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ARBITRAGE AND THE SAVINGS BEHAVIOR OF STATE GOVERNMENTS

Gilbert E. Metcalf

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ABSTRACT

The federal tax code creates strong incentives for tax arbitrage activity on the part of state governments. This arbitrage activity is illegal and previous research has typically assumed that the constraint against arbitrage activity is binding. This paper explicitly tests this proposition by considering whether financial asset holdings increase as the yield spread between taxable and tax exempt securities rises. Using a data set on 40 state governments over a 7 year period, I find that there is a significant response to changes in the yield spread. One implication of these results is that the Tax Reform Act of 1986 which made even greater efforts to curb arbitrage activity is likely to be ineffective.

Gilbert E. Metcalf
Department of Economics
Princeton University
Princeton, NJ 08544-1017

I. Introduction

One by-product of the tax exemption granted to municipal bonds is the opportunity for arbitrage by state and local governments. A state government, for example, has clear incentives to issue a tax exempt bond at rate r_m, invest the proceeds at taxable rate r and earn the difference $r-r_m$, the yield spread between taxable and tax exempt bonds.

This practice is illegal and the Internal Revenue Service (IRS) has made vigorous efforts over the past 15 years to prevent state and local governments from earning arbitrage profits. Previous research on the financial behavior of state and local governments has assumed that the IRS limitations on arbitrage are binding. This paper considers that question directly by measuring the responsiveness of financial asset holdings to changes in the yield spread between taxable and tax exempt securities. As the yield spread increases, there are greater incentives to engage in activities which allow assets and debt to be accumulated while avoiding IRS penalties for arbitrage. To test this, I employ a panel data set on forty state governments over a seven year period prior to the Tax Reform Act of 1986 (TRA86).

State governments are studied for several reasons. First, they are significant holders of financial assets. In fiscal year 1987 they held two-thirds of the $1048 billion stock of state and local government financial assets. Second, to the extent that sophisticated accounting practices are required to engage in arbitrage successfully, state governments may be better able to carry out arbitrage.

The empirical evidence in this paper suggests that the IRS has not been very successful in its efforts to halt arbitrage. Thus, at the margin states

respond to increases in the yield spread by holding greater amounts of financial assets. While TRA86 attempts to curtail arbitrage activity further, its basic approach is flawed and is likely to be ineffective.

This has implications which go beyond this particular issue. It has become increasingly popular to place legal restrictions on governmental activities. In addition to the arbitrage regulations, examples include Propositions 13 and 2 1/2, and balanced budget laws at the state and local level, and the Gramm-Rudman-Hollings Law at the federal level. The evidence in this paper provides additional evidence that these legal limitations are exceedingly difficult to enforce and suggests that some other approach to the problems underlying the limitations may be needed[1]. In the conclusion, I briefly mention an alternative solution to the arbitrage problem.

The next section of this paper gives some background on the growth and composition of financial assets held by state and local governments and explains some of the available arbitrage opportunities. A section follows which details an econometric model to test for the presence of arbitrage effects followed by a section of results. A brief conclusion ends the paper.

II. Arbitrage and Asset Accumulation

At the end of fiscal year 1987, state governments held $696 billion in cash and securities[2]. The build up cannot be solely attributed to an effort to fund pension liabilities as assets held in non-insurance trust fund accounts also increased substantially - to $253 billion by the end of 1987. Over the period from 1977 through 1985, the stock of financial assets grew at

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1 The experience at the federal level with the Gramm-Rudman-Hollings Law provides another example. While the letter of the law has been complied with, the spirit has certainly been violated.

2 All asset and debt figures are par value as reported in the U.S. Bureau of the Census, Government Finance publications for various years.

an annual rate of 14.5%[3] while long term debt grew at an annual rate of 11.6%. Over the same period, general expenditures grew at an annual rate of less than 9%.

There are two additional facts worthy of note. First, the composition of the non-insurance trust assets changed significantly over that decade. Whereas in 1977 29% of the assets were in short term cash and deposits, only 20% of the assets were held short term in 1987. Similarly holdings of state and local government bonds fell from 8% to 3%. Holdings of federal securities also fell from 26% to 21% while holdings on non-governmental securities rose from 37 to 55%.

