Don't Waste a Free Lunch: Managing the Advance Refunding Option

Andrew Kalotay and Lori Raineri

Abstract

A callable municipal issue which funds a new project is usually eligible for advance refunding. Under favorable market conditions this enables the municipality to lock in lower interest rates prior to the call date; waiting until the call date exposes the issuer to the risk of higher rates.

The right to advance refund is an option, whose value depends on the issuer's borrowing rate and on Treasury rates. Significantly, the Advance Refunding Option (ARO) is free to the issuer. While investors pay a lower price for a callable bond, the price is not affected by the bond's eligibility for advance refunding. In fact, investors prefer advance-refundable issues for well-understood reasons — inefficient refunding decisions by borrowers, and the fact that advance refunded bonds trade up since their credit effectively becomes that of the Treasuries backing the remaining cashflows to the call date.

Some may argue that there is no free lunch, but the ARO is a notable counterexample. This is evident when the escrow yield is higher than the issuer's funding rate to the call date. In this case, the present value of the cashflows to the call date exceeds the cost of the escrow. Thus the issuer can effectively repurchase the bonds below their fair market value. Hence municipalities should prefer an advance-refundable issue, and use the embedded ARO wisely.

An important consideration is that the ARO is exercisable only once in an issue's refunding life-cycle. If an issue is advance refunded, its replacement is not advance-refundable. However if an issue is called (current refunding), a callable replacement keeps the ARO alive. In this paper we develop an analytical framework to help issuers and their advisors deal with this problem. First, we take an in-depth look at the value of the ARO and explore how it depends on coupon, maturity, time to call, and prevailing Treasury rates. We then use the results to make a recommendation about the advance refunding decision – do it now or wait? In order to answer this question, we extend the standard measure of refunding efficiency to incorporate the value of the ARO of the replacement issue.

Our analysis shows that incorporating the ARO of the replacement issue provides a slower signal to advance refund than when it is ignored. This is most noticeable within a couple of years of the call date. In practical terms, disregarding the ARO of the replacement issue may lead to a sub-optimal advance refunding decision. Close to the call date, locking in savings with

a hedge is preferable to sacrificing the advance refunding eligibility of the replacement issue. Sophisticated issuers and their advisors will want to factor these important results into their debt management practice.

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Overview

Advance refunding is a common practice in municipal finance. It enables the issuer, under favorable market conditions, to lock in lower interest rates and thus reduce debt service *prior* to the call date. Waiting would expose the issuer to the risk of higher interest rates.

An advance refunding occurs when:

> . . . new bonds are issued to repay an outstanding bond issue more than 90 days before its first call date. Generally, the proceeds of the new issue are invested in government securities, which are placed in escrow. The interest and principal repayments on these securities are then used to repay the old issue, usually on the first call date.[1] (O'Hara, 2012)

Bonds issued to fund a new project (as opposed to a refinancing) are generally eligible for advance refunding.[2] The proceeds of the refunding issue are invested in an escrow portfolio consisting of Treasury bonds, which is structured so that its cashflows defease the original issue to the call date. Therefore the savings from advance refunding depend on both the issuer's refunding rate and on the yield of the escrow – the lower the refunding rate and the higher the escrow yield, the greater will be the savings.[3] In order to eliminate arbitrage, the yield of the escrow is capped by the yield (a slightly specialized version defined by federal regulation[4]) of the refunding issue.

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[1] See also the Municipal Securities Rulemaking Board's glossary entry for advance refunding, (http://www.msrb.org/Glossary/Definition/ADVANCE-REFUNDING.aspxfor advance refunding).
[2] State statutes govern refundings of local government bonds. The U.S. Internal Revenue Code (See 26 U.S. Code § 149) makes the distinction between advance and current refundings.
[3] The escrow yield determines the size of the refunding issue; the refunding rate determines that issue's debt service. Contrary to Congress's public policy objective of minimizing the volume of tax-exempt bonds outstanding, advance refunding in the presence of negative arbitrage has the opposite effect (low Treasury yields increase the cost of the escrow portfolio and therefore the size of the refunding issue).
[4] 26 CFR 1.148-4 - Yield on an issue of bonds.

The right to advance refund is an option. Significantly, this Advance Refunding Option (ARO) is free to the issuer. While investors pay a lower price for a callable bond, the primary market does not reveal any difference in price based on eligibility for advance refunding. In fact, investors prefer advance-refundable issues for well-understood reasons — inefficient refunding decisions and the fact that advance refunded bonds become rated AAA. Thus, with nothing to lose and something to possibly gain from an advance refunding, investors do not charge for the ARO.

