

OPTIMIZING RISK-RETURN OUTCOMES IN CORE FIXED INCOME

Over the last several years, we've experienced a wide variety of interest rate and risk regimes. This has provided a unique opportunity to assess our overall process and validate strategy refinements we implemented in 2015-16¹. We updated our analysis of performance data for a subset of fixed income indices across maturity, sector, and quality segments over the past 23 years. Our goal was to ensure we continue to focus on building portfolios that consistently emphasize sectors with the most attractive risk-reward profiles.

We believe the role of fixed income in an investor's portfolio is to provide risk mitigation, stable income, and a low correlation with risk assets, such as equities. Using a top-down, risk-focused approach, we seek to identify and invest in spread sectors (i.e., non-US Treasury sectors) that we believe will provide optimal risk-return characteristics.

Our objective is to generate a consistent risk-adjusted return profile to balance higher risk-seeking allocations in other areas of a portfolio. As such, we believe for a given level of expected return, a portfolio profile that is more certain and less volatile is superior to one with higher price volatility and less certainty. We offer our clients a repeatable process that is intended to deliver stable returns over time. We believe identifying and investing in spread sectors with favorable risk-reward attributes enables return consistency through economic cycles.

Generally, we define spread sector and security risk by the volatility of excess returns, calculated using duration-matched US Treasuries. In most cases, we assess a portfolio's risk-return tradeoffs relative to an index that includes both risk-free and spread sectors. As part of our investment process, we frame relative value across a matrix of more than 50 market subsectors using historical excess returns and volatility. We focus on sectors that

¹ -This publication is an update of a whitepaper first published in 2016.

KEY INSIGHTS

1

Structured products can provide an excellent source of diversification and return potential within a risk-focused investment framework. Our investing approach continues to emphasize Asset-Backed Securities (ABS) and Mortgage-Backed Securities (MBS), particularly in shorter-duration strategies.

2

Shorter-duration credit exhibits Modified Information Ratios (MIRs) comparable to that of structured products. As a result, we believe allocations to this segment can provide opportunities to enhance clients' portfolio returns.

3

The longer-term average excess return and volatility characteristics of 5- to 7-year credit securities have been attractive relative to 7- to 10-year credits. We have emphasized these maturities in our credit security selection process, a position validated by a comparison of MIRs relative to longer-duration maturities.

4

Investing in longer-maturity credit securities can play a role in maximizing the excess return of the overall portfolio. We try to increase the emphasis in these sectors when we determine the risk-return opportunities are favorable.

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have historically demonstrated attractive return per unit of risk to create fixed-income portfolios comprising the following sectors:

Structured Products: The agency MBS and consumer ABS sectors are fundamental building blocks for our strategies, providing diversification and the risk-return characteristics we desire.

Corporate Credit: This segment provides a wide range of attractive risk-return opportunities across qualities and maturities.

US Treasury Securities: We use Treasuries as a strategic sector allocation to provide stability, manage targeted-duration and yield-curve exposures, and as a source of liquidity. Treasuries are considered “risk-free” in that they are absent credit risk and therefore have no expected excess return or excess return volatility.

SECTOR ANALYSIS

To assess our investment process against our objective to optimize risk-return outcomes, we analyzed 23 years of fixed income index performance data across maturity, sector, and quality. Our primary goal was to quantify how these characteristics correlate with returns and evaluate those against our previous observations. One key measure we relied on was MIR, calculated by dividing realized excess returns by the volatility of those excess returns. We find this metric helpful in comparing sectors with distinct investment risks and characteristics.

The following table shows the risk-return characteristics of the spread sectors we believe should form the foundations of a diversified fixed-income portfolio: corporate credit, agency MBS, and AAA-rated ABS.

Sector	Average Return (% per year)	Volatility (% per year)	MIR	Average Spread	Spread Volatility	Year-End Spread	Effective Duration
Corporate Credit ¹	0.79	2.99	0.26	138	45	101	7.65
MBS (Agency) ²	0.46	1.25	0.37	132	33	91	3.56
ABS - Credit Card and Auto ³	0.55	0.51	1.08	59	29	42	1.54

1 - As measured by the ICE BofAML US Corporate Index.

