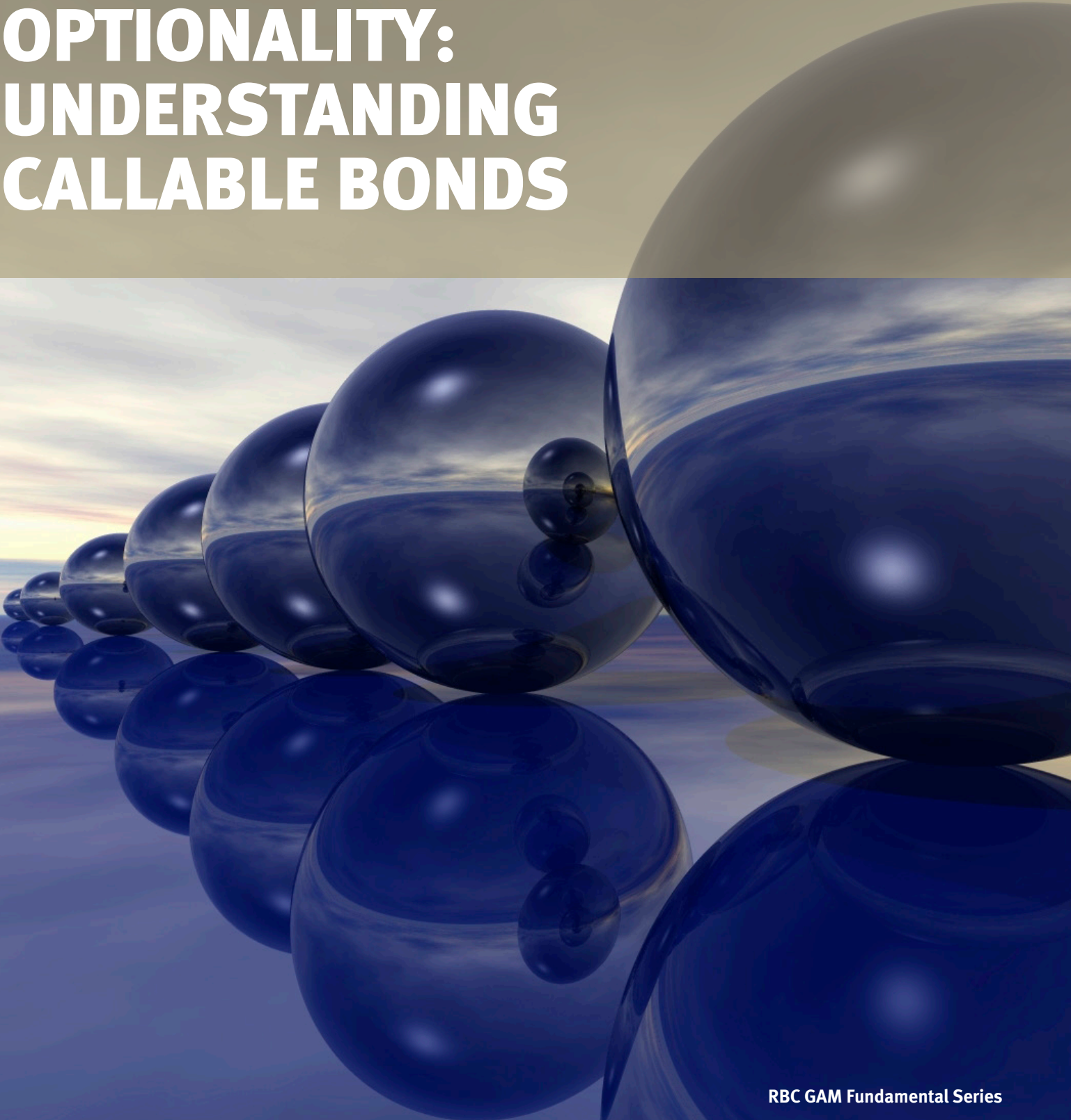




RBC Global
Asset Management

OPTIONALITY: UNDERSTANDING CALLABLE BONDS



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Introduction

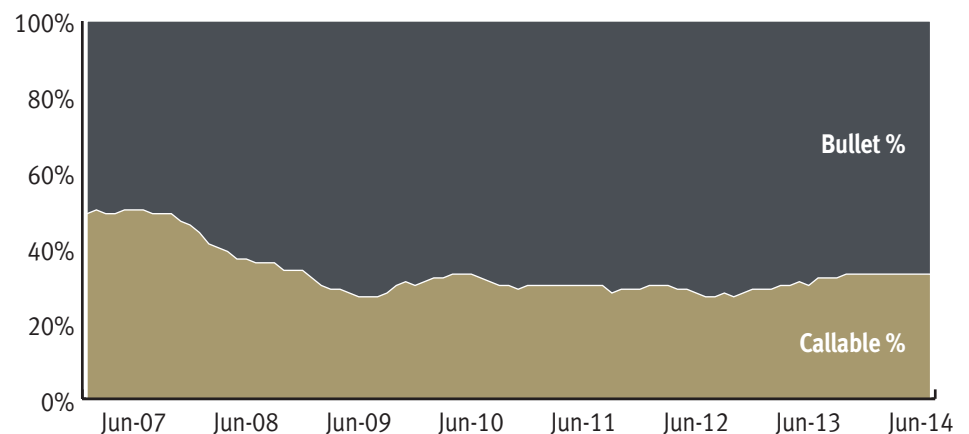
During this historically long period of low interest rates, investors continue to scour the investment universe for opportunities to improve yield. In this pursuit of higher yields, institutional investor interest in callable securities issued by corporations and the U.S. federal agencies tends to increase. Agency notes and highly rated corporate notes have long been a staple in the portfolios of risk-averse investors and are widely used in their non-callable, or bullet maturity, form.

While callable notes often have the same credit rating as other notes from the same issuer, they are also designed to take advantage of optionality—that is, bond features that can change the timing of principal repayment. Therefore, it is important for investors to assess the conditions under which a call may be exercised by the issuer and understand how that call impacts investment results.

In collaboration with investment banks, agency and corporate issuers have added features to callable bonds that introduce a level complexity which may result in investment outcomes that are misaligned with investor expectations. With that in mind, we will explore the particular characteristics of callable bonds, along with the appropriate method for evaluating these instruments on their own merits as well as relative to other fixed income security types. Our examples will focus on callable agency notes, but the underlying principles also apply to the broader range of notes with optionality.

EXHIBIT 1

\$1.9 Trillion Agency Debt Outstanding by Type



Sources: Citi Research. Data is through 7.1.14. Represents FFBC, FHLB, FNMA, FHLMC.

What Is Embedded Optionality?

Embedded optionality refers to the structure of a bond that allows the issuer or bondholder an option to take some action with respect to the other party. A common option is an issuer's right to call the bond before its maturity, and this is the focus of our analysis.

The Structure of Call Provisions

Across the spectrum of callable securities, one of the complicating factors is that call provisions are varied in their structures. The structural variables that impact investors the most involve 1) the timing of a call and 2) the determination of the price of a bond that is called.

1. The Timing of the Call

