Introducing TIC+
Rethinking TIC calculation

Municipalities typically issue a series of bonds of various maturities in a single debt deal. The bonds may share a single coupon (e.g. 5%) or may have maturity-specific coupons. In addition, longer bonds will almost always be subject to optional redemption. In a competitive deal, the municipal treasurer needs a single measure that encapsulates the cost of each bid to rank them for selection. The most widely-used such measure is the so-called True Interest Cost or TIC — the winning bid is the one with the lowest TIC. But TIC has a glaring defect. It's time to replace it.

In mathematical terms TIC is the discount rate that equates the present value of the debt service generated by the issue to the appropriately defined net proceeds. It is a straightforward concept. For example, if the issue consists of a single non-amortizing bond, TIC is essentially the yield to maturity based on the normalized proceeds. Consider a municipality authorized to sell $100 million tax-exempt debt; ignore transaction costs for simplicity. One possibility is to issue $87 million 30-year 5% bonds at a price of 115, generating $100 million in proceeds. The resulting TIC would be 4.124%, the YTM of a 30-year 5% bond priced at 115. A different way to raise the same amount is by selling $100 million 30-year 4% bonds at par; the corresponding TIC would be 4.000%.

Alternatives to TIC, such as Net Interest Cost (NIC) and average coupon rate, have a common shortcoming: they are not based on calculations that take into account the time value of money.

What's Wrong With TIC?

Unfortunately TIC itself, while capturing the time value of money and the differences in underwriting fees among the bidders, ignores a valuable asset received by the issuer. This is the right to refund at lower rates if the opportunity arises.

Investors recognize the possibly of early redemption (call) — a detriment from their perspective as it involves reinvestment risk. Thus they demand a higher yield for callable bonds. Premium bonds are 'priced to the call date' by convention. The TIC calculation does not recognize this tradeoff and uses the same 'yield-to-maturity' calculation whether the bonds are callable or not.

Of course, in a competitive deal every bond in a series is assumed to have the same optional redemption feature — usually callable at 100 after 10 years. However, all other variables being the same, the higher the coupon the greater is the value of the call option. Clearly, it is easier to economically refund a 5% bond than a 4% one. Because the greater option value of higher coupon bonds is not captured by TIC, lower-coupon deals sold near par usually win. In the example above, the 4% bonds with a 4.000% TIC would win over the 5% with a 4.124% TIC.

Introducing TIC+

Why not incorporate the value of the refunding option in calculating the cost of borrowing? The TIC calculation should be based on the sum of the proceeds and the refunding option value. We'll illustrate this 'TIC+' approach[1] shortly, but first let's discuss on a high level how the option value is obtained.

The calculation requires the issuer's optionless borrowing curve and interest rate volatility. The borrowing curve can be estimated from the issuer's spreads to a benchmark such as the MMA or the MMD. For volatility, we recommend a reasonable level; say 12% that should be used consistently to calculate option values.

Continuing with the example above, we estimate that the option value of the 5% bonds is 4.89% of par. In dollar terms, the option value of the 5% bonds is $4.25 million (4.89% of $87 million), and therefore the TIC of the 5% bonds should be based on received value of $104.25 million instead of $100 million. The resulting TIC+ is 3.876%. In comparison, for the 4% bonds the proceeds (including option value of 1.91% of par) would amount to $101.91 million and the TIC+ would be 3.892%. The 5% bonds win. See Table 1.

[1] *Patent Pending*

Table 1: TIC+ Picks the True Winner

Issue	Proceeds* ($ millions)	Value of Call Option	Cash + Option Value Received by Issuer ($ millions)	TIC	TIC+
$87 million 5% bonds issued at 115	100	4.25	104.25	4.12%	**3.88%**
$100 million 4% bonds issued at par	100	1.91	101.91	**4.00%**	3.89%

As you see, the missing piece in the calculation of TIC is the option value. While generally well-understood and easily accomplished, the calculation of option value is rendered more complicated if the bonds are also eligible for advance refunding.[2] Despite the added complexity, it is possible to correctly calculate the full option value of such bonds.

By adding the option value to the proceeds, TIC+ fully captures the tradeoff between higher yield and acquired optionality. The approach, described here for an individual bond, easily extends to a series of bonds. Look for TIC+ on Ipreo's BiDCOMP the next time to you need to pick the winner in a competitive offering.

Guest Author*: Andrew Kalotay

Andrew Kalotay, Ph.D., is president of the debt management advisory and fixed income technology firm, Andrew Kalotay Associates. He is an authority on bond valuation and is a member of the Fixed Income Analysts Society Hall of Fame

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[2] *Advance refunding depends on Treasury yields in addition to the issuer's borrowing rates. When Treasury yields are low, negative arbitrage reduces the advance refunding option's value.*