2 - As measured by the market-weighted ICE BofAML US FHLMC and FNMA 30-Year MBS Index and the ICE BofAML US FNMA 15-Year MBS Index.

3 - As measured by the market-weighted ICE BofAML AAA US Fixed Rate Credit Card ABS Index and ICE BofAML US Fixed Rate Auto ABS Index.

Note: Calculated using annualized excess returns with monthly periodicity from January 1997 to December 2019. Return calculations compiled using geometric means. Annualized volatility was calculated by multiplying the monthly standard deviations by the square root of 12. Asset-backed securities sectors displayed are AAA-rated. Spreads are relative to Treasuries. Corporate and ABS spreads are expressed as option-adjusted spread. Mortgage-backed securities spread is represented by the current coupon. **We exclude the time period between June 2008 and September 2009 from this analysis due to the exceptional volatility and correlations of excess returns exhibited at that time.** During this time period, primary fixed income sectors experienced return periods that were multiple standard deviation events relative to the historical evidence of the past 40 years.

Source: ICE BofAML US Broad Market Index series, PNC Capital Advisors.

SECTOR OBSERVATIONS

- Over the past 23 years, corporate credit generated the largest average excess return, but exhibited greater volatility and higher overall interest rate risk (as measured by effective duration).
- Agency MBS had an average spread comparable to that of corporate credit with considerably lower return volatility and interest-rate risk.
- Consumer ABS offered the lowest overall interest rate risk, as well as the lowest volatility of return.

Next we examine each of these sectors in more detail.

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CORPORATE CREDIT

We focused our analysis of the corporate credit sector on investment-grade securities, defined as BBB-rated and above. The profile of the corporate credit index can be deconstructed into two primary factors that describe risk and return: default risk and spread duration risk. We define default risk across three quality buckets: AAA-AA, A, and BBB. These ratings represent the average rating assigned between the primary credit rating agencies. Similar to modified duration, which measures a bond's price sensitivity to changes in yields, spread duration measures price sensitivity to changes in credit spread. We believe it is a good proxy for duration risk of excess return, as opposed to duration risk of total return (modified duration).

The tables below show excess return, volatility, and MIRs over various credit quality and bond maturity segments for the 23-year analysis period.

Return

- BBB-quality categories have had the highest average excess returns. Additionally, the A-quality segments have outperformed the AAA-AA tier in all maturity groups less than 10 years.
- Longer-maturity segments have not necessarily driven larger average annual excess returns. In fact, across credit quality groupings, the 5- to 7-year maturity category has generated the highest excess returns.
- The 10-plus-year maturity group had the lowest mean returns across the maturity landscape. Lower realized excess returns can be partially explained by demand from asset-liability managers and insurers with long-term liability targets. Demand from this investor base has compressed spreads in longer-dated securities and flattened credit curves. In addition, longer spread duration amplified the price impact from changes in risk premiums, which led to a greater proportion of time periods exhibiting negative excess returns than other maturity segments.

	Annualized Excess Return (%)		
	AAA-AA	A	BBB
1-3 year	0.63	0.83	1.13
3-5 year	0.65	0.92	1.24
5-7 year	0.88	1.17	1.36
7-10 year	0.40	0.53	0.75
10+ year	0.36	0.19	0.66

Note: As measured by the ICE BofAML US Corporate Index. Calculated using annualized excess returns with monthly periodicity from January 1997 to December 2019. Return calculations compiled using geometric means. Excess return is calculated relative to duration-matched US Treasuries. Source: ICE BofAML US Broad Market Index series, PNC Capital Advisors.

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CORPORATE CREDIT *Continued*

Volatility

- Within all credit quality segments, longer maturities resulted in substantive increases in return volatility; larger spread durations at longer maturities amplified volatility.
- Lower credit quality was also associated with increased return volatility across maturity categories. The table Spread Between Minimum and Maximum OAS illustrates the wide variation of risk premiums among these segments over the past 23 years, as measured by option-adjusted spread (OAS).

