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COST OF ISSUING DEBT: AN ANALYSIS OF THE FACTORS AFFECTING  
THE NET INTEREST COST OF STATE BONDS

DISSERTATION

Presented to the Graduate Council of the  
University of North Texas in Partial  
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Li-Kanz Chen, B.A., M.P.A.

Denton, Texas

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American states have faced increasing financial pressure since the 1970s. The tax revolt movement in late 1970s, major reductions in federal grants-in-aid in the 1980s, and enactment of the 1986 Tax Reform Act have affected state financial conditions. As a result, issuing bonds has become the most expedient way to provide states with capital financing. The need for a better understanding of the factors influencing the cost of state debt has become widely recognized.

The major purpose of this dissertation is to explore the determinants of interest cost for state bonds. Various kinds of variables pertaining to issue characteristics, market characteristics, economic conditions, and political variables were statistically tested to assess their impact on the interest cost of state bonds. A number of studies have focused on the factors influencing the interest cost of local government bonds, but these factors have not been empirically studied for state bonds. Scholars have identified such variables as the market rate of interest, percentage change in gross national product, callability, length to final maturity, number of bids, and credit rating to be significant in determining the interest cost of local debt. This research examines the variables found to be significant for local bonds, as well as some factors unique to state bonds, e.g., the types state agencies issuing debt and the effect of different state income tax policies.

Ordinary Least Square (OLS) regression is used to explore the determinants of interest cost for state bonds. Six research questions about various factors influencing interest cost were examined in this study.

Findings from this research suggest that state bonds perform differently in the financial markets than their local counterparts and the determinants of interest rates are somewhat different for state and local bonds. This study contributes to an understanding of the factors influencing the interest cost of state bonds. Knowledge of these factors affecting state borrowing cost is vital to understand the workings of the American federal system, and it also helps state policy makers reduce interest costs by adjusting their strategies for financing long-term debt.

## TABLE OF CONTENTS

LIST OF TABLES .....	v
Chapter	Page
I. INTRODUCTION .....	1
Statement of the Problem .....	9
Purpose of the Study .....	11
Research Questions .....	11
Significance of the Study .....	13
Organization of the Study .....	13
II. LITERATURE REVIEW .....	16
Theoretical Premises of Research on Municipal Bonds .....	17
Theories From Political Science and Public Administration .....	17
Theories From Economics and Finance .....	26
Relevant Literature on State Debt Practice .....	32
Review of the Characteristics of Municipal Bonds .....	43
Developmental Phase of Municipal Bonds .....	43
Municipal Bond Market .....	47
Issuers .....	47
Underwriters .....	53
Investors .....	53
Environmental Factors Affecting the Municipal Bond Market .....	54
The Tax Reform Act of 1986 .....	55
<u>South Carolina v. Baker</u> .....	58
Internal Factors Influencing the Cost of Municipal Debt .....	63
III. RESEARCH DESIGN, METHODOLOGY, AND DATA COLLECTION .	69
Research Questions .....	69
Selection of Variables .....	73
Utility of Multiple Regression .....	77

	Regression Models in the Study . . . . .	78
	Source of Data and Methodology of Codings . . . . .	84
	Coding of the Data Set . . . . .	85
	Data Transformation . . . . .	91
IV.	DATA ANALYSIS AND FINDINGS . . . . .	91
	Description of the Data Set . . . . .	91
	Testing for Multicollinearity and Autocorrelation . . . . .	93
	Research Questions and Findings . . . . .	98
V.	SUMMARY, FINDINGS, AND POLICY IMPLICATIONS . . . . .	121
	Summary of the Study . . . . .	122
	Research Questions . . . . .	122
	Findings of the Study . . . . .	124
	Implications of the Findings . . . . .	127
	Policy Recommendations . . . . .	129
	Limitations and Suggestions for Future Research . . . . .	131
	APPENDIX A . . . . .	134
	APPENDIX B . . . . .	136
	BIBLIOGRAPHY . . . . .	138

## LIST OF TABLES

Table		Page
1.1	Historical Growth of the Government Bonds Market From 1949-1992 .....	2
2.1	State Long-term Debts Outstanding .....	33
2.2	Long-term Tax-exempt Debts Issued by State Governments .....	35
2.3	State Constitutional Limits on State General Obligation Bonds Borrowing .....	38
2.4	States Classified According to Types of Entities with Principal Roles in Structuring and Selling State Debt .....	40
2.5	State Classified According to Types of Entities with Principal Roles in Authorizing Specific State Bond Issues .....	41
2.6	Participants in the Municipal Market .....	47
2.7	Moody's and Standard and Poor's Credit Rating Categories .....	49
2.8	Summary of State Income Tax Policies on Municipal bonds .....	62
3.1	Variables and Measurements .....	73
3.2	First Regression Model .....	79
3.3	Second Regression Model .....	82
3.4	Third Regression Model .....	83
3.5	Coding Schema for Data .....	86
3.6	Coding for Credit Enhancements .....	88
3.7	Coding for Credit Ratings .....	89

4.1	Descriptive Statistics for the Data Sample .....	92
4.2	Pearson Correlation Coefficients Matrix .....	94
4.3	Variance Inflation Factors of Variables .....	95
4.4	Plot of Partial Autocorrleation Coefficient Function .....	97
4.5	Regression Results of Model One: Analysis of Bonds Characteristics, Market Factors, Issue Size, Bond Insurance, and Comparison of GO v. Revenue Bonds .....	100
4.6	Comparison of Bond Rating Coefficients of State with Local Bonds .....	107
4.7	T-test Comparison of State and Local Credit Ratings .....	109
4.8	Regression Results of Model Two: Comparative Analysis of Various types of State Revenue Bonds .....	115
4.9	Regression Results of Model Three: State Income Tax Differentials Impact on GO Bonds .....	118



## CHAPTER I

### INTRODUCTION

Use of municipal bonds as a means for financing capital improvements in state and local governments in the United States has paralleled the growth of these units of government. Hillhouse (1936) reports that the first American city to issue bonds was New York City around 1812, and Boston issued \$100,000 in 1822 that subsequently increased to \$1.5 million by 1840.

The increase in the volume of state and local debt, collectively referred to as municipal bonds (or munis), continued as the country expanded. These bonds form a major part of the public debt, which includes the combined obligations of federal, state, and local governments. By 1880, the issuance of state and local government bonds exceeded the \$1.1 billion mark (Godfrey 1990, 19). This expansion in the national municipal bond market was interrupted in the twentieth century only by the Great Depression of the 1930s and pressures caused by capital shortages during World War II. Following the war, the dramatic economic and social changes that resulted in rapid expansion of cities, coupled with the growing need for public facilities caused by inadequacies in the infrastructure of state and local governments, created tremendous increased in the volume and uses of municipal debt. The national municipal bond market, as a result of continuous growth, by 1970 rose to \$143.6 billion for new debt issued; by 1985 it had expanded to almost \$571.3 billion; by 1992 it had reached \$970

billion (ACIR 1993). Table 1.1 shows this historical growth of municipal debt.

Table 1.1 Historical Growth of the Governmental Bond Market  
from 1848-1992 New debt issued (in billions\$)

Fiscal				
Year	Federal	State	Local	Total
1949	252.8	4.0	16.9	273.7
1959	284.8	16.9	47.2	348.8
1970	370.9	42.0	101.6	514.5
1980	914.3	122.0	213.6	1249.9
1985	1827.5	211.9	359.4	2398.8
1989	2881.1	295.5	502.9	3679.5
1990	3266.1	318.3	542.3	4598.9
1992	4082.9	371.9	598.1	5052.8

*Source:* ACIR, Significance of Fiscal Federalism, vol. 2, 1994. (Washington, D.C.: Advisory Commission on Intergovernmental Relations)

The volatile environment of state and local government finance in the 1970s and 1980s presented new challenges to finance officials. Mounting public opposition to tax increases threatened the ability of state and local governments to borrow. The increasing cost of government caused, in part, by the dramatic social and technological changes of the 1960s, the Vietnam War, and inflation fueled by the Middle East oil embargo in the 1970s, led to a tax revolt that started in California and then spread throughout the nation. As a result of this tax rebellion, state constitutions were amended to give citizens at the state or local government level recourse to an initiative or referendum on financial issues. The main protest was against excessive property

taxes, which are the key source for funding the overlapping financial system of local governments in the United States, and for securing repayment of general obligation bonds. The growing resistance to property tax increases threatened public expenditures for capital projects, especially after Reagan's new federalism reduced federal grants to state and local governments.

Passage of the Tax Reform Act of 1986 further complicated public funding of capital improvements by states and local governments. The exemption of interest income from federal taxation, which makes these bonds particularly attractive to investors because of the reduction in personal income tax liability, was limited by this act in an attempt to contain the use of municipal bonds for private purposes (Watson and Vocino 1990).

Prior to 1986, the lower cost of tax-exempt municipal bonds encouraged their use in financing many private, for-profit activities such as industrial parks and professional sports arenas. By 1986 the Department of Treasury and the Congress generally agreed that the supply of private-activity, tax-exempt bonds represented an uncontrolled tax expenditure that was costing the federal government at least \$17 billion annually in lost tax revenue (Petersen 1987, 1-7; Zimmerman 1991). The federal tax exemption, it was asserted, acted as a subsidy to state and local governments, which was borne by the federal government as otherwise foregone taxes in a time when the federal deficit was soaring and additional revenue was sorely needed to bring down the federal budget deficit. The rationale for limiting and reducing tax exemptions on private-activity municipal bonds rested not only on the desire to capture the lost federal

revenue, but also on a belief by some that there was an inherent unfairness in having tax exempt bonds used for essentially private purposes. It also was argued that not only was tax exemption an unfair subsidy to the wealthy who are the principal buyers of municipal securities, but also that subsidizing private activities created unfair competition for other private activities not benefiting from the same kind of subsidy (Watson and Vocino 1990).

Passage of the Tax Reform Act of 1986 attempted to restrain public funding of capital improvements for private activities by states and local governments. Municipal bonds, which had always enjoyed federal tax exemption, as a result of the passage of the Tax Reform Act of 1986 saw their tax-exempt advantage limited to so-called public-purpose bonds. The tax exemption, which is the main attraction of investing in municipal bonds, obviously greatly benefits state and local governments by keeping interest rates lower than comparable non-tax exempt rates. The change in this policy, therefore, affected many Americans and was seen as a serious limitation in the willingness of states and local governments to borrow funds (Birnbbaum and Murray 1987).

Another major event changing the environment of municipal debt was the 1988 Supreme Court decision in South Carolina v. Baker (99 L Ed 2d 592, 1988). This decision came on an appeal of the 1982 Tax Equity and Fiscal Responsibility Act, which required that state and local governments maintain a register of the names of investors in tax-exempt bonds. Prior to this time, municipal securities were issued as bearer bonds; the bearer of the bond was presumed to be the owner. This greatly

facilitated the transfer of ownership of these securities in the secondary market -- an informal bond market where municipal bonds are resold by dealers and brokers over-the-counter prior to the bonds' maturity date -- because it was unnecessary to update any records of ownership. The decision in South Carolina not only upheld the 1982 federal law requiring issuers to keep records of owners of such bonds but also overturned the reciprocal immunity doctrine that municipal bond interest is constitutionally protected from federal taxation which had been established in the case of Pollock v. Farmers Loan & Trust Co. (157 U.S. 492, 1895).

Essentially, the Court ruled that tax exemption is a privilege granted by the legislature, not a right granted by the Constitution. State and local officials should look to Congress, not the constitution, for protection from federal taxation of the interest earned on municipal bonds.

Defaults on several major issues of municipal bonds was a third factor affecting the bond market in recent years. Although municipal bonds are perceived as very safe securities, some highly publicized defaults in the 1970s and 1980s helped to create doubt about their safety, causing investors to become more selective and to look to other investment alternatives. Default of New York City and the state of Washington's Public Power Supply System (WPPSS) seriously affected investor confidence. New York City in 1975 was unable to pay its short-term noteholders on time (Lamb and Rappaport 1987, 281-283); in 1983, WPPSS defaulted on \$2.25 billion of municipal bonds following mammoth cost overruns in its ill-fated nuclear power plant projects (Jones 1984). These defaults, the largest in American history,

seriously threatened the municipal bond market.

These changes in the financial environment helped create a growing financial pressure in states and local governments and led many to believe the system of funding long-term capital projects was in serious trouble. By 1991, the Fiscal Survey of the States reported that states were in the worst financial shape since the Great Depression. Twenty-nine states in 1991 were forced to cut more than \$8 billion from their enacted budgets in order to stay within their revenue sources, and twenty-six states had to raise taxes by \$10.3 billion to balance their budgets (U.S. Congress, Senate 1991, 215). To make matters worse, as a result of the economic recession and the slow recovery in the early 1990s, state and local governments' revenues decreased or remained stagnant.

The financial crisis was worsened by the federally mandated spending requirements on subnational governments in such areas as Medicaid and environmental policies, as well as the judicial decisions requiring additional expenditures by states on such programs as education, prisons, and mental health and retardation facilities. As the federal government withdrew its support in the form of grants-in-aid for many programs in response to President Reagan's program of New Federalism, citizens continued to demand that public services from their state and local governments be maintained and even enhanced without increasing state and local taxes.

Unlike the federal government, which can operate with a budget deficit, state governments are typically required under their constitutions to balance their operating budgets. As a result, state governments face two options when confronted with

increasing service demands: either increase tax revenue or reduce spending. For many state officials, raising taxes may literally mean ending their political careers, and cutting other programs to reduce spending is almost as politically dangerous.

Therefore, the most common practice for state and local governments is either to cut expenditures, or in the case of capital improvements, to borrow and delay to the future the cost of paying for the improvement. Borrowing through municipal bonds becomes a vital tool in financing state and local governments' capital projects, and the tax-exempt feature also helps to promote public-private partnerships for infrastructure and economic development projects too expensive for a state or community alone (Watson and Vocino 1990).

Several key issues are raised by debt issuance. First is the question of whether to finance the capital projects under the principal of pay-as-you-go or pay-as-you-use. One of the more accepted principals of public finance is pay-as-you-use, which means that everyone should pay a pro rata share of cost of public facilities based on their use of them. If a facility is constructed with a life expectancy of 40 years, each generation during the life of the facility should share the cost. A second question pertains to how to devise an effective financial plan for obtaining the capital. This involves not only acquiring funds during the construction phase of a project but also assuring an adequate means of obtaining needed funds to repay principal and interest in a timely fashion. Finally, the method of obtaining required capital must be efficient. This involves conducting a cost-benefit analysis of the options for selecting a financial method.

Servicing the debt on state and local bonds then becomes a major commitment of public budgets and future taxes. Governments annually must budget for debt service to cover both interest and principal coming due on outstanding debt during the forthcoming fiscal year. It is essential, therefore, to obtain the lowest interest rate possible in order to keep future interest payments at a minimum. In recent years, it has been more difficult for state and local governments to achieve this objective. The volume of outstanding bonds has grown faster than the demand among investors. Interest payments on municipal bonds have leaped to historical highs since the 1970s as the volume of municipal bonds issued soared from \$143.6 billion in 1970 to \$970 billion by 1992 (see Table 1.1). The growth of the municipal bond market greatly increased competition among issuers and, hence, helped to drive up real interest rates. As the total amount of outstanding municipal debt has climbed, debt service payments by state and local governments have grown and assumed a larger proportion of total governmental expenditures.

The passage of the Tax Reform Act of 1986, the Court's adverse decision in South Carolina v. Baker, and the major defaults on municipal bonds have combined to make the issuance of debt administratively and politically more complex. Both the Tax Reform Act and South Carolina severely limited the tax-exempt status for private-activity bonds and restricted tax exemption to purely governmental (or public) types of purposes. The definition of governmental purpose and the freedom to issue municipal bonds as bearer bonds were also narrowed. All these events affected borrowers negatively and may have increased the cost of issuing debt. The continued growth of



inflation during the 1970s and 1980s affected interest costs on municipal bonds and nearly ended the modern trend toward public-private partnerships for constructing infrastructure and promoting economic development (Watson and Vocino 1990).

### Statement of the Problem

The increasing size of governmental debt at the national, state, and local levels today is one of the major challenges facing the country. Despite the significance of public debt and the political and economic challenges caused by increasing interest costs from debt, there is no theoretical framework integrating various concepts capable of structuring political dialogue on the subject of public borrowing or of analyzing questions pertaining to the cost of municipal debt. Lack of an integrated conceptual framework limits our ability to understand, explain, and control public borrowing and the cost of municipal debt.

Although there has been research on some of the factors affecting the interest cost of municipal bonds (Benson 1979, 1981; Bland 1984, 1985, 1987; Cook 1982; Cole 1982; Kaufman 1976), the factors influencing interest cost for states and their agencies, excluding local governments, remains largely unexplored. This research seeks to identify the type of factors influencing borrowing costs and to examine conceptual frameworks or models from various academic disciplines that might help better explain public borrowing. It examines the factors influencing the cost of borrowing by state governments, and particularly looks at such factors as issue size, state credit ratings, differences among the types of issues of various state agencies, and the impact of a state income-tax exemption on the interest cost of state bonds. In

addition, a comparison of the interest cost of state bonds with those of local governments with similar credit ratings is made.

State bonds differ from their local government counterparts in that states are recognized as having a greater economic and political position in the American federal system, and have greater constitutional and legal authority as well as larger geographic areas. Their inherent position in the federal system, plus the fact that state bonds are more widely recognized and are more likely to be marketed nationally by underwriters, enhances their ability to obtain better interest rates than local bonds. Interest rates on state bonds, however, may vary not only from state to state because of economic disparities but also according to the type of state agency issuing the debt and the state's tax treatment of interest income. Bonds issued by states may either bear a pledge of the full-faith-and-credit of the state or they may be issued by the various agencies of the state government, such as a state university, and backed only by the revenues of that agency. State bonds backed by the full-faith-and-credit of the state should have greater appeal to investors than the more limited state bonds issued by individual agencies or authorities. Furthermore, it is expected that all state bonds have greater investor appeal than comparable local government bonds. These assumptions are examined in this research.

Financial operations of states are decentralized through their many entities, such as hospitals, mental facilities, universities, water and port authorities, and turnpike authorities. These agencies differ widely in their financial resources and in how well they are managed, which in turn affects their ability to ensure timely debt service

payments. Such state entities, in a sense, resemble the various units of local government and may be marketed more regionally than state bonds generally. It is important, therefore, to examine how states and their agencies fare in the bond market.

### Purpose of the Study

One purpose of this research is to explore the effect of such factors as issue size, credit ratings, type of state entity issuing debt, and state personal income-tax policies on the borrowing cost of state bonds. Although there has been research on these factors affecting bond cost at the local level, state bonds remain a lesser understood subject for scholars as well as for state administrators and public officials. This research undertakes to answer the following research questions in an era when state governments face increasing financial burdens and pressures. A secondary purpose of this research is to explore models from various academic disciplines that may provide further insight into public borrowing and the variables that influence the cost of borrowing in the public sector.

### Research Questions

There have been a number of studies on the factors influencing interest costs of local government bonds. Scholars such as Cook (1982), Kidwell and Koch (1982, 1983), and Leonard (1983) have identified such variables as the market rate of interest, the per capita gross national product, credit rating of the issuer, number of bids, and the length to maturity as critical to determining a local government's interest cost for

debt. This research examines these and additional factors that may be unique to state bonds, such as the size of the bond issue, credit rating of the issuer, the type and authority of the state agency issuing debt, and the impact of partial exemptions from state income taxes on interest cost.

The first research question explores whether economic factors and issue characteristics influence interest costs of state bonds in the same way they were found to influence local bonds in other studies (Rogowski 1980, 216; Benson and Rogowski 1987; Roden and Bland 1986).

The second research question examines the effect of issue size. To what extent does issue size affect state bond borrowing cost? Does it portray the characteristic U-shaped found for local government bonds, where the cost of interest decreases as the size of a bond issue increases up to a point where scale economies are lost and costs begin to increase (Benson, Kidwell, and Koch 1981)? What was the economy of scale for state bonds in the period under study?

Third, does the bond market view state bonds the same as comparably rated local government bonds? In other words, do A-rated state bonds incur the same interest cost as A-rated local bonds? If they do not incur the same interest cost, what factors explain the difference?

Generally, state revenue bonds are either issued by line agencies such as department of commerce or by semi-autonomous authorities such as state water authorities or public finance authority. Does the bond market respond in the same way to these various types of state revenue bonds?

Furthermore, do state GO bonds incur the same interest cost as state revenue bonds? Previous research found that the borrowing cost of local GO bonds is lower than local revenue bonds (Kidwell and Koch 1982; Rogowski 1980). Is this pattern also true for state bonds?

The sixth research question examines whether state personal-income tax policies affect state borrowing costs. Do interest costs for state bonds vary as a result of a state's partial or full exemption of interest earned on bonds from income taxation?

#### Significance of the Study

- This study attempts to explain one key element in the complex intergovernmental fiscal system in the United States: the factors affecting interest rates on state bonds. The growing fiscal demands of the nation and especially state governments make this vitally important. As the middlemen in the federal system, states must be able to borrow funds at a reasonable interest rate in order to implement essential public policies. Knowledge of the factors affecting interest rates on state bonds is vital to both policy makers and academicians attempting to understand the workings of our federal system. An understanding of the factors affecting interest cost of state bonds may enable state governments to better respond to the investment market and reduce interest costs by adjusting their strategies for financing long-term debt.