An important limitation on the ARO is that once exercised, the replacement issue is not advance-refundable. By this rule, the IRS curtails the volume of tax-exempt bonds associated with the funding of a project. However, if the original issue is called[5], the ARO is kept alive in the replacement issue. In other words, the municipality can acquire additional value at no cost when it calls a bond and replaces it with one that is also callable. To summarize, the call option of a municipal bond can provide two related benefits to the issuer: to replace the outstanding bond with one with a lower cost, and, in case of calling, to obtain a free ARO. This gives rise to a challenging problem, not explored in this article: how to structure the call feature to maximize the value of the ARO?

An emerging trend in issuance is to include a 'make-whole' call (Kalotay, 2010) to the initial par call date (Weitzman, 2016). The make-whole price is determined by a fixed spread to an agreed upon benchmark yield, such as the AAA MMD yield to the regular call date. This feature enables the issuer to lock in interest savings prior to the regular call date, in a manner analogous to advance refunding. However, because the make-whole call price is higher than fair, there can be no free lunch in this case. If the bonds were advance refundable, the ARO could be preserved (which is not the case with advance refunding). But to date, the make-whole to call feature has been restricted to non-advance-refundable bonds. A plausible reason for this is that in an advance refunding the applicable call date and call price are the nearest ones – in this case the current make-whole date and price. This would effectively eliminate the possibility of a 'free lunch' in the event Treasury rates (which determine the escrow yield) exceed the issuer's funding rate to the call date.

Everything else being the same, an advance-refundable issue is preferable to one which is not. Thus the ARO should not be relinquished without adequate compensation. As an extreme example, advance refunding shortly before the call date would be foolish, because by deferring refunding until the call date the issuer could obtain a new ARO at no additional cost. Of course,

[5] Throughout this paper, 'called' means 'current refunded'. A refunding that occurs more than 90 days prior to the call date is an advance refunding.

normally the situation is not as clear cut. If the contemplated date of advance refunding is several years prior to the call date, waiting would entail considerable interest rate risk. At the same time, negative arbitrage of the escrow (discussed below) tends to discourage issuers from acting.

In this paper we develop the analytical framework to help issuers and their advisors deal with this problem. First, we take an in-depth look at the value of the ARO and explore how it depends on coupon, maturity, time to call (lock-out), and prevailing Treasury rates.[6] We then use the results in the second part to make a recommendation about the advance refunding decision – act now or wait? In order to answer this question, we will extend the standard measure of refunding efficiency to incorporate the ARO of the replacement issue.

What is the Value of an ARO?

As discussed above, the value of an ARO depends on both the municipality's borrowing rate and on Treasury rates, the latter determining the yield of the escrow. While these rates are positively correlated, the correlation is far from perfect. A discussion of the co-movements municipal and Treasury rates is beyond the scope of this article. Note, however, that the value of the ARO assuming no negative arbitrage does not require the modelling of Treasury rates. In the examples below the AROs are valued using Kalotay's proprietary approach; alternative approaches can be incorporated seamlessly. Our objective is to develop a method to determine the optimum refunding policy, assuming that the required ARO values are available.

The total optionality of the bonds under consideration can have as many as three components: the right to call, the right to advance refund, and the right to issue a replacement bond which is advance-refundable (for now, we will not consider the third component). We define the value of the ARO as the residual, after removing the values of the other options from the total.

Table 1 displays the assumed prevailing interest rates for both the issuer and the Treasury. In accordance with current practice (Kalotay, 2012), the issuer's rates are expressed as YTC's for 5% NC-10 bonds. Table 1 also shows the issuer's par non-callable (NCL) curve implied by the 5% NC-10 curve, assuming that the issuer's yield curve follows a lognormal process with 15% volatility. This volatility is used for all the examples below.

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[6] Escrow portfolios may consist of Treasuries purchased in the open market or lower-yielding 'State and Local Government Securities' (SLGS, colloquially 'slugs') issued by the U.S. Treasury for this specific purpose.

Table 1: Interest Rate Assumptions

Maturity (yrs)	1	2	3	5	10	15	20	25	30
5% NC-10 Yield (%)	0.50	0.81	1.09	1.40	2.15	2.62	2.91	3.10	3.19
Par NCL Yield (%) @ 15% vol	0.50	0.82	1.11	1.43	2.21	3.15	3.48	3.62	3.63
Treasury Yield (%)	0.58	1.03	1.30	1.74	2.25	2.50	2.66	2.89	3.00

Source: MMA, Bloomberg

Our 'base case' will be 5% NC-10 bonds, which are the current standard. Because 5% is well above the prevailing rates, these bonds are priced at significant premiums over par, depending on maturity, and they are excellent candidates for advance refunding. We will explore how the value of the ARO of 5% NC-10 bonds depends on maturity and Treasury rates, and then investigate the sensitivity of the results to other factors, namely coupon and lock-out (but not volatility).

