The State of Connecticut Municipal Swap

Teaching Note

Objectives

To discuss financial innovation and the use of synthetic finance in the municipal bond market. To understand the supply of and demand for various forms of tax-exempt debt and to discuss the determinants of municipal verses taxable yield curves. To discuss the opportunities and problems faced by issuers in attempting to use innovative methods to obtain cheaper financing.

Synopsis

The State of Connecticut is considering alternative proposals for raising long-term fixed-rate tax-exempt debt. The choice is between "plain vanilla" fixed-rate debt and various synthetic alternatives which involve issuance of long-term variable-rate debt coupled with an interest-rate swap. The synthetic alternatives require the issuer to bear various mismatch, basis and credit risks.

Suggested Assignment Questions

1. Analyze the structure of the variable rate debt described in the case (UPDATES, VRDOs, etc.).

   a) What is the importance of the put feature? The call feature? The cap?

   b) What is the role of the remarketing agent?

   c) At what rate should this debt trade? In particular, how did Merrill Lynch arrive at J.J. Kenny minus 55 basis points? Is this analysis correct?

2. Compare three forms of debt: fixed rate debt, floating rate debt (floating, say, with JJK), and the VRDOs described in the case. For each: what risks does the issuer bear? What risks does the investor bear?

This note was prepared by Professor André F. Perold and Senior Research Associate Wai Lee for the sole purpose of aiding classroom instructors in the use of the case The State of Connecticut Municipal Swap (291-024). It provides analysis and questions that are intended to present alternative approaches to deepening students' comprehension of business issues and energizing classroom discussion.

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3. Analyze the Merrill Lynch and Bankers' Trust fixed rate alternatives. Which is better for the State of Connecticut?

4. Analyze Bud Cohn's choices, including the possibility of entering into a fixed for LIBOR (one month or three month) swap with AIG. Assume AIG will quote the rates given in **Exhibit 1** of the case. NOTE: Try to avoid tedious calculations. A "quick & dirty" analysis should suffice.

   What should Cohn do?

5. In general, under what circumstances would synthetic fixed-rate debt like that contemplated in the case be most attractive for a tax-exempt issuer? Would there be any losers in such a transaction?

Teaching Plan

This teaching plan divides the class time into essentially three parts. The first part of the class deals with the financial engineering and pricing of long-term floating-rate debt in the municipal market. The floating-rate instruments described in the case represent important innovations in their own right, irrespective of their possible role in creating fixed-rate synthetic financing. The second part involves the analysis of the swap transaction and the pricing of the synthetic financing (in comparison with plain vanilla fixed-rate issuance). This part also involves an assessment of the risks involved in entering into the synthetic transaction. The final part of the class examines how the synthetic transaction creates value. The value created stems from an apparent anomaly in the pricing of municipal verses taxable yield curves - the municipal curve is steeper than the taxable curve. Whether there is indeed mispricing in these yield curves is not obvious.

The design and pricing of long-term variable-rate debt

I begin by asking students to explain the structure of the variable-rate debt described in the case (UPDATES or VRDO's) and to specifically explain the role of the put feature, the call feature, and the cap. Students' understanding of these securities is greatly aided by discussing a "day in the life" of the remarketing agent whose role is to price the upcoming coupon so as to keep the instruments worth par. These securities are structured with the same goal in mind as the instruments described in the ARPPS and MMP cases, i.e., to make them functionally equivalent to short-term (municipal) paper:

- The put option puts a floor of par on the security by giving the investor the right to sell it at par.

- The call option gives the issuer protection in case the yields on these securities are "absurdly high" (perhaps because of failure of the remarketing mechanism), in principle allowing the issuer to redeem the debt and refinance itself in a more "efficient" market.

- The letter of credit enhances the credit-worthiness of the put option. It is worth discussing the various types of letter of credit and how these are designed in the context of the specifics of U.S. bankruptcy law.

- The role of the cap feature is less obvious since the debt is puttable. If the coupon were to reach the cap (because the market rate to keep the price at par would exceed the cap), the investor can simply put the debt back to the issuer for par and invest the proceeds in the debt of another issuer. Thus the cap does not have much effect on the investor. Nor does it obviously help the issuer who is stuck having to refinance the debt at a higher rate than

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the cap. Perhaps the cap is there to assure the legislature or some other constituency of a maximum interest rate on this particular debt issue. Or, more likely, the cap limits the risk to the issuer in the event of a severe deterioration in its credit quality, shifting this risk to the provider of the letter of credit.

