The Municipal Finance Opportunity Cost Index

A municipal bond issue typically consists of a varied set of discrete debt instruments. The optional redemption feature is an integral component of these debt instruments. The most common of these instruments are current coupon serial and term bonds, but also common are capital appreciation bonds (CABs) or variable rate bonds. There are also several hybrids available such as deep discount bonds, premium bonds, CAB converter bonds, and derivatives, such as "inverse floater" type bonds.

In general, the optional redemption feature of a debt instrument will vary in logical fashion with the financial behavior of that debt instrument. For instance, deep discount bonds rarely have optional redemption premiums and premium bonds are rarely callable at par, if callable at all. Deep discount bonds are issued with either a par call, or in the rarer case when there is a call premium, it is usually applied to the lower accreted value of the instrument as of the optional call date. This type of optional redemption structure preserves the ability of the issuer to capitalize over time on decreases in available borrowing costs. In the case of premium bonds, they are usually callable at either a significant premium or are uncallable, in order to ensure the buyer a minimum yield on the buyer's investment. Any variation from these generally accepted rules will have an impact on the initial pricing of the securities being issued.

It becomes clear that there is a wide range of structural alternatives available to the issuer of municipal bonds. These alternatives can be viewed in terms of both the type of debt instruments to incorporate into the bond issue and the type of optional redemption features to incorporate into the debt instruments. As is the case in all situations where selections must be made among a wide variety of choices, the optimal set of selections among the available options will be the set that achieves the objectives of the process being undertaken in the most efficient or costs-effective manner, as determined by an understood and accepted set of evaluation criteria. For instance, in the case of a municipal bond issue, the immediate objective of the issuance process is to satisfy a set of financing of high coupon debt. The efficiency or cost effectiveness of a municipal transaction is most often measured in terms of the borrowing cost of the transaction, and the most widely accepted measure of this is the internal rate of return or yield of the bond issue.

What also becomes clear is that each time a set of selections is made by a decision maker, a set of opportunity costs arises. These costs are a result of not selecting other options available to that decision maker. For instance, consider the simple case of an uncallable versus a callable term bond. In the current environment, an uncallable bond can be sold to investors at yields approximately five to ten basis points lower than a callable term bond of like maturity. It is obvious that in the current environment, the use of the uncallable term bond will lower the initial cost of borrowing or yield on a bond issue. However, by using an uncallable term bond, the issuer loses the opportunity to refund the term bond in the future when downward movements in interest rates may create debt service savings opportunities. This cost must be evaluated relative to its initial benefit in order to make a fully informed structural decision. That is, the lower initial costs of borrowing resulting from the use of an uncallable term bond must be measured against the potential loss of refunding savings afforded by a callable term bond in order to determine whether, in a certain interest rate environment, it is appropriate to incorporate an uncallable term bond into a bond transaction.

In this example, it is very easy to calculate the benefit of using the uncallable term bond. The benefit is simply the difference in debt service and yield resulting from the use of the uncallable term bond relative to the use of the callable term bond. This difference is easily understood; however, it is far more difficult to both calculate and understand the costs associated with not using the callable term bond. As this cost is critical to the structural decision making process, it becomes evident that a critical statistical measure is not being considered as part of the calculus of municipal finance decision making.

The lack of consideration of such a statistical measure has resulted in general industry-wide confusion and a lack of consensus about such critical issues as what the appropriate refunding threshold should be, what the true benefits of using call protection are, and what the true benefits of using capital appreciation bonds are. More disturbingly, in the absence of such a statistical measure, far reaching structural decisions are made based on very narrow, transaction-specific informational parameters, to the detriment of the long-term potential of many bonding programs around the country.

The purpose of this article is twofold. One is to introduce a statistical measure called the Opportunity Cost Index (OCI). The OCI is designed to measure, in a way that can be easily understood by all municipal finance professionals, the benefits of selecting a certain structural option relative to the costs of not selecting an alternative option. The OCI model is purposely designed to be less statistically and theoretically demanding of the municipal finance decision maker than analogous models, such as the Option Adjusted Spread Analysis model and the binomial model, that are commonly used in the corporate finance community. The OCI is designed in this way because it is not requisite in municipal finance, as it is in corporate finance, that decision makers have the sophisticated mathematical and statistical tools necessary to successfully employ such sophisticated models as the Option Adjusted Spread Analysis model. Therefore, the OCI is designed to fill in the gap that currently exists in municipal finance decision making by providing a statistical measure of practical value that can be easily understood and applied in a useful way by all in the municipal finance community.

The OCI will be demonstrated and discussed in three contexts:

1. The use of call protected long-term capital appreciation bonds versus the use of callable current coupon bonds;
2. The use of an all-term bond issue versus the use of term bonds and serial bonds; and
3. The selection of the outstanding maturities that are the best candidates for refunding.

The second and more significant purpose of this article is to demonstrate that the application of traditional decision criteria often results in bond structures that diminish the leveraging capacity of ongoing bonding programs and to therefore argue, using the analytical processes contained in the OCI approach, that structural evaluation criteria in municipal finance should be focused on maximizing leveraging capacity, not on minimizing transaction yields.

