk premium represents high-yield bonds' greater risk of default. This risk has declined significantly since its peak of nearly 16% during the 2008–2009 financial crisis, but has trended higher in 2016. Defaults reached 7.58% in August—partly reflecting the impact of declining oil prices that have since stabilized (Exhibit 6).

**Exhibit 6. The default rates of high-yield bonds have declined markedly since the financial crisis of 2008–2009\***



\*According to the Moody's US trailing 12-month speculative-grade default rate as of September 30, 2016. Yield to worst figures of the BofA Merrill Lynch US High Yield Index, as of September 30, 2016.

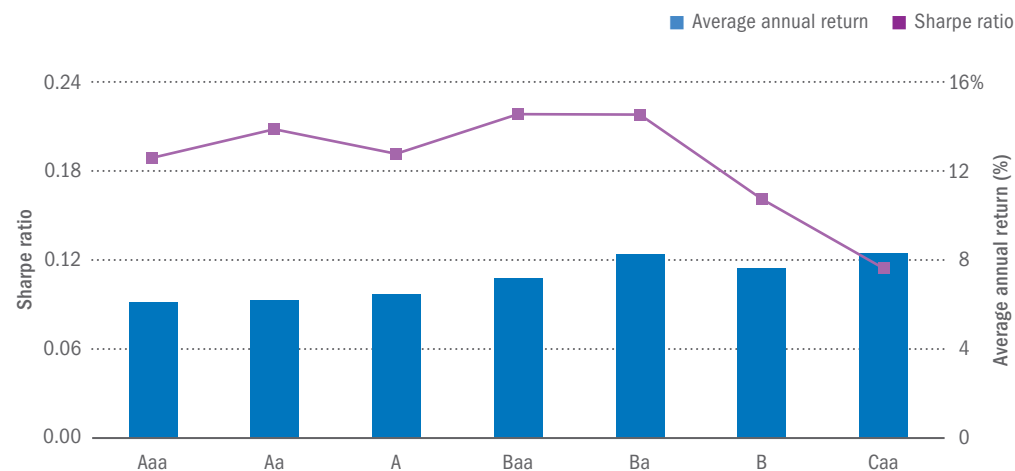
However, default rates aren't evenly distributed across the high-yield market as a whole. There are noteworthy disparities in credit risk among categories of high-yield bonds—disparities that investors should consider in their long-term allocations.

### Addressing the credit risk of high-yield bonds

Whether measured over the short or long term, comparisons of high-yield default rates show that higher-quality bonds carry disproportionately less risk. According to Moody's, over a series of rolling five-year periods between 1994 and 2016, 5.3% of Ba-rated bonds and 15.4% of B-rated bonds defaulted on average, versus 38.5% of bonds rated C to Caa+.<sup>1</sup>

As a result, higher-quality bonds in the high-yield market have experienced lower volatility and better risk-adjusted returns, as reflected in their higher Sharpe ratios measuring returns per unit of risk (Exhibit 7). Most notably, over the last two decades, Ba-rated bonds exhibited Sharpe ratios almost twice the levels of Caa-C-rated bonds—and even higher risk-adjusted returns than high-grade corporate bonds and Treasuries.

**Exhibit 7. U.S. high-yield bonds of higher credit quality show attractive risk-adjusted returns over the last two decades\***



\* From January 1, 1993, through September 30, 2016. It is not possible to invest in an index. Performance for indices does not reflect investment fees or transactions costs. Source: Bank of America Merrill Lynch.