5% NC-10 Bonds: No Negative Arbitrage

As discussed earlier, the allowed yield of the escrow is capped by the yield of the refunding issue. Everything else being the same, the most favorable case, i.e. the one that maximizes the value of the ARO (and minimizes the size of the refunding issue), is when the escrow yield achieves the refunding yield. The terminology for this case is that 'there is no negative arbitrage' (Kalotay and May, 1998, and Zhang and Li, 2004). Under the current conditions of historically low Treasury rates value of the ARO is significantly smaller.

To begin, we observe that the term 'no negative arbitrage' is a misnomer, because it implies that an escrow yield lower than the issuer's refunding yield is a 'bad deal'. In fact, the critical threshold of the escrow yield is the issuer's *funding yield to the call date*, rather than the (higher, longer-term) refunding yield. From the issuer's perspective, an escrow yield higher than the issuer's funding rate to the call date gives rise to an arbitrage (free lunch), because the fair value of the to-be-defeased bonds would then exceed the cost of the escrow portfolio.

Free Lunch Example

Consider advance refunding a 5% 20 NC-10 bond with 15 years left to maturity, i.e., 5 years to the call date. This bond would be trading at a price reflecting the certainty of being called, assuming the issuer's credit is roughly in line with the benchmark curve shown in Table 1. So, its fair value would be about 117.33 (YTC of 1.40%, the 5-year yield in the table). The refunding yield (maturity-matched 5% 15NC-10) would be 2.62%. This would be the 'no-arbitrage' cap for the yield of the escrow portfolio of Treasuries. In other words, if Treasury rates were high enough, the escrow portfolio would be permitted to earn as much as 2.62%, making the cost of the escrow portfolio 111.09% of amount outstanding. In other words, the issuer would be able to extinguish an obligation with a fair value of 117.33 at a cost of 111.09 — a financial arbitrage of over 6 points in a (legally speaking) no-positive-arbitrage advance refunding. But even at the current 5-year Treasury rate of 1.74% there is a free lunch, because the cost of the escrow is only 115.60, which represents a 1.78 point of arbitrage *without* violation of the no-arbitrage rule. Ang et al. (2013) completely miss this point.

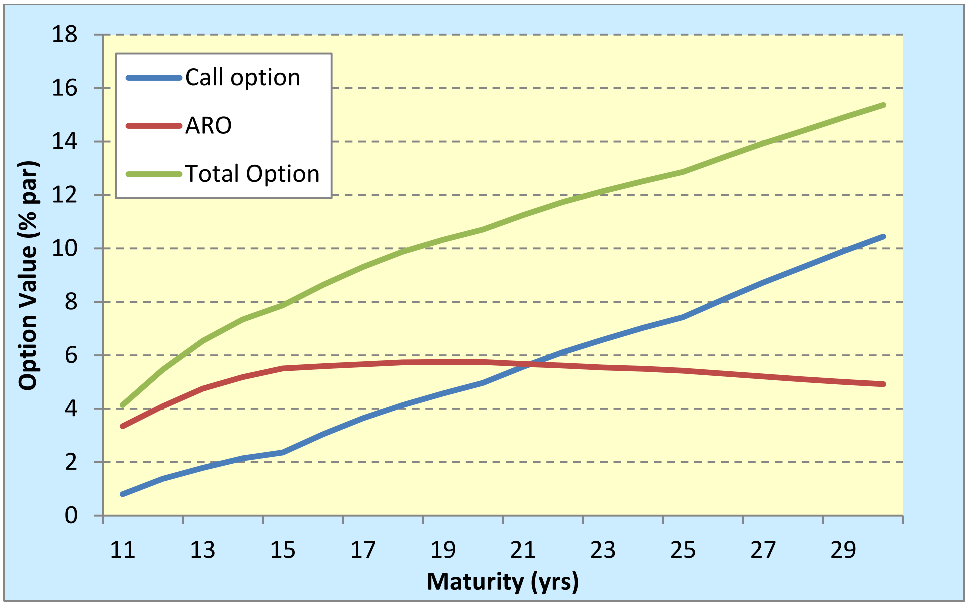
Issuers can raise the refunding yield, and therefore the legal cap on the escrow yield, by manipulating the structure of the refunding issue. Of course, in the current regime of low Treasury rates, there is little incentive to do so.

Figure 1 displays the value of the ARO for 5% NC-10 bonds of various maturities under the assumption of no negative arbitrage, along with the value of the call option. As shown, the total option value and that of the call option increase as the maturity increases. However the value of the ARO peaks between 15 and 20 years, at slightly below 6% of the face amount, and then gradually declines to about 5% for a 30-year maturity.