Housing Finance Authority assets make up one component of the non-governmental securities category. Gold (1986) notes that Housing Finance Authorities (HFAs) hold a large proportion of financial assets and that there has been rapid growth in this category of assets since 1979. (Much of the value of assets held by Housing Finance Authorities is the value of houses on which mortgage loans have been written. In no sense do they represent financial assets available to the Authorities.) The other major component of this category is the state and local government holding of corporate bonds. Unfortunately, it is not clear which of these assets predominate in this category since the Census data do not break out holdings of corporate bonds. The Federal Reserve Board Flow of Funds Balance Sheets do not help either. The balance sheets incorrectly assume that the state and local sector holds no corporate bonds, an error the Board of Governors is currently correcting[4].

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[3] Financial assets less the insurance trust assets grew at an annual rate of 14%. These are all nominal growth rates.

[4] Loans to the private sector may take other forms. The Wall Street Journal (Aug. 24, 1987, p. 25) reported that Louisville Ky. invested $5 million in Small Business Administration backed business loans underwritten by local banks. While the intention of this initiative was to promote local business, it should be noted that these loans paid near-commercial loan rates to the

There are two types of arbitrage that states can engage in which will lead to an increase in financial asset holdings.[5] First, states can borrow by issuing municipal bonds, paying interest rate r_m, and then invest the proceeds in higher yielding corporate or U.S. Treasury securities. This becomes more attractive the greater the yield spread between taxable and tax exempt securities. I will call this financial arbitrage. Alternatively, states can raise taxes and invest the proceeds in financial assets. The interest from the investment is returned to taxpayers through lower taxes in the future. In essence, states do the savings for their residents at the before-tax interest rate; the arbitrage gain to this activity is $r - (1-t)r$ or rt where t is the marginal tax rate on interest income to taxpayers in the community. I will call this saving arbitrage.

Section 103(c) of the Federal Tax Code specifically prohibits financial arbitrage[6]. A fundamental problem with regulation of this form of arbitrage is the need to link bonds with specific assets. Consider a state which historically has paid for bridge construction through tax revenues and raises a certain amount of taxes each year for "capital improvements". Then one year, it issues a bond for bridge repair and uses the bond proceeds to fix the bridge. The additional tax revenues that would have been used for bridge repair can now be invested in an unrestricted fashion. Clearly, with sufficiently sophisticated (or intricate) bookkeeping, it will be difficult for the IRS to prove that arbitrage is occurring.

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city.

[5] Gordon and Slemrod (1986) present a detailed explanation of the various types of arbitrage activities in which communities can engage. Steuerle (1985) also discusses tax and financial arbitrage at some length.

[6] After Tax Reform, the arbitrage rules are mainly collected into section 148. Metcalf (1988) describes the evolution of the arbitrage regulations in detail.

The IRS has never tried to prohibit saving arbitrage altogether, perhaps partly due to the difficulties involved in measuring the substitution of community for individual saving and partly due to the lack of a general principle which would motivate their concern.[7] Since the gain from this activity is equal to $r\tau$, we would expect states to increase their holdings of financial assets as $r\tau$ rises. However, states with a mobile population should be less inclined to undertake this activity since the residents who paid the higher taxes initially may not remain in the community to obtain the future benefits.[8]

While simple in concept, saving arbitrage may require the co-operation of many different individuals from different parts of government. Taxes must be raised - involving legislative as well as administrative action - and investment decisions made. Then some mechanism must exist to transfer investment earnings to the General Fund in future years and to lower taxes by an amount equal to the transferred funds. Such a degree of co-operation may be difficult to imagine. However, saving arbitrage is not simply an academic construct. The state tuition prepayment programs which have recently become popular are clear examples of saving arbitrage[9].

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[7] In the case of arbitrage bonds, the guiding principle was that these bonds were a form of federal subsidy over which the federal government had no control. From both efficiency and equity considerations, they were indefensible.

[8] Mobility should be irrelevant if capitalization of the future tax savings occurs in housing prices. However, capitalization depends on perfect knowledge on the part of potential buyers of the property in the community. While there exists empirical evidence in support of capitalization of local taxes and services (viz Bloom, Ladd, and Yinger (1983)), it is hard to imagine that potential buyers would have complete understanding of the savings compact, especially at the state level.

[9] The IRS agrees and has moved to tax the income accruing to these funds to the individuals participating in these programs (New York Times, Aug, 29, 1988, p. D2).