The remarketing agent tries to clear the market, finding buyers to match the sellers exercising their put options. The task is to find the lowest yield that attracts sufficient buyers. It should be made clear that the yield so chosen applies to the *whole* issue so that even if a small number of participants are setting the yield at the margin, all holders of the security earn this yield until the next reset.

Together these features result in a long-term security that will trade at par and have a yield very close to that on tax-exempt commercial paper. A major benefit to the issuer of this form of debt, over the alternative of rolling over short-term commercial paper, is that for budgetary and other purposes it offers "guaranteed availability" for an extended period of time while retaining all the benefits of commercial paper, such as being able to dynamically adjust the maturity of the paper - perhaps from one week, to three months, back to one week - and in general being able to pay coupons tied to short-term rates.

It is instructive to compare this form of variable-rate debt with other types of fixed- and floating-rate debt. See **Exhibit TN-1**. There are essentially two forms of risk faced by holders and issuers of debt—interest-rate risk and credit risk. For investors, risk is defined here as exposure to *price* changes, while for issuers risk is defined as exposure to changes in their cost of funds. In the case of fixed-rate debt, both interest-rate risk and credit risk are borne by the investor. With "regular" floating-rate debt, which pays a coupon that floats according to a predetermined formula such as LIBOR plus a fixed spread, interest-rate risk is borne by the issuer, while credit risk is borne by the investor (because of the fixed spread). In the case of UPDATES or VRDOs, it is the issuer that bears both types of risk. In particular, the coupon increases as the issuer's credit deteriorates, forcing the issuer to pay a higher spread. The investor bears only the default risk of the supporting letter of credit.

Finally, there is the question of the rate at which this paper will trade. Merrill Lynch is quoted in the case as arguing that the paper will trade at the J.J. Kenny rate minus 55 basis points. This differential stems from the tax savings by Connecticut residents which is adjusted for the fact that state taxes are deductible at the federal level. This analysis, however, assumes that the marginal investor in the securities that underlie the J.J. Kenny index is *out-of-state*. If the marginal investor is in state, then there may not be any differential versus the J.J. Kenny. The differential will be driven by the difference between the Connecticut tax rate and the average tax rates of other states, subject to a floor given by the after-tax yield on other taxable investments for State of Connecticut investors.

The fixed-rate alternatives

The analysis of the fixed-rate alternatives presented by Merrill Lynch and Bankers Trust is relatively straightforward, with the all-in costs being given in the case as 7.060% and 6.964% for the ML and BT proposals, respectively. There are two aspects worth noting:

- These are different from traditional debt offerings by virtue of their serial nature. Why municipalities issue bonds serially is an interesting question. The hypothesis advanced in the case is that smoothed debt service is easier on the budget process. A related but alternative hypothesis is that investors do not wish to be exposed to the risk of the state legislature suddenly deciding not to pay off on its debt when faced with a lump-sum obligation. Thus, it might be investors who require the serial structure as a means of reducing credit risk.

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- A second point to note is that serial maturities can be accomplished in more than one way. In the Banker's Trust case, part of the serial structure is accomplished through sinking funds. The Merrill Lynch proposal makes no use of sinking funds.

The synthetic fixed-rate alternatives

The structure of the synthetic alternative is diagrammed in **Exhibit TN-2**. A simple first-pass analysis involves totaling the various costs related to the swap and the variable-rate debt, and also making an assumption as to what the State of Connecticut will pay on its variable-rate debt. As shown in **Exhibit TN-3**, if the rate on the variable-rate debt is J.J. Kenny-55 or TENR-25, there is a per annum savings over plain vanilla fixed-rate issuance of 44.5 basis points and 32.4 basis points on the two deals, respectively. Merrill Lynch is quoted in the case saying it can achieve even greater savings because the UPDATES structure allows it to opportunistically alter the maturity of the reset period.

The class can now proceed to analyze the risks to the State of Connecticut of going the synthetic route. The first is basis risk - the risk that the State of Connecticut may end up paying a rate on its variable-rate debt much higher than J.J. Kenny-55 basis points. This would occur, for example, if the State's credit quality deteriorates or if there are adverse relative tax changes - such as the tax rate on interest income rising in other states relative to that in Connecticut.

A second risk is term mismatch arising from the swap being of only ten-year maturity (versus twenty years on the debt). Thus, in year ten, interest rates might be high making this form of debt issuance expensive ex post. The risk is symmetric, however, in the sense that rates may also be lower in year ten, resulting in a cost of funds that is low ex post. Moreover, the risk applies only to the principal remaining in year ten.

