



# ISSUE BRIEF

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## INVESTING IN CALLABLE SECURITIES

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In recent years, “callable” securities, which contain options that allow issuers to retire them prior to their final maturity dates, have gained usage among public fund investors. Their greater usage as a tool for state and local investment officials largely can be seen in the wide variety of bonds containing call features that are available for public fund investment. For example, corporations and U.S. Agencies both issue a variety of different types of callable bonds. The increased use of callable securities is due, in part, to the growing sophistication of financial markets. Over the past twenty years, methods for comparing intricately structured investments have been developed and refined, thus allowing public fund investors to be able to more easily compare and better understand the risks and value of these potential investment alternatives. Moreover, during times of lower returns on investment, callable bonds provide relatively higher returns than noncallable bonds because investors are compensated for the potential call risk they face without incurring additional credit risk.

However, while the higher yields available on callable securities can be attractive for investors who can accept call risk in their fixed-income portfolios, these instruments can introduce other types of risk that public investors should consider. Most

notably, investment in callable securities can increase a portfolio’s “reinvestment risk” (that is, the risk of having to reinvest money in a lower interest-rate environment if the original investment is called); consequently, investors need to weigh the potential benefits and drawbacks of such an investment.

This *Issue Brief* seeks to provide public investment officials with information to assist them in evaluating callable securities relative to noncallable securities. It provides information on the key characteristics of callable securities, the potential advantages and disadvantages of incorporating them into an investment portfolio, and how to assess their value compared to noncallable securities. It concludes with recommendations to consider when deciding whether to invest in callable securities.

### **I. An Overview of Callable Security Features**

Callable securities are term bonds within which the issuer has the option to retire the bonds prior to the final maturity of the issue. In such cases, the issuer is enabled, during specific time periods, to “call”, or repurchase, a bond away from the investor at a specified price. The action is entirely at the election of the issuer, with no recourse by the investors in the bonds. The

call feature has a noticeable impact on the issuer's cost of borrowing, and hence the returns achieved by public fund investors. To compensate for the maturity uncertainty that an investor is assuming, the yields on callable securities are at a premium over those obtainable from fixed maturity debt with the same final maturity.

### Diversity of Call Types

Corporations and U.S. Agencies issue callable debt in a variety of forms; for example, the Federal Home Loan Mortgage Corporation (Freddie Mac) alone reported issuing callable debt with 61 different call options in 2001. Final maturities typically range from one to thirty years. In addition, all callable bonds have a period of time during which the issuer cannot call the bond – the “lockout period”. The lockout period can be as short as three months or as long as ten years after the securities are issued. The securities can be issued with either single or multiple call provisions. Popular types of call provisions include the following three popular types:

- **European Call.** The bonds may be called one time only on a pre-specified date after the initial lockout period.
- **Bermudan Call.** The bonds may be called according to a pre-specified schedule (e.g. monthly, quarterly, or semi-annually) after the initial lockout period.
- **American Call.** The bonds are continuously callable after the initial lockout period. That is, they are callable at any time on or after the first call date.

As is the case with investment products generally, the variations on the basic call structures continue to grow. For example, one variation includes the “step-

up” call structure. A step-up call will have a call date at which point the issuer may retire it or the security will “step up” to a higher coupon value. As an example, a step-up callable security may have an initial coupon rate of 5 percent and then be called or stepped-up to 6 percent.

### Regulations Regarding Disclosure of Call Features

Municipal Securities Rulemaking Board (MSRB) Rule 12 and Rule 15a require broker/dealers to inform investors that an investment has a call option and to provide information about whether/how that option may impact the investment's value. Specifically, in the case of callable securities, the broker/dealer must provide the yield/price of the lower of the following two scenarios:

- 1) The bond's yield/price to call, which assumes the bond is called, typically at the next/first call date.
- 2) The bond's yield/price to maturity, which assumes the bond is never called and instead is held to maturity.

In addition, the broker/dealer must provide information on the date and the yield/price of the bond's next call.