	Volatility (% per year)		
	AAA-AA	A	BBB
1-3 year	0.60	0.91	1.46
3-5 year	1.31	1.79	2.32
5-7 year	1.89	2.50	3.23
7-10 year	2.68	3.14	3.93
10+ year	4.46	4.86	6.39

	Spread Between Minimum and Maximum OAS		
	AAA-AA	A	BBB
1-3 year	198.00	256.29	354.00
3-5 year	213.00	274.00	317.00
5-7 year	202.00	274.00	302.00
7-10 year	206.00	222.00	268.00
10+ year	189.00	191.64	268.30

Modified Information Ratio (MIR)

- While shorter-maturity groupings have generated the most attractive risk-return profiles (the highest MIRs), the magnitude of average annual excess return in these segments is generally more modest.
- Lower-quality and longer-maturity credit have the potential to provide opportunities to maximize excess return.

	Modified Information Ratio		
	AAA-AA	A	BBB
1-3 year	1.05	0.91	0.77
3-5 year	0.50	0.51	0.53
5-7 year	0.47	0.47	0.42
7-10 year	0.15	0.17	0.19
10+ year	0.08	0.04	0.10

Note: All data for the period January 1997 to December 2019. Annualized volatility calculated by multiplying the monthly standard deviations by the square root of 12. MIRs calculated by dividing Annualized Excess Return over the period by Annualized Volatility. Source: ICE BofAML US Broad Market Index series, PNC Capital Advisors.

CORPORATE CREDIT OBSERVATIONS

- Corporate credit has the potential to provide important sector allocation opportunities to produce alpha in client portfolios.
- Given the more pronounced idiosyncratic risk, it is important to maintain both a well-diversified portfolio and a disciplined research process.
- High-quality, low-risk premium portions of the market exhibit greater return consistency in the context of our historical analysis. As a result, we believe more persistent allocations to this segment provide the potential to enhance portfolio returns.
- Selective investments in lower-quality and longer-maturity credit securities can play a role in maximizing excess return of an overall portfolio.

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STRUCTURED PRODUCTS

Between 1997 and 2019, AAA-rated ABS and agency MBS sectors exhibited significantly less volatility of excess return than nearly all credit sectors, resulting in compelling MIRs. Additionally, there was a low correlation of excess return between structured products and the corporate credit sector over the 23-year period, due in part to the high-quality and shorter-duration profile of structured products relative to the overall credit index.

Sector	Average Excess		MIR	Correlation to Corporate Credit
	Return (% per year)	Volatility (% per year)		
MBS 30-Year ¹	0.47	1.29	0.37	0.45
MBS 15-Year ²	0.34	1.07	0.32	0.42
AAA ABS - Credit Card and Auto ³	0.55	0.51	1.08	0.48

¹ - As measured by the ICE BofAML US FHLMC and FNMA 30-Year MBS Index.
¹ - As measured by the ICE BofAML US FHLMC and FNMA 30-Year MBS Index.

² - As measured by the ICE BofAML US 15-Year MBS Index.

³ - As measured by the market-weighted ICE BofAML AAA US Fixed Rate Credit Card ABS index and ICE BofAML AAA US Fixed Rate Auto ABS Index.

Note: Calculated using annualized excess returns with monthly periodicity from January 1997 to December 2019.

Source: ICE BofAML US Broad Market Index series, PNC Capital Advisors.

We believe structured products provide an important source of diversification and can improve the risk-return characteristics of an overall portfolio. The diversification benefit provided by incorporating structured products in an asset-allocation strategy can be illustrated by comparing two portfolios, one consisting solely of government and credit sectors (Bloomberg Barclays Government Credit Index) and the other that includes structured products (Bloomberg Barclays Aggregate Index).

As shown in the following table, adding structured securities to a government-credit portfolio over the period 1997 to 2019 would have produced higher annual excess return, a reduction in return volatility, and a higher MIR.

Sector	Average	Volatility (% per year)	MIR
	Excess Return (% per year)		
Bloomberg Barclays US Government/Credit Index	0.34	1.17	0.29
Bloomberg Barclays US Aggregate Index	0.38	1.06	0.36

Note: Calculated using annualized excess returns with monthly periodicity from January 1997 to December 2019.