#### Organization of the Study

This dissertation is arranged in five chapters as described below.

Chapter I provides an overview of the factors causing financial pressures on state

and local governments and some methods used by subnational governments to overcome these conditions. Next, this chapter includes the purpose of the study, the research questions, and organization of the study.

Chapter II explores the various academic disciplines concerned with public borrowing and the theories or conceptual frameworks that can be used to explain the debt process and the various factors that influence the cost of debt. Second, the chapter reviews the relevant literature on state debt practices and describes the institutional structure and constitutional restrictions on state debt.

The third section of Chapter II provides a review of previous research on the factors affecting the cost of state and local borrowing. This study examines both the nature and the characteristics of municipal bonds, especially state bonds, along with a discussion of the key participants in the municipal market including types of issuers, underwriters, and investors. The processes and strategies used in borrowing are examined. Such technical aspects as the methods of sale, the nature of the secondary market, and credit enhancements are explained. Also, a review of the legislative and judicial events affecting the municipal bond market during the 1980s is presented. The history and impact of the 1986 Tax Reform Act and the 1988 Supreme Court decision in South Carolina v. Baker also are discussed in detail.

Chapter III spells out the research questions to be studied, the data collection process, and the methodology. The chapter presents regression models with a number of independent variables known to affect net interest costs (NIC). For each of the models, the variables and the source of data are explained.

Chapter IV presents the findings. The regression process statistically isolates the effect of each independent variable on the net interest cost. These results are presented and interpreted.

Chapter V presents a summary and conclusion that answers the research questions guiding the study. The conclusion presents both the findings in this study and other relevant findings of previous research in a fashion useful for both academicians and policy makers. Chapter V also considers the implications that these findings have for state policy makers and considers further research needed in the field.

## CHAPTER II

### LITERATURE REVIEW

Despite the increasing significance of public debt, a theoretical framework has been lacking that integrates various concepts capable of structuring political dialogue or of analyzing questions pertaining to the cost of municipal debt. The purpose of the first section of this chapter is to summarize a few selected and very different academic theories that promote a better understanding of public borrowing. Questions pertaining to public borrowing and costs of municipal bonds may be viewed from the three phases of the debt cycle, namely, authorization of debt, the designing and selling of bonds, and administering repayment. These three phases fall within the bounds of the academic disciplines of political science, public administration, economics, and finance. Pertinent concepts from each of these fields are examined to see how they relate to the debt cycle and their ability to provide an understanding of the borrowing process.

Second, the chapter reviews relevant literature on state debt practices and describes the institutional structure and the constitutional restrictions on state debt. Third, the chapter describes the characteristics of municipal bonds and the municipal bond market. This section focuses first on the development of municipal bonds and deals with the technical aspects of issuing debt. Next it considers the environmental factors affecting the market, including the impact of legislative and political events on tax-exempt bonds. Finally, it reviews factors that influence the interest cost of



municipal bonds.

### Theoretical Premises of Research on Municipal Debt

#### Theories from Political Science and Public Administration

General questions pertaining to the process for authorizing state and local debt have long been recognized as falling within the scope of political science, particularly as it pertains to the policy making process. The discipline of political science in recent years has attempted to explain policy making, including authorization of public debt, from the perspective of a number of models such as interest groups, systems theory, and the policy window (Easton 1957, 1965; Kingdon 1984; Latham 1956; Truman 1951). Although these concepts do not directly deal with determining the cost of debt, they may help our understanding of the debt issuance process.

Interest Group Theory. Interest group theory is a concept for explaining policy making which may help us understand debt issuance. An interest group is defined by Truman as "a shared-attitude group that makes certain claims upon other groups in society" (Truman 1951). The policy making process starts when an interest group exerts demands on government. Group theorists claim that policy is made when the struggles among groups reaches an equilibrium point (Latham 1956, 239). An of iron triangle and issue networks are built upon the basic concept of interest groups. The concept of iron triangle describes the alliance among interest groups, bureaucrats, and key legislators for influencing policy issues. In this alliance, they become mutually dependent and develop beneficial triangular relationships. An issue network is a group

of people that shares concern and knowledge about a particular issue or policy. These various networks may consist of members of the legislature, committee staffers, agency officials, lobbyists, scholars, and citizen groups who work together to influence policies in a specific area. These related concepts pertaining to interest group theory may provide a perspective for understanding the politics of debt issuance. Interest groups at the state level, such as business associations, engineering and contracting firms, and citizen groups exert demands on government to build capital projects that benefit them. Groups preferring other projects compete in the political process for their preferences. Through this group competition, a project or a policy pertaining to capital projects is selected. The costs, especially if the project is financed by debt, are shifted forward to future budget periods, thereby deferring the more politically difficult task of selecting a method for financing the project. The concepts of interest groups, iron triangles, and issue networks provide a means to understand the political process at all levels of our federal system, and also provide a tool for understanding state debt issuance.

Systems Theory. Easton defined the political system as a group of interrelated structures and processes functioning to allocate values for a society (1957; 1965). Public policy is a response of the political system to the forces emerging from the environment. Four major elements of this theory are the environment, political system, input/output, and feedback. The main function of the political system is to deal with the demands and supports from the environment (inputs), and to function as an authority to allocate values for a society. Government expenditures are one of the

core aspects of the allocation process. From the context of systems theory, state governments respond to the demands of economic, social, and political forces in order to maintain support from the public. Systems theory provides a useful but simplistic framework for studying the debt issuance process and the role of participants in shaping capital spending choices.

Policy Window Model. A more recent policy framework was developed by John Kingdon in 1984. His so-called "policy window" model, built on the logic of March et al., in their "Garbage Can" model of decision making (Cohen, March and Olsen 1972), asserts that there are three separate policy process streams flowing in government: (1) problem identification stream, (2) policy proposal stream by specialists, such as bureaucrats, interest groups, and academicians, and (3) political stream, such as public opinion, party activities, election results, and change of administration. These different policy streams develop and operate independently from one another. At critical times these separate streams come together and there is a "policy window" opening for policy making. The policy window only opens for a short period of time to resolve a recognized problem in society. When the opportunity passes, the window for policy making is closed. Kingdon's policy window model not only may be used to explain policy making in the government, but it also may provide a useful concept for viewing expenditures and the debt process. It seems to provide a framework for the debt process since different participants such as interest groups, public financial bureaucrats officials, private financial experts, and decision makers in government are dependent upon a number of uncertain environmental events and

problems that make it possible to enact new policies. When a critical time arrives, issuance of debt for capital improvements may bring all of these different streams pertaining to state capital investment together.

Public administration, which developed as a part of political science, has been more directly involved in the study of all three phases of the debt cycle. Its emphasis on intergovernmental relations and the perspective that federalism is a single, complex political system where the actions of each level of government impact other levels provides a holistic view of governmental finance (Vile 1961). Also, public administration's emphasis on public management has created a particular interest in the other two phases of the debt cycle, the process of issuing and selling bonds and debt management. Furthermore, studies on decision making and budgeting evolved out of public administration's concern for governmental management.

Federalism and Intergovernmental Relations. Intergovernmental fiscal relations, or fiscal federalism, is central to the study of contemporary intergovernmental relations, as can be seen from the fact that the U. S. Advisory Commission on Intergovernmental Relations (ACIR) entitled one entire issue of its journal, Intergovernmental Perspectives, "Federalism Becomes Finance" (Winter, 1988, vol. 14, no.1). Policies and actions of each level of government, including public borrowing, impact other levels of government. Because states are the vital middlemen in our governmental system, their actions both influence and, in turn, are influenced by the actions of both the federal and local governments. An understanding of the intergovernmental system because of this interrelatedness, seems essential to any conceptual framework of public borrowing and the cost of debt.

Although strides have been made in understanding our complex intergovernmental system in recent years, there still is no agreed upon integrated theory for studying the impact of political actions such as borrowing by various units of government. Up until the 1950s, the concept of federalism was looked upon as a legal or constitutional framework for government. The concept of dual federalism, propounded by the "old Court" before the New Deal era, continued largely to structure political discourse and to serve as a normative or ideal goal for the governmental system.

As a result of the dominance of the so-called layer-cake model of federalism, political science tended to view national, state, and local governments as virtually distinct fields of inquiry and to teach separate courses for each level of government. Public debt also was viewed according to the level of government issuing the debt, with each having little or no effect on the other.

The layer-cake model of federalism was seriously challenged during the Eisenhower administration by ACIR, which was created to study "the means of achieving a sounder relationship between federal, state, and local governments" (Advisory Commission on Intergovernmental Relations Report 1955). The commission's report answered the question concerning the present position of constitutional doctrine as it bears on nation-state relations as follows:

The constitutional restrictions now applicable to any government in the United State are chiefly procedural, are quite similar in their admonitions to the Nation and to the States, and consequently under the philosophy of these decisions exert major trust on the working division of labor and authority between them one or the other (p. 30).

The Commission concluded that the basic problem of maintaining the federal

system lies mainly in the political, economic, and administrative areas, rather than in the legal area. As to the financial aspects of the American federal system, it pointed out that in a fundamental sense there is but one economy from which all governments derive their financial strength, and that the strength of our system is no greater than the strength and vitality of the many governments that compose it. It called for a reappraisal of fiscal policies including taxation and borrowing as it issued a warning that "failure to come to grips with fiscal problems may undermine the very strength of our governmental system" (pp. 90-91). The 1955 ACIR Report helped advance development of the concept of cooperative federalism, which Grodzin and Elazar proposed in 1966 (Grodzin).

Competition and conflict between the various levels of governments and regions, however, were largely ignored by the cooperative federalism perspective although competition and conflict are inherent to our decentralized governmental structure. Much of state politics arises out of the competition between local and state governments over who will receive the benefits or burdens from state policies. Similarly, matters such as attracting or retaining businesses and industries create competition between local and state governments and greatly influence state politics and policies, including taxing, borrowing, and spending policies (Dye 1990, 120; Vile 1961, 107). Competition between various regions of the country over who will receive the benefits or burdens of federal policies also is an underlying aspect of our national politics. Similarly, efforts to reduce the number of military bases and facilities affect states and localities differently, and as a result become a major source of political conflict. This type of state and regional conflict, coupled with the political

needs of representatives in the Congress to protect the interests of their constituents, is a factor explaining the difficulty of balancing the federal budget and stemming the increase in the federal deficit. Despite the growing recognition of the significance of competition in our political system, we have not developed a unified concept of federalism that adequately deals with these conditions.

The intergovernmental character of American federalism has its most profound impact in the area of public finance and, according to Richard Leach, it foreordained many of our financial problems (1982, 194). Students of fiscal federalism have examined from an intergovernmental perspective various aspects of public finance, such as the power to tax, spend, and borrow. All levels of government have the power to tax, spend, and borrow, and no single level of government may be called the controlling revenue authority. Although to a large degree all three levels of government tax the same sources, this results in a complicated, conflicting tax system. States and local governments in this competitive environment suffer from what has been termed a "fiscal mismatch" in that the federal government with the broadest tax base relies on the income tax, giving it the most productive and flexible tax source. States, on the other hand, rely most heavily on general sales and to a slightly lesser degree on income taxes, whereas local governments still depend mainly on property taxes, although in recent years a growing number have gained authority to tax a number of non-property tax sources, particularly sales (Gittell 1986, 312-314).

The strong competition between the national government and the states is far from being the only competition in the tax system. States also compete with one another for tax advantages. The economic disparities between rich and poor states

aggravate the situation and make interstate tax competition intense. Fear of losing business to another state or city haunts politicians, and businesses skillfully exploit this fear. There is also a great deal of conflict in the tax field between states and local governments, which grows partially out of the subordinate legal position of local governments, which are in the least enviable revenue position in the federal system (Leech 1982, 204-205). Studies of the politics of taxation in each of these fields rely on an intergovernmental perspective.

The development of state and federal grant-in-aid programs as a cooperative means of stimulating and implementing public policies is still another field requiring an intergovernmental perspective. Federal grants-in-aid to state and local governments since the 1960s have become so prominent a feature of American government that every national administration must make decisions about their design and use (Brown, Fossett, and Palmer 1984, 1-2). Federal grants not only are stimulating and supporting various policies, but they also help pay for state and local capital programs, such as roads and streets, water, sewage treatment facilities, and a host of other community facilities. This aid to states and local governments from the federal government for capital projects obviously helps lessen the indebtedness of units of government.

Despite the significance of federal grants, studies have not been undertaken to determine the impact these grants have on interest costs of municipal bonds. Since the 1980s, as the national deficit has increased rapidly and New Federalism has reduced the federal grant programs, states and cities have had to fend for themselves and bear an increasing burden of debt (Shannon 1987). The impact of this financial change also has not been adequately studied. Increasingly, there is a need for expanding our



conceptual schema to examine the impact of federal grants on the willingness of states and local governments to issue debt.

Decision-Making Theory. Decision-making has been a major focus of the study of public administration since Simon's seminal work on the subject. Simon (1947) called for a more rational process of making decisions that emphasizes seeking out possible alternatives, ranking those alternatives, and then choosing the best or highest ranked alternative. Although Simon recognized that administrators could not be entirely rational in making decisions, he saw decisions as products of a complex social process that includes attention-directing or intelligence processes and that considers possible courses of action and evaluates alternatives before making a decision. This theory obviously relates to capital budgeting, to questions of whether to borrow for a project, and to determine the most cost-effective way of obtaining capital.

Much of the literature on decision-making since Simon has criticized the rational model. Lindblom and others argued that it is impossible to follow a purely rational approach. Instead, they suggested that governmental decisions are made on an incremental basis (Lindblom 1959; Pfeiffer 1960; Wildavsky 1984). Incrementalism stresses that governmental decisions are made on an incremental basis that result in a series of limited successive changes. Instead of seeking to maximize benefits in all phases of decision-making, which creates a great deal of political conflict, decisions are made on an incremental basis that result in a less controversial solution. Although selling bonds is one of the major decisions made by state and local governments, there has been few studies investigating these decision processes. As a result we have little

knowledge of how financial decisions on bonds are made in states and local governments.

Budgets are the central arena for decisions pertaining to public expenditures and borrowing, and scholars have studied the budgetary process to better understand how decisions are made to allocate resources. Although the process of budgeting is basically political, in that various groups exert power to obtain their preferences through governmental actions (Wildavsky 1984), there are major managerial aspects of budgeting, such as planning, prioritizing demands, forecasting revenues and expenditures, and evaluating outcomes. All of these operations require making decisions, and these aspects of budgeting have applications to state bonds because bonds raise funds for budgeted programs and because the cost of bonds is a liability to be repaid, which affects future budgets allocations. Decision-making theory within the budgeting and financial areas may provide a useful tool in developing a framework for public borrowing.

#### Theories from Economics and Finance

Economics offers several conceptual approaches that are relevant to public borrowing and the cost of municipal debt. The concept of a market economy, which depends on voluntary exchange with demand and supply determining prices, is the classical model of welfare economics. According to this theory, prices, including interest for bonds, are set by the law of supply and demand. Money and banking is another field of study in economics that directly deals with debt and interest cost. It focuses on the role of the central bank in preserving monetary stability and considers

interest rates as a part of this process. Search theory, which deals with the cost borrowers and investors must pay for information about investment opportunities, is another recent theoretical construct of economists. Still another concept used by finance to explain interest rates of municipal bonds is risk aversion theory. The following sections examine each of these concepts and how they contribute to understanding the cost of municipal bonds.

Classical Economics and Loanable-Fund Theory. Classical economic theory from the time of Adam Smith has focused on the free marketplace, with demand and supply setting prices. Most economists until the 1930s followed classical theory and viewed interest rates as being determined entirely by the law of demand and supply. In the case of the cost of capital, this law was conceived to be affected by two factors: savings of individuals and demand by individuals and businesses for additional capital. According to this theory, the size of the loanable or available fund of capital depends first on the willingness of individuals to forgo the pleasure of consumption and to save, and the number of businesses or individuals willing to pay the interest charge asked for borrowing funds. Interest rates are set at the point where the demand curve of investors crosses the supply curve of capital. One problem with the classical theory in this regard is that it does not consider government as an entity in this process. Demand and supply of funding in the market are important factors affecting interest cost of bonds.

Monetary Theory and the Federal Reserve Bank. The Federal Reserve Bank, established in 1913, was an attempt to control the nation's money and credit after

decades of bank panics and failures. The Federal Reserve Bank, which operates as an independent governmental agency, is responsible for setting monetary policy of the nation. Its goals, according to Samuelson and Nordhaus, are to preserve price stability, to encourage real growth, to promote employment, and, most importantly, to control inflation (1984). To achieve these goals, the Federal Reserve Bank is authorized to use three major policy instruments, namely open market operation, control of discount rates on commercial bank borrowing, and reserve requirements for banks. With these policy tools, the Federal Reserve Bank attempts to preserve the monetary stability and financial health of the economy.

Modern monetarists believe that changes in the money supply have a significant impact on the economy. An increase in the money supply is seen as a means to reduce interest rates (increase the price) on bonds, to drive up stock prices, to increase investments, and to enhance the GNP. Government should focus mainly on monetary policy through the Federal Reserve Bank.

Debt financing by the central government in a federal system, according to Wallace Oates (1972), differs fundamentally from the function of debt by state and local governments. The basic role of debt by the central government is to help stabilize the economy at a high level of employment without inflation. The Federal Reserve Bank may purchase or sell U.S. bonds and thereby inject or withdraw money from the economy. In this fashion, monetary policy affects the economic condition of the country. State and local bonds, on the other hand, are basically to finance capital projects, the need for which is largely driven by changing demographic and development patterns. This type of debt is a means of ensuring that all present and

future users of capital projects pay their share for the construction-- that is, it promotes intergovernmental equity to the extent that the debt service schedule approximates the depreciation schedule. In a sense, like private debt state and local debt is a withdrawal from the loanable supply of capital that has to be repaid over a period of years. It does not play a role in monetary stabilization as does federal debt.

Market Segmentation Theory. Market segmentation theory holds that different segmented markets exist for bonds or securities with different maturity lengths, liquidation, or tax treatment (Culberston 1957; Hendershott and Kidwell 1978; Kidwell and Koch 1982). Market segmentation exists because of legal restrictions on certain bonds or rigid preferences of investors. For example, commercial banks usually prefer short to medium-term maturities because of their emphasis on liquidity. Insurance companies with longer maturities because their long-term liabilities. In an extreme form, a market segmentation theory means that the interest rate of a particular maturity is only determined by demand and supply condition for that maturity.

A moderate form of segmentation theory is the preferred habitats theory (Modigliani and Sutch 1966). Preferred habitats theory suggests that while investors have their preferences, they will leave their preferences if a significant inducement is offered. However, if the inducement is not good enough, these investors will still remain in their preferred maturities or investments. Therefore, this preferred habitat causes financial market for loan to be partially segmented (Van Horne 1994, 101).

Search or Information Cost Theory. Search, or information cost, pertains to the cost investors or buyers must pay in the search to determine the credit worthiness of

an investment and to monitor how borrowers use the funds acquired. Bond and stock markets are not equipped to provide investors with all the information investors require. This lack of information forces investors to seek out financial intermediaries to provide assistance in obtaining needed information. These financial intermediaries provide a service with an information-gathering service fee, such as the service performed by bond rating agencies. George Stigler (1961) emphasized that information is a valuable resource and that knowledge is power.

Benson was the first to operationalize search theory to include the factors of the number of bids (dimension of competition) and the intensity of the bids (dispersion of the bids) in a model of the cost of municipal debt. He found in his research that the degree of competition that is indicated by the number of bids and the intensity of underwriters' search is inversely related to interest cost (1979). Kessel's research also verified that greater competition is inversely related to interest cost. He found that issues receiving five or ten bids carry an interest rate of 23 and 32 basis points lower than an issue that receives only one bid. He further found that the marginal effect of additional bids on interest cost declines as the number of bids increases, that is there are declining returns to increased competition (Kessel 1971). In other studies where number of bids has been tested, researchers report similar results (Benson, Kidwell, and Koch 1981; Cagan 1978, 1979; Kidwell and Trzcinka 1982).

Risk Aversion Theory. Another concept used by economists and finance scholars to explain interest rates of municipal bonds is risk aversion theory. Risk aversion theory means if an investor is given a choice of investments, generally he

will choose the one with the lowest risk. Individual investors consider risk differently. Some investors are highly risk averse, while some are moderately risk averse. Others are risk takers. If an investor invests in a highly risky investment, he normally requires a higher rate of return in order to compensate for the possibility of loss. Over the years, municipal bonds have been regarded generally as safe investments, particularly when compared to corporate bonds. This is not to say that there is no risk in municipal bonds, but they are seen as relatively safe investments. New York City's default on notes in 1975 and the Washington Public Power Supply System crisis in 1983, for example, frightened investors in the municipal bond market. As a result, investors became more concerned about a number of different risks with municipal bonds, such as their liquidity and creditworthiness.

Because there are many municipal bond issues sold every year, individual and institutional investors have no way of knowing the capability of these issuers to make timely repayment of the debt other than through credit ratings. Credit rating companies such as Moody's and Standard and Poor's perform a vital function in determining the credit worthiness of all units of government desiring to float bonds. The higher the credit rating set by the rating company, the lower the presumed risk of default and, consequently, the lower the interest cost for issuers. Some securities with low credit ratings are perceived to have higher degree of credit risk, therefore, purchasing credit enhancements may be the only way to attract investors. Credit enhancements such as private insurance and letters of credit ensure that issuers pay the principal and interest on time even in case of default.

