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Implications of Foreign Investment Patterns for Federal, State, and Local Bond Financing

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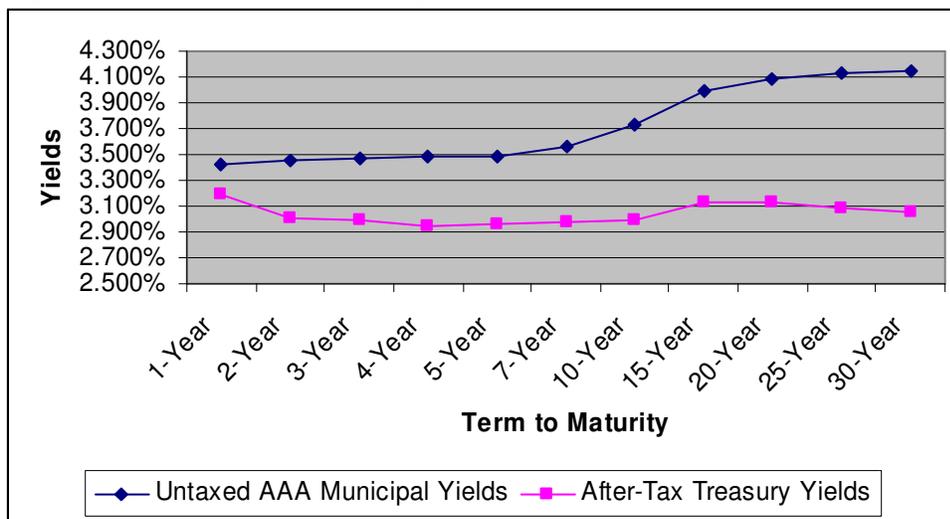
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What is the Municipal Bond Puzzle?

First identified by scholars in the 1970s, the municipal bond puzzle refers to the unusual relationship between the yields of U.S. Treasury and municipal bonds that deviates from standard economic theory. One of the key differences between Treasury and municipal bonds is that while interest income from Treasury bonds is subject to taxation, interest income from municipal bonds is not. Economic theory suggests that the difference in tax treatment will result in a predictable difference in yields for the two types of bonds. Economists argue that buyers and sellers will bargain until the after-tax yield on Treasury bonds is equal to the untaxed yield on municipal bonds.

The municipal bond puzzle emerges because this predicted relationship does not hold empirically. Actual bond yield data suggest that the untaxed yields on municipal bonds are greater than the after-tax yields on Treasury bonds (see Figure 1).

Figure 1. Treasury and Municipal Bond Yields



Source: Bloomberg Financial (November 2, 2006)

Figure 1 suggests that, ignoring the difference in risk, bond investors should invest solely in municipal bonds because their yields are higher than the after-tax yield on Treasury bonds.

Why is the Puzzle Important for Policy Decisions?

The municipal bond puzzle is an important concept for state and local policymakers because of their use of bond issues to finance government activities. As we will demonstrate later in this paper, factors that alter the relationship between Treasury and municipal bond yields will have an impact on the ability of municipal governments to attract investors to purchase their bonds. Similarly, changes in the relationship between municipal and Treasury yields have implications for federal policymakers. As we will demonstrate, changes in the relative yields of Treasury and municipal bonds are likely to affect both the volume and type of investors interested in purchasing U.S. Treasury bonds. Thus, changes in any of the factors generating the municipal bond puzzle could alter the cost to the federal government of financing its activities through bond issues as well as alter the composition of the parties to which the federal government is indebted.

Possible Explanations for the Municipal Bond Puzzle?

Economists have proposed several explanations for why the municipal bond puzzle occurs.

- *Differences in default risk.* Because municipal bonds carry a higher risk of default than Treasury bonds, investors would naturally demand a higher rate of return on municipal bonds (Liu et al., 2003). However, scholars are not in complete agreement on whether this effect can fully explain the puzzle. Studies that have examined the relationship between the yields on Treasury bonds and very low risk municipal bonds have found that the municipal bond puzzle persists. These studies conclude that default risk cannot explain why the puzzle occurs (Chalmers, 1998).