Under the 'no negative arbitrage' assumption Treasury rates do not have to be considered explicitly – all we need to know that the Treasury rates exceed the refunding yield.[7] In general, the value of an ARO does depend on the prevailing Treasury rates.

[7] Bankers used to 'assist' issuers in meeting the escrow yield cap by selling them Treasuries for the defeasance portfolio at lower yields (higher prices) than available in the market, a practice known as yield burning. For many years now, Treasury rates have been too low for yield burning opportunities.

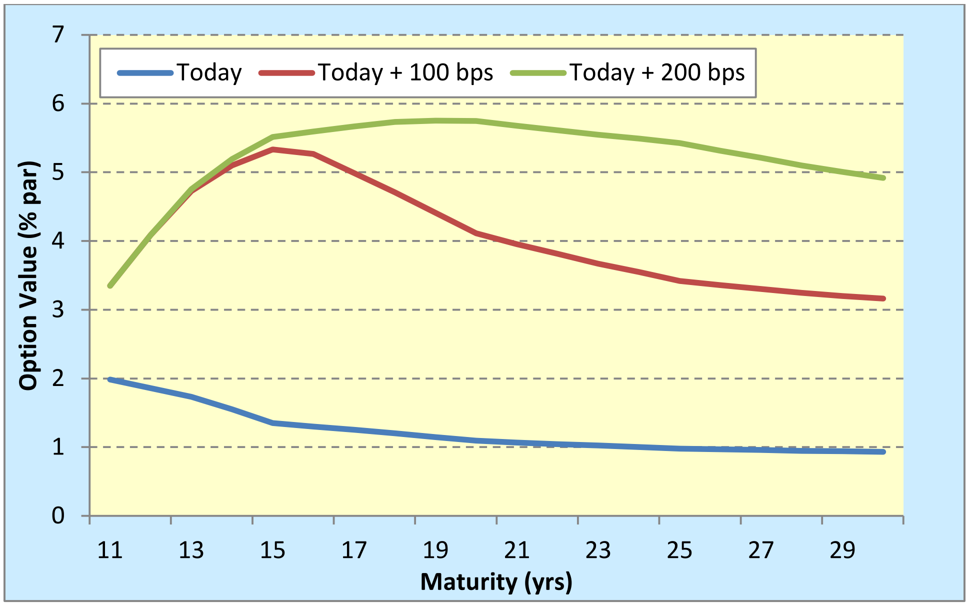
Figure 1: Option Values of 5% NC-10 Bonds Assuming No Negative Arbitrage



5% NC-10 Bonds: Dependence of ARO on Treasuries

Figure 2 displays the how the values of the AROs of 5% bonds with different maturities depend on Treasuries (today's, +100 bps, +200 bps). Here, we do not show the value of the call option, which is the same as in Figure 1. The +200 bps case is essentially the no negative arbitrage case considered above. As the maturity increases beyond 20 years, the value of the ARO gradually declines. As we have seen earlier, at the 20-year maturity the value of the ARO at current Treasuries is 1%, and at +100 bps it is 4%.

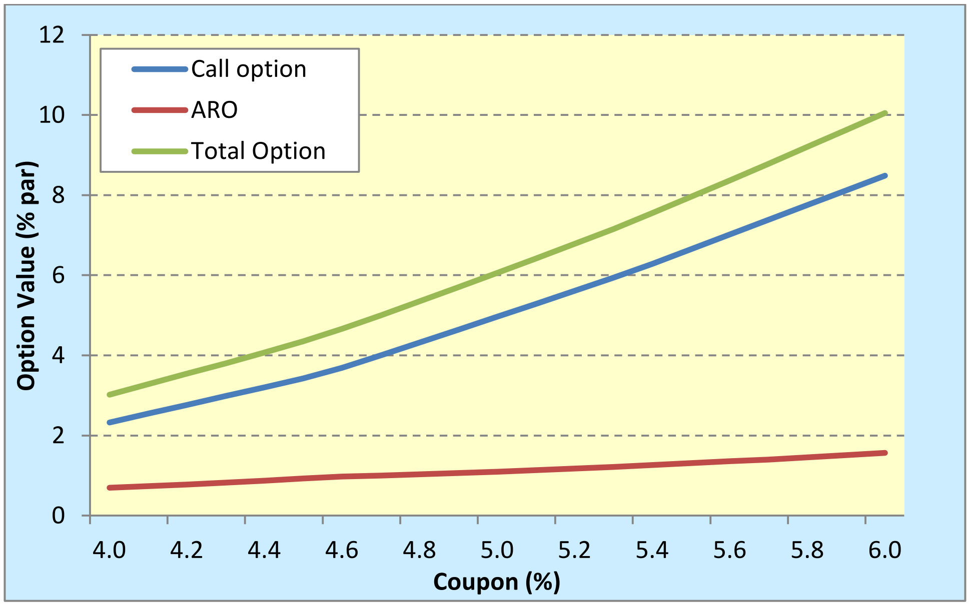
Figure 2: Sensitivity of ARO of 5% NC-10 Bonds to Treasury Rates