### Relevant Literature on State Debt Practices

In the last four decades, state debt practices have received little scholarly attention separate from those of local governments (Aronson and Hilley 1986; Heins 1962; Ratchford 1941). As a result, there are gaps in our understanding of state debt management practices. The significance of state debt and debt management has become increasingly recognized since the 1980s as states have experienced severe fiscal pressures. Diminishing federal aid, enactment of tax limitations in the late 1970s, and the passage of the Tax Reform Act in 1986 pressured state governments to recognize the significance of their debt practices. This literature review discusses debt management in state governments.

#### Trends in State Debt

Despite the lack of scholarly and public attention, state debt continuously has increased since the end of World War II as shown in Table 2.1. The amount of long-term tax-exempt state debt issue has grown from \$87 billion in 1977 to \$264 billion in 1987, and to \$368.9 billion in 1992 (Hackbart and Leigland 1990; ACIR 1993). Because of present tax limitations and the anti-tax climate, borrowing has emerged as the only realistic way for state governments to finance many of their capital improvements. Managerial tools and policies for capital planning and debt management have become increasingly critical for states.

In addition to the growth of outstanding state debt, there has been a major shift in the type of bonds issued by states since the late 1970s. In Table 2.1, states had approximately an equal amount of outstanding GO debt as revenue (or nonguaranteed)



debt in 1977. Ten years later, this pattern had shifted and states had almost three times as many revenue bonds outstanding as GO bonds; the same pattern remained in 1992. Many states permit executive agencies and public authorities, or special districts, to issue nonguaranteed bonds. Furthermore, the number of separate state entities issuing long-term debt increased significantly over this period (Hackbart and Leigland 1988, 39). These new state public authorities and special districts have increased from 224 to 345 nation wide, a 50 percent increase from 1977 to 1988 (Hackbart and Leigland 1990, 38).

Table 2.1 State Long-Term Debt Outstanding(\$ in millions)

	1976-77	1986-87	1991-92
State Long-Term Debt Outstanding:			
Full-Faith & Credit	\$42,913	\$66,758	\$96,598
Nonguaranteed	\$44,271	\$197,314	\$272,303
Total	\$87,184	\$264,071	\$368,951

*Source:* Hackbart, Merl M. and James Leigland. 1990. "State Debt Management Policy: A National Survey." Public Budgeting & Finance 10(1): 37-54; U.S. Bureau of the Census. State Governments Finances: 1992, series GF/92-3. U.S. Government Printing Office, Washington. DC, 1993.

#### Types of State Debt

There are four major types of long-term, tax-exempt debt obligations issued by state governments for capital projects: general obligation debt, state revenue debt,

special authority debt, and lease-backed debt (see Table 2.2) (Hackbart and Leigland 1990; Regens and Lauth 1992). Thirty-nine states issue GO debt, and this debt is backed by the state's full-faith-and-credit. Thirty-four states issue revenue bonds backed by specific revenue resources. State revenue bonds generally are issued by line departments of state governments such as department revenue bonds in Utah and Wyoming or state highway department revenue bonds in Texas (Hackbart and Leigland 1990, 43). States also issue so-called special authority bonds. These bonds are issued by public authorities, such as special districts, bond banks, associations, boards, public corporations, and commissions. Usually state authorities or special districts have authority to issue revenue bonds backed by fees or charges from their programs, although they do not have the power to levy taxes. States, at times, may enhance these bonds by pledging their moral obligation on revenue bonds.

These moral obligation bonds are not only secured by revenue from the financed projects, but also backed, though not legally binding, by reserve funds appropriated at the discretion of the state legislatures to make up any shortfall in debt payment (Hackbart and Leigland 1990).

Lease-backed debt is structured like revenue bonds and secured by lease payments. Lease-backed debt often is used to purchase expensive equipment and differs from traditional revenue bonds, although they are structured as revenue bonds, by being secured either by lease payments or with an option for the borrower to purchase the equipment at the end of the lease period. The popularity of lease-backed is partially because a lease is not treated as general debt of a state government, and

TABLE 2.2  
Long-term Tax-exempt Municipal Debts Actively Issued by State Governments

STATE	TYPES OF DEBT			
	General Obligation Debt	State Revenue Debt	Special Authority Debt	Lease- Backed Debt
Alabama	X		X	
Alaska	X	X	X	
Arizona		X	X	
Arkansas	X	X	X	
California	X	X	X	X
Colorado		X	X	X
Connecticut	X	X	X	
Delaware	X		X	
Florida	X	X	X	X
Georgia	X		X	
Hawaii	X	X	X	
Idaho			X	
Illinois	X	X	X	X
Indiana			X	X
Iowa		X	X	
Kansas		X	X	X
Kentucky		X	X	X
Louisiana	X		X	
Maine	X		X	X
Maryland	X		X	X
Massachusetts	X	X	X	X
Michigan	X	X	X	X
Minnesota	X		X	X
Mississippi	X	X	X	
Missouri	X	X	X	X
Montana	X	X	X	
Nebraska		X	X	
Nevada	X	X		
New Hampshire	X	X	X	
New Jersey	X	X	X	X
New Mexico	X	X	X	
New York	X		X	X
North Carolina	X	X	X	X
North Dakota		X	X	X
Ohio	X	X	X	X
Oklahoma	X		X	
Oregon	X	X	X	
Pennsylvania	X		X	
Rhode Island	X	X	X	X
South Carolina	X	X	X	
South Dakota			X	
Tennessee	X		X	
Texas	X	X	X	X
Utah	X	X	X	X
Vermont	X		X	
Virginia	X	X	X	X
Washington	X		X	
West Virginia	X	X	X	
Wisconsin	X	X	X	
Wyoming		X	X	
TOTAL	39	34	49	23

Source: Hackbart, Merl M. and James Leigland. 1990 "State Debt Management Policy: A National Survey." Public Budgeting & Finance 10(1): 37-54, Figure 5.

partially it also avoids the hindrance of bond referendum or voters approval (Lamb and Rappaport 1987, 187-188).

#### State Capital Budgeting

Budgeting for capital improvements normally is not shown in a state's operating budget that presents proposed expenditures and revenue for the current year. Capital budgeting is the process of budgeting for major capital improvements. Forty-two states have capital budgets, and thirty-seven rely on borrowing to pay for their capital spending (Hush and Peroff 1988, 68). The state agencies and the method of budgeting for capital projects vary widely among states, and large amounts of state spending, especially for transportation, are not included in state capital budgets (Hush and Peroff 1988). Furthermore, many of the state authorities and special district budgets are not included as a part of state capital budgets. Methods of financing capital also vary widely among states, and capital improvements may be financed through state current revenues (taxes, fees), federal grants, or borrowing (Hush and Peroff 1988, 74).

#### Constraints on State Debt

A variety of constraints on debt limit state policy makers. Many of these constraints on state borrowing are in the form of state constitutional restrictions. Enactment of Tax Reform Act by the Congress in 1986 also acts as a constraint on state debt since it limits the types of bonds that are immune from federal taxation (Petersen 1987; Zimmerman 1991).

State GO bonds are the major target of most state debt constraints. Table 2.3 shows which states have state constitutional limitations on GO bond issues. Forty states have no limitation on the purpose of GO bonds, but ten states have provisions limiting issuance of GO bonds only to casual or extraordinary expenses. The approval process required for debt creation varies widely among the states as can be seen in Table 2.3, with five states requiring voter approval in a referendum. Another six states require an extraordinary legislative majority for the approval of debt creation, and six states have a dollar limitation on debt which, if exceeded, requires a referendum vote. In the case of Texas, the state's constitution restricts borrowing to \$200,000; if this amount is exceeded, borrowing requires a constitutional amendment approved by voters (Hackbart and Leigland 1990, 40).

Another constraint on state debt limitation is the passage of Tax Reform Act 1986. Tax Reform Act of 1986 restricts the definition of "public purpose debt" to limit the issuance of tax-exempt bonds. Furthermore, a cap on the amount of "private purpose bonds" for each state was set at an amount of the greater of \$150 million or \$50 per capita. Tax Reform Act of 1986 also limits the issuance of certain kinds of bonds, such as bonds for family housing, and sewage and solid waste disposal facilities (Petersen 1987; Zimmerman 1991).

#### Governmental Entities Responsible for Issuance of State Debt

Research on the basic questions of the kinds of governmental entities that authorize, structure, and sell state debt is difficult to find. In part, this is due to the complexity of the federal system, but also because the importance of state borrowing has not been fully recognized until recently. A 1988 national survey of state debt

TABLE 2.3  
State Constitutional Limits on State General Obligation Borrowing

LIMITATION BY APPROVAL PROCESS REQUIREMENT:	LIMITATION BY PURPOSE	
	No Limit on Purpose	Limited to Casual Deficits or Extraordinary Expenses Only
Voter Approval Required for Borrowing: A. Referendum	AK, AR, NY, PA, OK	
B. With Legislative Approval	MI, WA	
C. Within Flexible Limits	FL, NM, VA	
Extraordinary Legislative Majority Approval Required*	DE, IL, LA MA, MN, MT	
Flexible Debt Limit:** Referendum Required to Exceed Limit	NJ, NC, WY	
Other Conditions for Exceeding Limit	SC	
No Additional Debt Allowed	CT, GA, HI, NV, SD, UT, WI	MS
Dollar Limit on Debt: Referendum Required to Exceed Limit	CA, CO, ID, KS, ME, RI	IA, KY, MO
Other Conditions for Exceeding Limit	ND, OR	OH
No Additional Debt Allowed	AL	AZ, NE, TX
Simple Legislative Majority Approval	MD, NH, TN, VT	
No Borrowing Limit Specified		IN, WV

Total Number of States

40

10

Source: Hackbart, Merl M. and James Leigland. 1990. "State Debt Management Policy: A National Survey." *Public Budgeting & Finance*, 10(1): 37-54. Figure 4.

\* 3/5 to 3/4

\*\* Limits tied to revenue collection, property values, etc.

practices and management policies, sponsored by the Council of State Governments, provides the most recent overall picture concerning state officers or agencies involved in the debt issuance process for the fifty states (Hackbart and Leigland 1990). As can be seen from this survey, states have a variety of structures involved in the formation and processing of state debt. Table 2.4 shows the variety of entities that structure and sell the three different kinds of state debt, namely state GO bonds, state revenue bonds, and state special authority revenue debt. Table 2.5 shows that 36 out of the 39 states selling GO bonds have a more centralized finance office under either the governor or an executive branch commission for selling these bonds. Only three states sell GO bonds under the authority of a legislature and executive commission or board.

The structure and sale of state revenue debt by state line departments, as opposed to special authority revenue debt, also follows a more centralized pattern in 26 states (Hackbart and Leigland 1990, 47). State revenue bonds are structured and sold by the finance office of the chief executive branch in 17 states and by a board of the executive branch commission in 9 states. GO bonds tend to be sold through a centralized finance office, whereas revenue bonds tend to be sold in a more decentralized fashion through joint legislative and executive commissions. Special authority revenue bonds follow the decentralized approach. Forty-three states sell their special authority bonds in a decentralized manner and there is no direct supervision from the state government or state finance office.

The types of entities authorizing state debt are shown in Table 2.5. As can be seen

**TABLE 2.4**  
**States Classified According to Types of Entities with Principal Roles**  
**in Structuring and Selling State Debt**

TYPE OF AUTHORIZING ENTITY:	TYPE OF DEBT ISSUED:		
	State General Obligation Debt	State Revenue Debt	Special Authority Revenue Debt
Central Executive Branch Finance Office	AL, AR, CA, CT, DE, HI, IL, ME, MD, MA, MI, MN, MS, MT, NV, NH, NJ, NY, NC, OK, OR, PA, RI, SC, UT, VT, WI	AR, CA, HI, IL KY, MS, MT, NV, NH, NJ, NC, OR, RI, SC, UT, WI, WY	KY, NC, OR,
Executive Branch Commission, Authority or Board	AK, FL, MO, NM, OH, TX, VA, WA, WV	AK, FL, KS, MO, NE, NM, TX, VA WV	KS
Joint Leg/Executive Commission or Board	GA, LA, TN		GA, TN
Individual Departments, Agencies, or Authorities		AZ, CO, CT, IA, MA, MI, ND, OH	AL, AK, AZ, AR, CA, CO, CT, DE, FL, HI, ID, IL, IN, IA, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NH, NJ, NY, NM, ND, OH, OK, PA, RI, SC, SD, TX, UT, VT, VA, WA, WV, WI, WY
Total Number of States	39	34	49

Source: Hackbart, Merl M. and James Leigland. 1990 "State Debt Management Policy: A National Survey." *Public Budgeting & Finance* 10(1): 37-54. Figure 6.



TABLE 2.5  
States Classified According to Types of Entities with Principal Roles  
in Authorizing Specific State Bond Issues

TYPE OF AUTHORIZING ENTITY:	TYPE OF DEBT ISSUED:		
	State General Obligation Debt	State Revenue Debt	Special Authority Revenue Debt
Central Executive Branch Finance Office		AR, CO, NH, NJ NC, OR, RI, WY	KY, NC, OR
Executive Branch Commission, Authority or Board	MS	AZ, FL, MA, MI, MS, NM, TX, VA	DE, MS, NM
Joint Leg/Executive Commission or Board	CT, SC	SC	LA, SC, TN
Legislative Majority	DE, GA, HI, IL, LA, MD, MA, MN, MO, MT, NH, NC, RI, UT, VT, TN, WI	AK, CA, CT, HI, IL, IA, KS, KY, MO, MT, NE, NV ND, UT, WV, WI	AL, CA, GA, HI, ID, KS, ND, MV
Electorate (referendum)	AL, AK, AR, CA, FL, ME, MI, NV, NJ, NM, NY, OH, OK, OR, PA, TX, VA, WA, WV		
Individual Departments, Agencies, or Authorities		OH	AK, AZ, AR, CO, CT, FL, IL, IN, IA ME, MD, MA, MI, MN, MO, MT, NE NH, NJ, NY, OH, OK, PA, RI, SD, TX, UT, VT, VA, WA, WI, WY

Total Number of States

39

34

49

Source: Hackbart, Merl M. and James Leigland. 1990. "State Debt Management Policy: A National Survey." *Public Budgeting & Finance* 10(1): 37-54. Figure 7.

for state GO bonds, 19 states require approval in a referendum and 17 states require a legislative majority. State revenue debt is authorized by an extraordinary legislative majority in 17 states, and in another 16 states revenue bonds are authorized through either a central executive finance office or an executive branch commission or board. South Carolina authorizes revenue bonds through a joint legislative and executive commission. For special purpose revenue bonds, the majority of states (32) require only approval of the individual department, agency, or special authority.

#### Issues in State Debt Management and Practice

The literature review on state debt practices shows the diversity and complexity of state debt management in the federal system. Not only does it complicate the decision making process of issuing state debt, it also raises questions as to how to rationally analyze cost determinants of state debt. Without a more centralized management system, how can states coordinate debt as to the proper issue size and timing of bond issues? How can states protect their credit ratings when revenue bonds of special authorities are practically independent of the state finance office, the governor, or even the state legislature? Any default or degrading of these state revenue or special purpose bonds threatens or even damages the overall credit ratings of the states. These issues are critical today when states face decreasing federal aid, increasing demands for state goods and services, and limits on the amount of state tax-exempt bonds.

### Review of the Characteristics of Municipal Bonds

The literature on municipal bonds may be divided into three categories. Many of the earlier studies present a history of the development of municipal bonds and tend to deal with technical and legal aspects of issuing debt (Heins 1963; Hillhouse 1936; Moak 1970; Ratchford 1941;). These studies also describe the principal participants and their roles in the bond market. A second group of writings considers the environmental factors affecting the market and, since the mid-1980s, have focused on the impact of legislative, judicial, and regulatory changes on the tax-exempt bond market (Keohane 1988; Petersen 1987; Watson and Viocino 1990; Wrightson 1989). More recent studies also have begun to use statistical models to determine the impact of various factors on the cost of state and local debt. A third category of literature on municipal bonds considers the influence of fiscal competition between various units of government in the federal system and how this competition influences tax and expenditure policies of the various units of government (Brucato, Forbes and Leonard 1991; Kenyon and Kincaid 1991; Kidwell, Koch and Stock 1984). This section of the chapter is organized around these three aspects of research on municipal debt.

#### Developmental Phase of Municipal Bonds

Municipal securities have grown dramatically since the nation was founded and this growth has increased most rapidly in the period since the late 1970s and 1980s (Public Securities Association 1990). The immense growth of municipal debt also may be seen in the fact that the volume of municipal bonds was more than twice the amount of corporate debt issued since the 1970s.

A municipal bond is a bond issued by a state or a local government, in contrast to a corporate bond which is issued by a profit-generating corporation. Both types of bonds typically provide fixed payments over the life of the security and both usually can be quickly liquidated when needed. Unlike most corporate issues, which are usually composed of bonds with a single maturity (term bonds), most municipal bonds have serial maturities with interest repaid in semi-annual installments over the life of the issue (Public Securities Office Association 1990). The fundamental difference between municipal and corporate bonds, however, is the exemption from federal income taxation for interest earned on most municipal bonds. Also, state law often exempts interest income of municipal bonds from state income taxation. As a result of the tax exemption provisions, municipal bonds normally incur interest rates below comparably rated corporate bonds (Public Securities Association 1990).

Municipal bonds have evolved into several types. They may be categorized by the length of maturity into long-term and short-term bonds. Short-term securities, usually called "notes," mature in one year or less; long-term bonds may extend from two to thirty years to maturity. Notes are frequently issued by governmental units to cover cash shortfalls until anticipated tax, grant, or bond revenues become available. Municipal bonds also may be divided into three categories according to the type of credit backing: general obligation (GO), revenue, and hybrid bonds.

A GO bond represents a commitment of the "full faith, credit and taxing authority" of the issuer (Public Securities Association 1990). It implies that the issuer has the authority to use all available sources of revenue and taxing power to repay

outstanding securities. State statutes generally require voter approval for the issuance of GO bonds and in some states (e.g., Texas), there are constitutional requirements calling for public approval before GO debt can be issued. There are, however, differences in the nature of the constitutional guarantees for general obligation bonds. Most state constitutions provide for unlimited tax support for bonds voted by the public. These are termed unlimited tax bonds (ULT) because the credit support for repaying the debt is not subject to any kind of constitutional or statutory limitation. Other state constitutions limit the rate of taxes that can be assessed against property values. Bonds in these states are designated as limited tax bonds (LT) because they are protected only to the extent of the maximum tax levy permitted by the state constitution (Lamb and Rappaport 1987, 66).

In recent decades, many states have abandoned the ad valorem tax, leaving it mainly for their local governments. States, as a result, normally secure their bonded indebtedness through sales, income, or other types of taxes. Municipalities, however, like other units of local government, still rely heavily on the property tax to secure their indebtedness.

Revenue bonds, unlike GOs, are issued to finance revenue-generating projects, such as toll roads, dormitories, hospitals, and public utility services. Only the revenue generated from these projects is pledged to repay outstanding obligations. Normally, revenue bonds do not require electoral approval or constitute "debt" within the meaning of applicable constitutional or statutory limitations (Public Securities Association 1990, 18).

Revenue bonds frequently are called by the enterprise they fund, such as sewer, water, or electrical bonds. User charges for these services repay the debt and meet the annual debt service obligation. Other revenue debts, such as highway, bridge, airport, and seaport bonds, are financed through tolls, concessions, and direct fees.

Revenue bonds are considered inherently more risky than GO bonds due to their more limited credit backing. The interest cost of revenue bonds is generally 6 percentage points higher than comparable GO bonds (Gurwitz 1983-1984; Kidwell and Koch 1982; Rogowski 1980). These studies have only examined local revenue bonds, and it remains as yet unknown whether such a price differential exists at the state level. In spite of higher interest costs, revenue bonds are increasingly popular with state and local governments because they do not require voter approval for issuance; they also tend to ration the use of the service by charging user fees, thus promoting economic efficiency.

The issuance of revenue bonds has increased greatly over the past twenty years. In 1993, they accounted for 68 percent of all new long-term municipal bonds issued, compared with only 48 percent in 1975 (The Bond Buyer 1994, 11).

Hybrid bonds are a third category of municipal bonds; they are secured by the pledge of two or more sources of revenue. For instance, in some states a bond is secured first by a user fee, and may in addition be secured by ad valorem or other tax sources. These bonds are also called double-barrelled securities because of the contingent source of revenue backing the debt should the primary source be insufficient.

## Municipal Bond Market

Most of the literature on the development of the municipal bond market discusses the various parties participating in the market and their role in the process. Issuers, underwriters, and investors are the most important participants in the municipal bond market as illustrated in the following flow diagram.

Table 2.6 Participants in the Municipal Market

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ISSUERS (states, municipalities, counties, school districts, special districts, statutory authorities)

- ...>Capital budget or plan; approval for issuing bonds
  - ...>Credit rating
    - ...>Financial advisor
      - ...>Bond counsel
        - ...>Credit enhancement
          - ...>Method of bond sales

UNDERWRITER (investment banks, commercial banks)

- ...>Syndicate to bid a large issue
  - ...>Sales of individual bonds to investors

INVESTORS (individuals, bond funds, property and casualty)

- ...>Insurance corporation commercial banks
  - ...>State and local governments

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Issuers. All municipal bonds are issued either by the state and its agencies or by units of local government. Bonds are typically not sold directly to investors, but to intermediary underwriters. The bonds are then resold to investors.