Finally, there is default risk on the swap. From other classes - such as the B.F. Goodrich-Rabobank Interest Rate Swap - students should recall that it is small to begin with - since only the net payments are at risk - and that this risk can be managed, among other means, by both sides posting (a small amount of) collateral. On the other hand, the case gives credit risk as a key reason why the business of writing long-term swaps was dominated by AAA-rated firms.

The LIBOR-based swap

To illustrate the attempted "yield curve arbitrage" underlying this deal, it is useful to examine a 20-year LIBOR for fixed-rate swap. This is done most easily by assuming an average ten-year life for the swap on a fixed notional amount (as an approximation to a swap on an amortizing notional amount). From **Exhibit 1** in the case, this swap would carry a rate of 76 basis points per annum over the 0-year Treasury (T_{10}). The swap would be written on a notional amount given by 70% of the initial balance of $325 million, on the assumption that the J.J. Kenny index will average 70% of LIBOR (see case **Exhibit 5**). The State of Connecticut will thus be receiving 70% of LIBOR and paying 70% of T_{10} + 76 on the full principal outstanding. As shown in **Exhibit TN-4**, if the J.J. Kenny index indeed stays at 70% of LIBOR, this swap would be even better. In reality, of course, the State of Connecticut would be exposed to the basis risk of the J.J. Kenny index deviating from 70% of LIBOR.

Yield-curve arbitrage?

The above analysis shows that there can be "value added" using a simple taxable interest-rate swap. The intuition is perhaps most easily demonstrated by drawing two yield curves, one for taxables and one for municipals, and observing that the municipal yield curve is not proportional to the taxable yield curve. See **Exhibit TN-5**. At the short end, municipals trade at 74% of taxables, while at the long end, the ratio is 84% of taxables. Moreover, this pattern of pricing has persisted for many years. The key question is: Why are these ratios different?

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There are a variety of potential hypotheses often advanced to explain the discrepancy. One is that tax rates are expected to decline in the future. This is an unlikely explanation given the long-run persistence of the phenomenon, and the fact that taxes seem about as likely to rise as to fall in the future. Another is that the yield differential at the long end is a "liquidity premium," reflecting the fact that municipal bonds are less liquid than Treasurys. A third hypothesis is simply oversupply of long-term municipals relative to the size of the tax clientele. A fourth is that the municipal yield curve should be aligned with the higher after-tax yields that can be obtained in the taxable market through various dynamic and static portfolio strategies: Constantinides and Ingersoll (1984)[1] show that the tax timing option increases after-tax yields while Green (1993)[2]shows that long and short positions in taxable instruments can be used to effect tax deferral. All except the first hypothesis are consistent with the notion of a "free lunch" for municipal issuers: There is money to be made issuing short-term municipal debt- the segment of the market that is liquid, free of the tax-timing option, and where there is relative "undersupply," and swapping fixed for floating in the taxable market, attempting to benefit from the relatively more favorable pricing of long-term fixed-rate taxable debt. The pervasive use of this strategy by municipal issuers might ultimately lead to the municipal and taxable yield curves being more proportional. See Scholes and Wolfson (1992) for a general discussion of clientele-based tax arbitrage.[3]

It is important to point out that if this is indeed the value-added in the transaction, then many of the details in the transaction concern better implementation given the issuer's needs. In particular, swapping fixed for J.J. Kenny as opposed to 70% of LIBOR is to remove an element of basis risk for the issuer (for which it probably is paying the dealer a premium), as opposed to being a source of arbitrage profit.

The decision

Bud Cohn ultimately chose not to proceed with either of the synthetic proposals, in part because the margin of "profit" seemed too slim. However, in the late fall of 1990, the State of Connecticut did execute a large synthetic fixed-rate financing structured very similarly to the proposals in the case.

[1] Constantinides , George M. and Jonathan E. Ingersoll, Jr. (1984), "Optimal Bond Trading with Personal Taxes," *Journal of Financial Economics*, 13 (3), 299-335.
[2] Green , Richard C. (1993), "A Simple Model of the Taxable and Tax-Exempt Yield Curves," *The Review of Financial Studies*, 6 (2), 233-264.
[3] Scholes , Myron S. and Mark A. Wolfson (1992), *Taxes and Business Strategy: A Planning Approach*, Prentice Hall, New Jersey, Chapter 6.

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Exhibit TN-1 Who Bears What Risk?