Coupon Effect for 20 NC-10s at Current Treasuries

Figure 3 displays how the coupon affects the value of the call option and the ARO for 20-year NC-10 bonds. As expected, the higher the coupon, the greater is the value of both the call option and the ARO, because there will be more opportunities to refund. The value of the ARO is around 0.75% at a 4% coupon, rising to 1% at a 5% coupon, and 1.75% at a 6% coupon.

Figure 3: Effect of Coupon on Option Value of 20 NC-10 Bonds (Current Treasury Rates)



20 NC-10's — Effect of Treasuries

Next, we'll explore the effect of Treasuries on the value of the ARO, keeping the issuer's current borrowing rate unchanged. Note that the value of the call option depends only on the issuer's borrowing rates.

Figure 4: ARO Value of 20 NC-10 Bonds – Sensitivity to Treasury Rates

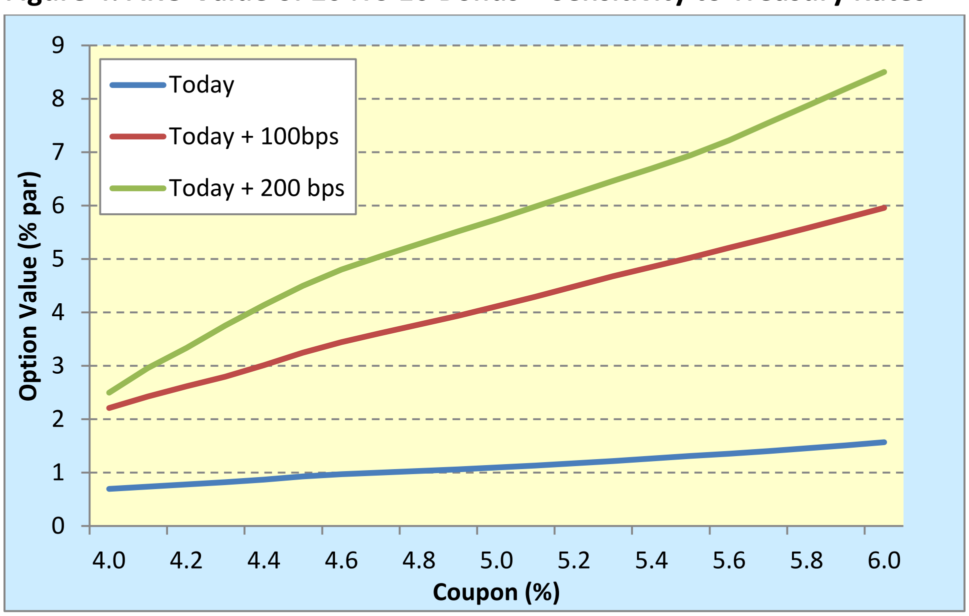


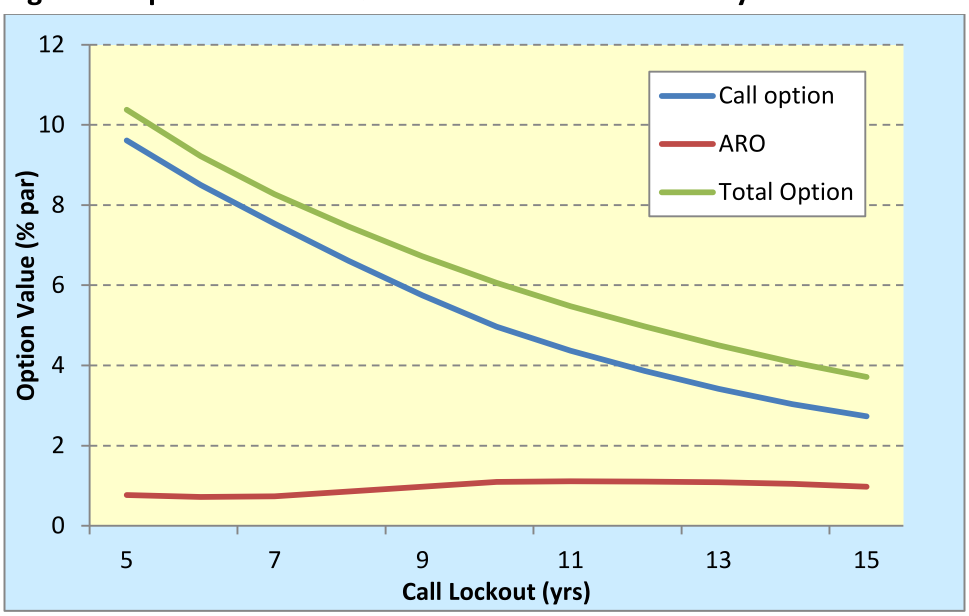
Figure 4 shows the values of the AROs for 20-year bonds, coupon ranging from 4% to 6% at current Treasuries, +100 bps, and +200 bps. Not surprisingly, the higher the escrow yield, the greater the value of the ARO. For example, at a 5% coupon increasing Treasuries by 100 bps raises the value of the ARO from 1% to 4% of the face amount.