The issuance process is initiated by a state or local government desiring to build or expand their facilities requiring long-term capital. Many states and local

governments in their financial planning, called capital budgeting, consider needed capital projects over a period of five to seven years. Most governments rely on a mix of debt, grants and current revenue to finance such capital acquisitions. In the capital planning process, the legislative body of the governmental unit must formally approve the issuance of the bonds. In the case of general obligation bonds, voter approval normally is required depending on state or local law. Revenue bonds, however, normally may be issued by the governing authority to obtain funds to finance revenue producing facilities without a vote of the public.

States and local governments are vitally concerned about their credit ratings because the cost of borrowing is directly affected by the issuer's creditworthiness. The credit rating of the issuer is, in fact, the most consistent determinant of an issue's interest cost (Lamb and Rappaport 1987, 47). In order to provide investors with a symbol of credit quality, and also provide public officials with an independent appraisal of their government's relative standing in the investment world, private rating agencies provide such an evaluation. For investors, the rating answers these questions: What is the probability of the timely repayment of principal and interest on this bond and what is the risk of a rating downgrade (Lamb and Rappaport 1987, 36) ?

There are two major rating agencies in the municipal bond market: Moody's Investors Service and Standard & Poor's Corporation (S&P's). Each rating firm uses its own symbols to indicate their analysis of credit worthiness of a bond issue. Table 2.7 summarizes the credit rating symbols used by these firms. Studies consistently show that the interest cost of municipal bonds significantly varies as a result of ratings



(Lamb and Rappaport 1987, 46). Generally, there is a reverse relationship between bond ratings and interest rate, that is, the higher the bond rating, the lower the interest rate. High ratings reflect a low risk of default, whereas low rating means higher risk of default. All long-term rated debt below the Baa/BBB is speculative grade and is often referred to as "junk" bonds.

Table 2.7 Moody's and Standard and Poor's Credit Rating Categories

Credit Categories	Moody's	S&P's Grades	
Best Quality	Aaa	AAA	investment grade
High Quality	Aa	AA	investment grade
Upper Medium	A	A	investment grade
Medium Grade	Baa	BBB	investment grade
Lower Medium	Ba	BB	speculative grade
Lower Grade	B	B	speculative grade
Poor Grade	Caa	CCC	speculative grade
Highly Speculative	Ca	CC	speculative grade
Defaults	C	C, D	speculative grade

*Source:* John L. Mikesell. 1995. Fiscal Administration: Analysis and Applications for the Public Sector. 4th ed. Wadsworth Publishing Company, p. 484.

*Note:* For those bonds in the Aa through B categories that have the strongest credit feature within their respective categories, Moody's designates them with 1, such as Aa1. S&P uses a plus (+) or minus (-) sign to show the upper and lower segment of the rating category.

A rating evaluation is initiated on application and payment of a fee by issuers of bonds. The fee in the 1980s ranged between \$1,000 and \$10,000 (Reeve and Herring 1986, 68). Because of the cost, about 30 percent of the municipal bonds are not rated

by either Moody's or S&P's (Reeve and Herring 1986, 66).

General obligation bonds are rated according to the issuer's overall credit worthiness and thus the rating applies to all outstanding GO bonds of that issuer. The two rating agencies consider four basic factors in making a rating decision for GO bonds: an issuer's debt burden, economic base, finances, and management capability (Lamb and Rappaport 1987, 62-65). When evaluating an issuer's debt service burden, rating agencies usually focus on the current debt service level, debt pledged, and future debt needs. On the issue of economic condition, rating agencies consider such factors as income, population growth, diversity, and growth in the tax base. For the financial condition of the issuer, the rating agency takes into consideration the issuer's accounting and financial reporting practices, and its ongoing operating budget balance. Lastly, the evaluation of management capacity of the issuer depends on the degree of organizational autonomy, the decision-making and managerial skills, and the range of services the governmental unit can provide.

Revenue bonds are rated differently. The stability of revenues committed to repaying the debt is the most important factor in establishing the issue's credit worthiness. Each revenue bond issue and the revenue sources to repay it affect its credit rating. Governmental units preparing to issue bonds normally employ advisors to assist them in preparing for the bond issue. Financial advisors analyze the financial needs of the community, organize the sale, advise the government unit on strategies of credit enhancement and provide help in choosing an underwriting syndicate. Financial advisors, in some instances, may also act as the underwriter for an issue. These

advisors are paid for their services on a fee basis.

Another specialized advisor, the bond counsel, verifies that the interest on the issue is tax-exempt according to federal income-tax laws, and state and local laws. The bond counsel issues an opinion verifying that the issue is a legal, valid, and binding obligation of the issuer, and that it meets the legal requirements to make it a tax exempt bond. No underwriter will release an offering until a bond counsel has provided a clean legal opinion.

Before the bond issue is sold to an underwriter, government units pursue various strategies designed to increase the appeal of their debt, collectively known as strategies for credit enhancement. This has become necessary in recent years because of the uncertainty in the bond market that in part was caused by a number of highly publicized defaults of municipal bonds in the 1970s and 1980s. There are three means of credit enhancement: private bond insurance, standby letter of credit (LOC), and various state-funded programs for assisting local governments in the bond market. These enhancement programs aim to reduce risks of default, and thus appeal to risk-averse investors. About one-third of municipal bonds come to the market with some form of credit enhancement (Bland and Yu 1987). According to one study, insured bonds sell at interest rates comparable to A-rated issues, not Aaa-rated ones (Bland 1987; Bland and Yu 1987) It also indicated that the most interest savings from credit enhancements are on bonds with lower credit ratings. However, the insurance industry is inclined to insure only those bonds with higher ratings to avoid potential default.

A letter of credit calls for a bank commitment to pay bondholders in the event of

default. Thus, rating companies rate LOC-backed debt on the bank's ability to pay, not on the issuer's credit worthiness (Moody's Investor Service 1987; Standard and Poor's Corporation 1986). Kim and Stover (1987), however, found that savings from LOCs are negligible when compared with their cost (Kim and Stover 1987).

State funded programs for assisting local governments in the bond market are another means of enhancing the credit of local governmental units. States follow several ways of enhancing the credit of their governments, such as state credit guarantees, state payment of debt credit service, and state financial intermediation (Forbes and Petersen 1983). According to state guarantee programs, repayment of debt is legally guaranteed by the state in the case of default by the local issuer. The program may be a collateralized commitment in which earmarked revenues are pledged to satisfy local debt payment in default, or it may be an unfunded commitment in the form of a full-faith-and-credit pledge (Bland 1987).

In the case of state payment of debt service, states earmark revenues or grants-in-aid to guarantee timely payment of an issuer's debt. For example, in the State of Indiana, the state treasurer earmarks state aid to pay debt in the event of default of its school districts. In the case of state financial intermediation, a state agency or authority serves as a financing conduit on behalf of the local government. An example is the creation of a state bond bank. A state bond bank pools many relatively small local governments' long-term bonds and resells these bonds in the state agency's name (Kidwell and Rogowski 1983; Cole and Millar 1982). The advantage of state bond banks is that they lower the flotation costs--the up front costs incurred in issuing

debt--because of economies in marketing the debt.

The governmental unit, after ensuring it has done all that it can to lower the cost of borrowing, sells the issue to an underwriting syndicate. GO bonds are most often issued through competitive sales, except in the case of refunding bonds. In some instances, bonds may be sold through negotiation. Normally, bids are solicited from underwriters and the lowest interest rate is accepted. Once a bid is legally accepted, the underwriters are obligated to pay the price they offered no matter whether they can resell the bonds to investors or not.

Underwriters. Municipal bonds are sold by issuers to underwriters who then resell the debt to investors. The intermediary, known as an underwriter, functions like a wholesaler. An underwriter may be either an investment banking firm or a commercial bank. Usually, underwriting of larger issues is made by a syndicate or group of underwriters to raise sufficient capital to purchase and resell a pending bond issue. The larger the issue, the greater the number of firms coming together to bid on an issue. The underwriter of a new bond issue may use other commercial banks and investment firms to sell the bonds, or it may act as its own retail outlet.

Investors. The ultimate purchasers of municipal bonds include individuals, mutual funds, property and casualty insurance companies, corporations, and commercial banks. The largest purchasers in the municipal market from the 1960s to 1986 were commercial banks, followed by individual investors, and property and casualty insurance companies. The relative importance of the major investment categories,

however, has shifted over the years. For example, throughout the period from the 1960s, commercial banks were able to deduct 80 percent of their cost of buying tax-exempt bonds because the interest income from the municipal bonds are tax-exempt. Commercial banks in this period absorbed approximately two-thirds of new municipal bonds issued. After the Tax Reform Act of 1986 (TRA 1986) sharply restricted banks' ability to deduct interest on debt incurred to purchase tax-exempt bonds, the share of municipal bonds purchased by commercial banks decreased to only 15 percent of new sales in 1990 (Petersen 1987; Zimmerman 1991). Mutual funds have assumed a more dominant role in the municipal bond market in recent years and have become the second largest purchaser after individuals, and their holdings now exceed commercial banks and insurance companies (Lamb, Leigland, and Rappaport 1993).

#### Environmental Factors Affecting the Municipal Bond Market

Another body of literature on municipal bonds considers environmental factors affecting the market. Many of these works examine the cause for the decline of general obligation bonds in favor of revenue bonds since the 1970s. GO debt comprised 65 percent of the new issues in 1960, while made up only 35 percent in 1992 (The Bond Buyer 1994). Other studies focused on economic and political events, such as the municipal bond defaults of the 1970s and 1980s, the tax reform legislation of 1986, and the Supreme Court decision in of South Carolina. Other studies have focused on various variables, some directly within the market system and some broader economic and political factors affecting the market but not directly within the sphere of the bond market. Factors such as market interest rate, issue size,

issue types, and credit ratings normally are factors considered directly within the market system, while the impact of differing issue entities, state income taxes, along with other legislative, judicial, and demand and supply of municipal bonds are factors influencing the market from outside of the bond market.

The Tax Reform Act of 1986. Other literature on environmental factors influencing the municipal bond market has focused on the recent major legislative and judicial events affecting the bond market, such as the Tax Reform Act of (TRA) 1986 and the Supreme Court case of South Carolina v. Baker in 1988. Tax Reform Act of 1986 was the most sweeping restriction on tax-exempt bonds in history. First, it more narrowly defined public-purpose bonds, then further limited private-purpose bonds through a 10 percent private use test, set state limits on the volume of private-purpose municipal bonds, and imposed a 5 percent loan test (Petersen 1987, 987). Moreover, the TRA of 1986 further limited the practice of advance refunding and arbitrage that had greatly benefitted state and local governments; lastly, enactment of TRA caused the emergence of new taxable municipal bonds, which had to compete with corporate bonds.

The TRA of 1986 narrowed the scope of tax-exemption for municipal bonds to only those that met a restricted definition of public-purpose debt. Public-purpose bonds, also called "government bonds," may be issued under the act only for governmental purposes such as roads, school buildings, water treatment and distribution systems, and other facilities operated by government entities. Other debt issued by governments for such projects as industrial development parks, student

loans, and nonprofit hospitals are no longer tax-exempt, as these projects are now considered to be private activities.

Before passage the TRA of 1986, municipal bonds were governmental bonds as long as no more than 25 percent of the bond issue was used for a private purpose. Consequently, governmental issued tax-exempt debt for a wide range of purposes that otherwise would have been financed by taxable securities. The benefit was to greatly expand state and local governments role in economic development by providing below market interest rates to private business. Under the TRA of 1986, a bond is a private-activity bond if more than 10 percent of the bond sale proceeds are used to benefit a private trade or business. Bonds exceeding these limits are classified as private purpose, with some exceptions, and subject to the state's volume limits set by TRA of 1986.

New volume limits or caps were placed on states as to the amount of municipal tax-exempt private-purpose bonds they could issue for purposes such as industrial development, student loans, nonprofit hospitals, and mortgage revenue bonds and still enjoy the tax-exempt privilege on interest income. The TRA of 1986 lowered each state's volume limit for private-purpose debt to the greater of \$50 per capita or a total of \$150 million per state (Petersen 1987). The only private-purpose bonds not subject to the volume limit and still tax exempt are those used for government-owned airports, docks, wharves, and solid waste disposal facilities, qualified veteran mortgage programs, and 501(c)(3) organizations, e.g., nonprofit hospitals (Lamb and Rappaport 1987).



The TRA of 1986 also set forth limitations on advance refunding and arbitrage profits on tax-exempt bonds. Advance refunding is a common practice used by local governments to save interest payments by issuing new debt at lower interest rates for replacing existing bonds. From the Treasury's point of view, this practice means a multiplication in available tax yields and thus a revenue loss for the federal government. The TRA of 1986 allows only governmental bonds and 501(c)(3) bonds to take advantage of advance refunding, and it provides that such refunds can be made only twice in the term of the bond.

The practice of arbitrage involves issuers earning higher interest rates from their investment than the interest costs they pay on the borrowed amount. The difference constitutes arbitrage income for the issuer, and can amount to a substantial amount as market interest rates rise. The TRA of 1986 basically eliminated this practice. All arbitrage profits from investment of construction funds, debt service reserve funds, and capitalized interest accounts must be rebated to the U.S. Treasury Department (Petersen 1987).

Another impact of the enactment of TRA of 1986 was the creation of taxable municipal bonds (Bland and Chen 1990). These new bonds are primarily municipal "private-purpose bonds" that are not tax-exempt. These bonds incurred higher interest costs than their tax-exempt counterparts, and interest on the new taxable revenue issues was even higher than interest rates on corporate bonds generally. State and local governments as a result of this change were forced to pay more interest for these taxable municipal debts (Bland and Chen 1990). They found in year of 1986-1987

that the taxable municipal GO bonds incurred interest cost 200 basis points higher than their tax-exempt counterparts. For revenue bonds, the difference between taxable revenue bonds and tax-exempt bonds is even greater--219 basis points. This may due to the inefficient of market for these newly issued taxable municipal bonds (p 47). As a result, state and local governments are forced to look to alternative measures or taxable municipal bonds for financing their capital budgets.

South Carolina v. Baker. The second major event to change the landscape for municipal debt during the period under study was the 1988 Supreme Court decision in South Carolina v. Baker. This decision came on appeal of the 1982 Tax Equity and Fiscal Responsibility Act that required state and local governments to maintain a register of the names of owners of their tax-exempt bonds in order to limit tax avoidance of federal income tax liability. Prior to this time, municipal securities were issued as bearer bonds; the bearer of the bond was presumed to be the owner. This device greatly facilitated the transfer of ownership of these securities in the secondary market because it was unnecessary to update any records of ownership. The decision in South Carolina not only upheld the 1982 federal law requiring states to keep records of who buys such bonds but also overturned the reciprocal immunity doctrine that municipal bond interest is immune from federal taxation.

The immunity doctrine was first established by the U.S. Supreme Court in McCulloch v. Maryland (4 L Ed 579, 1819) and was explicitly applied to municipal bonds in of Pollock v. Farmers Loan and Trust Co (39 L Ed 1108, 1895). The Court held unanimously in Pollock that the federal government has no power under the

Constitution to tax either the instrumentalities or the property of states, including the interest on state and local bonds (Hedlund and Dewe 1986, 27; Keohane 1988).

Basically, this immunity doctrine withstood major constitutional changes until the Court's decision in South Carolina.

The Supreme Court, however, on April 20, 1988 reserved the precedent established in Pollock by saying that interest on municipal bonds was not constitutionally protected by either the Tenth Amendment or the doctrine of intergovernmental tax immunity. The majority ruled that "owners of state bonds have no constitutional entitlement not to pay taxes on income they earn from state bonds, and states have no constitutional entitlement to issue bonds paying lower interest rates than other issuers." The Court further maintained that state and local governments should seek such exemptions on their debt through the political process, i.e., the national legislative process, rather than through the courts. Essentially, the Court stated that tax exemption on municipal bonds is a privilege granted by the legislature, not a right granted by the Constitution. Margaret Wrightson explained the 1988 decision as a proclamation that national sovereignty is always greater than state authority (Wrightson 1989). State and local officials, therefore, must look to Congress for political protection for tax exemption on bonds. State and local governments, furthermore, need to concentrate on the economic soundness of their bonds in order to maintain congressional support for tax exempt bonds (Keohane 1988; Watson and Viocino 1990).

Economic Conditions. Economic conditions also are a major factor influencing

the bond market. Researchers normally use two variables to reflect economic conditions, the percentage change in gross national product and market interest rate at the time of sale. A number of studies have shown that interest costs of bonds follows inversely with the percentage change in GNP (Rogowski 1980; Benson and Rogowski 1978; Roden and Bland 1986). In other words, if the economy is expanding, bond interest is low. It also is reasoned that when economic conditions are prospering, the revenue of state and local governments increases and the risk of default decreases. Under these conditions, interest on bonds normally decreases.

Fluctuation in market interest rates is another variable that has been found to affect the interest costs of bonds. In the bond market, the interest cost of issues is positively correlated with prevailing market rates. That is, when the market interest rate is low, the interest cost of bonds also declines, but when market interest rate is high, the interest cost of bonds increases.

The fluctuation of the market interest rates is driven mainly by the amount of capital available in the market and demand for these capital. The Federal Reserve Bank (FRB), influences the amount of capital available through various monetary regulations such as changes in reserve requirements for banks, adjusting discount rates, and open market operations (Samuelson and Nordhaus 1984, 294-312). Since the FRB's activities affect interest rates, bond dealers closely watch and attempt to forecast their actions.

Competition Among Units of Government. Competition in the American federal system is a major political aspect of the decentralized system of government. The

states and local government units compete for domestic as well as foreign resources, such as manufacturing plants, jobs, tourism, and military bases. The ensuing rivalry between units of government for these scarce resources affects the politics and the policies they enact. The effect of this competition among states in the 1980s, according to Gold (1991), can be seen in the politics over state income taxes. He stated that competition caused states to reduce their income tax rates in order to keep themselves competitive tax-wise with other states. Maintaining a "good business climate" is almost a universal creed in the politics of every state and local government, and it affects numerous policy areas such as labor, welfare regulation, and especially taxation.

States often use their tax and expenditure powers in competition with other states. They attempt to attract particular business firms by not adopting taxes particularly onerous to business, or by making expenditures favorable to that business. These practices have raised questions about the impact of a state income tax. Also, the question of whether such an income tax affects the borrowing of states has been raised.

Some states have enacted state tax differentials on municipal bond interest as a means of reducing the disadvantage from state income taxes for investors in municipal bonds. State tax policies treat interest earned on municipal bonds in one of four categories as seen in Table 2.8.

Table 2.8 Summary of State Income Tax Policies on Municipal Bonds

- 
- A. States do not tax interest income on municipal bonds.
  - B. States tax interest income on in-state and out-of-state municipal bonds equally.
  - C. States levy an intangibles tax on out-of-state municipal bonds.
  - D. States levy income taxes on only out-of-state bonds.
- 

*Source:* Brucato, Peter F., Jr. Ronald W. Forbes., and Paul A. Leonard. 1991. "The Effects of State Tax Differential on Municipal Bond Yields," Municipal Finance Journal, 12: 59-77.

Policies A and B in Table 9 do not provide any special incentives to in-state investors to buy state bonds. Policies C and D both provide incentives for in-state investors. Investors in these states have a clear preference for in-state issues because they can avoid state income taxes on interest earnings from these municipal bonds. California, for example, levies a state income tax on interest from out-of-state bonds held by residents of California, but does not tax the same investor's interest income from bonds sold by a government entity within the state. The demand for bonds sold by California governments thus is enhanced, while the demand for out-of-state bonds is reduced. Texas, by contrast, does not have a state income tax. As a consequence, Texas state and local bonds have no tax advantage over bond issues from other states and there is no tax incentive for Texas investors to purchase in-state municipal bonds. One may expect, therefore, Texas securities to bear higher interest costs than similar issues in California.

Kidwell et al. found in their research on local bonds that small issues of less than \$5 million in a state with a positive tax differential over out-of-state bonds incur interest costs about 4 basis points lower. The reason for excluding larger issues in

their study was because larger issues are marketed nationally; therefore, the effect of state income taxes is negligible (1984). Brucato et al. confirmed that in states with a positive state tax differential over out-of-state bonds, interest costs are lower by 18 basis points. The research by both Kidwell and Brucato was on bonds sold by local governments. The impact of state tax differentials on state borrowing has not yet been undertaken.

### Internal Factors Influencing the Cost of Municipal Debt

In recent decades, many of the studies on municipal bonds have examined internal factors influencing the rate of interest. Most of these statistical studies have focused on those factors directly in the sphere of the bond market, such as the issue size, types of bonds, issuing authority, term to maturity, call provisions, number of bids, and credit ratings. Most of these studies, however, have examined variables affecting local bonds not state bonds.

Issue Size. The impact of the size of bond issues on interest rates was one of the variables studied particularly from the late 1960s to the 1980s. One study by Tanner in 1975 argued that larger bond issues incur higher interest cost "because the demand curve for any particular issue usually is downward sloping" (Tanner 1975, 77). Tanner's hypothesis, however, was challenged by Benson, Kidwell, Koch, and Rogowski (1980) who argued that the size of an issue is also an equivalent of marketability. They argued that marketability increases with issue size because larger bonds are issued by more well-known issuers and are more active in the secondary

market, which increases their liquidity and in turn lowers interest rates. Benson and his associates found that the relationship between size and interest is manifested in a U-shaped curve that indicates that interest cost of a bond will decrease up to a point, and only beyond that point will interest costs increase because larger issues become more difficult to market.