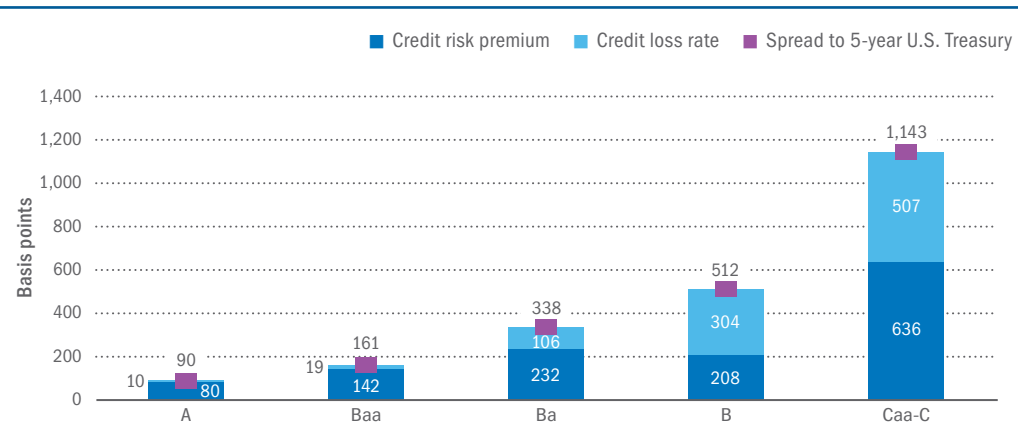
Stable to potentially improving corporate fundamentals, a relatively benign default environment, and continuing investor demand for yield suggest high-yield bonds with the lowest credit rating (Caa-C) have the potential to outperform higher-quality groups in the short term as their credit profile improves. However, their higher default risk leads to higher principal losses over the long term, reflected by their historically lower Sharpe ratios (Exhibit 7). We believe higher-quality high yield will continue to provide better risk-adjusted returns than lower-quality high yield over the longer term.

### Analyzing the credit risk premium

One way to look at this in more detail is by decomposing the bond spread and looking at each rating group. Bonds would be expected to earn the risk-free rate of return *plus* a premium for their credit risk vs. “risk-free” Treasuries, *plus* a premium to account for credit losses as issuers default and repay less than their full obligation. The spread or “extra” return over Treasuries equals the credit risk premium plus the factor to account for credit losses. By comparing current spreads versus historical credit losses, we can estimate a current credit risk premium.

In Exhibit 8, we have calculated the credit risk premia of bond rating groups by considering a 5-year investment horizon for five Moody’s rating groups: A, Baa, Ba, B, Caa-C. Returns for each group are calculated using yields from Bank of America Merrill Lynch bond indices.<sup>2</sup> The returns are adjusted for losses using historic average cumulative credit loss rates from 1982 to 2015 over the investment horizon.<sup>3</sup> The returns are then compared to that earned on the 5-year U.S. Treasury and the credit risk premium is calculated.

Exhibit 8. Credit risk premium of U.S. corporate debt by quality rating



Results based on 5-year Average Cumulative Credit Loss Rates from 1982 to 2015. Pricing data as of June 30, 2016. Sources: Bank of America Merrill Lynch, Moody's, TIAA-CREF.

What this exhibit shows, for example, is that Ba bonds carry a 338 basis-point spread versus Treasuries. The historical loss rate averaged 106 basis points, leaving 232 basis points as the credit risk premium [ $338 - 106 = 232$ ].

In the short run, strong technicals led by investors' search for yield and a stable default environment may help Caa-C bonds to outperform as they have in 2016 through the third quarter. The lowest rating tier currently has the highest credit risk premium, suggesting at least the potential for market-leading returns. However, it is also the most susceptible to any deterioration in the economy, corporate fundamentals and market liquidity. And even if default rates and losses remain low near-term, Caa-C bonds' can still underperform if markets become more fearful and defensive, as they did in 2011. Therefore, we recommend a high-yield strategy emphasizing bonds in the mid- to high-quality segments, such as those rated Ba and B, rather than bonds with the lowest credit ratings.

Long-term data show that income—not price fluctuation—is the predominant source of high-yield total returns.

### Income as the predominant component of high-yield returns

With the narrowing of high-yield spreads in a very low interest rate environment, investors should no longer expect price gains to contribute as much to returns going forward. The combination of exceptionally low rates and recent growth in demand for yield of any kind have limited the potential for appreciation through future bond-price increases for fixed-income assets generally.

While price can be an influential component of total returns for high-yield bonds in the short run, long-term data show that income—not price fluctuation—is the predominant source of high-yield total returns. Consider a comparison of *annual* to *annualized* returns over the past 30 years. During the period from 1986 through August 2016, the annual total return of high-yield bonds has fluctuated within  $\pm 2$  percentage points of the income component of their return just three times, according to the BofA Merrill Lynch US High Yield Index (a proxy for high-yield corporate bonds). In contrast, on an *annualized* basis, over the entire period, the index delivered total returns of 8.57% despite a price decline (or principal loss) of 0.71%. The index more than made up for this principal loss thanks to a coupon of 8.15%.<sup>4</sup>

Our conclusion is that, despite short-term price volatility, year-over-year price fluctuations tend to cancel each other out on a cumulative basis over the longer term, allowing the income component (i.e., the coupon) to drive total returns.