Let's keep in mind that the issuer's borrowing rate is correlated with Treasuries. If Treasury rates increase, muni rates are likely to follow suit. Also, the value of the ARO does not increase indefinitely with Treasury rates, because the escrow yield is capped by the yield of the refunding issue (which, in order for the refunding to be beneficial, has to be significantly lower than the coupon of the outstanding bond[8]).

Effect of Remaining Time to Call

Figure 5 displays how the value of the call option and the ARO is affected by the lockout, for 20-year 5% bonds at current Treasury rates. A shorter lockout steeply increases the value of the call option (and commensurately reduces the price of the bond). Although a shorter lockout provides fewer opportunities to utilize the ARO, the value of the ARO is relatively insensitive to the lockout; at current Treasury rates it is roughly 1%.

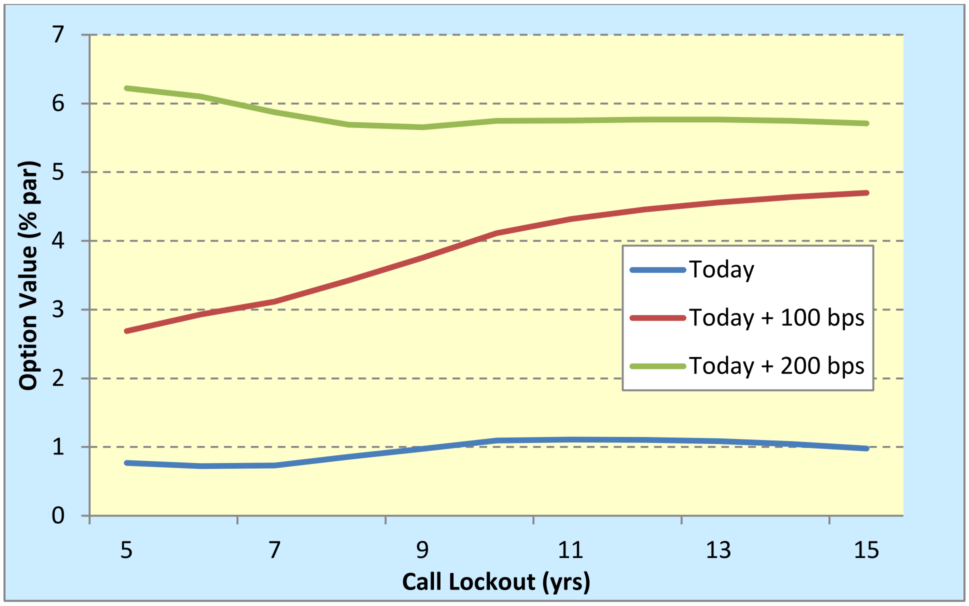
Figure 5: Option Value of 5% 20-Year Bonds – Sensitivity to Call Lockout



[8] Assuming the refunding is being done to achieve savings. Occasionally, refundings are executed to get out of cumbersome covenants, or for some other non-economic reason.

Figure 6 displays the relationship between lockout period and Treasury rates. As we have seen, at current Treasury rates, it is worth roughly 1 point virtually independent of the lockout period. In the no negative arbitrage case (+200 bps) it is worth roughly 6%, independent of lockout. Between these extremes the value of the ARO gradually increases, because there are more opportunities to use it.

Figure 6: ARO Value of 5% 20-Year Bonds – Sensitivity to Call Lockout and Treasury Rates



Recap of Factors Affecting Value of ARO

As shown above, the value of an ARO of a new issue depends on the interest rate environment – it varies from substantial to almost negligible. Because the ARO is obtained at no cost to the issuer, a callable bond which is eligible for advance refunding is a preferable to issuing a bullet. Transaction costs (not considered here) should be taken into account.