In the empirical part of this paper, I will restrict my analysis to non-insurance trust financial assets (hereafter, simply referred to as financial assets). Arbitrage opportunities certainly exist in pension funds. In fact, prior to the Tax Reform Act of 1986, state and local governments could issue tax exempt bonds and use the proceeds to purchase annuities for their pension funds. However, there are a variety of complicating factors which come into play when public sector pension funds are included in the analysis. These include the composition and size of the public sector, the bargaining power of public sector employees, and their attitude toward unfunded pension liabilities, among other things.

There exist additional reasons for states to hold financial assets beyond arbitrage considerations. The buildup in financial assets may simply reflect the conversion of non-financial assets into financial assets. Perhaps the most important non-financial assets that governments hold are the future tax claims on minerals still in the ground beneath the community or state. Given the volatility of mineral prices, tax smoothing considerations would argue for saving a large portion of severance tax revenues. A major source of financial assets is the Permanent Funds - proceeds from severance taxes (the two largest being Alaska and Texas). While these funds are important for helping to explain the growth in financial assets in the late 1970s during a period of high oil prices, they are less helpful in explaining the growth in the 1980s.

Gramlich (1978) implicitly considered the question of the size of financial asset holdings by the state and local government sector by investigating the large budget surpluses of the latter 1970s. He finds evidence that the states accumulated surpluses partly as a result of the emergence from a recession during which taxes had been raised and partly as a result of a fall off in construction expenditures due to peculiar properties

of the Public Works Employment Act of 1976. His first explanation suggests that some measure of economic activity in a state (e.g. the unemployment rate) should help explain asset holdings.

It is generally perceived that TRA86 contains the strongest language yet to control and curb arbitrage activity. The two major features of the law which accomplish this are new volume caps and arbitrage rules.[10] Prior to TRA86, volume caps of $150 per capita existed for industrial development bonds (IDBs) and student loan bonds. Now there is a uniform cap for most private-purpose bonds of $75 per capita or $250 million, whichever is greater; the cap will fall to $50 per capita (or $150 million) at the end of 1987. In 1984, $108.6 billion of new issue municipal bonds were underwritten; of this amount, 31 percent would have fallen under the newly defined category of private activity capped bonds, according to Petersen.

Tax reform should produce several offsetting effects. First, there is likely to be a sharp reduction in the issue of private activity tax-exempt bonds (mitigated to the extent that those bonds are repackaged in such a way as to become categorized as "governmental purpose" and thus not subject to the cap). This will limit arbitrage activity by limiting the availability of municipal debt. Second, the elimination of many tax shelters will likely increase the demand for municipal bonds, thereby driving r_m down. However, lower individual marginal tax rates should decrease the demand for municipal bonds. The net effect on the yield spread is ambiguous. The evidence from monthly rates on AAA rated general obligation municipal bonds and 30 year Treasury bonds indicates that the lower marginal tax rate effect dominates. The average yield spread over the period from 1980 through 1985 is over 100

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[10] See Petersen (1987) for a thorough discussion of the effect of the Tax Reform Act of 1986 on the municipal bond market.

basis points higher than in the period from 1987 through June 1988. (I exclude 1986 for timing reasons. There was a massive surge of new issues in 1986 to avoid being subject to new regulations contained in Tax Reform. This surge briefly drove the implicit tax on municipal bonds to zero.)

New arbitrage rules limit the amount of legal arbitrage that can be earned. Additionally, more stringent penalties are imposed for arbitrage violations. The effect of these restrictions should be to reduce the amount of debt issue as a result of increases in the yield spread. But the new rules do not affect incentives to issue "governmental purpose" debt (which in 1984 accounted for nearly 40% of new issues using the post-TRA86 definitions) to replace taxes as a source of revenue for projects. Hence, it is not clear that arbitrage activities as typified by the bridge example will be eliminated.

There has been very little research on the accumulation of financial assets. The paper closest in spirit to this one is a paper by Gordon and Slemrod (1986) which examined data on 276 communities in 4 of the 6 New England states for the fiscal year ending in 1977. They find little evidence of saving arbitrage and, because they lack data on municipal borrowing rates, they present no evidence on the magnitude of financial arbitrage.[11]

While Gordon and Slemrod's paper accomplishes much, it suffers in several respects. First, it assumes away financial arbitrage. Second, they examine a period before the IRS implemented significant regulations which were intended to shut off this form of activity.[12] Finally, they cannot control for individual effects ("tastes" for assets, if you will) using only a single

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[11] They assume that at the margin the IRS is able to enforce section 103(c).