### Managing default risk to preserve principal

The higher default risk of high-yield bonds can limit the ability to preserve principal—the key to a long-term strategy for maximizing risk-adjusted returns. Principal preservation is important because risks in high-yield bonds are asymmetrical in relation to returns: There is upside potential, but a default could trigger significant principal losses and wipe out coupon gains. Hence, a successful high-yield strategy is as much about reducing exposure to potential defaults as it is about pursuing attractive income. To help achieve this outcome, we advocate using active management based on proprietary credit research and an understanding of how credit quality gradations can impact the long-term performance of high-yield bonds.

### Advantage of actively managed over passive vehicles

Differences in the performance and liquidity of underlying benchmarks highlight an advantage of actively managed over passive vehicles. The high-yield market includes many securities that for various reasons are relatively illiquid and trade infrequently, although they are included in broader benchmarks, such as the Barclays High Yield Index. In contrast, most passive vehicles, such as index-based ETFs, use more liquid benchmarks, such as the Barclays High Yield Very Liquid Index, to facilitate trading. For the five-year period ended September 30, 2016, the more liquid index had average annual returns of 8.15%. Matching even the more liquid index return has proven difficult for active and passive vehicles alike. Overall, active high-yield funds have performed better against this benchmark, averaging annual returns of 7.56% net of fees for the past five years on an asset-weighted basis.<sup>5</sup> Investments in vehicles tracking the more liquid indexes also have fees and significant tracking error versus the index. As a result, the average annual return for high-yield ETFs was 6.82% for the five-year period on an asset-weighted basis—or 74 basis points less than the average for active high-yield funds.<sup>6</sup>

### Conclusion

Despite cyclical price and yield fluctuations, high-yield bonds—especially those of mid- to high-credit quality—have demonstrated their ability to diversify portfolios by providing the following long-term benefits:

- Attractive risk-adjusted returns
- Negative or low correlations to Treasuries, high-grade corporate bonds and equities
- Lower sensitivity to interest rates than Treasuries and high-grade bonds
- Significantly higher yields compared to high-grade corporate bonds and Treasuries
- A return dominated by the income component, which over the long term outweighs short-term price fluctuations

These characteristics represent an appealing risk/return profile and make an enduring case for diversifying portfolios through a strategic allocation to high-yield bonds.

To learn more about TIAA Global Asset Management, visit [TIAA.org/assetmanagement](https://TIAA.org/assetmanagement) or speak with your relationship manager.

## Appendix A

### Analysis of returns during periods of rising rates

There have been 15 different periods of moderate and steady interest-rate increases of 50 basis points or more between 1998 and September 2016. Total returns on high-yield bonds exhibited lower sensitivity to increases in the 10-year Treasury rate than returns on high-grade corporate bonds, mortgage-backed securities, or 10-year Treasuries themselves.