The date at which the bond may first be called is referred to as the "first call date." Bonds may be designed to be continuously callable or callable on certain milestone dates. A "deferred call" is a provision that the bond may not be called within the first several years of issuance. The timing makes it more difficult for investors to calculate the bond's expected yield relative to other investment opportunities.

Callable debt typically has one of four types of call features:

- European – The issue can be called on only one predetermined date.
- Bermudan – The issue is usually callable only on a predetermined schedule of dates.
- American – The issue can be called on the first call date or any time thereafter until maturity.
- Canary – The issue is callable for a designated period of time on a predetermined schedule of dates. After the designated period, the issue is no longer callable.

2. The Price Paid for a Called Bond

Another variable in understanding callable securities is the "exercise price," or the price at which the issuer calls the bond for redemption. The exercise price depends on the provisions of the bond structure, but could be any of the following:

- Fixed regardless of the call date
- Based on a certain price according to a predetermined schedule
- Subject to "make whole" provisions based on a premium calculation formula

The exercise price of one or more calls of a security is important because it complicates the bond's expected yield and relative attractiveness to investors.

The Call Decision

An issuer's decision to call a security is driven by:

- Interest rate factors – When interest rates are declining, issuers have an incentive to redeem outstanding bonds with relatively high coupon rates and replace them with newly issued bonds with lower coupon rates. When interest rates are rising, issuers have an incentive not to exercise calls. This may run counter to investor expectations and may lead to a decline in a bond's yield over the term of the investment.
- Timing – The bond's structure may be flexible in terms of when a call is made.
- Frequency – The bond's structure may be flexible in terms of call frequency.
- Other conditions – Economic and other conditions may lead an issuer to determine that it is beneficial to call the security.

It is important for investors to understand that all of these determinants are driven by what is best for the issuer. They all pertain to the issuer's management of their borrowing costs. Therefore investors need to assess the conditions of a call and how they impact the investment outcome.