Source: Bloomberg Barclays Indices, PNC Capital Advisors.

When constructing a portfolio, there are additional aspects of the MBS and ABS sectors to consider.

MBS

- Interest-rate volatility has the largest impact on relative performance of MBS. The inherent prepayment-convexity risk of these securities affects the timing of cash flows from monthly amortization of principal and interest.
- The MBS and corporate credit sectors are driven by different economic and market dynamics: interest-rate volatility (MBS) versus business fundamentals and corporate default cycles (corporate credit).

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STRUCTURED PRODUCTS *Continued*

ABS

- While the ABS market has very little exposure to prepayment volatility, and relative performance is not interest-rate driven, the sector has shown a low correlation with credit overall due to limited exposure to the corporate business cycle.
- Additionally, ABS securities benefit from structural enhancements that boost credit quality. These include cash reserves, overcollateralization and/or subordination, which can mitigate the loss potential for investors at the top of the capital structure.

STRUCTURED PRODUCTS OBSERVATIONS

- Structured securities can play an important role in optimizing the risk-return profile of a fixed-income portfolio.
- The enhanced income and relatively low volatility historically offered by AAA-rated consumer receivables make the sector an important component in the construction of a risk-focused portfolio.
- We believe the credit card and prime auto segments of the ABS market are high-quality, liquid asset classes with an attractive risk-return profile.

OUR COMMITMENT TO OUR CLIENTS

We believe opportunistic sector allocation, coupled with an investment process focused on risk management and identifying relative value opportunities can lead to consistent risk-adjusted returns over a full market cycle.

Over the last several years, we've experienced a wide variety of interest rate and risk regimes. We've adhered to the tenets of our risk-based philosophy throughout and used these opportunities to evaluate the findings of our historical analysis in practice.

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Indices

The **ICE BofAML US Mortgage Backed Securities Index** tracks the performance of US dollar denominated fixed rate residential mortgage pass-through securities publicly issued by US agencies in the US domestic market. 30-year, 20-year and 15-year fixed rate mortgage pools are included in the Index provided they have at least one year remaining term to final maturity and a minimum amount outstanding of at least \$5 billion per generic coupon and \$250 million per production year within each generic coupon. Hybrid, interest-only, balloon, mobile home, graduated payment and quarter coupon fixed rate mortgages are excluded from the index, as are all collateralized mortgage obligations.

The **ICE BofAML US Corporate Index** tracks the performance of US dollar denominated investment grade corporate debt publicly issued in the US domestic market.

The **ICE BofAML Conventional 30-Year Mortgage Backed Securities Index** is a subset of ICE BofAML US Mortgage Backed Securities Index including all 30-year securities issued by Fannie Mae and Freddie Mac except for interest-only fixed rate mortgage pools and hybrids.

The **ICE BofAML US 15-Year Mortgage Backed Securities Index** is a subset of ICE BofAML US Mortgage Backed Securities Index including all 15-year securities issued by Fannie Mae except for interest-only fixed rate mortgage pools and hybrids.

The **ICE BofAML AAA US Credit Card Asset Backed Securities Index** is a subset of ICE BofAML US Fixed Rate Asset Backed Securities Index including all asset backed securities collateralized by credit card loans and rated AAA.

The **ICE BofAML AAA US Fixed Rate Automobile Asset Backed Securities Index** is a subset of ICE BofAML US Fixed Rate Asset Backed Securities Index including all securities collateralized by auto loan receivables and rated AAA.

The **Bloomberg Barclays US Government Credit Bond Index** is a broad-based flagship benchmark that measures the non-securitized component of the US Aggregate Index. The index includes investment grade, US dollar-denominated, fixed-rate treasuries, government-related and corporate securities.

The **Bloomberg Barclays US Aggregate Bond Index** is a broad-based flagship benchmark that measures the investment grade, US dollar-denominated, fixed-rate taxable bond market. The index includes Treasuries, government-related and corporate securities, MBS (agency fixed-rate pass-throughs), ABS and CMBS (agency and non-agency).

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