Other studies have attempted to identify the optimum size of bond issues that incur the lowest cost. Kidwell and Rogowski (1983) in another article found that the optimum issue size for obtaining the lowest interest cost was \$60 million in 1972 dollars. They also report that as size exceeds \$60 million, marketability gradually declines and interest cost increase. Another study by Bland (1984) found through multiple regression that there was an interaction of the size of bond issues and the frequency issuers entered the bond market. He concluded that the best market rate occurred at an issue size of \$40 million in 1976 dollars when the issuers had entered into the market only once every eight years. His study was limited to issues sold by local governments in five northern states.

Types of Bonds. The type of bond is another variable that is considered to influence interest rates. A number of studies have compared the interest difference of municipal general obligation bonds with revenue bonds. All of these works have found that interest cost on revenue bonds exceeds that of GO bonds (Kidwell and Koch 1982; Rogowski 1980). Interest on revenue bonds, according to several studies, averaged between 6 percent to 10.5 percent higher than comparable GO bonds (Bland and Chen 1990; Gurwitz 1983-1984; Kessel 1971).



After the passage of the Tax Reform Act of 1986, new types of municipal bonds appeared on the market, such as taxable municipal bonds. These bonds incur higher interest costs than their tax-exempt counterparts, and interest on the taxable revenue issues are even higher than interest rates on corporate bonds generally.

Types of Issuing Authorities. Special districts or public authorities are a fast growing phenomenon across the country. One major incentive for establishing these authorities is to increase the access to the capital markets in order to pay for their capital projects. Generally, the number of special districts authorized to issue either general obligation or revenue bonds have grown phenomenally in recent decades. Although the popularity of these special districts is well known, the cost of borrowing for these authorities has not been examined fully.

Influence of Length to Maturity. The length to maturity of bonds is also a variable that influences the rate of interest. It is commonly thought that the longer the term to maturity, the higher the interest will be because investors bear greater risk having their funds committed for a long period (Tanner 1975). The reverse is also believed to be true, that the shorter the period to maturity, the lower the interest (Braswell, Fortin, and Osteryoung 1984, 342). In order to avoid having all their bonds with a long maturity, most governments issue bonds with serial maturities that have a diversity of maturity dates. These type of issues are attractive to a wider range of investors because they meet investors' diversified needs. The trend in local government issues seems to be toward more short maturity bonds in an attempt to take

advantage of relatively lower interest rates.

Influence of Call Provisions. The presence or absence of a call provision is still another variable influencing interest costs. Most tax-exempt bonds have call provisions that permit the issuer to redeem them prior to maturity date. A study by Kidwell (1974, 28) spelled out some advantages of callable bonds, such as the fact that they provide flexibility to reduce the debt burden if the market interest declines below the interest rate of the bond. From the view of bond investors, however, callability increases the risk of financial loss when market interest rates decline. As a result, in order to compensate for this additional risk, callable municipal bonds incur a higher interest cost than noncallable bonds (Braswell, Fortin, and Osteryoung 1984 344-346). According to Petersen (1991, 308), callable bonds usually incurs a 10 to 50 basis point higher interest rate than comparable noncallable bonds for compensating the risk of being called. Calling debt is not cost free; the premium for calling a bond usually costs 2 percent to 5 percent above the par value of a bond (Petersen 1991, 309).

Method of Sale. Generally, there are two ways of selling municipal bonds: competitive bidding and negotiated sales (Joehnk and Kidwell 1980; Mease 1985). In competitive bidding, the issuer has to prepare all papers pertaining to the bond before it goes to public auction. These tasks include deciding the maturity schedule, preparing the financial and legal documents, and obtaining a bond rating, and in some instances purchasing insurance. After the sale is publicly posted, underwriters submit bids to the issuer. The award is to the lowest bid. Most states require competitive

bidding for GO bonds, but revenue bonds may be issued by competitive or negotiated sales. In a negotiated sale a bond is awarded not through market competition but on the basis of the underwriter's expertise, experience. After the negotiated sale is made, underwriters help issuers prepare and structure the bond since competitive bidding is generally perceived as the most effective way to sell bonds since it may lower interest costs because of market competition.

Number of Bids. Studies by Benson and Kessel found that the degree of competitiveness among underwriters can be indicated by the number of bids; therefore, the number of bids received from underwriters is negatively correlated with the interest cost (Benson, 1979; Kessel 1971). As the competitiveness between underwriters heats up, interest costs decline. Kessel (1971) further added that each bid signifies that underwriters have identified potential buyers who encourage them to enter a bid. Kessel's research showed that the marginal effect of an additional bid on interest cost decreases when the number of bids increases (Kessel 1971). Intensity of the bids, another dimension of underwriters competition identified by Benson, pertains to the dispersion of interest rates among bidders. This dimension of underwriter competition also is inversely related to interest cost (Kessel 1971).

Credit Ratings. Credit ratings are one of the most significant determinants of interest cost of an issue (Lamb and Rapport 1987). The higher the rating, the lower the interest costs. The interest cost difference between the highest rated issue AAA bonds and a lower rated A issue, according to Petersen, is about 30 basis points, and

the difference for a BB rated bond more than 100 basis points (Petersen 1974). Basically, credit ratings provide investors an objective evaluation of an issue's credit quality. Credit ratings during the 1980s, as a result of the abuses and defaults of municipal bonds, became even more important in providing information on the financial soundness of a specific issue. Credit ratings also affect the marketability of some bonds because federal laws and regulations limit some financial institutions and mutual funds from purchasing bonds below certain ratings.

Because many small bond issues do not have credit ratings by Standard and Poor's or Moody's, they enter the market at a disadvantage. Reeve and Herring found, however, that the interest costs of smaller unrated bond issues was 10 basis points lower than comparable Baa bonds, indicating that these small bond issues often were perceived to be sound despite being unrated (Reeve and Herring 1986). On larger unrated bond issues, however, the interest cost was 30 basis point higher than the comparable Baa bonds. These bonds obviously are seen as being quite speculative.

As much of the literature on municipal bonds has focused on local governments, this research looks at state bonds. Many of the variables found to affect interest rates of local government bonds are expected to influence state bond interest cost, too. This will be analyzed along with other variables that are unique to state bonds, such as the issuing authority and the state tax differential for income taxes.

The next chapter discusses the research design, methodology, source of data, as well as the methods of coding the data.

## CHAPTER III

### RESEARCH DESIGN, METHODOLOGY AND DATA COLLECTION

This chapter explains the research design, methodology, and source of data in the analysis of state bonds, as well as the methods of coding the data. Variables found to influence interest cost of local bonds are included in the regression models used to identify factors potentially influencing interest rates on state bonds. In addition, several factors particularly unique to state bonds are included in the model. One such factor pertains to the type of state agencies issuing bonds, i.e. the various types of state agencies or state authorities. Another unique state factor grows out of the fiscal competition among states. The impact of state income tax differential policies on the borrowing costs of state bonds is also considered in the regression models.

#### Research Questions

Previous research has found that the cost of local government bonds is affected by such factors as the market interest rate at the time of sale, percentage change in gross national product, callability, length to maturity, credit rating of the issuer (or issue in the case of revenue bonds), and the number of bids. Do these variables affecting local government bonds also influence the interest cost for state bonds?

The next inquiry pertains to whether investors view bonds issued by state governments as being the same as comparably rated local government bonds. In many studies state and local bonds are put together as if they were seen by investors as

substitutes. If state and local bonds, however, do not incur the same interest costs, what factors explain the difference?

A somewhat similar question asks whether state GO and revenue bonds follow the same pattern of interest cost as local GO and revenue bonds. Previous research of local bonds has found that interest costs of local GO bonds are lower than revenue bonds because revenue bonds were backed by more limited revenue pledges of the issuing government. Is this pattern also true for state bonds?

A fourth issue pertains to how the market views state bonds issued by state agencies or by state special districts or authorities. State bonds are issued either in the name of a particular state agency or by a special authority, such as a state bond bank, state housing authority, or university. The question arising from the decentralized mode of operation of states is whether the bond market treats these state revenue bonds in the same way.

Another question pertains to the issue size of state bonds. The study by Benson et al. (1981) of local government bonds found that interest costs and issue size portrayed a U-shaped relationship. Interest costs accordingly decreases as the size of a bond issue increases up to a point where the maximum economy of scale is surpassed, then interest costs increase. The question raised is, do state bonds follow this pattern? Also, what is the optimum size for state bonds, that is the size incurring the lowest interest cost during the period under study?

A sixth series of questions arises out of the competition found in American fiscal federalism. Does the fact that the states with different policies pertaining to the tax

treatment of interest income from state bonds affect their borrowing costs? Because states compete for domestic and foreign resources, it may be that those states with the most attractive policies pertaining to taxing interest of state bonds will obtain lower interest costs on bonds. This may be a significant point in a state's strategy to maintain a "good business climate."

Research questions were developed to guide this study from these general inquiries about factors affecting interest rates. The research questions are summarized as follows:

- (1) Do the same factors found to influence interest cost of local government bonds also influence interest cost of state debt?
- (2) Does the interest cost of state bonds follow the characteristic U-shape found in previous studies of local debt? What economies of scale exist for state issues?
- (3) Do comparably rated state bonds incur the same interest cost as local issues? If they do not incur the same cost, what factors explain the difference?
- (4) Do state GO bonds incur the same costs as state revenue bonds, or do they follow a similar pattern as local bonds with GO bonds having a lower interest cost?
- (5) Does the bond market treat various state agencies and special purpose bonds the same or different? In other words, are all state agency bonds treated alike in the bond market?
- (6) Does the enactment of state income taxes differential on the interest income from bonds influence the borrowing costs of state governments?

### Selection of Variables

Table 3.1 provides a summary of the operationalization of each of the variables used in the analysis.

#### Dependent Variable

Net interest cost (NIC) is used as the dependent variable in this research. NIC is a measure of the weighted average interest rate for a serial bond issue calculated on the basis of simple interest (Braswell, Fortin, and Osteryoung 1984). Municipal bonds generally are issued in serial maturities that spread payments over a number of years. NIC is a simplified way of calculating the total amount of interest without considering the changes in the time value of money that will be paid over the life of the bond issue (Public Securities Association 1990).

NIC is chosen in this research over the alternative method of determining effective costs, i.e., True Interest Cost (TIC), for several reasons. First, the data on NIC are more readily available in the Daily Bond Buyer published by the American Banker, and it is the more frequently used measure of the cost of bonds. Second, TIC treats debt service payments in present-value terms and is much more difficult to calculate. Hence, it is not as readily available.



Table 3.1 Variables and Measurements

Variable Names and Abbreviation	Codes/Values
<u>Dependent Variable</u>	
net interest cost (NIC)	simple interest rates
<u>Independent Variables</u>	
percentage change in gross product (PCGNP)	sum of percentage change national in real GNP for the current and preceding quarters
market interest rate (MKINT)	average interest on newly issued prime and good grade bonds
number of bids (NUMBIDS)	number of bids offered (logged)
final maturity (FINMAT)	final years to maturity
issue size (SIZE)	total dollar value of the bond issue (in millions)
callability (CALL)	0=noncallable 1=callable
credit backing (STGO)	0=revenue bonds 1=GO bonds
type of issuer (ISSUER)	revenue bonds issued by state 01=state revenue bonds 02=university bonds 03=mini bond banks 04=housing authorities 05=other state agencies
effective state income tax (INCOMTAX)	Effective state tax on out-of-state bonds less the effective tax on in-state bonds

### Independent Variables

The first two independent variables, i.e., the percentage change in the gross national product (PCGNP) and the market interest rate at the point of sale (MKINT), are chosen as variables to reflect economic conditions. PCGNP is operationalized as the sum of the percentage change in real gross national product of the economy (GNP) for the current and preceding quarters. Previous studies also suggest that interest costs vary inversely with the percentage change in GNP (Rogowski 1980; Benson and Rogowski 1978; Roden and Bland 1986). For example, as the revenues of local governments declines during a recession, the risk of default on bonds increases; as a result, the interest cost increases. Thus, the coefficient for the variable PCGNP is expected to be negative.

Market interest rate (MKINT) recognizes that fluctuations in interest rates affect interest costs of bonds. To control the fluctuation of market interest rate at the time the bond was sold, the market interest variable is operationalized by using the average interest on newly issued prime grade bonds (Aaa and Aa) of 5, 10, 15, 20, 25, and 30 year maturities.

Interest rates are driven mainly by the amount of capital available in the market. The Federal Reserve Board (FRB), the principal monetary agency in the country, influences the amount of capital available through various monetary regulations, such as changes in reserve requirement for banks, adjusting discount rates, and open market operations (Samuelson and Nordhaus 1984, 294-312). Because net interest cost of state bonds should fluctuate almost perfectly with market rates, the coefficient for

market interest rate should be close to 1.00.

Vital aspects of bond issues that have previously been identified as variables affecting interest on local bonds, such as the issue size (SIZE), the number of bids (NUMBIDS), the callability of bonds (CALL), and the number of years to maturity (FINMAT) are also used as variables in this study. Size of the issue has been found in studies of local bonds to affect interest costs. Up to a point, the larger the issue size, the more economies of scale there are for underwriters, and the lower the NIC (Kidwell and Rogowski 1983, 109-110). Marketability of large issues, however, declines as issue size increases at some point because they exceed the economies of scale and then NIC increases. Based on these findings, issue size in this research is specified as a quadratic function --  $SIZE + SIZE^2$ . The coefficients are expected to show the U-shaped relationship between issue size and net interest cost. The coefficient for the issue size variable is expected to be negative, and the coefficient for the squared term is expected to be positive.

The number of bids (NUMBIDS) variable reflects the degree of competition among underwriters for a bond issue, which is inversely correlated with the net interest cost of a bond issue. That is, as the number of underwriting firms submitting bids for an issue increases, interest cost should decline (Benson 1979, 882-883). It is also known that the marginal effect of each additional bid on net interest cost decreases as the number of bids increases (Kessel 1971, 722-723). Thus, the variable for number of bids (NUMBIDS) is logged. The coefficient is expected to be negative.

Bond provisions permitting early recall of bonds also influence interest rates.

The CALL variable in this research is coded as a zero-one dummy variable: if the bond is callable, it is coded as call=1; if the bond lacks a call provision, it is coded as call=0. From past empirical studies of local government bonds, callable bonds are sold for higher NIC than similar noncallable bonds because of the increased risks for investors when bonds are called in a period of lower interest rates. The coefficient for this variable is expected to be positive.

Length to maturity of bonds (FINMAT) is another variable influencing interest costs. Investors tend to avoid longer term bonds of a series unless the yield is adequate to compensate for the increased risk of holding such a security. Long-term bonds, therefore, are more price volatile than short-term bonds. Other things being equal, the longer the time to maturity, the higher the net interest cost of a bond. The coefficient for the variable measuring length to final maturity (FINMAT) is expected to be positive.

Variables pertaining to financial aspects of the state or the state agency issuing debt, namely credit rating (RATING) and the type of state issuers (ISSUER) also influence interest cost of bonds. The credit rating of borrowers is a key factor affecting the cost of borrowing. Moody's credit ratings on state bond issues are used for measurement purposes in the regression models to correspond with the five categories of ratings by Moody's. Credit rating is entered as five dummy variables. The interest cost of the Baa-1 rating is the omitted category and is to be compared with the interest cost of the other five ratings Aaa, Aa-1, Aa, A-1, A. Regression coefficients for this variable show the degree of difference in interest cost among the

various credit ratings with respect to the omitted category.

To distinguish between state agency bonds and state special purpose bonds issued by a special district or authority, another dummy variable, *ISSUERS*, is added to the regression model. *ISSUERS* is entered as four dummy variables: university bonds, municipal bond banks, housing authorities, and other state agencies. State agency bonds are used as the omitted category. The regression coefficients for these variables show the degree of difference in interest cost among the various types of state issuers.

The influence of state tax policies on bond interest is measured through the variable, *INCOMTAX*. Following the studies by Kidwell, Koch and Stock (1984) and Brucato et al. (1991), the *INCOMTAX* variable is operationalized as the effective state tax rate on out-of-state bonds minus the effective rate on in-state bonds. The values are reported in Appendix A. The *INCOMTAX* variable is calculated from a compilation of state tax schedules. The coefficient for *INCOMTAX* is expected to be negative for in-state investors because discriminatory state tax provisions tend to provide an incentive for buying in-state bonds and a disincentive to buy out-of-state bonds.

#### Utility of Multiple Regression

Multiple regression models are used to examine the impact of various independent variables on the dependent variable, state borrowing costs (NIC). Multiple regression is a data analysis technique used whenever a dependent variable is to be studied as a function or relationship to any factors of interest (independent variables). This technique is chosen for several reasons. First, multiple regression can

consider more than one independent variable; thus, it provides a more complete explanation of the influences on the dependent variable NIC. Multiple regression also statistically isolates the effect of each independent variable on the dependent variable without distorting influences from other independent variables (Lewis-Beck 1986).

In a general multiple regression, the dependent variable (Y) is assumed to be a function of a set of independent variables-- $X_1, X_2, X_3, X_4...$ etc. This equation is illustrated as follows:

$$Y = a_0 + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_kX_k + e$$

In this equation, the letters of coefficient  $a_0, b_1, b_2, b_3, \dots, b_k$  represent estimates of population parameters;  $b_1$  the partial slope coefficient, is the slope of the relationship between the independent variable  $X_1$  and the dependent variable Y by holding all other independent variables constant (Cohen and Cohen 1983). The regression technique is used to determine to what extent an independent variable affects the dependent variables.

#### Regression Models in This Study

A series of regression models is used to determine the influence of the various independent variables on the dependent variable in this study. Three separate regression models were used to answer the research questions. The first model shown in Table 3.2 is established to answer the first to fourth research questions.

Table 3.2 First Regression Model

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Regression Equation:

$$\text{NIC} = F(\text{PCGNP}, \text{MKINT}, \text{NUMBIDS}, \text{CALL}, \text{FINMAT}, \text{SIZE}, \text{SIZESQ}, \text{RATINGS}, \text{STGO})$$

Quantitative Independent Variables

PCGNP= percentage change in gross national product  
 MKINT= market interest rate  
 NUMBIDS= number of bids (logged)  
 FINMAT= final maturity  
 SIZE= size of issues (\$ in millions)  
 SIZE SQ= issue size squared

Qualitative Independent Variables:

STGO: bond types, dummy variable  
 yes=1                    no=0

Call: call provisions, dummy variable  
 yes=1                    no=0

Ratings: credit worthiness of bonds, with 5 categories  
 Aaa = Aaa rated bonds without third-party backing  
 yes =1                    no=0  
 Aa-1= Aa-1 rated bonds without third-party backing  
 yes =1                    no=0  
 Aa = Aa-1 or Aa rated bond without third-party backing  
 yes =1                    no=0  
 A-1 = A-1 rated bonds without third-party backing  
 yes =1                    no=0  
 A = A rated bonds without third-party backing  
 yes =1                    no=0  
 INS = bonds with insurance  
 yes =1                    no=0  
 UNRATED = unrated bonds without third-party backing  
 yes=1                    no=0  
 Baa-1= Baa-1 rated bonds without third-party backing  
 yes=1                    no=0  
 (Baa-1 bonds is omitted category)

---

The first regression model pertaining to the first three research questions is composed of the following variables: market interest rate (MKINT), percentage change in gross national product (PCGNP), number of bids (NUMBIDS), years to maturity (FINMAT), and callability (CALL). These variables were entered to examine whether they also influence state borrowing costs as they do for local bonds. Variables from the second research question, issue size (SIZE) and size square (SIZESQ), were added to reflect the expected U-shaped relationship between net interest cost and issue size. Issue size in this research was deflated to reflect constant first quarter 1982 dollars; and therefore, the inflation bias is controlled.

The third research question pertaining to the comparison between state bonds with comparable local bonds was entered into the equation as a qualitative variable with five categories. Moody's ratings were used as a major measurement of the credit worthiness. The main purpose of this model is to answer whether the bond market views state bonds the same as comparably rated local bonds. A previously published local bond study for the period under study is used for comparative purposes (Bland and Chen 1990). A coefficient spread from Aaa to Baa-1 for both state and local bonds also is compared as to whether there is any difference between the two groups of bonds. Is there a difference in interest costs between comparable state and local bonds? If so, what explains this difference? In order to compare the borrowing cost of state GO bonds and state revenue bonds as called for by research question 4, a dummy variable, STGO, is employed. When the bonds are state GO bonds, the variable STGO=1; when the bonds are state revenue bonds, the variable STGO=0. By



using a dummy variable, it is possible to compare the interest difference between state GO bonds and state revenue bonds.

The second regression model, shown as Table 3.3, is designed to answer research questions five and six. It contains variables pertaining to these research questions, namely, types of state issuer (ISSUERS), and state tax differentials (INCOMTAX).

ISSUERS is entered to represent type of issuers, and is entered as four dummy categories: university bonds, municipal bond banks, housing authorities, and other state agencies. State revenue bonds issued by state line departments are used as an omitted category. Regression coefficients for this variable show the degree of difference in interest cost among the various state revenue bonds.