The OCI and the Use of Call Protected Capital Appreciation Bonds

Tax-exempt capital appreciation bonds are instruments that are sold at a deep discount from par and pay interest only at maturity. Interest usually compounds semi-annually until maturity, based on the instrument's stated yield. The appeal of CABs to investors is that they receive a guaranteed re-investment rate; that is, interest generated by the investment is automatically converted to principal, and interest for the next period is calculated based on the higher accreted value of the investment. The yields of CABs relative to current coupon bonds of like maturity vary with the absolute level and slope of the yield curve and the perceived direction of interest rates. In general, CAB yields will be closer to or lower than current coupon yields if the perception in the investor community is that rates are on a downward trend. In this case, the locked in re-investment of interest has a greater appeal to the investor.

For the borrower, long-term CABs have the effect of shortening the average life of a bond issue. Because of the compounding effect, a small principal amount of CABs uses up a significant amount of long-term debt service capacity without generating current interest. Therefore, a larger amount of shorter term debt service capacity is available for the amortization of principal. This freeing up of short-term debt capacity for principal amortization is what shortens the average life of a bond issue. The overall effect of the shorter average life is a function of the shape of the yield curve and the spread between the borrowing yields available for current coupon bonds and CABs.

Table 1 sets forth the base case parmeters for this example. This table presents a sample $100 million bond issue structured to achieve level debt service using current coupon serial and term bonds with mandatory sinking fund requirements. These bonds are assumed to be issued with a standard ten-year call protection with an optional call premium of 2 percent. Table 2 sets forth the annual debt service of the base case structure. Table 2 sets forth the annual debt service of the base case structure. This debt service is then used as a constraint against which an alternative structure is applied. This alternative structure, presented in Table 3, differs from the base case structure in that the 2009 term bond is assumed to be an uncallable capital appreciation bond with a yield ten basis points lower than the 2009 current coupon term bond presented in the base case. As can be seen on Table 4, the same revenue stream that only supported $100 million of proceeds in the base case scenario supports $102,630,952.90 of proceeds in the alternative call protected CAB scenario. The marginal leveraging capability provided by the CAB structure is due to the shorter average life effect of using the CABs, and the lower assumed yeld on the CABs relative to the yield on the term bond used in the base case scenario.

A decision make confronted with these two structural alternatives would typically look to the yields of the two bond issues for guidance as to which is the appropriate structural alternative to select. For instance, the yield of the CAB scenariou is 7.130935 percent. The magnitude of this spread makes a compelling argument for selecting the CAB structure. The danger of this often-used decision process is that it does not relfect the diminished refunding opportunities of the CAB scenariou relative to the base case scenario. The purpose of the opportunity cost index is to provide a measure of the opportunity costs associated with selecting the CAB approach withan an anlytical framework that defines the ultimate objective of the municipal finance debt issuance decision making process as being the maximization of long-term leveraging capacity.

Mechanics

The first step in calculating the OCI of the CAB structure relative to the base case structure is to calculate the future refunding potential of each scenariou across the range of interest rates wherein each structure generates savings. The refunding scenarious used in this analysis are assumed to be structured four years after the original issue date of the two structures being evaluated. The refundings were structured so that any debt service savings attributable to the assumed lower interest rates are releveraged and taken in the form of additional proceeds. This increase in leveraging capacity resulting from the future potential refundings is et forth on Table 5. Table 5 also factors in the future value of the original leveraging benefit of using the CAB structure.

As can be seen on Table 5, the long-term capacity impact of the CAB scenario relative to the base case scenario becomes negative as rates decrease between 200-300 basis points from the scale used in the base case. This indicates that if future rates fall to sufficiently low levels, the refunding benefit available from the base case exceeds the total initial/refunding benefit of the CAB scenario.

Table 6 sets forth the final step in the analytical process of determining a useful measure of the opportunity costs associated with using the CAB structure. Table 6 calculates the weighted average of the marginal leveraging capacity of each scenario by assigning a probability to the likelihood that rates would ever decrease to the levels set forth in the analysis. This weighted average can be understood as the level marginal leveraaaging capacity that the issuer could reasonably expect to realize from the two structural approaches being evaluated.

As indicated on Table 6, the expected level of marginal leveraging capacity for the base case scenario is $6,540,000 and the expected level of marginal leveraging capacity for the CAB scenario is $5,545,698. Put in simpler terms, based on the assumptions set forth in the analysis, the base case scenario can be expected to generate $106,510,000 of proceeds by leveraging the base debt service constraint, whereas the CAB scenario can be expected to generate only $105,545,608 by leveraging the same constraint!

The OCI for the CAB scenario relative to the base case scenario is calculated as set forth on Table 6. The ratio between the expected marginal leveraging capacity afforded by the CAB scenario and the expected marginal leveraging capacity afforded by the base case secenario is substracted from one and then converted to a percentage. This percentage is the OCI of the CAB scenario relative to the base case scenario. It can be interpreted as indicating that under the CAB scenario, 14.821656 percent of the maximum expected level of marginal leveraging capacity will be left unrealized. By the same formula, the OCI of the base case scenario relative to the CAB scenario is 0.00 percent because the base case scenario generates the maximum expected level of marginal leveraging capacity.

It is obvious that the OCI is sensitive to the probablility distribution used to determine the weighted average of the marginal leveraging capacity of each scenario. The conclusion of this article discusses this issue in detail, and explains why the OCI should be used by the decision maker in conjunction with yeld information to determine the most appropriate structural alternative for its bond issue. But first, two other examples of the OCI approach will be presented.