[12] For example, there were few limits on the use of sinking funds to carry out financial arbitrage.

cross section of data.

III. Econometric Model and Data

The financial data for state governments used in this study are from the Annual Survey of Government Finances conducted by the Census Bureau. Data on revenues and expenditures as well as asset and debt composition are collected from all state governments as well as a sample of local governments (town and county governments, school districts, etc.). All financial variables are in per capita, real dollars (1982 dollars using the CPI). For the taxable interest rate, I use the rate on 20 year Treasury bonds as of the beginning of the fiscal year. I compute municipal interest rates (r_m) based on Moody's credit ratings for each state's general obligation (G.O.) debt (where applicable) as published monthly in Moody's Bond Record. I use the rating that held at the beginning of the fiscal year. Moody assigns credit ratings to many outstanding debt issues and also for most states assigns a rating to apply to G.O. debt in general. However, not every state is assigned a rating, many because they do not issue G.O. debt (e.g. - Colorado). In the econometric analysis, I exclude states which have no outstanding G.O. debt as well as Alaska.[13] Alaska is particularly troubling since it has financial asset holdings per capita which are some 14 times the national average. After determining ratings for each state in each year, I assigned an interest rate based on the average rate for that class for the month of July, which Moody's also publishes.

Table 1 reports some summary statistics on interest rates. The mean municipal rate rose from a low of 5.35% in 1977 to a peak of 12.02% in 1982. The implicit municipal tax rate series, $\tau_m = (r-r_m)/r$, for the mean municipal

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[13] The excluded states are Alaska, Arizona, Arkansas, Colorado, Indiana, Iowa, Kansas, Nebraska, South Dakota, and Wyoming.

rate is close to the one reported by Poterba (1986)[14]. The key statistic however is not the implicit municipal tax rate but the yield spread itself. As the table shows, they can move in opposite directions (viz 1981-1982). More importantly, a low implicit municipal tax rate does not imply a low yield spread. In two of the three years when the yield spread exceeded 3 percentage points, the implicit municipal tax rate was less than 26%.

Based on the discussion of the previous section, I estimated a model of the form:

$$A_{it} = \beta_1 S_{it} + \beta_2 r_t \tau_{it} + X_{it}\beta_3 + \theta_i + \phi_t + \varepsilon_{it}, \qquad (1)$$

where i runs from 1 to N and t from 1 to T. Financial assets (A_{it}) in state i in year t depend on the yield spread (S_{it}), a measure of saving arbitrage, and a vector of demographic and fiscal variables (X_{it}). Also (4) allows for fixed effects (θ_i) as well as macroeconomic influences not specific to any one community (ϕ_t).

The tax variable (as well as other tax variables discussed below) are calculated using individual tax returns and the National Bureau of Economic Research's TAXSIM model for the years 1979 through 1985.[15] The tax variable is a weighted average of the additional taxes paid per additional $100 of interest income. A weighted average of itemization status in each state (computed from TAXSIM) is included in the equation. The itemization probability is important in the saving arbitrage story. If taxpayers all itemize (for simplicity), then taxes can be raised $1/(1-\tau)$, which only costs

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[14] The implicit municipal tax rate is the tax rate which equates the after tax yield on tax-exempt and taxable securities of equal riskiness. That is, the tax rate is defined by equating $(1-\tau_m)r = r_m$.

[15] The number of actual tax returns in each year varied from 76,561 in 1983 to 165,810 in 1979.

the taxpayer 1 after deducting state taxes on her federal return. In future years, $r/(1-\tau)$ is returned through lower taxes which is only worth r, again because of the federal deduction on state taxes. Itemization leads to greater amounts of asset holdings. No attempt is made in this paper to identify rigorously a "decisive" voter and whether she is an itemizer or not. Rather, I assume that decisions are made through some voting/bargaining framework and that itemizers and non-itemizers are both important. Therefore the proportion of itemizers in each state should be positively correlated with asset and debt holdings.