- *Differences in liquidity.* Because the municipal bond market is less liquid than the Treasury bond market, investors would naturally demand a higher return on municipal bonds (Wang et al., 2005).
- *Expectations of higher taxes.* Some researchers have suggested that investors may anticipate a change in the tax treatment of municipal bond yields (Poterba, 1986).
- *Portfolio structure.* Others have suggested that the way investors structure their portfolios may reduce their incentive to invest in tax-exempt bonds over taxable bonds (Green, 1993).
- *Composition of investors.* Finally, some economists argue that changes in tax law have changed the composition of investors in municipal bonds. Previously dominated by commercial banks, the market for municipal bonds is increasingly comprised of other types of investors in light of tax reforms. Some scholars argue that municipal yields have increased relative to after-tax Treasury yields to induce individual investors to purchase municipal bonds. Thus the puzzle occurs because untaxed municipal bond yields remain higher than after-tax Treasury yields to fill the gap previously occupied by commercial bank investors (Hein et al., 1995).

An Alternate Explanation for the Puzzle

In this paper, we hypothesize that a factor contributing to the municipal bond puzzle is the increased volume of foreign investment in U.S. Treasury bonds in recent years. Because foreign investors are not subject to U.S. income tax law, the investors will be more likely to purchase Treasury bonds because the bonds carry higher pre-tax yields than municipal bonds. Increases in their purchases of Treasury bonds will drive Treasury yields lower so that the after-tax Treasury yields become lower than the untaxed yields on municipal bonds.

Using statistical modeling, we find that, holding all else equal, increases in foreign purchases of U.S. Treasury bonds have corresponded to decreases in the yields on Treasury bonds so that the gap between the yields on untaxed municipal bonds and the after-tax yields on Treasury bonds has widened.* We conclude that the municipal bond puzzle is due, at least in part, to increased purchases of U.S. Treasury bonds by foreign investors.

Implications for Federal, State, and Local Policymakers

Our conclusion that foreign purchases in U.S. Treasury bonds form one of the main drivers of the municipal bond puzzle has major implications for policymakers on all levels of government. First, our results suggest that by allowing municipal bond yields to be tax free, the federal government has encouraged foreign investment in Treasury bonds. By designating municipal bond yields as free from federal income taxation, federal lawmakers originally intended to make it easier for state and local governments to finance their activities through bond issues. However, it was actually an unanticipated consequence of this tax provision that has facilitated bond financing at the state and local level. Namely, because the federal government has exempted municipal bond yields from taxation, it has induced increased foreign investment in Treasury bonds, and provided additional incentive for domestic investors to purchase municipal bonds.

Our results suggest that continued foreign investment in Treasury bonds will continue to drive down the yields on these bonds relative to municipal bonds. As a result, the after-tax yield on Treasury bonds will decrease to become less than the untaxed yield on municipal bonds. Thus, this will give domestic investors greater incentive to increase their purchases of municipal bonds, while giving foreign investors incentive to increase their purchases of Treasury bonds. Our results suggest that the market for government-issued bonds is likely to become segmented

* See Appendix

as a result of increased foreign purchases of federal bond issues. From the perspective of local policymakers, these results could be very positive in that as long as foreign investors continue to show more interest in Treasury bonds, it will become easier for municipal governments to finance their activities through bond issues because municipal bonds will become a more attractive investment for domestic investors. It also means, however, that the federal government will find itself increasingly indebted to foreign investors as domestic investors shift their investments out of comparatively lower-yielding Treasury bonds.

This segmentation effect is mitigated if foreign investors show greater interest in other investment vehicles like private equities. The decreased demand for Treasuries would drive up the yields so that their after-tax yields would become comparatively much more attractive to domestic investors. Thus, the segmentation of foreign investors in Treasury bonds and domestic investors in municipal bonds would likely blur. This conclusion has implications particularly for local and state policymakers in that it suggests that the global bond market is as important for federal policymakers as it is for state and local policymakers. Paying attention to foreign investment strategies, such as the recent Chinese purchase of a stake in Blackstone, can help local-level policymakers determine market climates in which bond issuance is a good strategy for raising capital. Our conclusions suggest that increases in equity investment by large foreign investors in the United States are likely to have an impact on municipal governments to the extent that they can lead to a decrease in the volume of domestic investors willing to purchase municipal bonds.