## II. Underlying Objectives for Issuing Callable Bonds

The largest issuers of callable bonds are corporations and U.S. Agencies. The U.S. Agency bond issues include: (1) obligations directly issued by departments of the United States government, and (2) obligations issued by entities chartered by the United States Congress for the purposes of fulfilling a specific mission, most notably the federal government's various lending

programs<sup>1</sup>. For these issuers, callable bonds play an important role in achieving two key objectives:

### 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 call option gives the issuer the right (but not the obligation) to redeem the bond after a specified lockout period. A callable bond issuer has incentive to redeem the bond (exercise the call option) when the market-determined yield of a comparable new issue drops adequately below the yield on the outstanding bond<sup>2</sup>. For example, a 20-year corporate bond might be issued at a rate of 8 percent with a provision that it can be called away from holders after five years. If, five years later, the interest rate for similar bonds has dropped to 6 percent, the issuer may find it favorable to call the original bond and replace that debt with a less expensive 6 percent bond. Consequently, call redemptions increase during periods when interest rates decline; issuers redeem outstanding bonds with relatively high yields and replace them with newly issued bonds with lower yields. Many issuers exercised their option to call their securities in 2001 because of the continuous decline in interest rates that occurred for most of the year. Thus, call redemptions reduce issuers' overall long-term costs.

<sup>1</sup> The five largest Agencies are the Federal Farm Credit System (FFCB), Federal Home Loan Bank (FHLB), Federal National Mortgage Corporation (FNMA, "Fannie Mae"), Federal Home Loan Mortgage Corporation (FHLMC, "Freddie Mac"), and Student Loan Marketing Association (SLMA, "Sallie Mae").

<sup>2</sup> In this context, "comparable" means having similar risk and remaining maturity.

### Matching Assets and Liabilities

Callable securities provide 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 mortgagee 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 U.S. Agencies, callable bonds on the liability side of the balance sheet complement callable mortgages on the asset side (because each can be replaced with lower-cost debt as interest rates decline).

## III. Factors Affecting Callable Bond Pricing and Yield

A local governmental entity that invests in a callable security effectively is entering into two distinct transactions: the purchase of a noncallable bond (also known as a "bullet") and the sale of a call option to the issuer. Thus,

$$\text{PRICE}_{\text{callable}} = \text{PRICE}_{\text{bullet}} - \text{PRICE}_{\text{call option}}$$

This equation illustrates two key things. First, the price of a callable bond must always be less than or equal to the price of a bullet security with similar terms (the difference will depend on the value of the call option to the issuer). Second, the price of a callable bond is influenced by both (1) the *same* factors that affect the prices of bullet bonds and (2) factors that affect *only* the price of the call option.

Conversely, the yield of a callable bond must always be greater than or equal to the yield of a similarly termed bullet:

$$\text{YIELD}_{\text{callable}} = \text{YIELD}_{\text{bullet}} + \text{YIELD}_{\text{call option}}$$

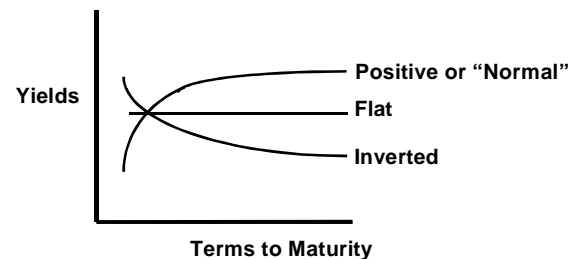
This explains the primary motivation of why investors purchase callable bonds: the incremental yield pickup over bullet securities of comparable risk and maturity.

### Bullet Price and Yield Considerations

Several factors affect the price and yield of the bullet portion of callable bonds:

- **Credit Risk.** U.S. Treasury bonds possess the highest possible credit rating and are viewed in the marketplace as essentially free of default-risk. All other bonds, including U.S. Agency, corporate, and municipal bonds, are considered “spread products” because they are issued at some spread above the yields on U.S. Treasury bonds due in part to the incremental credit risk over U.S. Treasury bonds.
- **Market Risk.** This refers to the impact that changes in the prevailing level of interest rates have on the market value of all outstanding bonds. When interest rates decline, bond prices rise, and when interest rates rise, bond prices decline. Therefore, an investor holding a bond bearing interest rates higher than the new prevailing market interest rates will see an increase in the value of the security (the converse is true for an investor holding a bond bearing interest rates below the new prevailing market interest rates). Thus, longer-term securities have greater market risk due to the chance for more market variation over a longer period of time.
- **Liquidity Risk.** This risk relates to the ability to sell a security without taking a loss. Liquidity is higher when there is an active secondary market for the security. For an investor who plans to hold the bond until the maturity date, liquidity risk is less important.
- **Level and Shape of the Yield Curve.** Because U.S. Agency and corporate bonds are issued at a spread above the yields on U.S. Treasury bonds, the shape and level of the U.S. Treasury yield curve (see Figure 1) has a significant impact on their pricing. For example, when the yield curve is very flat or inverted (as was the case in 2000), investors received only a small yield pick-up for extending a bond’s maturity.