Demographic variables include the percentage of population aged 18 to 44, and the percentage aged 65 and older. Fiscal variables include per capita tax collections (less severance tax collections) and per capita severance tax collections. Also included is the state's average unemployment rate. In summary, I have data on 40 states covering the fiscal years 1980 through 1986. Table 2 presents some sample statistics describing the data.

Before discussing regression estimates, there are important simultaneity issues which need to be considered which may impart bias to coefficient estimates. First, the credit rating of a community is endogenous and responsive (among other things) to changes in debt and asset levels. Also there may be unobserved determinants of asset levels which also determine credit ratings. Events or propensities which induce a community to hold greater amounts of assets will likely lead to a higher credit rating and hence lower borrowing costs. Or more directly, higher asset levels may lead to a higher credit rating and lower borrowing cost. This is less likely. Credit ratings depend on a measure of net debt rather than any measure that includes asset holdings. Moreover, this definition of net debt is simply debt that must be repaid out of the General Fund (as opposed to having an earmarked revenue source). In either case, the coefficient on the yield spread is

biased upward and it will be difficult to distinguish whether a positive coefficient on this variable is due to arbitrage activity or to simultaneity bias.

Offsetting this bias is bias due to opportunities for legal arbitrage and the endogeneity of debt. Prior to TRA86, it was possible to hold roughly 15% of the bond proceeds in a debt reserve fund[16]. Therefore states with large amounts of debt may be able to hold larger amounts of assets. However, the larger debt is likely to lower the government's credit rating. This effect will bias the estimates downward.

Because of these problems, I employ an instrumental variables estimation procedure to estimate consistent values of the coefficients, relying for identification on the excluded variables from the unspecified credit rating determination and debt equations. I employ as instruments per capita income in the state, tax capacity and tax effort indices as measured by the Advisory Commission on Intergovernmental Relations (ACIR)[17] and the percentage of taxes raised by the largest tax. The first three instruments are reasonably measures of the fiscal well-being of a state which should affect its credit rating. Also, because tax revenues are included in the regression, I would not expect that the error in the regression equation would be correlated with the instruments. The last instrument measures the extent to which a state diversifies its tax collections. This measure should be correlated positively with the municipal rate; again there is no reason to expect that it would be correlated with the error in the regression equation. (For a discussion of the determination of a community's credit rating, see Rubinfeld (1973) or

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[16] Assets could be held in debt reserve funds, debt service funds and temporary funds. See Metcalf (1988) for more details.

[17] Tax capacity is the amount of taxes a state could collect if it applied an average set of rates to its tax base. Tax effort is the ratio of actual tax collections to tax capacity.

Aronson and Marsden (1980).) A complete model would link the financing decisions with the tax and spending decisions. I assume here that the tax variables, while endogenous, are uncorrelated with the error term in the asset equations. Since unanticipated tax collections lead directly to higher financial asset holding, this is not an unreasonable assumption.

As written, equation (7) allows for fixed effects. Ignoring these parameters creates no bias so long as the effects are uncorrelated with any included variables. As in most empirical studies in state and local public finance, this is unlikely to hold (viz Holtz-Eakin (1986)).

IV. Results

Table 3 presents estimation results for the model in equation 1 above. All of the regressions have per capita real financial assets (net of insurance trust assets) on the left hand side. Fixed effects and year dummies are not reported in the table. The first regression ignores the endogeneity in the determination of the state's credit rating. The coefficient on the yield spread variable is positive and significant at the 95% level suggesting the responsiveness of financial assets to movements in the yield spread. The effect of changes in the yield spread is important. A one standard deviation move in the yield spread implies an increase in financial assets of $70 per capita, 9% of the mean holdings across the 40 states over the seven year period.

None of the other variables in the regression are significant (other than year and state dummies). The data provide no support for savings arbitrage. The coefficients on the interest tax wedge variable ($r\tau$) and fraction itemizers variable are actually negative, contrary to theory, and entirely insignificant. Aside from the practical difficulties of engaging in savings arbitrage at the state level, there are statistical difficulties. Changes in these two variables are closely linked to changes in the federal tax code.

Much of the variation in these data is likely to be captured in the year effects.

The trade off involved in estimating fixed effects models is apparent in the significance of the other coefficients. Most of the variation in the tax variables and the demographics variables is across states rather than within states across time. In fact, for these four variables, the fraction of the total variance in the variables accounted for within states across time never exceeds 15%. In contrast 36% of the variance in the unemployment rate is within states across time while nearly 90% of the variance in the yield spread variable is within states across time.