The third conclusion that we can draw from our research is that a major future sell off of U.S. Treasury bonds will have an impact not only on the federal government's finances, but the finances of state and local governments as well. If, as some scholars and analysts have predicted,

large scale investors in U.S. Treasury bonds start moving their assets toward other investments, such as Euro-denominated bond issues, this will likely drive up the yields on U.S. Treasury bonds to the point where their after-tax returns may be greater than untaxed municipal yields. Thus a major shift in investment away from U.S. Treasury bonds by large scale foreign investors could have far-reaching effects in the United States in that it could make it more difficult for municipal governments to finance their activities through municipal bond issues since domestic investors would be more likely to shift their assets into Treasury bonds.

Appendix

In order to determine the factors that likely affect the relationship between Treasury and municipal bond yields, we estimated the following econometric model:

$$\frac{Y_{it}^M}{Y_{it}^T} = \alpha + \beta_1 C_t + \beta_2 P_t + \beta_3 L_{it} + \beta_4 \frac{S_{it}^M}{S_{it}^T} + \beta_5 F_{it} + \beta_6 \frac{Y_{i,t-1}^M}{Y_{i,t-1}^T} + \varepsilon_{it}$$

- Y_{it}^M Municipal bond yield of the i^{th} term to maturity at time t
 Y_{it}^T Treasury bond yield of the i^{th} term to maturity at time t
 C_t Highest marginal corporate income tax rate at time t
 P_t Average marginal personal income tax rate at time t
 L_{it} Municipal bond liquidity measure for the i^{th} term to maturity at time t
 S_{it}^M Supply of municipal bonds of the i^{th} term to maturity at time t
 S_{it}^T Supply of Treasury bonds of the i^{th} term to maturity at time t
 F_{it} Growth rate, from time $t-1$ to t , in foreign purchases of Treasury bonds of the i^{th} term to maturity

The data span the period from the second quarter of 1992 to the fourth quarter of 2006 and includes 1-year, 2-year, 5-year, 10-year, 15-year, 20-year, and 30-year maturities. We estimate this model via two-stage least squares using the above regressors lagged 1, 2, and 3 periods as instruments for the lagged yield ratio. The results of our estimation appear in Table 1:

Table 1. Estimated Econometric Model

Coefficient	Estimate	Standard Error
$\hat{\alpha}$	0.437	(0.216)*
$\hat{\beta}_1$	-0.012	(0.006)*
$\hat{\beta}_2$	-0.015	(0.002)**
$\hat{\beta}_3$	0.000001	(0.0000003)**
$\hat{\beta}_4$	1.039	(0.150)**
$\hat{\beta}_5$	0.068	(0.007)**
$\hat{\beta}_6$	-0.207	(0.042)**
R^2	0.101	
Durbin-Watson	2.038	
**Significant at 1% level, *Significant at 5% level		

Based on the fact that the foreign investment variable ($\hat{\beta}_5$) is positive and significant at the 1-percent level, we conclude that increases in the growth rate of foreign purchases of U.S. Treasury bonds correspond to increases in the yield ratio. We hypothesize that these increases in the yield ratio are due to the fact that increased foreign investment in U.S. Treasury bonds causes the yields on Treasury bonds to increase so that their after-tax yields decline in relation to the untaxed yields of municipal bonds.

References

- Chalmers, J.R. 1998. Default Risk Cannot Explain the Muni Puzzle: Evidence from Municipal Bonds that are Secured by U.S. Treasury Obligations. *The Review of Financial Studies* 11 (2): 281-308.
- Green, R.C. 1993. A Simple Model of the Tax-Exempt and Taxable Yield Curves. *The Review of Financial Studies* 6 (2): 233-264.
- Hein, S.E., Koch, T.W., and MacDonald, S.S. 1995. The Changing Role of Commercial Banks in the Municipal Securities Market. *Journal of Money* 27 (3): 894-906.
- Liu, S., Wang, J., and Wu, C. 2003. Effects of Credit Quality on Tax-Exempt and Taxable Yields. *Journal of Fixed Income* 13 (2): 80-99.
- Poterba, J.M. 1986. Explaining the Yield Spread between Taxable and Tax-Exempt Bonds, in H. Rosen (ed.). *Studies in State and Local Public Finance*, University of Chicago Press: Chicago.
- Wang, J., Wu, C., and Zhang, F. 2005. Liquidity, Default, Taxes and Yields on Municipal Bonds. FEDS Working Paper No. 2005-35.