Figure 1: Examples of the Yield Curve



### The Call Option

Several factors affect the price of the call option. They generally can be summarized into two groups: the flexibility of the call option (that is, the relative ease in which an issuer can call the security) and the likelihood that it will be exercised (commonly expressed as “come into the money”).

The more flexible the option is to the issuer, the more the issuer will pay for it through higher yields. Key factors affecting the flexibility of a call option include:

- **Type of Option.** To compensate for the uncertain maturity of a callable security that an investor assumes upon purchase, the yields on callable securities are set at a premium over that of a bullet or fixed maturity debt with the same final maturity. American call options provide the greatest flexibility to the issuer, and hence are the most valuable to them; conversely, European call options are the least valuable. In other words, because bonds with American call options may be called anytime after the lockout period, issuers value them more than those that can be called less frequently, and are willing to pay a higher yield. Thus, investors apathetic to call option type (all other considerations being equal) can receive additional yield by purchasing a security with an American call option.
  - **Lockout Period.** All callable securities have a period of time that the issuer cannot call the bond. The beginning of the lockout period is the bond's settlement date and typically will be a period from three months to ten years. The shorter the lockout period, the greater the issuer's flexibility to call the bond and the more valuable the call option is to the issuer. Therefore, bonds with shorter lockout periods will tend to have higher yields and lower bond prices than those with longer lockout periods to compensate the investor for the issuer's greater call flexibility.
- Similarly, a call option is more valuable as the probability that it will be exercised increases. As call option prices increase, the price of a callable bond declines. Key factors affecting the likelihood that the call option will be exercised (or "come into the money") include:
- **Interest Rate Volatility.** The volatility of interest rates plays a significant role in deciding whether the call option will be exercised. In theory, the value of any option increases with the volatility of interest rates. The greater volatility means there is a greater chance that interest rates will decline by a margin sufficient for the issuer to replace the higher yielding debt with lower cost debt. The likelihood that interest rates could rise is also greater with higher volatility, but there is no incremental loss to the issuer when rates move higher because they can simply choose not to exercise the option. In other words, while the potential loss to the issuer is limited as volatility increases, the potential gain is not. Thus, issuers will pay more for call options through higher yields and lower bond prices when interest rate volatility is high or expected to be high during the term of the bond.
  - **Shape and Level of the Yield Curve.** The shape of the yield curve affects the price of the call option too. A rising yield curve (i.e., increasing rates for longer maturities) implies that interest rates are expected to increase. The more steeply or positively sloped the yield curve, the stronger the suggestion that interest rates will rise. A flat yield curve implies no expected change in interest rates, while a declining, or inverse, yield curve implies an expectation of declining long-term interest rates. The value of the call option will be lower the greater the upward slope of the term structure. This is because the likelihood of a profitable decline in interest rates is more remote the more positive the yield curve. A nearly flat or negative term structure will tend to result in a larger option value.

## IV. The Investor's Potential Benefits and Disadvantages for Investing in Callable Bonds

### Potential Benefits of Investment

From the viewpoint of the public funds investor, callable securities have the following potential benefits:

- **Additional Yield.** Callable bond investors typically must be “compensated” for the risks associated with purchasing bonds that may be retired before maturity. One form of compensation is higher yields on callable securities relative to noncallable securities.
- **Constant Credit Risk.** The call option on a callable security does not increase the credit risk of the obligation because it does not directly affect the issuer's ability to repay its debt.
- **Premium Payments.** The higher yield alone is often not sufficient compensation to the investor for granting the call privilege to the issuer. Thus, the price at which the bond may be called, termed the call price, is normally higher than the principal or “face value” of the issuer, at least for the earlier dates upon which the call option can be exercised. The difference between the call price and the face value is the “call premium”.