**Exhibit 9. Returns and interest rate changes during periods of rates rising 50 basis points or more: 1998–2016**

| Period range      | 10Y Treasury yield-start <sup>1</sup> | 10Y Treasury change in yield (bps) <sup>1</sup> | High Yield OAS (bps)-start <sup>2</sup> | High Yield OAS (bps)-end <sup>2</sup> | High Yield change in OAS (bps) <sup>2</sup> | High Yield total return <sup>2</sup> | High Grade total return <sup>3</sup> | Mortgage backed total return <sup>4</sup> | 10Y Treasury total return <sup>1</sup> | S&P 500 total return |
|-------------------|---------------------------------------|---|---|---------------------------------------|---|--------------------------------------|--------------------------------------|---|--|----------------------|
| 09/30/98-01/31/00 | 4.42%                                 | 225   | 540                                     | 434                                   | -106  | 3.97%                                | -1.27%                               | 1.74%                                     | -10.06%                                | 39.44%               |
| 10/31/01-12/31/01 | 4.27%                                 | 77  | 908                                     | 777                                   | -131  | 2.52%                                | -1.40%                               | -1.33%                                    | -4.93%                                 | 8.61%                |
| 02/28/02-03/31/02 | 4.87%                                 | 55  | 767                                     | 656                                   | -111  | 2.38%                                | -1.86%                               | -1.07%                                    | -3.71%                                 | 3.76%                |
| 09/30/02-11/30/02 | 3.61%                                 | 61  | 1007                                    | 864                                   | -143  | 5.10%                                | 0.09%                                | 0.46%                                     | -4.04%                                 | 15.21%               |
| 05/31/03-08/31/03 | 3.35%                                 | 110   | 669                                     | 537                                   | -132  | 2.58%                                | -3.63%                               | -0.95%                                    | -7.20%                                 | 5.07%                |
| 03/31/04-06/30/04 | 3.84%                                 | 78  | 432                                     | 403                                   | -29   | -0.88%                               | -3.33%                               | -1.16%                                    | -4.84%                                 | 1.72%                |
| 08/31/05-10/31/05 | 4.02%                                 | 54  | 360                                     | 356                                   | -4  | -1.71%                               | -2.59%                               | -1.28%                                    | -3.53%                                 | -0.87%               |
| 12/31/05-06/30/06 | 4.40%                                 | 74  | 366                                     | 332                                   | -34   | 3.01%                                | -1.47%                               | -0.12%                                    | -3.87%                                 | 2.71%                |
| 03/31/08-06/30/08 | 3.43%                                 | 55  | 817                                     | 732                                   | -85   | 1.80%                                | -0.73%                               | -0.56%                                    | -3.53%                                 | -2.73%               |
| 12/31/08-02/28/09 | 2.25%                                 | 79  | 1806                                    | 1717                                  | -89   | 1.80%                                | -1.23%                               | 0.82%                                     | -5.87%                                 | -18.18%              |
| 03/31/09-06/30/09 | 2.69%                                 | 84  | 1679                                    | 1035                                  | -644  | 22.55%                               | 10.82%                               | 0.61%                                     | -6.19%                                 | 15.93%               |
| 11/30/09-12/31/09 | 3.20%                                 | 63  | 749                                     | 628                                   | -121  | 3.00%                                | -1.00%                               | -1.48%                                    | -4.85%                                 | 1.93%                |
| 08/31/10-03/31/11 | 2.48%                                 | 97  | 682                                     | 470                                   | -212  | 10.08%                               | -0.04%                               | 0.51%                                     | -6.04%                                 | 27.78%               |
| 07/31/12-12/31/13 | 1.49%                                 | 152   | 607                                     | 392                                   | -215  | 13.63%                               | 0.88%                                | -1.33%                                    | -8.69%                                 | 38.34%               |
| 01/31/15-06/30/15 | 1.68%                                 | 66  | 519                                     | 493                                   | -26   | 1.79%                                | -3.11%                               | -0.60%                                    | -4.89%                                 | 4.36%                |
| <b>Mean</b>       | <b>3.33%</b>                          | <b>89</b>                                       | <b>794</b>                              | <b>655</b>                            | <b>-138.8</b>                               | <b>4.77%</b>                         | <b>-0.66%</b>                        | <b>-0.38%</b>                             | <b>-5.48%</b>                          | <b>9.54%</b>         |

<sup>1</sup> BofA Merrill Lynch 10-year US Treasury Index; <sup>2</sup> BofA Merrill Lynch US Cash Pay High Yield Index; <sup>3</sup> BofA Merrill Lynch US Corporate Index; <sup>4</sup> BofA Merrill Lynch US Mortgage Backed Securities Index. It is not possible to invest in an index. Performance for indices does not reflect investment fees or transactions costs.

Sources: TIAA-CREF, Bank of America Merrill Lynch and Bloomberg.



1. Moody's Annual Default Study: Corporate Default and Recovery Rates, 1920-2015, Page 39, Exhibit 40
2. Bank of America Merrill Lynch US Cash Pay High Yield and 1-10 Year US Corporate Indices
3. Moody's Annual Default Study: Corporate Default and Recovery Rates, 1920-2015: page 23, Exhibit 22
4. Annualized figures for total return compared to the sum of its components (price and coupon) will differ due to the effect of return compounding on component factors.
5. Returns represent the average annual performance of all actively managed high-yield mutual funds listed in the Morningstar Direct database for the 5-year period ended September 30, 2016. Asset-weighted returns are based on assets as of September 30, 2016.
6. Returns represent the average annual performance of all high-yield ETFs listed in the Morningstar Direct database for the 5-year period ended September 30, 2016. Asset-weighted returns are based on assets as of September 30, 2016.

**High-yield bonds are subject to interest rate and inflation risks, and have significantly higher credit risk than investment-grade bonds.**

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