For U.S. agencies and corporate issuers, callable bonds play an important role in achieving two key objectives:

1. Reducing the Cost of Funds

Callable bonds lower issuers' overall long-term cost of funding by providing them the opportunity to refinance their debt when interest rates decline. The cost of exercising a call and issuing new debt is low for agencies.

2. Matching Assets and Liabilities

Callable securities provide the issuer an opportunity to match assets and liabilities – one of the basic principles of investing. For example, U.S. agencies commonly hold a combination of mortgage-backed securities and loans in their portfolios. A unique feature of mortgage assets is the right of the borrower to pay off the mortgage at any time, usually for the purpose of refinancing when interest rates decline. Consequently, mortgages, like callable bonds, contain an embedded call option. Thus, for the issuers, callable bonds on the liability side of the balance sheet complement pre-payable mortgages on the asset side because each can be replaced with lower cost debt as interest rates decline.

Identifying Risk

For callable bonds, investors need to consider the following key risks:

- **Call Risk** – Since it is not known when or if the bond will be called, the interest and principal payments on the bond are more difficult to predict for a callable bond than a non-callable bond.
- **Interest Rate Risk** – Bonds tend not to be called when interest rates are rising, exposing the bond to unfavorable price movement that ultimately hampers investment performance. Investors may expect a call (as well as related principal repayment and interest) that is not exercised. Investors may also find that if they want to sell the security, they must accept a lower price than they wanted.
- **Reinvestment Risk** – Bonds tend to be called when rates fall below certain breakeven rates as determined by the issuer, which are often related to the coupon rate on the bond. When the issuer exercises the right to call the security, the action returns principal and accrued interest to the investor which forces the investor to reinvest those funds at prevailing market rates. The timing of that call may be inopportune and after a period when interest rates have fallen, which will result in the investor experiencing reinvestment risk of a lower return over the term of the investments.

Investors also need to be aware of credit and liquidity risk, although these risks are not substantial for agency debt, which is backed by the full faith and credit of the U.S. government.

Evaluating Risk: Option-Adjusted Spread

Option-adjusted spread (OAS) offers a means to isolate the impact that optionality has on a security's value, enabling various callable and non-callable securities to be evaluated in an “apples to apples” manner.

In this context, the term “spread” refers to the difference (expressed in percentage yield or basis points) between two fixed income instruments. For example, the spread on a 10-year agency note yielding 2.85% versus a 10-year Treasury note yielding 2.52% is 0.33%, or 33 basis points. By illustrating the spread of 33 basis points for an agency note relative to a risk-free Treasury, investors can begin to evaluate the relative value of different asset types. Exhibit 2 below tracks the historic spread between a 5-year non-callable agency and U.S. Treasury notes.

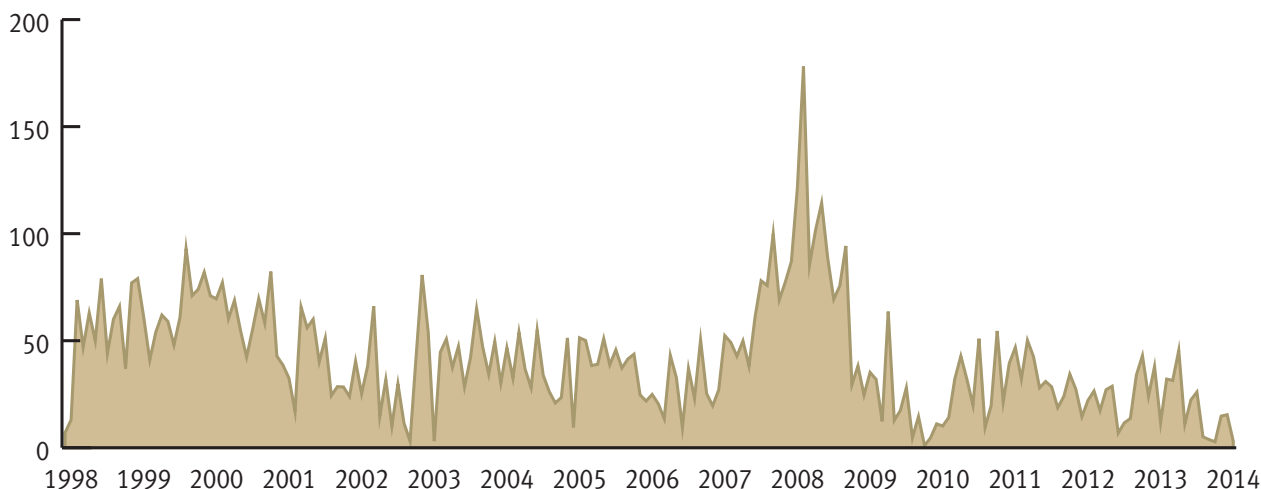
Spread figures into the OAS analysis in the following way:

$$\text{OAS} = \text{Spread} - \text{Spread Attributable to Optionality}$$

For example, two 5-year callable agency notes may have spreads of 8 basis points and 10 basis points as compared with a Treasury security with an equivalent maturity. By factoring the impact of various call provisions, the resulting OAS for the two securities becomes 6 basis points and 4 basis points, respectively. By adjusting the ordinary spread for optionality, an investor can more accurately evaluate securities to understand how these features will impact their investment results.