Some callable securities are issued at a discount and have par call features, while other issues may have a premium call that declines as it approaches maturity. Corporate issuers generally issue callable securities that will be called at a premium over par, while the bulk of U.S. Agency issues have par calls. Regardless of the call feature, the investor must be adequately

compensated for these features by the issuer via either a call premium and/or a higher yield.<sup>3</sup>

### Potential Disadvantages of Investment

At the same time, the public investor faces several potential disadvantages associated with callable bonds:

- **Reinvestment Risk.** The issuer of a callable security likely will call the bond should prevailing bond market yields drop below the rate on the outstanding callable bond. When the issuer calls the bond and returns the principal and accrued interest to the investor, the investor is faced with reinvesting the money in a lower interest rate environment. If that occurs, the investor will be unlikely to find another security of similar quality that will provide as high a yield.
- **Cash Flow Uncertainty.** The investor who purchases a callable security does so without knowing in advance whether a bond will be called and under what terms. Thus, the cash flow stream on a callable bond is somewhat unpredictable, and is dependent on the call feature and structure. For example, cash flow uncertainty is much larger with a security that can be called continuously after one year than one that can be called only one time over five years.
- **Price Compression (or Negative Convexity).** As discussed above, a bond's price and its yield have an inverse relationship. However, that relationship is not constant – that is, a

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<sup>3</sup> Measuring the value of the calls on callable issues is a very difficult calculation and goes far beyond simple credit and interest rate risk measures. This is addressed in the next section.

bond's price does not increase in a one-to-one relationship as interest rates decline. In a lower interest rate environment, investors can increasingly expect issuers to redeem outstanding bonds. However, as interest rates decline, the price appreciation of a callable bond is limited – price increases at a slower rate relative to the decline in interest rates. This disadvantages investors trying to sell callable bonds prior to the call date. This is sometimes referred to as “price compression” or “negative convexity.”

- **Increased Accounting Complexities.** Because the issuer can redeem callable securities prior to their final maturity date, they present an increased level of complexity for local governmental jurisdictions' accounting staffs with respect to valuation. Local treasurers should confirm with their accounting staff that they have the ability to handle such investments.

Given these potential benefits and disadvantages, it becomes important for investors to evaluate whether the risk-return profile of a particular callable bond is suitable for their investment portfolio before investing in it. As part of the measurement of potential benefits, investors need to assess the value of the callable security versus other comparable instruments.

## V. Valuing Callable Securities

### Yield Calculations

The yield on callable securities is not calculated via a single formula. Instead, there are three methods of calculating yield in common use:

- **Yield-to Maturity.** The yield-to-maturity calculation assumes (1) that the security is not called and (2) the investor holds the bond to its final maturity date. The yield is calculated from the cash flow at maturity and the interest payments generated by the bond (reinvested at a rate equal to the bond's yield-to-maturity).
- **Yield-to-Call.** The yield-to-call calculation assumes that the bond is called on the next eligible call date. The yield is calculated from the cash flows from the coupon payments plus the cash flow of the redemption proceeds at the time of the call.
- **Yield-to-Worst.** A more conservative alternative to the yield-to-call method is the yield-to-worst method. Many bonds are continuously callable after their first call date (typical of American-style call features). Because of the uncertainty of the call date, the yield-to-worst method was developed. To derive a yield-to-worst, a yield-to-call is calculated for the initial call date and each coupon payment thereafter. Additionally, a yield-to-maturity calculation is also performed. The yield-to-maturity calculation and all of the yield-to-call calculations are then reviewed and the lowest yield from the group becomes the yield-to-worst.

When making purchase decisions based upon yields it is important to understand which of the three methods has been used in deriving the stated yield and how rate changes will affect the final yield performance of the security. When prevailing interest rates are higher than the coupon on the bond, it is assumed that the issuer *will not* call the bond, and yield-to-maturity is most commonly used.

Conversely, when prevailing interest rates are lower than the interest rate on the issue, it is assumed that the issuer *will* call the bond, and yield-to-call is most commonly used.

### **Measuring Relative Value – Option Adjusted Spread**

One of the challenges that investors face today is comparing the relative value of one fixed income investment to another. Prior to the 1970s, investors used more simple methods such as yield comparisons for analyzing fixed income instruments with imbedded options because:

- The structuring of fixed income instruments was more uniform than it is today.
- Interest rates were less volatile, so imbedded options were worth less.
- A reliable method for valuing options had not yet been developed.