The unemployment and lagged unemployment rate variables were included in the regression to test for Gramlich's hypothesis that surpluses accumulate as states emerge from recessions due to lags in state law tax changes. This hypothesis suggests that the coefficient on the unemployment rate variable should be negative. Current unemployment comes in positive and lagged unemployment negative, albeit with a t statistic of one[18].

The remaining regressions in table 3 are instrumental variable regressions to control for the endogeneity in the credit rating (and hence the yield spread variable). The second regression is the full model. Nothing qualitatively changes from the OLS regressions except for the magnitude of the coefficient on the yield spread variable. It increases to 673.11 and while the standard error increases, it is still significant - now at the 99% level. The positive coefficient on the yield spread variable is not due to credit rating agencies giving higher ratings to states with large amounts of financial assets[19]. The final regression drops all of the variables from the

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[18] The regression was run with variants on which unemployment variables are included in the regression. The results do not change appreciably.

[19] This raises the issue though of the proper treatment of debt. As a first

regression except the yield spread variable and the year dummies. The magnitude of the yield spread effects drops somewhat but is still significant at the 95% level[20].

As with all instrumental variable regressions, it is important to consider the exogeneity of the instruments. One could make a reasonable argument that the tax effort variable is correlated with the error in the equation. A shock to the local economy which drives down asset holdings might also be related to the effort that a community makes to raise taxes. The correlation would likely be negative since tax effort would probably be increased due to an increased need for transfers and a diminished tax base. A similar argument would suggest a positive correlation between the shock and tax capacity. I attempt to control for this type of correlation by including tax collections in the regression so that this shock is not incorporated in the error term. Hausman and Taylor (1981b) suggest a variant on the Hausman Specification Test which can test for the appropriateness of my control (see their paper for a more precise formulation of the statistic). I compute the statistic under the assumption that the variable measuring the proportion of taxes raised by the largest tax is an admissible instrument for the municipal rate. The chi-square statistic will have one degree of freedom. I first test for the admissibility of each instrument separately and then test them as a group. The highest chi-square statistic occurs in the test of tax capacity (.68) but is well below the 10 percent significance cut off point. This test

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effort to control for the legal arbitrage opportunities, I ran a regression in which I assumed that states always invest 15% of their debt proceeds for the life of the bond. The dependent variable then is financial assets less 15% of outstanding debt. While the regression estimate falls by $100 per capita, it is still quite substantial and still significant at the 95% level.

[20] A Wald test for dropping the eight variables from the regression is not rejected. The test statistic is 7.22 and is distributed as a Chi Square random variable with 8 degrees of freedom (See Engle (1984) for a derivation of this test.)

can also be used to check for endogeneity of the yield spread variable. Under the assumption that the yield spread is exogenous, the OLS regression can be interpreted as the efficient IV estimator for the purposes of the test. I compare the IV estimator with all four instruments included to the OLS estimator. The test statistic is 4.82 and exceeds the critical value for a chi square statistic with one degree of freedom at the 95% level.

V. Conclusion

This paper has shown that there may be significant marginal arbitrage effects due to the yield spread between taxable and tax-exempt interest rates. For fiscal year 1986, the standard deviation of the yield spread across the forty state sample was 0.17. Based on the IV regression estimates from Table 3, this implies a difference in financial asset holdings of $114 per capita, 14% of the mean financial asset holdings across the states in the seven year sample. As in Gordon and Slemrod's paper, there is no evidence of savings arbitrage. Clearly one area for further research would be to replicate this analysis for a large panel of local governments from the Annual Survey of Government Finances. Besides the greater number of observations, this would provide opportunities to contrast state level behavior to local government behavior.

The regression results suggest that the Tax Reform Act will not eliminate arbitrage activity by municipal governments. We should expect that the trend toward private activity tax-exempt bonds will be reversed with greater reliance now on governmental activity municipals[21]. These bonds will still provide opportunities for arbitrage.

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[21] This is borne out by the evidence on new debt issues in calendar year 1986. Issues of private activity municipal bonds fell dramatically while new issues of public purpose debt rose. As in previous years, a large amount of borrowing occurs toward the end of the calendar year and is reflected in fiscal year 1987 totals, not in the data employed in this study (Statistics of Income, Summer 1988).