How the Refundability of Replacement Bond Affects Option Values

As previously mentioned, the value of the ARO is defined as the residual, after removing the values of the other options from total optionality. Advance-refundability of the replacement bond in the event of a call increases total option value. It also provides an incentive to wait until the call date and then issue a bond which is advance refundable. However, if the initial call date is in the distant future, we would expect this consideration to be relatively insignificant, in contrast to when the call date is imminent.

Analytical Framework for the Refunding Decision

Refunding is an option exercise. The primary benefit is cashflow savings, but it comes at a cost. Refunding today forfeits the option to refund the outstanding bond in the future. Advance refunding also forfeits the opportunity to advance refund the replacement bond. A callable replacement bond reduces the savings (because it increases the coupon or lowers the price), but provides additional option value in return.

We need a formula which, based on the above variables, provides a sensible recommendation for the refunding decision (act now or wait). In the absence of advance refunding, the recommended approach is to use the so-called generalized refunding efficiency (Kalotay, et al., 2007):

$$Refunding\ Efficiency = \frac{PV(Savings)}{Option\ Value_{old} - Option\ Value_{new}}$$

The numerator is the correctly discounted present value of the cashflow savings. The denominator is the difference between the option value being given up and that acquired through the replacement bond.

The maximum value of refunding efficiency is 100%. Once that level is reached the issue should be refunded; there is no incentive for waiting. Risk aversion may provide an impetus to refund below 100%. However, in that case alternative transactions such as hedging or market purchase should be considered.

The challenge is to incorporate the ARO into the refunding efficiency formula. The critical consideration is that the call option of the outstanding bond provides two potential benefits to the issuer: to refund at a rate below the coupon, and to obtain an ARO at no cost by issuing a callable replacement bond. Advance refunding forfeits both of these options. However, in the case of calling, the issuer can acquire a new ARO.

$$Refunding\ Efficiency = \frac{PV(Savings)}{Option\ Value'_{old} - Option\ Value'_{new}}$$

Option Value'$_{old}$ = Old call option + R + Old ARO, where R is the right to issue a replacement bond eligible for advance refunding
Option Value'$_{new}$ = New call option + New ARO

These option values depend on prevailing market conditions. (Perfectionists may include the negligible value of subsequent ARO's, in the event the replacement bond is eventually called rather than advance refunded.)

Waiting until the call date preserves the right to advance refund the refunding issue. In that case the benefit would consist of cashflow savings, the call option of the refunding issue, and the ARO of the refunding issue.

Refunding Efficiency in Action: Examples

We consider an advance-refundable 5% bond, with original maturity 30 years, and explore the efficiency of refunding it at various times prior to the call date. In this case the replacement bond would not be advance-refundable. However, beyond the call date the replacement bond could be advance refunded.

We assume that the replacement bond is a maturity-matched 5% NC-10 structure. Thus if the outstanding bond is refunded at the end of Year 7 the replacement bond would be an 23-year 5% NC-10 bond, and if it is called at the end of Year 12 the replacement bond would be an 18-year 5% NC-10 bond.

The results for 3 years prior to the call date are shown in Figures 7 and 8. For illustrative purposes, we assume the value of the ARO in the replacement bond is 2% of the amount outstanding. In Figure 7, the results are under a 'no negative arbitrage' regime. Under this assumption both efficiencies are close to 100%, but it is higher if the new ARO is (mistakenly) ignored. The difference is striking during the year just prior to the call date: new ARO-aware analysis reduces the efficiency below 94%; otherwise it is essentially 100%, signaling incorrectly that the bond should be advance refunded. (Risk-averse issuers who recognize the value of the new ARO should consider hedging.)

Figure 8 considers the same decision under current market conditions. In this case the efficiencies are uniformly lower than those in Figure 7. As before, near the call date the efficiency in the case ignoring the new ARO is very close to 100% (recommending advance refunding), while in the ARO-aware case it is only 91% (recommending waiting until the call date). Note that two years prior to the call date the efficiency, ignoring the new ARO, is about 94%, while including it causes the efficiency to be significantly lower, roughly 86%.