Since the 1970's (as inflation rates increased), however, interest rates have become significantly more volatile, and a wider variety of fixed income instruments have come into use. Comparing relative yields of callable securities to noncallable securities may prove misleading as the callable instrument's yield will be inflated to compensate investors for the call option imbedded in the instrument. Many investments today entail complex embedded options, which make measuring a security's relative value more difficult. A sophisticated method for valuing fixed income options valuation was developed to address these complexities—it is known as the Option Adjusted Spread (OAS).

### **Option Adjusted Spread**

Today, it is common for fixed income investors to employ option-pricing techniques to value embedded options and adjust their valuation of the related securities accordingly. Thus, fixed income instruments are compared no longer according to their absolute yields, but according to their "option-adjusted spreads". These methods determine the component of a security's yield that is attributable to imbedded options. In other words, when the Treasury yield and other non-option related risk factors are subtracted out, the result is the OAS.

The benefit of the OAS is that it enables investors to measure their compensation for accepting an embedded option and the risks that come with it. Investors can compare the OAS of a callable debt security to the option-adjusted or bullet spreads of other fixed-income securities when making investment decisions.

Callable securities are usually priced and evaluated using an OAS framework similar to that used for other option-embedded securities that have cash flows that are sensitive to changes in interest rates. Because a callable security consists of a bullet component and a call option component, OAS provides an investor with a methodology to analyze a callable debt security by isolating the yield premium associated with the call option. The OAS of a callable debt security is expressed as a spread over the Treasury curve. The OAS analysis framework is based on a forward interest rate curve, certain volatility assumptions, and the current security price. An OAS model generates the average spread to the forward interest rate curve under a number of potential interest rate paths.



For many fixed-income investors, OAS is one of the most useful measurements for assessing value in a callable security. Nevertheless, option pricing still remains largely more art than science. A security's OAS will depend not only upon the characteristics of that particular security, but also upon the assumptions (such as the volatility of interest rates) incorporated into the option pricing model.<sup>4</sup> Therefore, the accuracy of the underlying OAS assumptions plays a significant role in the effectiveness of the model's estimates.

The actual OAS calculation is complicated and requires software and technical knowledge to achieve accurate results. Investors have several options for obtaining OAS information:

- ***Obtain OAS Software for In-House Use.*** Various software is available for calculating OAS. While operating such software in-house would provide information readily to the public investor, the cost of purchasing and operating such software may be prohibitive.
- ***Use Bloomberg Terminal for Information.*** Investors with access to Bloomberg terminals can analyze option adjusted spreads through the OAS1 screen by entering a yield curve, implied volatility and price, and setting the "Calculate" box to "O" for OAS. The price or volatility can be calculated instead of the OAS just as easily by plugging in the remaining two parameters and changing the "Calculate"

box accordingly. As with purchasing and operating in-house software, however, the cost of purchasing a Bloomberg terminal may be prohibitive to many public-fund investors that do not already have them.

- ***Seek Information from Broker/Dealer or Investment Advisor.*** Investors can ask their broker/dealer for OAS information for securities they are interested in purchasing. Broker/dealers and investment advisors generally have access to Bloomberg or other software that provides such information. While the information may not be as readily available as in the above two cases, investors can minimize costs and obtain assistance from broker/dealers and investment advisors in the interpretation of the results.

## VI. Recommendations

Callable securities do not perform uniformly in changing interest rate climates. When interest rates are either stable or rising, callable securities will tend to be left outstanding to maturity; conversely, when interest rates are declining, they may be called, requiring investors to reinvest the proceeds under relatively less favorable conditions. For investors who can accept maturity uncertainty in their fixed income portfolios, the higher yields available on callable bonds can be attractive. However, investing in callable securities requires more of a commitment to understanding the various nuances of the investment than does investing in bullet securities. These nuances include discerning the impact of a call premium and the valuation of the callable security using such tools as OAS analysis. As with all investments, both benefits and

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<sup>4</sup> Volatility represents the amount of interest rate fluctuation that is expected over a given period of time. The expectation of future rate volatility may be influenced, or determined in part, from historical measures of volatility.

disadvantages should be considered before investing in such instruments.

CDIAC believes that public investors should consider the following checklist when deciding whether or not to invest in callable securities:

- Determine whether the investment meets the general risk tolerance levels specified in the local agencies' investment policies and is acceptable for their current portfolios.
- Evaluate the specific benefits and disadvantages of the investment, including the yield spread, call premium, reinvestment risk, and cash flow uncertainty.
- Obtain an OAS or similar analysis and compare the results to other investments that the local agency may be considering.

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