EXHIBIT 2

Historic Spread Between 5-Year Agency and Treasury Securities



Sources: Bloomberg on 7.3.14

Valuing Fixed Income Investments: Yield Measures

Yield is an assessment of the worth of a fixed income instrument in terms of the anticipated or projected return on the invested funds. Investors should consider this worth in context, evaluating not only the projected return, but also the projected return relative to comparable investments. There are a variety of measurements of yield including:

- Current yield
- Yield to maturity
- Yield to call
- Yield to worst

Each measure includes a specific set of data inputs and has particular advantages and drawbacks.

Yield to Maturity

Yield to maturity is our starting point and incorporates three general inputs:

1. Coupon interest payments
2. Reinvestment of interest
3. Gains or losses

A simplified method of estimating yield to maturity is:

$$\text{Approximate Yield to Maturity} = \frac{C + \frac{F-P}{n}}{\frac{F+P}{2}}$$

Where:

C= Coupon Payment

F= Face Value

P= Price

n = Years to Maturity

While this valuation methodology may be effective in analyzing non-callable bonds, it falls short when analyzing callable bonds because it does not contemplate optionality, the impact of call features. To further complicate things, a security could have more than one call date. The price and the timing of the call will alter the results of the calculation of yield that the investor realizes over the holding period of the security.

Two additional measurements can be used with yield to maturity to provide a more accurate valuation: yield to call and yield to worst.



Total Return in a Changing Interest Rate Environment

Is it better, factoring in income and price changes (total return), to own a callable bond versus a non-callable bond, when interest rates are changing? Take, for example, the performance of a 3-year U.S. Government agency security purchased in January 2007. This security is structured with an issuer's option to call the security on a quarterly basis. Depending on historically representative rates, the bond is either called and reinvested in an identically structured security or held for another 3 months until the next call opportunity. The results of this scenario are compared with BofA/ML 1-3 Year Government Index returns, which serve as a proxy for a portfolio of non-callable government securities.

Performance for this scenario runs from January 2007 through December 2011. This time line represents a period where interest rates were falling from a near-term high in 2007.

Total Return January 2007-December 2011		
	Callable	Non Callable
One Year	0.89%	1.55%
Three Years (annualized)	1.27%	1.56%
Five Years (annualized)	2.34%	3.69%

In this particular period of changing interest rates, investing in bullet maturities was the better choice. Despite the attractiveness of higher reported yield to maturity on the callable securities, the call provisions eroded the total return prospects considerably.

Yield to Call

This measure evaluates the bond in terms of the next call date and call price, with the assumption that the call provision will be exercised. For example, if the yield to call is 1.00% and the yield to maturity is 1.50%, an investor must acknowledge the impact of the call provision on the security's yield potential during the actual life of the security. If a call is exercised, the investor must reinvest the proceeds at prevailing market rates.

Yield to Worst

Yield to worst accounts for the multiple scheduled call dates and prices that an investor could encounter. Once the various yields have been tabulated, the lowest or worst yield is posted as yield to worst.

For example, a security may have multiple possible call dates and therefore provide a yield of 0.9%, 1.1%, 1.2% or 1.4%. In this instance, we will assume that the actual outcome after the call is exercised is a yield to worst of 0.9%. In this case, the investor may have been better off with a non-callable bond of similar maturity because it would have provided a higher yield over the investment period.

A comparison of callable bonds with each other or with non-callable bonds should not stop at yield to maturity, but incorporate yield to call and yield to worst.

So far, our examples have been presented from a yield perspective. It is important to recognize that when we consider these securities in the context of a diversified portfolio the investor may be more interested in an analysis from a total return perspective. Total return recognizes that the overall performance of an investment is derived from both an income return over the life of the security and the principal valuation – or price return – at points along the term of the investment. (The example on the left represents an investment comparison of callable and non-callable securities from a total return perspective.)

Interpreting This Information

The investment management industry has gone to great lengths, via tools that include OAS measurement, to evaluate callable bonds. It should be clear at this point that callable bonds present a more complicated investment decision than is evident by simply looking at a comparison of yields to maturity at the time of purchase. Given that OAS capabilities are often proprietary and mostly limited to the professional investment management industry, how should investors evaluate the use of callable bonds?