Figure 7: Refunding Efficiency of Seasoned 30 NC-10 Bonds Assuming No Arbitrage

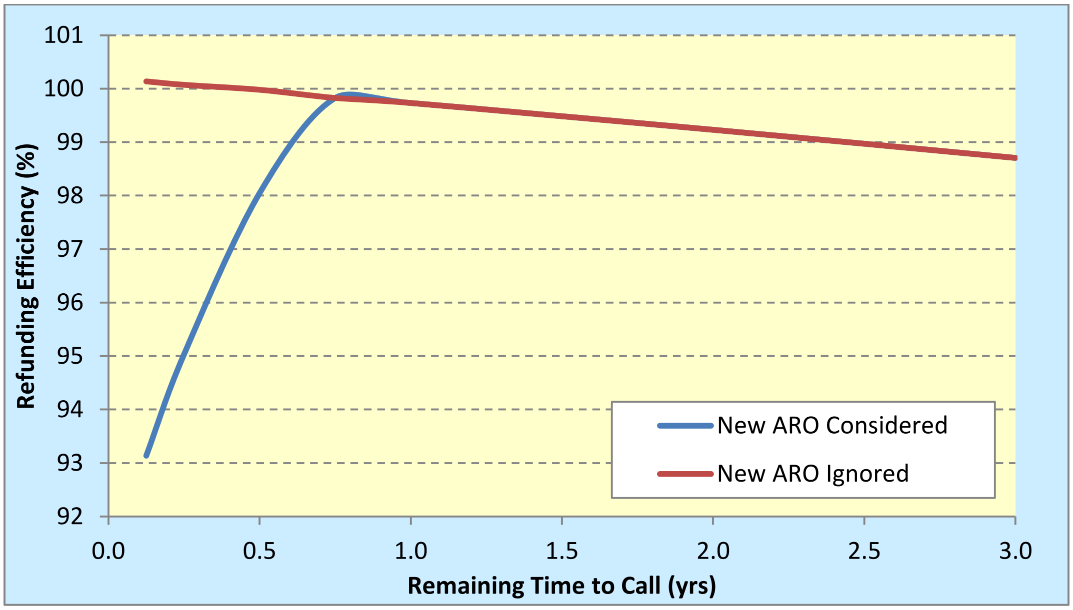
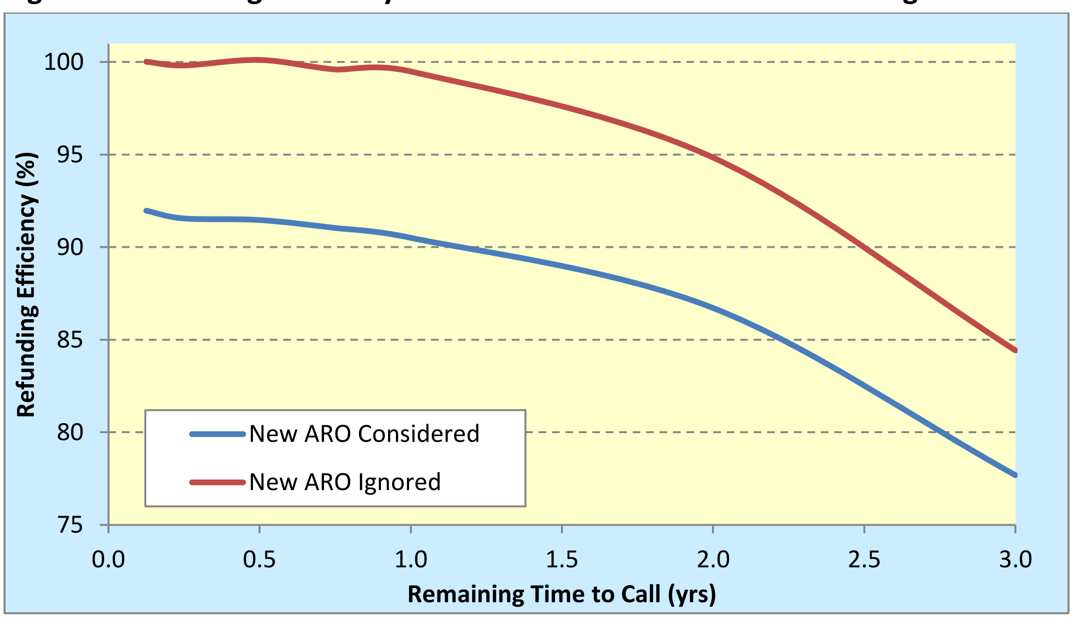


Figure 8: Refunding Efficiency of Seasoned 30 NC-10 Bonds Assuming Current Treasuries



Summary

A municipal issue funding a project may be eligible for advance refunding. Advance refunding is a valuable option; when the escrow yield is higher than the issuer's funding rate to the call date, the issuer can in essence repurchase the bonds below their fair market value. The advance refunding option is acquired automatically, at no cost, by issuing a fairly priced callable bond.

If the original issue is advance refunded, the replacement bonds are not advance-refundable. However, refunding beyond the call date preserves eligibility – there's a potential free lunch down the road.

To determine how the above consideration affects the advance refunding decision, we extended the refunding efficiency formula to incorporate the advance refundability of the replacement issue. Application of this formula reveals that close to the call date ignoring the ARO of the refunding bond favors the wrong decision of advance refunding. In such cases, it may be preferable to hedge the forward long-term rate, and then current refund as of the initial call date.

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