Lastly, the influence of state tax policies on bond interest rates raised in research question six is measured through the variable INCOMTAX. This variable is operationalized as the effective state tax rate on out-of-state bonds minus the effective rate on in-state bonds. The coefficient result of INCOMTAX is expected to be negative for in-state investors because discriminatory state tax provisions tend to provide an incentive for buying in-state bonds and a disadvantage for buying out-of-state bonds. The impact of state income tax differentials on revenue bond interest is tested in regression model 2, as can be seen in Table 3.3. Model three is to examine whether state income tax differentials influencing state GO bond interest costs. See Table 3.4.

Table 3.3 Second Regression Model

---

Regression Equation:

$$\text{NIC} = F(\text{PCGNP}, \text{MKINT}, \text{NUMBIDS}, \text{CALL}, \text{FINMAT}, \text{SIZE}, \text{STATE RATINGS}, \text{ISSUERS}, \text{INCOMTAX})$$

Quantitative Independent Variables

PCGNP= percentage change of gross national product

MKINT= market interest rate

NUMBIDS= number of bids (logged)

FINMAT= final maturity

SIZE= issue size (in millions)

INCOMTAX= effective out-of-state tax rate minus  
effective rate on in-state bonds

Qualitative Independent Variables:

Call: call provisions, dummy variable

yes = 1                      no = 0

Issuers: types of state revenue bond, with 5 categories

if state revenue bond, then =1;

if university bonds, then =2;

if bonds banks, then =3;

if housing authority bonds, then =4;

if other state bonds, then =5;

state revenue bonds the omitted category

Ratings: credit worthiness of bonds, with 5 categories

Aaa rated bonds without third party backing

yes = 1                      no = 0

Aa-1 rated bonds without third-party backing

yes = 1                      no = 0

Aa rated bonds without third-party backing

yes = 1                      no = 0

A-1 = A-1 rated bonds without third-party backing

yes = 1                      no = 0

A = A rated bonds without third-party backing

yes = 1                      no = 0

INS = Bonds with insurance

yes = 1                      no = 0

Baa-1= Baa-1 rated without third party backing

yes = 1                      no = 0

(Baa-1 bond is omitted category)

---

Table 3.4 Third Regression Model

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Regression Equation:

$NIC = F(PCGNP, MKINT, NUMBIDS, CALL, FINMAT, SIZE, STATE RATINGS, INCOMTAX)$

Quantitative Independent Variables

PCGNP= percentage change of gross national product

MKINT= market interest rate

NUMBIDS= number of bids (logged)

FINMAT= final maturity

SIZE= issue size (in millions)

INCOMTAX= effective out-of-state tax rate minus effective rate on in-state bonds

Qualitative Independent Variables:

Call: call provisions, dummy variable

yes = 1                      no = 0

Ratings: credit worthiness of bonds, with 5 categories

Aaa = Aaa rated bonds without third party backing

yes = 1                      no = 0

Aa-1= Aa-1 or Aa rated bonds without third-party backing

yes = 1                      no = 0

Aa = Aa rated bonds without third-party backing

yes = 1                      no = 0

A-1 = A rated bonds without third-party backing

yes = 1                      no = 0

INS = Bonds with insurance

yes = 1                      no = 0

UNRATED = unrated bonds without third-party backing

yes = 1                      no = 0

Baa-1 = Baa-1 rated without third-party backing

yes = 1                      no = 0

(Baa-1 bond is omitted category)

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### Source of Data and Method of Coding

Data pertaining to interest rates on state bonds and their credit ratings were obtained from the Daily Bond Buyer published by American Banker. The Post Sale Index of Competitive Bonds in the Daily Bond Buyer for 1987, 1988, and 1989 along with the Range Yield Curve Scale from Delphis Hanover Corporation were used to obtain data pertaining to the market interest rates on state bonds. Only the bonds sold competitively were selected because competitive bonds are more homogeneous than negotiated bonds. Bonds issued by state governments, state agencies, and state universities bonds were selected. All data are coded into an 80 column fortran coding form. Each data point contains three lines of data. The first line of data records the items such as date of issue, the name of issuer, the size of the issue, callability, years to call, years to maturity, and interest rate of the issue. The second line records the issue categories, and the credit rating of the issue. The Range of Yield Curve Scales provided by Delphis Hanover Corporation is used in the third line of the data to reflect market interest rate (MKINT). Market interest rate is operationalized by using the average interest rates on newly issued prime grade bonds (AAA and AA) of 5, 10, 15, 20, 25, and 30 year maturities.

The data collected from the years of 1987, 1988, and 1989 from the Daily Bond Buyer and the range of yield curves are large enough for the regression analysis undertaken here. Generally, it is believed that thirty data points will be sufficient for regression analysis. Furthermore, although in 1988 the Supreme Court case of South Carolina created a heated discussion about state and local government finance, the

case according to most accounts did not create panic in the bond market because of the strong support for tax immunity in the Congress.

Data needed to compare municipal bond interest cost among various ratings with comparable state bond ratings as called for in research question three were obtained from an article that studied municipal bond interest cost for the same period. The article "Taxable Municipal Bonds: State and Local Governments Confront the Tax-Exempt Limitation Movement," was published in 1990. As this articles used data in 1986-1987 and is in the similar period as those studied here, the results may be compared to the interest rates on state issued bonds.

The INCOMTAX variable, as called for in research question six, is operationalized as the effective state tax on out-of-state bonds less the effective tax on in-state bonds. Data pertaining to this variable were obtained from an article written by Burcato, Forbes and Leonard in 1991. State income tax differentials are shown in appendix A. These data were entered into the regression model.

#### Coding of the Data Set

The data published by Bond Buyer provide many characteristics of bonds, such as issue date, name of issuer, issuing state, size of issue, credit ratings, average maturity, and callability. Each of the items is assigned to different columns in the data set. Each data set point has three records that contain various characteristics of the bonds. The data are coded according to the schema presented in Table 3.5.

Data for records 1 and 2 were obtained from the 1987, 1988, and 1989 issues of the Daily Bond Buyer. The third record relating to interest rates was obtained from

Delphis Hanover Corporation's range of yield scales for the same period. Information about state income tax differentials was obtained from the article by Burcato and his associates, which calculated the differential state tax rates on in-state and out-of-state bonds.

Table 3.5  
Coding Schema for Data

<u>Record #1</u>		<u>Record #2</u>		<u>Record #3</u>	
column	item	column	item	column	item
1-6	date	1-6	date	21-48	prime grade market
7-9	000	7-9	000		interest rates
10-11	state	10	insurer	52-79	good grade market
					interest rates
12-31	issuer	11	type of bonds		
32-38	size	12-28	blank		
39-40	issuer	29-38	credit ratings		
41-42	type	73	callable		
43-44	# bids	74-75	years to call		
45-46	maturity				
47-52	nic				

The various columns in the data set are coded to include pertinent aspects relating to bonds. Table 3.5 shows the information for each of the columns. Some of the items are self-explanatory, such as the issue date shown in column 1 to 6 of the first record. Other items call for more explanation. The item pertaining to the issuing state of bonds in record 1 columns 10 to 11, for instance, is coded as a separate two-digit number representing the name of the state. The coded number for each state is shown in Appendix B. The item pertaining to the type of issuer in columns 39-40 is coded

as five different categories and entered as 01 to 05. If a state bond is issued by a general state government, it is coded 01; if it is issued as a university bond, it is coded 02; if the bond is issued by a state established municipal bond bank, it is coded 03; if it is issued by a state housing authority, it is coded as 04; and if it is issued as any other kind of state agency, it is coded as 05. Bonds are coded as university bonds only if they are issued for use of a specific university. If the bonds are issued for general statewide higher education purposes, they are classified as other agency bonds because those bonds are not funded by specific university revenue resources such as university tuition revenue bonds.

Some items in the second record also need further explanation. Credit enhancement, for example, shown in column 10 is coded from 0 to 9 to reflect various types of credit enhancement available in the market. Table 3.6 shows the meaning of these various classifications. If bonds are enhanced, they are coded from 1 to 9 to reflect the type of credit enhancements.

The item for type of issue in record 2 column 11 was coded to show whether bonds are general obligation or revenue bonds. General obligation bonds or unlimited tax-backed bonds are categorized as "A"; limited tax-backed bonds are coded as "B"; and revenue bonds are categorized as "C."

Table 3.6  
Coding for Credit Enhancements

Categories	Meaning of categories
0	No credit enhancement or insurer
1	American Municipal Bond Assurance Corporation (AMBAC)
2	Municipal Bond Insurance Association (MBIA)
3	Municipal Guaranty Insurance Co. (MGIC)
4	Financial Guaranty Insurance Co. (FGIC)
5	Health Industry Bond Insurance (HIBI)
6	Bond Investors Guarantee Insurance Co. (BIGI)
7	Industrial Indemnity Insurance Co. (III) or USF & G
8	FHA backing or other
9	Letter of credit

The item for credit ratings in columns 29 to 38 uses Moody's ratings unless they are not available. Standard and Poor's rating is substituted under these circumstances. Table 3.7 shows how the credit ratings are coded in the data set for columns 29 to 38.

Table 3.7  
Coding for Credit Ratings

Moody's	S & P's	
Aaa	AAA	1 0 0 0 0 0 0 0 0 0
Aa-1	AA+	0 1 0 0 0 0 0 0 0 0
Aa	AA	0 0 1 0 0 0 0 0 0 0
	AA-	0 0 0 1 0 0 0 0 0 0
A1	A+	0 0 0 0 1 0 0 0 0 0
A	A	0 0 0 0 0 1 0 0 0 0
	A-	0 0 0 0 0 0 1 0 0 0
Baa-1	BBB+	0 0 0 0 0 0 0 1 0 0
Baa	Baa	0 0 0 0 0 0 0 0 1 0

Column 73 is coded to register whether there is a call provision or not. If the



bond is callable it is coded 1, if it is not callable it is coded 0. The number of years to call is coded in columns 74 and 75. The comparative data of local bond interest costs from Bland and Chen's article are not used directly in the regression model, but instead are used as a reference with the findings pertaining to state bond interest to compare local bond interest charges with state bond interest.

#### Data Transformation

Data for some variables in this study have been transformed so that they could be more readily used in the regression analysis. Available data for such variables as percentage change in gross national product (PCGNP), market interest rate (MKINT), number of bids (NUMBIDS), and issue size (SIZE) require such treatment.

Data pertaining to the percentage change of gross national product (PCGNP), derived from Survey of Current Business show only the change in gross national product in 1982 constant dollars. The percentage of change is not given and had to be calculated for use in this regression analysis. The percentage change in GNP was calculated by dividing current quarter GNP minus GNP of the preceding quarter by the GNP of the preceding quarter.

Data for the variable market interest rate (MKINT) from Delphis Hanover Corporation's indices of tax-exempt yield on newly issued prime-grade bonds (AAA and AA) of 5, 10, 15, 20, 25, and 30 year maturities for weekly sales were averaged for use in the regression model. All 5, 10, 15, 20, 25, and 30 year municipal bonds at the time of sale were averaged to reflect the market interest rates. The average index was used because it is expected to approximate the average years to maturity for the

state data set used in this study (Kidwell and Koch 1982).

Data for the number of bids (NUMBIDS) also needed transformation. Number of bids (NUMBIDS) in the equation reflects the degree of competition among underwriters, which is inversely correlated with the net interest cost of a bond issue, i.e. as the number of underwriting firms submitting bids for an issue increases, interest cost declines (Benson 1979, 882-883). It is also known that the marginal effect of each additional bid on net interest cost decreases as the number of bids increases (Kessel 1971, 722-723). The variable for number of bids, therefore, is entered as a logarithm in order to correct its nonlinear relationship with the dependent variable, NIC.

As a result of previous research on local municipal bonds, it is expected that there will be a U-shaped relationship between issue size and issue cost. Accordingly, issue size is used as a quadratic function in this study; size and size square (SIZE and SIZESQ) are coded to reflect this relationship. In order to limit the inflation factors, issue size was deflated by the consumers price index to reflect constant first-quarter 1982 dollars.

The next chapter discusses the process of data analysis and presents the findings from the regression models.

## CHAPTER IV

### DATA ANALYSIS AND FINDINGS

This chapter describes the characteristics of the data set, shows the tests for multicollinearity and autocorrelation among the independent variables, and reports the findings from the regression models pertaining to the research questions. Three regression models for answering the research questions were analyzed. The findings and an analysis of the results are presented in this chapter.

#### Description of the Data Set

The data were collected from the Daily Bond Buyer bond sale sheets for 1987, 1988, and 1989. The Daily Bond Buyer collects all state long-term competitive bond sales that exceed more than \$1 million. The issuer or its financial advisor completes a form that provides information on the sale and returns it to the Daily Bond Buyer in New York City. This research only applies to those long-term competitive bonds with issue sizes more than \$1 million, and does not apply to private placement sales or to state bond sales less than \$1 million. A total of 445 state bonds were analyzed; 173 of these were GO bonds and 272 were revenue bonds. Descriptive statistics such as the mean, standard deviation (SD), and also the percentage of bond ratings in the data set are shown in Table 4.1.

The average net interest cost (NIC) for GO bonds ranged from a high of 8.90 percent to a low of 4.29 percent, with a mean of 7.03 percent. The standard

Table 4.1 Descriptive Statistics for the Data Sample

	All Bonds		GO Bonds		Revenue Bonds	
	MEAN	SD	MEAN	SD	MEAN	SD
NIC(%)	7.20	0.71	7.03	0.65	7.30	0.71
Final Maturity	21.62	7.81	19.88	6.45	22.72	8.40
Number of Bids	5.27	2.29	4.79	1.97	5.57	2.44
Size (in 1982 million \$)	49.67	61.34	84.27	77.47	27.67	33.26

Bond Ratings: Actual Count and Percentage of Observations in Data Sample

	All Bonds		GO Bonds		Revenue Bonds	
	Actual	%	Actual	%	Actual	%
Aaa	52	11.7	41	24.0	11	4.0
Aa-1	15	3.4	11	6.4	4	1.5
Aa	147	33.0	67	38.0	80	29.9
A-1	93	20.9	49	28.6	44	16.1
A	69	15.5	1	0.6	68	24.8
Baa-1	4	0.9	1	0.6	3	1.1
Baa	9	2.0	0	0.0	9	3.3
Ins	43	9.7	3	1.8	40	14.6
Unrated	13	2.9	0	0.0	13	4.7
Total	445	100	173	100	272	100

Source: Daily Bond Buyer, 1987-1989.

deviation (SD) for GO bonds was 0.65 percent indicating the range of variability of GO bonds is small. The range of NIC for revenue bonds was from a high of 10.03 percent to 4.78 percent, with an average of 7.30 percent and a standard deviation of 0.71 percent. The NIC for the combined data set of GO and revenue bonds ranged from a high of 10.03 percent to a low of 4.29 percent, with an average of 7.20 and a standard deviation of 0.71 percent.

The mean for the final maturity of GO bonds was 19.88 years with a range from 4 to 41 years. The average maturity of revenue bonds was 22.72 years, with a maturity range from 3 to 50 years. The average maturity for the combined data set was 21.62 years with a range from 3 to 50 years.

The number of bids for GO bonds averaged 4.79, ranging from 1 to 11. Bids for revenue bonds averaged 5.57, with a range from 1 to 17. The combined data set had an average of 5.27 bids.

The size of GO bond issues averaged \$84.27 million (measured in 1982 dollars), with a range from \$0.84 to \$373.24 million. The size of revenue bond issues averaged \$27.67 million (in 1982 dollars), with a range from \$0.88 to \$200.32 million. The size of bond issue in the combined data set averaged \$49.67 million (in 1982 dollars). The percentage of bonds within the various categories of ratings is also shown in Table 4.1.

#### Testing for Multicollinearity and Autocorrelation

Multicollinearity and autocorrelation are two major problems that often exist in

multiple regression research. Multicollinearity exists when there is high intercorrelation among the independent variables. This condition biases coefficient estimates, making the results misleading (Berry and Feldman 1985, 40-43; Lewis-Beck 1986; Welsh 1980). To determine whether multicollinearity exists among the independent variables, a Pearson correlation coefficient matrix among explanatory variables was examined. See Table 4.2.

Table 4.2 Pearson Correlation Coefficients Matrix

	PCGNP	MKTINT	FINMAT	CALL	NUMBIDS	SIZE
PCGNP	1.00					
MKTINT	0.025	1.00				
FINMAT	-0.113	0.048	1.00			
CALL	0.003	0.011	0.406	1.00		
NUMBID	0.062	-0.093	-0.094	0.102	1.00	
SIZE	0.015	-0.085	-0.015	-0.091	-0.305	1.00

As can be seen from Table 4.2, the correlation coefficients for the independent variables are not high enough to indicate the existence of severe multicollinearity. The correlation coefficients range from -0.015 to 0.406, well below the value of 0.6 which typically is used to indicate a multicollinearity problem (Lewis-Beck 1986).

Because economic indicators similar to those used here are likely to have problems of multicollinearity, a second test, Variance Inflation Factors (VIF) was

employed where percentage change of gross national products was used as the dependent variable. Results from this test can be seen in Table 4.3. This test confirmed that there is no problem of multicollinearity as the value of VIF is far less than the standard of 10 that is commonly used to indicate that a multicollinearity problem may be present (Marquardt 1980).

Table 4.3 Variance Inflation Factors of Variables

---

Dependent Variable: PCGNP

	Variance Inflation
MKINT	1.0278
CALL	1.2131
NUMBIDS	1.1358
FINMAT	1.2136
SIZE	1.1310

---

Autocorrelation, a second possible problem with regression analysis involving correlation among the residuals across time, was also examined. Two diagnostic tests were employed to test for the presence of residual correlation among variables: Durbin-Watson d statistic and Partial Autocorrelation Coefficient Function (PACF). Durbin-Watson d statistic may range between 0 and 4. If the residuals are uncorrelated, the d statistic equals 2.0; if residuals are positively correlated, the d statistic is smaller than 2.0; and, if the residual correlation is strong and positive, the d

statistic equals 0. If residuals are negatively correlated, then the d statistic is greater than 2.0, and if the residual correlation is highly negatively correlated, then d is equal to 4. In this research, the Durbin-Watson value of first model, second model and third model were 1.89, 1.94, and 1.76 separately which are close to the ideal value of 2.0 in the Durbin-Watson d statistic, indicating that there is no autocorrelation problem present.

Due to the potential presence of time series correlation in data sets, a second test, partial autocorrelation coefficient (PACF) also was employed to examine the existence of autocorrelation. The graphic results of this autocorrelation coefficient function indicates that there is no time series correlation (see Table 4.4). Only at the lag six data point occurs a minor spike, but it does not show any time series correlated trend or pattern on the graph. This indicates that there is no problem with autocorrelation.

#### Interpretation of Unstandardized and Standardized Regression Coefficients

Results of both unstandardized (B value) and standardized (Beta value) coefficients are reported in the regression models. Generally unstandardized coefficients (B value) are interpreted as the average change in Y associated with a unit change in  $X_k$ , when the other independent variables are held constant. However, it is not possible to compare which independent variables have more influence on the dependent variable with unstandardized coefficients.





The standardized regression coefficients (Beta value) make the comparison between various independent variables possible since the units are the same. Standardized regression coefficients or beta coefficients are calculated by  $b1(S_{xi}/S_y)$ , when  $S_{xi}$  and  $S_y$  are the standard deviation of the  $X_i$  and  $Y$  value respectively (Neter, Wasserman, and Kutner 1989). Unstandardized coefficient also are shown since they reflect the association between the dependent variables and independent variables before an adjustment is made among the independent variables.

### Research Questions and Findings

The objective of this study is to investigate the factors influencing state borrowing cost. The first regression model addresses the first four research questions, namely:

(1) Do the factors such as market interest rate (MKTINT), percentage change in gross national product (PCGNP), final maturity (FINMAT), callability (CALL), and number of bids, (NUMBIDS), which have been found to influence the interest cost of local bonds, also influence interest cost of state bonds? (2) Does the interest cost of state bonds follow the characteristic U-shaped curve for issue size found in previous studies of local debt? If so, what economies of scale, if any, exist for state bond issues? (3) Do comparable rated state bonds incur the same interest cost as local issues? If not, what explains the difference? Second, how does private insurance affect interest costs of state bonds? (4) Do state bonds follow the pattern of local bonds with GO bonds having a lower interest cost than revenue bonds?

As explained in the research design in Chapter three, the first regression model, which is used to answer the first four research questions was specified as:

$$\text{NIC} = f(- \text{PCGNP}, + \text{MKTINT}, + \text{FINMAT}, + \text{CALL}, - \text{NUMBIDS}, + \text{SIZE}, - \text{SIZESQ}, - \text{CREDIT RATINGS}, - \text{STGO})$$

Results of the first regression are presented in Table 4.5. The independent variables in this model explain 73.29 percent of the variation in the NIC of the issues in this data set. The F-value, 82.23, implies that the overall model is useful in prediction and analysis. The Durbin-Watson of 1.885 indicates that there is no autocorrelation problem present in this regression.

The unstandardized coefficient (B value) represents the relationship between independent variables and dependent variables. The standardized coefficient (beta value) enables an assessment of the relative importance of each independent variable on the dependent variable. By comparing the beta coefficient of these independent variables in model one (see Table 4.5), it can be seen that market interest rate is the most significant factor, followed by length to final maturity, credit ratings, size, percentage change in gross national product, and callability.