If financial arbitrage is to be eliminated, some other approach will have to be taken. The obvious approach, to tax municipal bond interest, is unlikely to be taken. There is strong political support for the exemption. Another approach that deserve considerations is a first dollar arbitrage rule. Here, unrestricted yields could only be earned on an amount of assets equal to the net financial holdings of a community. This rule, in effect, broadens the concept of replacement and eliminates the need to create a link between specific debt obligations and asset holdings.[22] While a more detailed analysis of this proposal would be necessary, one effect of this approach to arbitrage might be to induce state and local governments to fund more of their unfunded pension liabilities.

Questions about marginal arbitrage activity relate to the larger question of the determinants of the yield spread between taxable and tax-exempt rates. Explanations of the spread have traditionally concentrated on demand side theories attempting to identify the marginal investor in tax-exempt bonds (see Poterba for a description). The supply side stories may be an important determinant as well. High levels of asset accumulation due in part to arbitrage may help explain the low implicit municipal tax rate observed in recent years.

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[22] Henry Simons (1938) notes that Andrew Mellon proposed this idea in 1923 to curtail individual arbitrage activity (investing borrowed funds for which a tax deduction has been taken in municipal bonds).

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Table 1. Summary Statistics on
Tax-Exempt Interest Rates

Fiscal Year	Mean	Std Dev	Minimum	Maximum	Yield Spread	Implicit Municipal Tax Rate
1980	5.74	0.15	5.58	5.95	3.04	34.6
1981	7.53	0.19	7.35	7.99	2.48	24.8
1982	10.52	0.27	10.21	11.04	3.12	22.9
1983	12.02	0.42	11.47	12.99	2.04	14.5
1984	9.10	0.33	8.68	9.90	2.05	18.4
1985	10.21	0.12	10.10	10.55	3.56	25.9
1986	8.53	0.17	8.34	9.18	2.02	19.2

The yield spread and implicit municipal tax rate are based on the mean value of the municipal rate and the rate on 20 year Treasury bonds. N = 40.

Table 2. Sample Statistics on Regression Data

	Mean	Std. Dev.	Minimum	Maximum
Financial Assets	801.20	559.69	174.74	3633.00
Municipal Rate	9.09	1.94	5.58	12.99
Taxable Rate	11.71	1.95	8.78	14.06
Yield Spread	2.61	0.63	1.07	3.67
Severance Taxes	32.46	67.49	0.00	277.81
Taxes	707.67	183.95	304.34	1235.66
Interest Tax Wedge	1.98	0.51	0.72	3.28
Proportion of Itemizers	33.04	7.27	13.81	50.04
Percentage Aged 18-44	42.25	1.76	36.80	46.90
Percentage Aged 65+	11.45	1.76	7.50	17.60
Unemployment Rate	7.85	2.36	2.80	18.00
Instruments:				
Per capita Income (x1000)	10.64	1.59	7.23	15.93
Largest Tax as Percentage of Taxes	39.37	9.58	20.45	66.30
Tax Capacity	97.82	16.02	68.00	154.00
Tax Effort	96.95	19.18	60.00	171.00

Number of Observations: 280

Table 3. Regression Estimates:
Dependent Variable: Financial Assets.

	(1)	(2)	(3)
Regression:	OLS	IV	IV
Yield Spread	111.88	673.11	458.43
	(49.94)	(260.38)	(214.27)
Severance Taxes	0.71	0.64	-
	(0.53)	(0.66)	
Taxes	0.15	0.24	-
	(0.19)	(0.24)	
Interest Tax Wedge	-0.66	-0.77	-
	(0.99)	(1.24)	
Proportion of Itemizers	-0.37	1.88	-
	(3.81)	(4.86)	
Percentage Aged 18-44	-49.34	-37.68	-
	(34.41)	(43.33)	
Percentage Aged 65 +	1.28	74.15	-
	(48.03)	(68.41)	
Unemployment Rate	15.14	20.00	-
	(10.15)	(12.87)	
Lagged Unemployment	-9.16	-2.94	-
	(9.22)	(11.86)	
Adjusted R^2	0.96	0.94	0.95

Standard errors reported in parentheses.
Number of Observations: 280.

Regressions include fixed effects and year dummies. Year dummies are always significantly different than zero. Full regression outputs are available on request from the author.