- 1. Yield.** Be sure to gather multiple yields, including yield to call and yield to worst, when evaluating the expected investment outcome.
- 2. Risk.** Understand the impediments to realizing the full investment results in callable securities. Call risk should be central in this analysis.
- 3. Cash Flow Projections.** Be comfortable that, regardless of the economic and interest rate scenario, your investment income projections are conservative and are not reliant upon certain income levels that may not be achieved if your bonds are called.
- 4. Simplification.** All things equal, choose callable securities with the fewest possible call provisions.
- 5. Diversification.** Limit the position size and total portfolio allocation to callable securities.

Conclusion

By acknowledging the various measures of yield, structure and risk, evaluating callable bonds is more involved than simply shopping for the highest yield. Investing in callable bonds requires a commitment to understanding these nuances. Perhaps most significantly, understanding the embedded features of callable bonds brings the investor closer to an essential rule—investors need to be sure they can tolerate whatever outcome results from the purchase of a callable note. As interest rates shift, the most optimistic yield projections of a callable bond are unlikely to be realized.

About the Authors



Scott Cabalka
Vice President,
Institutional
Portfolio Manager

Scott Cabalka is responsible for our client service coverage of the RBC Money Market

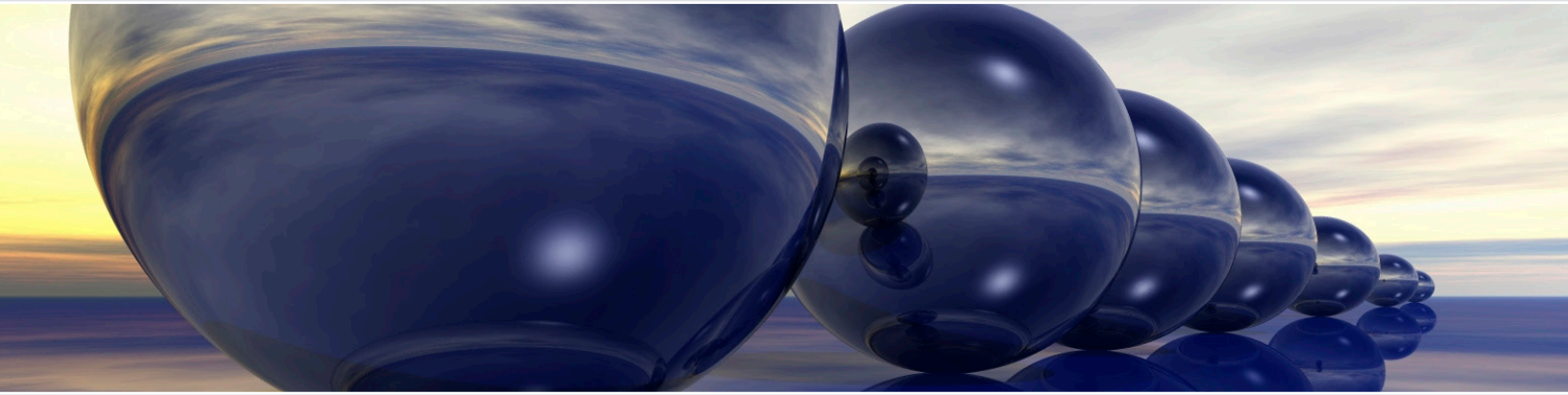
Funds, local government investment pools, and other short fixed income solutions. Scott is a veteran member of the firm's Money Market Committee and Fixed Income Strategy Committee, and provides guidance on investment policy and implementation for all of our short mandates. In addition, he leads our communication with clients invested in our short fixed income strategies and ensures that they receive the most appropriate solutions and service. Before joining RBC GAM-US in 1993, Scott was an account executive at Merrill Lynch, where he focused on short strategies for institutional investors. He has specialized in short fixed income since he began working in the investment industry in 1980. Scott earned a BS and an MBA in Finance from the University of Minnesota Carlson School of Management and holds a FINRA Series 7 license.



Lee Morgan
Vice President,
Institutional
Portfolio Manager

Lee Morgan is responsible for overseeing all aspects of the client service

experience for public fund clients. Lee joined RBC GAM-US in 2007 from Fifth Third Bank, where he spent 14 years assisting governmental, tax-exempt, and other institutional clients with their investment management, banking, and borrowing needs. He has worked in the financial services industry since 1993. Lee earned a BA in Political Science from Bates College and an MBA from the University of Cincinnati.



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