Table 4.5 Regression Results of Model One:  
 Analysis of Bonds Characteristics, Market Factors, Issue Size,  
 Bond Insurance, and Comparison of GO vs Revenue Bonds

<u>Independent Variables</u>	<u>Unstandardized Coefficients</u>	<u>Standardized Coefficients</u>	<u>t value</u>	<u>p value</u>
PCGNP	0.2061	0.0986	3.88	0.0001
MKTINT	0.9670	0.5931	23.52	0.0001
FINMAT	0.0453	0.5046	17.56	0.0001
CALL	0.2070	0.0827	3.03	0.0026
NUMBIDS (logged)	-0.0154	-0.0098	-0.35	0.7237
SIZE (in million \$)	-0.0015	-0.1280	-1.97	0.0501
SIZESQ (in million \$)	0.0046 <sup>1</sup>	0.1003	1.63	0.1043
RATINGS: <sup>2</sup>				
Aaa	-0.7809	-0.3584	-6.60	0.0001
Aa-1	-0.6669	-0.1720	-4.71	0.0001
Aa	-0.5104	-0.3430	-4.70	0.0001
A-1	-0.6083	-0.3533	-5.49	0.0001
A	-0.4576	-0.2366	-4.12	0.0001
INS	-0.4694	-0.1981	-3.99	0.0001
UNRATED	-0.4189	-0.1008	-2.94	0.0035
STGO	-0.0040	-0.0028	-0.09	0.9306
CONSTANT	0.2316	0.0000	0.78	0.4399

Adjusted R<sup>2</sup>=0.7329

F=82.23

N=445

Durbin Watson=1.885

<sup>1</sup> Coefficient multiplied by 1,000.

<sup>2</sup> The omitted category is Baa-1 bonds

Research Question 1: Economic Determinants and Issue Characteristics. Two economic factors--market interest rate (MKTINT) and the percentage change in gross national product (PCGNP)--were entered in the regression model to capture the national economic trends in the market for long-term debt. Both of these factors were found to significantly influence state bond interest costs, just as they were found to influence local bonds in previous studies (Rogowski 1980, 216; Roden and Bland 1986; Benson and Rogowski 1987). Percentage change in gross national product and market interest rates were found to be statistically significant at the 0.01 level (see Table 4.5).

Market interest rate (MKTINT) is used to portray the fluctuation of interest rates in the market at the time of the bond issue. Previous research on the variable indicates that the net interest rate should fluctuate almost perfectly with the market interest rate at the time of sale (Hendershott and Kidwell 1978, 343; Kidwell and Koch 1982, 53; Roden and Bland 1986, 168; Benson 1979, 879). This means that when a bond issue is sold during a period of low market interest, the issue should also have a low interest cost, and vice versa.

The percentage change in real gross national product (PCGNP) is used to capture the effect of national economic activities on interest cost of state bonds. Previous research suggests that interest rates for municipal bonds vary inversely with changes in GNP (Rogowski 1980, 216; Benson and Rogowski 1987). The revenue resources of local governments decline during an economic downturn, risk of default on bonds increases, causing the interest cost on bonds to increase. This research on state bonds,

however, found that the coefficient of percentage change in gross national product (PCGNP) is positive and statistically significant. Every percentage increase in gross national product results in a 20.61 basis points increase in state bonds interest rate. This finding may be the result of economic growth increasing demand for money in the financial market, thereby driving up interest costs of state bonds as state governments compete with other borrowers. Therefore, percentage change of gross national product (PCGNP) turns out positive in regression model one.

The results from the economic factors--market interest rate (MKTINT) and percentage change in gross national product (PCGNP)--demonstrate that proper timing for issuing state debt is critical for lowering state interest cost. State governments need to closely monitor and evaluate the most advantageous time to issue state debt.

Bonds and market characteristics, such as final maturity (FINMAT), callability (CALL), and number of bids (NUMBIDS), also are tested to determine their effect on the interest rate of state bonds. Among these three, the coefficients for both final maturity and callability are positive and statistically significant at the 0.01 level, as seen in Table 4.5. The coefficient for number of bids (logged), however, is negative and statistically insignificant.

The final maturity variable (FINMAT) measures length to final maturity of state bonds in the data set. Previous research has found that the interest rates of long-term bonds are likely to be subject to greater price fluctuation than their short-term counterparts. As a result, investors tend to avoid long-term bonds unless the interest rates are sufficiently high to compensate for this increased risk (Sorensen 1983).

Other things being equal, the longer the time to final maturity, the higher the net interest cost of a bond (Benson 1979; Hendershott and Kidwell 1978). The result of this variable, final maturity (FINMAT), on state bonds is positive and statistically significant. As can be seen in table 4.5, every one year longer maturity results in 4.53 basis points increase in state bonds interest rate. It shows that state bonds with long-term maturity cost more than bonds with shorter maturities. Issuing short term bonds results in lower interest costs for state governments.

The coefficient for the variable callability is positive and statistically significant. This finding indicates that callable bonds incur 20.70 basis points higher interest cost than noncallable bonds (see Table 4.5). A call provision permits issuers to purchase the bonds before maturity at a predetermined price. Call provisions provide flexibility to the issuer because the bonds can be refinanced if interest rates decline in the future. This flexibility benefits the issuer at the expense of the buyer. In order to compensate for the potential loss in interest income, investors require a higher initial interest rate for callable bonds. This finding verifies that state callable bonds have higher interest costs, which is consistent with other research (Kidwell 1975). Issuers need to carefully evaluate the potential benefits of a call provision against the higher cost incurred.

The number of bids variable (NUMBIDS) reflects the competition in the market for state bonds sold between 1987-1989. The coefficient for the number of bids (logged) variable in the regression model one is negative but statistically insignificant. This finding is different from previous studies in that the number of bids is inversely

related to interest cost of the bond (Kessel 1971; Benson 1979). Frequently, the method of selling bonds is restricted by state statutes. Most states require that GO bonds be sold by competitive bidding, whereas revenue bonds may be sold by either competitive bidding or negotiated sale (Public Securities Association 1990). The results of the number of bids variable in state government is different from research on local bonds, indicating that the market competition does not ensure lower interest cost of state bonds. This may be due to the fact that states are better known political entities with larger issues in the national market, which ensures greater price competition regardless of the number of underwriting syndicates submitting bids.

Research Question 2: The Effect of Issue Size. The second research question investigated whether the relationship of interest costs and issue size of state bonds follows the characteristic U-shaped curve found in previous studies of issue size using local bonds. This U-shaped phenomenon in local bonds shows that up to a point the larger the issue, the more marketable the bonds, and the lower the net interest cost (Bensen, Kidwell, Koch, and Rogowski 1981; Kidwell and Rogowski 1983). Beyond this optimum size, interest costs increase, other things being equal. Two reasons account for this U-shaped curve. First, local bonds typically do not have large secondary markets where securities can be traded after they are first sold. Investors will pay a higher price for a new issue if they know that the securities can be sold at a reasonable price before their maturity. Only the bonds of larger governments are actively traded in the secondary market (Kidwell and Rogowski 1983). Second, economies of scale applies to underwriting of municipal bonds. That is, up to a point,



an increase in size of a bond issue lowers interest cost, but beyond the point of maximum economies of scale, interest cost begins to increase. Kidwell and Rogowski (1983) found that issues of \$60 million (constant 1972 dollars) was the optimum issue size for local bonds; beyond that size interest costs increased.

From this previous research, the coefficient of issue size usually shows a positive sign and a negative coefficient for size<sup>2</sup> to portray the U-shaped curve relationship between size and interest rate. However, in this research, the coefficients of both size (SIZE) and square of the size (SIZESQ) variables are small and statistically not very significant on state bonds interest cost. The coefficient of issue size is marginally significant ( $t=0.05$ ) but the coefficient of SIZESQ is statistically insignificant. These findings are not in agreement with previous U-shaped relationships between issue size and interest cost for local bonds. For every one million dollars increase in state bonds, there is a decrease of 0.15 basis points of state bonds interest rates. The impact of size square is not statistically significant. This may be because state bonds are backed by state taxes or other general revenues, and as issuers states are generally better known to investors. States are sovereign units of government with broader and larger financial capabilities, and have more revenue raising flexibility. Because states have larger issues size, they are marketed nationally and thus have a larger pool of potential investors. The marketability of state bonds, therefore, is greater than their local counterparts. The costs (risks) of marketing larger issues by underwriters results in lower interest rates for state bonds. The answer to research question two is that state bonds do not follow the characteristic U-shaped found in previous studies of

local bonds. Without the U-shaped phenomenon occurring, the optimum size for state bonds cannot be determined in the same fashion as for local bonds.

Research Question 3: Rating Factor and Impact of Bond Insurance. The third research question examines whether the credit ratings of state bonds, which range from Aaa to Baa-1 bonds, incur the same range of interest costs as local bonds with comparable ratings. Another way of viewing this comparison is does the market value of a Aaa/AAA (or another rating) state bond have the same interest as a Aaa/AAA bond sold by a local government? If there is a difference, what explains the difference? The second portion of this question investigates the cost-effectiveness of insured state bonds.

Previous research has concluded that interest cost is significantly related to the bond issue's rating. Generally the higher the rating the lower the interest cost and vice versa (Lamb and Rappaport 1980, 46; Petersen 1974, 44). Even after bonds are sold, the credit rating companies continue to monitor and evaluate the ongoing condition of the issuer. If the credit rating of a state declines it reflects a worsening of economic or financial conditions of the issuer, causing the interest cost of future borrowing to increase. It also casts a shadow on the financial competence of the public officials. Because of the significance of ratings on interest cost, maintaining a high bond rating is an important goal of elected and appointed leaders in state and local government.

As can be seen in Table 4.6, the credit ratings variable was divided into six dummy variables and the coefficients of these variables all indicate a negative

relationship with NIC when compared to the omitted category, Baa-1. State Aaa bonds incurred interest costs that were on the average 78 basis points lower than the omitted category Baa-1. AA-1 bonds are 67 basis points lower than

Table 4.6 Comparison of Bond Rating Coefficients of State with Local Bonds

	State Bond Ratings		Local Bond Ratings* <sup>1</sup>	
	Coefficient	t-value	Coefficient	t-value
Aaa	-0.78	-6.67	-0.64	-8.45
Aa-1	-0.67	-4.79	* <sup>2</sup>	
AA	-0.51	-4.74	-0.60	-10.10
A-1	-0.61	-5.58	-0.46	-7.70
A	-0.46	-4.12	-0.44	-7.73
Baa-1	* <sub>3</sub>		-0.12	-1.72
Insured	-0.41	-2.94	-0.33	-5.96

\*<sup>1</sup> Source: Robert Bland and Li-Khan Chen, "Taxable Municipal Bonds: State and Local Governments Confront the Tax-Exempt Limitation Movement." Public Administration Review 1990(January/February), pp. 42-48.

\*<sup>2</sup> In Bland and Chen's research, AA-1 data were combined with the Aa category.

\*<sup>3</sup> In this research, Baa-1 is the omitted category.

\* In Bland and Chen's research, data were collected between July 1986 to June 1987.

Baa-1 bonds, and Aa bonds are 51 basis points lower than Baa-1 bonds.

These findings generally are in agreement with previous research that found that lower rated bonds incur higher interest costs. The findings also show that ratings are

an important factor affecting the interest cost of state bonds. In Bland and Chen's (1990) research using local government bonds between 1986 and 1987, Baa was the omitted category, and coefficients of various ratings show that bonds with higher ratings incurred lower cost. Bonds rated higher than Baa bonds incurred lower interest cost than Baa bonds. Aaa, Aa-1, Aa, A-1, A, and insured bond all showed negative signs and were statistically significant (see Table 4.6).

A comparison of the interest rates for state and local bonds with various ratings was compared in two ways. First, an "eyeballing" comparison was made from table 4.6. Second, a T-test statistical comparison was made comparing the differences between the interest spread from Aaa to Baa-1 for both state and local bonds.

Comparing the coefficients of state and local bonds from the table did not provide a clear answer to the research question, do comparably rated state bonds incur the same interest cost as local issues. The results of the eyeballing comparison are inconsistent. State Aaa bonds have a larger coefficient than local Aaa bonds (-0.78 to -0.64), but local A bonds have a merely equally coefficient than state bonds (-0.44 to -0.46). Because of the inconsistency of this paired comparison, statistically this procedure is of little use. The T-test comparison of the spread of interest rates for state and local bonds is presented in Table 4.7. The mean difference between state and local interest rates is only -0.683 and the T-test for these two group is 0.415 and 0.401 which indicates that the difference is statistically insignificant. Comparison of these two groups of interest coefficients indicates that there is no discrimination of interest rates for or against either state or local bonds.

Table 4.7 T-test Comparison of State and Local Bonds

	Cases	Mean*	t-value	2-tail
State Group	5	-0.60	-0.87	0.415
Local Group	4	-0.56	-0.89	0.401

\* Mean difference = -0.0683

The second part of the third research question examines how credit enhancement, such as private bond insurance, affects interest cost on state bonds. Is private insurance for state bonds cost effective? Credit enhancements provide assurance to investors that debt service payment will be made in full and on time, even in the event of default. There are three major kinds of credit enhancements: letters of credit (LOCs), private bond insurance, and various state-funded programs (Lamb and Rappaport 1986; Mikesell 1995). Private insurance has dominated the bond credit enhancement market. For example, in 1993, of those issues with credit-enhancement, 91 percent used bond insurance (Tigue 1994). In order to obtain bond insurance, issuers must pay an insurance premium. The cost of purchasing bond insurance has remained relatively constant during the 1988 to 1992 period (Tigue 1994). The average insurance premium for GO bonds is in the range of 43 to 50 basis points on total of principal and interest payments. For revenue bonds, the insurance premium is in the range of 56 to 60 basis points of total principal and interest payments (Tigue 1994, 4).

Previous research suggests that the benefit of insurance on local bonds is dependent on the underlying creditworthiness of the issue (Bland 1987; Bland and Yu 1989; Braswell, Nosari, and Browing 1982; Kidwell, Sorensen, and Wachozich Jr. 1987). Some studies have found little or no savings from purchasing private bond insurance (Bland 1987; Bland and Yu 1989; Braswell, Nosari, and Browing 1982). Other research, however, found that there was a net positive benefit from having bond insurance (Call and Officers 1981; Kidwell, Sorensen and Wachozich Jr 1987). As can be seen from Table 4.6, this research on state bonds finds that insured bonds incur interest costs 41 basis points lower than the Baa-1 bonds, and this is close to the interest costs for A-rated issues. A-rated bonds are 46 basis point lower than Baa-1 bonds. This finding is consistent with previous research on local bonds, which found that insured bonds incur an interest rate more comparable to A-rated issues than Aaa-rated issues, although insured state debt has an Aaa-rating (Bland 1987). From 1987 to 1989, investors did not necessarily perceive insured state bonds to be equal to Aaa-rated bonds. As can be seen in Table 4.6, insured state bonds are rated by the bond market as only A-rated securities not Aaa-rated.

#### Research Question 4: State GO Bonds Compared with State Revenue Bonds.

Research question four seeks to determine whether state GO bonds follow the pattern of local GO bonds and have lower interest costs than revenue bonds. In order to avoid the complication of voter approval and state debt limitations, states have turned increasingly to revenue bonds since the 1970s. States issue revenue bonds through state agencies, state authorities, and special districts. General obligation bonds

are backed by the full-faith-and-credit of the state whereas revenue bonds are funded from activities that generate their own revenues; thus, revenue bonds are considered to be more risky because of their limited backing. Local government general obligation bonds usually incur lower interest than comparably rated revenue bonds (Kidwell and Koch 1983; Rogowski 1980). Research question four asks whether state bonds follow the same pattern as local bonds.

In this research, the variable of state general obligation bonds (STGO) is entered into the first regression equation as 1 when a bond is a state GO bond, and as 0 when it is a revenue bond. From previous research, it is expected that the variable GO bonds would incur a lower interest cost than state revenue bonds. As can be seen in Table 4.5, the coefficient for state general obligation bonds (STGO) is statistically insignificant. This finding indicates that state GO bonds do not incur different interest rates from revenue bonds sold by state agencies. This differs from previous studies on the comparison of local GO and revenue bonds. State bond investors evidently do not differentiate between state general obligation and revenue bonds as do investors in local bonds. This finding indicates that issuing state revenue bonds is not necessarily more costly than issuing GO bonds. This is good news for state governments that have dramatically increased their use of revenue bonds while decreasing the use of GO bonds during the past two decades.

An explanation of why there is no difference in interest costs for state GO and revenue bonds may be because risk averse investors perceive state revenue bonds generally to be supported by sounder revenue projects and to have broader and more

secure financial bases than local revenue bonds. Furthermore, the perception of investors is that state governments are more likely to aid state agencies in financial difficulties because any default may jeopardize a state's GO credit rating. In a telephone interview with Professor Thomas Keel, former director of the budget office of the Texas State Legislature, currently teaching at Lyndon B. Johnson School of Public Affairs, University of Texas, he suggested that state revenue bonds are perceived by investors to be more secure and to have a broader and sounder economic base than their local counterparts. He also agreed that any default of state agency bonds could damage the overall credit ratings of the states and as a result state officials seek to protect a state's revenue bonds.

#### Research Question 5: Comparison of Interest Costs for Various State Revenue

Bonds. In order to examine the interest cost differences among various state revenue bonds, the fifth research question seeks to answer how different types of revenue bonds of state governments perform in the market.

The increasing complexity of state debt recently has drawn attention from both scholars and practitioners. The huge increase in the amount of state debt outstanding, the increase in the number and type of state issuing authorities, and the more complex state debt management practice after enactment of Tax Reform Act in 1986 have combined to create more complexity for state governments.

Borrowing has emerged as the most expedient way to finance state capital projects. There are four major types of long-term, tax-exempt debt obligations issued



by state governments for these capital projects: general obligation debt, state revenue debt, special purpose revenue debt, and lease-backed debt (Hackbart and Leigland 1990; Regens and Lauth 1992). The first three are included in the scope of this research. State revenue bonds are generally issued by regular line departments of state governments (Hackbart and Leigland 1990, 43). States also issue so-called special purpose revenue bonds issued by a number of state entities such as an authority, special district, bond bank, association, board, corporation, and commission. Some of these bonds may be backed by the moral obligation of the state (Hackbart and Leigland 1990). The increasing number of state agencies, authorities, and special districts appears to be a means of circumventing state debt limitations (Bennett and Dilorenzo 1982; Walsh 1978). Usually, state authorities or special districts have the authority to issue revenue bonds backed by fees or charges from programs, although they do not have the power to levy taxes.

There has been little empirical analysis comparing the borrowing cost of various types of state revenue bonds. Research question five analyzed the cost of borrowing among various types of revenue bonds in state government. Do financial markets and investors view various state revenue bonds differently? In other words, do these various revenue bonds incur different interest rates? Five types of revenue bonds are classified in this research since there were a sufficient number of sales in each category that were available: state revenue bonds issued by line departments (N=10), state university bonds (N=93), state bond banks (N=22), housing authority bonds (N=40), and other state special revenue bonds (N=107). Other state special authority

bonds include revenue bonds such as transport authority, economic development authority, port authority, and those education bonds not related to a specific university. State revenue bonds issued by line departments are used as the omitted category.

A comparison of various state revenue bonds was made in the regression model.

$$\text{NIC} = f(- \text{PCGNP}, + \text{FINMAT}, + \text{MKTINT}, - \text{CALL}, - \text{NUMBIDS}, - \text{SIZE}, - \text{RATINGS}, - \text{UNIREV}, - \text{REVBDBK}, - \text{REVHSING}, - \text{REVOTHER}, - \text{INCOMTAX}(\text{REV}))$$

Results of this regression are shown in Table 4.8. The data used in model two were limited to revenue bonds only. In order to compare different state revenue bonds, a variable is entered to represent various types of state revenue bonds. There are four dummy categories in this variable: university bonds, municipal bond banks, housing authority bonds, and other state revenue bonds.

Table 4.8 Regression Results of Model Two:  
Comparative Analysis of Various Types of State Revenue Bonds

<u>Independent Variables</u>	<u>Unstandardized Coefficients</u>	<u>Standardized Coefficients</u>	<u>t value</u>	<u>p value</u>
PCGNP	0.2938	0.1397	4.125	0.0001
FINMAT	0.0403	0.4742	10.668	0.0001
MKTINT	0.9347	0.5744	17.078	0.0001
CALL	0.2214	0.0708	1.977	0.0491
NUMBIDS (logged)	-0.0056	-0.0035	-0.092	0.9270
SIZE (in 1982 million \$)	-0.1100 <sup>1</sup>	-0.0051	-0.136	0.8919
RATINGS: <sup>2</sup>				
Aaa	-0.9536	-0.2633	-5.997	0.0001
Aa	-0.4545	-0.2903	-3.899	0.0001
A-1	-0.4573	-0.2360	-3.894	0.0001
A	-0.4017	-0.2438	-3.618	0.0004
INS	-0.4177	-0.2073	-3.400	0.0008
UNRATED	-0.4053	-0.1212	-2.716	0.0071
STATE REVENUE BONDS: <sup>3</sup>				
University	0.0296	0.0197	0.226	0.8213
Bond Bank	-0.2024	-0.0773	-1.357	0.1760
Housing Authority	0.3029	0.1504	2.030	0.0434
Others Revenue Bond	0.1315	0.0900	1.044	0.2976
INCOMTAX(REV)	0.0103	0.0330	0.937	0.3498
CONSTANT	0.2119	0.0000	0.508	0.6120

Adjusted R<sup>2</sup>=0.7247

F=42.96, N=272

Durbin-Watson=1.937

<sup>1</sup> Coefficient multiplied by 1,000.