		Floating-Rate Debt	
Risk	**Fixed-rate Debt**	**Fixed Spread**	**VRDO**
Interest-Rate Risk	Investor	Issuer	Issuer
Credit Risk	Investor	Investor	Issuer & LOC

Exhibit TN-2 Structure of the Proposed Transaction

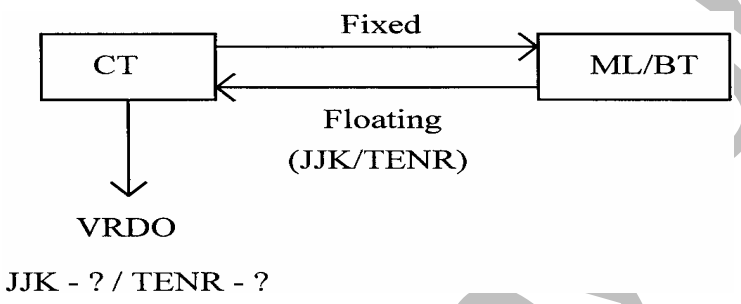

Exhibit TN-3 Analysis of the Synthetic Fixed-Rate Alternatives

	ML	BT
Underwriting fee	0.425% (0.06% p.a.)	0.325% (0.05% p.a.)
Remarketing fee	0.125% p.a.	0.100% p.a.
LOC	0.075% p.a.	0.070% p.a.
Receive	JJK	TENR
Pay	6.905%	6.67%
VRDO	JJK - 55 b.p.	TENR - 25 b.p.
Total	6.615%	6.640%
Fixed-rate alternative	7.060%	6.964%
Savings	44.5 b.p.	32.4 b.p.

Exhibit TN-4 Analysis of the LIBOR Swap

Receive	70% of LIBOR
Pay	70% of Treasury + 76 b.p.
	= 70% of (8.64 + 0.76)%
	= 6.58%
Pay	JJK - 55 b.p.
Total	6.03% + JJK - 70% of LIBOR
	= 6.03% if JJK equals 70% of LIBOR

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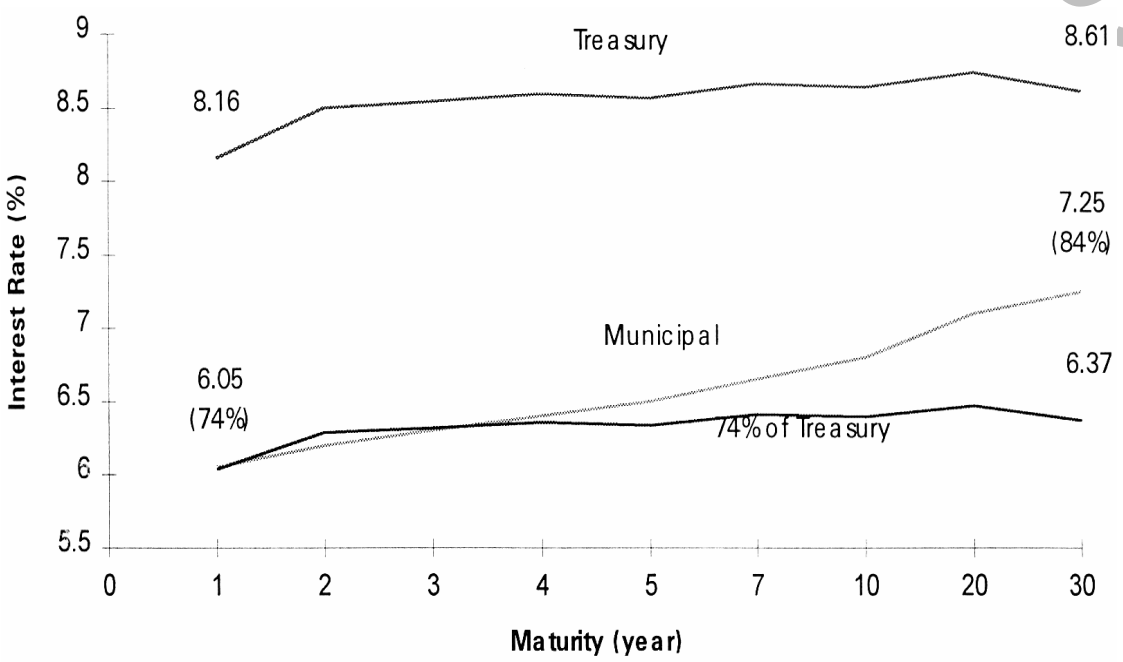
Exhibit TN-5 Taxable vs. Tax-exempt Yield Curves



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