<sup>2</sup> The omitted category is Baa-1

<sup>3</sup> The omitted category is state revenue bonds

The state revenue bonds of line department are specified as the omitted category. The sample size is 272 and the adjusted  $R^2$  is 0.7247. The Durbin-Watson value is 1.937, which indicates that there is no autocorrelation problem. By comparing the results of standardized (beta) coefficients in model two, market interest rate is the most significant factors influencing net interest rate, followed by length to final maturity, credit ratings, percentage change in gross national product, housing authority, and callability.

As can be seen from Table 4.8, the interest costs of state revenue bonds issued by state line agencies were statistically insignificant from the interest costs of other state special purpose revenue bonds except state housing revenue bonds. Most revenue bond categories in this research, e. g., university revenue bonds, bond bank revenue bonds, and other state agency revenue bonds show no statistically significant interest cost difference from the omitted category, state line agency revenue bonds (see Table 4.8). The category of housing authority bonds, however, incurred 30.29 basis points higher interest than state agency bonds and is statistically significant. This may be due to the fact that risk-averse investors perceive housing authority bonds to be riskier than other revenue bonds because of the welfare nature of the program. From these results, special purpose authority bonds generally do not incur higher interest rates than state line agency revenue bonds. This result may be explained by the fact that most of the special purpose bonds are considered to have larger geographic and financial capacities to levy user fees or charges than their local counterparts. Furthermore, investors evidently feel secure with various state special purpose bonds

because of the perception that the state will seek to protect its overall state credit ratings when necessary.

Research Question #6: Impact of State Income Tax Policy. Some states have enacted an income tax differential on municipal bond yields as a means of reducing the disadvantage from state income taxes for investors in municipal bonds. The sixth research question seeks to test empirically the impact of state tax differential policies on borrowing costs of state bonds. To answer the sixth research question, the variable state income tax difference (INCOMTAX) is entered into regression models two and three to capture the impact of different state income tax policies on either state GO or revenue bonds. As can be seen from Table 4.8, regression two is to test the impact of state income tax policies on revenue bonds. Therefore, another regression model three is required to test the impact of state income tax policies on GO bonds. Model three for measuring the impact of state income tax on GO bonds is shown below:

$$\text{NIC} = f(- \text{PCGNP}, + \text{FINMAT}, + \text{MKTINT}, - \text{CALL}, - \text{NUMBIDS}, - \text{SIZE}, - \text{RATING}, - \text{INCOMTAX}(\text{GO}))$$

Results of the regression model three are shown in Table 4.9. The sample size of this model is 173 and the adjusted R square is 0.8005. The Durbin-Watson value is 1.755, which indicates that there is no autocorrelation problem.

The state income tax differential variable (INCOMTAX) is operationalized as the effective income tax on out-of-state bonds minus the effective rate on in-state-bonds. Results of the regression of the two models are shown in Tables 4.8 and 4.9.

Table 4.9 Regression Results of Model Three:  
State Income Tax Differential Impact on GO Bonds

Independent Variables	Unstandardized Coefficients	Standardized Coefficients	t value	p value
PCGNP	0.0824	0.0419	1.189	0.2363
FINMAT	0.0407	0.4044	9.806	0.0001
MKTINT	1.0510	0.6763	19.072	0.0001
CALL	0.2169	0.1144	2.844	0.0050
NUMBIDS (logged)	-0.1388	-0.0954	-2.269	0.0246
SIZE (in 1982 million \$)	-0.0004	-0.0461	-1.094	0.2755
RATINGS: <sup>1</sup>				
Aaa	-0.9787	-0.6469	-3.335	0.0011
Aa-1	-0.7967	-0.3021	-2.635	0.0092
Aa	-0.8275	-0.6265	-2.836	0.0052
A-1	-0.8450	-0.5954	-2.885	0.0044
INS	-0.2840	-0.0576	-0.844	0.3997
INCOMTAX(GO)	-0.0513	-0.2192	-5.793	0.0001
CONSTANT	0.4652	0.0000	0.908	0.3651

Adjusted R<sup>2</sup>=0.8005

F=58.50

N=173

Durbin-Watson=1.755

<sup>1</sup> The omitted category is Baa-1 bonds

It was found that state income tax differential was negative and statistically insignificant for state revenue bonds as shown in Table 4.8. However, the state income tax difference variable (INCOMTAX) was found to be negative and statistically significant for state GO bonds as shown in Table 4.9.

For GO bonds, this finding indicates that the states with discriminatory income tax policies have lower interest costs than those states without discriminatory tax policies. In other words, this tax differential practice increases in-state investor buying of more in-state bonds. For revenue bonds there is no significant difference between states with or without discriminatory tax policies, as shown in Table 4.8.

The finding concurs with the theory of market segmentation which states that interest rates differ because of differences in perceived risk, maturity, and tax treatment (Kidwell and Koch 1982; Kidwell and Koch 1983; Hendershott and Kidwell 1978). With tax differential treatment, the market for state GO bonds is segmented (Cunningham 1989). However, it was found that the state tax differential policies did not lower interest of state revenue bonds despite the fact that these policies also apply to revenue bonds. This may be due to several reasons. Since the passage of Tax Reform Act in 1986, commercial banks are prevented from deducting interest income from tax-exempt bonds except for certain "bank qualified " GO bonds (Petersen 1987; Zimmerman 1991). The loss of this incentive for purchasing tax-exempt revenue bonds reduced the demand for these bonds from commercial banks. Second, the information cost of investors searching for revenue bonds is greater than for GO bonds because the financing practices of revenue bonds generally are more diverse and

complex. Therefore, the preferential state personal income tax treatments on state revenue bonds are offset by the cost of the information search of revenue bonds. As a result, the state income tax differential treatment does not make a difference on the interest cost of revenue bonds.

In summary, the following can be stated about the variables considered in this research. Economic factors (percentage change in gross national product, PCGNP; and market interest rate, MKINT) affect state bond interest rates significantly. Credit ratings as expected also were found to be a significant factors affecting state bonds interest cost. Among the issue characteristic variables, callability and final maturity were found to be significant factors. Two other issue characteristic, number of bids and issue size, however, were found not to be significant factors affecting interest rates of state bonds. The political factors used in the research such as issue entities and differential state income tax policies were not as significant as expected. There were two unexpected results, namely, that state GO bonds and revenue bonds incurred no difference in interest costs, and that differential state income tax policies affected interest on GO bonds but not revenue bonds.

The next chapter discusses the findings, implications and makes policy recommendations.



## CHAPTER V

### SUMMARY, FINDINGS, AND POLICY IMPLICATIONS

This chapter presents a summary and conclusion, and discusses policy implications from the research. The policy implications are presented for both state policy makers as well as for financial administrators. This chapter also considers limitations on the study and makes suggestions for future research.

States have faced increasing fiscal pressures since the late 1970s. The tax revolt movement, which began in the late 1970s, was followed by major changes and reductions in federal grants-in-aid in the 1980s. At the same time, states were facing increasing demands as a result of aging state and local infrastructure and ever-increasing demands for more services. Furthermore, enactment of the Tax Reform Act of 1986 dampened already worsening state financial conditions by limiting the issuance of tax-exempt bonds. Issuing debt has become the most expedient way to provide states with new capital finance. The amount of outstanding long-term state bonds increased tremendously throughout the last three decades. This rapid borrowing trend has drawn attention and concern from both academicians and practitioners. The need for a better understanding of the cost of state debt and the factors influencing state debt has become widely recognized. This research focused on the factors influencing the cost of state debt.

### Summary of the Study

The major purpose of this research is to explore the determinants of interest cost for state bonds. Various kinds of variables pertaining to issue characteristics, market characteristics, economic conditions, and political variables were statistically tested to see their impact on the interest cost of state bonds. A number of studies have focused on the factors influencing interest costs of local government bonds, but these factors have not been empirically studied for state bonds. Scholars have identified such variables as the market rate of interest, percentage change of gross national product, callability, term to final maturity, number of bids, and credit ratings to be significant in determining interest cost for local debt. In this research, those variables found to be significant for local bonds, as well as some factors unique to state bonds, e.g., the various state agencies issuing bonds and the effect of different state income tax policies on state bonds were tested. A secondary purpose of this research is to explore concepts from various academic disciplines that may provide further insights into public borrowing and the variables that influence the cost of state borrowing.

### Research Questions

Six research questions guide the study. The following questions were raised:

Previous research has found that the cost of local bonds is affected by such factors as market interest rate at the time of sale, percentage changes in gross national product, callability, final length to maturity, and the number of bids. The first question sought to determine if these variables affecting local government bonds also influence the interest cost for state bonds.

The second research question examines the effect of issue size. To what extent does issue size affect state bond borrowing cost? Does it portray the characteristic U-shaped pattern similar to local government bonds, where the cost of interest decreases as the size of a bond issue increases up to a certain point where economies of scale are lost and costs begin to increase (Benson et al. 1981)?

Third, does the bond market view state bonds the same as comparably rated local government bonds? In other words, do A-rated state bonds incur the same interest cost as A-rated local bonds or is the interest spread from Aaa to Baa-1 the same for state and local bonds? If state and local bonds incur different interest rates, what explains the difference?

Fourth, do state GO bonds incur the same interest cost as state revenue bonds? Previous research found that the borrowing cost of local GO bonds is lower than that for local revenue bonds (Kidwell and Koch 1982; Rogowski 1980). Is this pattern also true for state bonds?

Fifth, state revenue bonds are issued by various state agencies, such as state housing authorities and universities. Does the bond market respond in the same way to various types of state revenue bonds?

The sixth question guiding this study examines whether state personal income-tax policies affect state borrowing costs. Do interest costs for state bonds vary between states with policies granting a partial or full exemption of bonds from income taxation and those without such policies?

Three multiple regression models were employed to answer these research questions. Four categories of variables were included in these regression models: (1)

economic factors, such as percentage changes in gross national product and market interest rate; (2) underwriter competition, such as the number of bids submitted for an issue; (3) bond issue characteristics, such as the number of years to final maturity, size of the issue, callability, and the quality of bonds measured by credit ratings. In addition, several political factors unique to state bonds were included. Factors relating to different types of state agencies issuing state bonds, and various state income-tax policies made up the fourth category of variables used in the regression models. The data were collected from the Daily Bond Buyer competitive post sale index for the years 1987, 1988, and 1989.

#### Findings of the Study

Findings from my research suggest that state bonds perform differently in financial markets from their local counterparts and the determinants of interest are somewhat different for state and local bonds. The major findings are summarized as follows:

(1) The variables affecting local government bonds such as callability, term to maturity, and the market interest rate have a similar influence on state bond interest as their local counterparts. On the other hand, the percentage change in GNP, the number of bids, and issue size of bonds do not influence state bonds in the same fashion as they impact local bonds.

(2) It was found that issue size, which is a significant factor affecting interest cost on local bonds, is not as significant for state bonds because state issues usually are larger and attract investors from across the nation. State bonds, as a result, do not

follow the same U-shaped pattern as local bonds.

(3) Credit ratings were found to be very significant determinants affecting interest costs for both state and local bonds. The spread for interest between the highest and lowest state bond ratings (Aaa and Baa-1) in this data set are not significantly different from their local counterpart. This indicates that both state and local bonds are affected by credit quality. Earlier research had found that the higher the credit rating, the lower the interest cost and vice versa. This pattern also holds for state bond.

(4) One of the surprising findings of this research is that there is no significant difference in interest rates for state general obligation bonds and revenue bonds. From previous research of local bonds, it has been found that local general obligation bonds incur lower interest rates than revenue bonds because investors' risk aversion tendencies lead them to general obligation bonds that are legally backed by the full-faith-and-credit of local governments. Although the same results for state bonds were expected, this research did not find this pattern for state revenue bonds. This finding may be due to the fact that investors perceive state revenue bonds generally to be supported by sounder revenue projects and to have broader and more secure financial bases than local revenue bonds. Furthermore, the perception of investors may be that state governments are more likely to aid state agencies in financial difficulties because any default may jeopardize a state's credit rating.

(5) State revenue bonds are issued by state agencies with different purposes, such as state universities, housing authorities, state bond banks, etc. My finding indicates that there is no significant interest difference among types of state revenue bonds with

same credit ratings with the exception of housing authority bonds. Financial markets treat various state revenue bonds alike. Evidently, investors feel more secure with state revenue bonds regardless of different issuing entities because of the perception that state revenue bonds have broader and more secure resources.

(6) States with income-tax policies that discriminate in favor of in-state bonds have lower interest cost for general obligation bonds than states without such policies. This indicates that preferential state personal income tax treatment of in-state bonds encourages in-state investors to purchase more in-state GO bonds. The finding concurs with the theory of market segmentation which states that interest rates differ because of a difference of perceived risk, maturity, and tax treatment (Kidwell and Koch 1983; Hendershott and Kidwell 1978). With tax differential treatment, the market for state GO bonds is segmented (Cunningham 1989). However, it was found that the state tax differential policies did not lower interest of state revenue bonds despite the fact that state tax policies also apply to them. This may be explained in several ways. Since the passage of the Tax Reform Act in 1986, commercial banks were prevented from deducting interest income from tax-exempt bonds (Petersen 1987; Zimmerman 1991). The loss of this incentive for purchasing tax-exempt bonds, particularly revenue bond, reduced demand for state bonds from these commercial banks. Second, the information cost of investors searching for revenue bonds is greater than for GO bonds because the financing practices of revenue bonds generally are more diverse and complex. Therefore, the preferential state personal income tax treatments for revenue bonds are offset by the cost of the information search of revenue bonds. As a result, the state income tax differential treatment does not make

a significant difference on the interest cost of revenue bonds.

### Implications of the Findings

This study contributes to an understanding of the factors influencing the interest cost of state bonds. In the fiscal crisis facing the nation, states have emerged as vital middlemen in this complex intergovernmental fiscal system. States must be able to borrow funds at reasonable interest rates in order to implement essential public policies. Despite the significance of state borrowing, little recent research has focused on state debt or the determinants of interest costs. Knowledge of determinants of interest costs of state debt is one of the lesser understood areas of state and local finance. Knowledge of how these factors affect interest rates on state bonds is vital to both policy makers and academicians attempting to understand the workings of our federal system. By advancing understanding of the factors affecting interest cost of state bonds, this study may ultimately help state governments to better respond to the investment market and reduce interest costs by adjusting their strategies for financing long-term debt. Some implications can be drawn from these findings:

(1) Some factors derived from local bond research have a similar influence on state bonds, such as callability, term to maturity, and the market interest rate. It is important for state officials to recognize the significance of these factors when designing and structuring bond issues. Officials need to evaluate and compare the cost of using or not using these variables in structuring state bonds. The research also shows that market interest rate has an important impact of the interest rate on state bonds. A financial consulting firm may help state officials predicting and selecting a

proper time for issuing bonds.

(2) The variable of percentage change in gross national product is a significant factor influencing state interest cost. Since most state bonds are sold in the national market, national economic conditions have an impact on the interest rate of bonds. This finding indicates that when the national economy prospers, demand increase in the capital market, thus it drives up the market interest rates and the bonds interest rates accordingly. Since most state officials can not closely monitor changes in the economy and in financial markets, outside advisors are recommended to advise them on a proper timing for debt issues. The number of bids and issue size of bond do not influence state bonds in the same fashion as they influence local bonds. The number of bids and size of state bond issue do not influence interest costs of state bonds as these factors do for their local counterparts because states bonds usually are larger and have better marketability.

(3) Maintaining a good credit rating is essential to states because credit ratings consistently have been found to influence interest rates. This implies that states must manage their debt in such a way as to protect the credit ratings of all state entities issuing debt. It may be that more centralized debt management, which can monitor and regulate the host of debt issuing state entities is needed.

(4) Insured state bonds were not valued as Aaa bonds in financial markets, instead they were treated only as A-rated bonds. As a result, insurance benefits only bonds with Baa-1 ratings. Since state bonds are rarely rated below Baa-1, insurance is not a cost-effective device for state bonds.

(5) There is no statistically significant difference between the interest rates of



state revenue bonds and state GO bonds for 1987-1989. This suggests that issuing state revenue bonds is not necessarily more costly than issuing GO bonds. Since issuing state revenue bonds do not require voters approval, states may use revenue bonds advantageously to finance needed state services and capital projects.

(6) State income-tax differential policies lower the interest cost of state general obligation bonds by 5.13 basis points. My finding concurs with the previous research (Burcato et al. 1991; Kidwell, Koch, and Stock 1984). Kidwell et al. (1984) found that the estimated coefficient of tax differential variable lower the interest cost by 3.6 basis points. I also found that tax differential policies do not lower the interest cost of state revenue bonds. Since most state bonds are issued as revenue bonds, therefore, it is suggested that state officials critically evaluate and compare the benefits of lowering borrowing cost against the loss of state income tax revenues from subsidizing in-state residents.

### Policy Recommendations

Most academicians and state practitioners usually consider state and local bonds together for empirical analysis. State and local bonds are expected to perform in a similar pattern in the financial marketplace. In fact, much of the previous research has treated state bonds as being identical to local municipal bonds. This research finds that state bonds perform somewhat differently in the financial market from local bonds. It is important, therefore, that state policy makers and financial administrators recognize the differences in order to better manage state debt.

Credit ratings are important factors in deciding interest cost both in state and

local bonds. This finding concurs the earlier research that the higher the credit rating, the lower the interest cost and vice versa. It is important that states maintain good credit ratings for all of the state agencies issuing debt. A financial management system for reviewing, approving, and monitoring state debts, such as the Texas Bond Review Board created in 1987 is an example of how states may help to ensure good credit ratings. Furthermore, private insurance was found to be cost-effective only with bonds rated of Baa-1 or less. It is recommended that state financial officials consider the cost of insurance premiums in their decision making process. In other words, if the cost of insurance premiums exceed estimated interest savings from insurance, the issuers should not consider purchasing of insurance.

One important finding of this research is that state GO bonds do not necessarily incur lower interest cost than state revenue bonds. This is a significant finding for state financial officials as most state long-term debt today is issued as revenue debt through various agencies. Whether states should issue general obligation or revenue bonds is a political decision by state policy makers. The general rule of thumb is that general obligation bonds are used to finance projects which benefits the overall public. Revenue bonds are to finance specific projects which benefits only a certain group of citizens. This finding indicates that issuing state revenue bonds do not necessarily cost more than GO bonds, therefore, states may should flexibly and timely utilize revenue bonds.

I also found that the financial market values different types of state revenue bonds equally, with the exception of housing authority debt. It appears that investors perceive that various state revenue bonds with the same credit ratings are equally

secure. This finding also suggest a need for a more centralized state debt management system which regulates and monitors issuing processes for all state revenue bonds regardless of the type of issuing agency because any default by a state agency may affect the state's GO rating.

State income tax differential policies do encourage investors to purchase more in-state GO bonds. State GO bonds in states with such policies incurs a 4 basis points lower interest rates. This indicates that state can use personal income taxes policies to lower in-state borrowing cost of GO bonds. State income tax differential policies, however, do not lower the interest of state revenue bonds. Since far more state bonds are issued as revenue bonds than GO bonds, state officials need to critically evaluate the cost-effectiveness of this policy since they may be losing income tax revenues by subsidizing in-state residents through the process of waiving their income tax on state bonds. Improvements in state capital planning and debt management policies may result in strengthening state financial conditions, and thus it may improves the state's credit ratings. This may be a more cost-effective method for attracting investors across the nations than providing a differential income tax benefits.

#### Limitations and Suggestions for Future Research

Obtaining data concerning state bond sales is difficult and costly because this information can be obtained only from private financial companies; as a result, the range of this research is limited to three years. However, this does not undermine the validity of these findings since these three years are representative normal years of general state bond sales. Neither the Tax Reform Act of 1986 nor the 1988 South

Carolina Supreme Court case changes the pattern of municipal bond sales covered in our research. In 1986, the volume of long-term state bonds sale peaked at \$206.9 billion as issuers rushed to issue bonds before the passage of the tax reform Act of 1986. After the passage of the act, the volume returned to normal at \$ 98.7 billion of 1987, \$117.7 billion in 1988, and \$125 billion in 1989 (Bond Buyer 1994 Yearbook). Second, the data of each state bond sale were collected according to the date of each bond issued. Therefore, the data are not systematic across states or distributed uniformly across time. This inconsistency disallows the use of pooled cross-sectional analysis for this research.

There is no overarching concept or model to explain the cost of state debt. Many different theories or concepts contribute to the understanding of different phases of the debt issuance and determinants of cost of debt, but none of these theories alone explain the cost of debt. Therefore, an interdisciplinary study among political science, public administration, economics, and finance is recommended to fully explore this area and hopefully develop a more comprehensive model or theory to provide us a better picture of the public borrowing and cost determinants of state debt.

This study is vulnerable to the criticism that only a few state factors are used in the study. There is no clear agreement as to what factors need to be considered in this type of research because there is a lack of an overarching framework for guiding research on the cost of state debt. Little research has been done in the area of cost of state debt. Although several political factors are included in this study, more factors relating to state government and politics may enhance the research. Such political factors as state partisan politics, state interest group politics, and state socioeconomic

factors (e.g., state gross domestic product, state debt burden, demographic variables, etc.) all may be factors in future studies of the cost of state debt. Without a more comprehensive framework, there is no definite way to determine what variables need to be considered.

Little research has examined the impact of political structures, legal constraints, and the willingness of state officials to issue debt on state borrowing costs. The increasing popularity of revenue bonds, is to a large degree due to the fact that they may be issued without the voters' approval which must be obtained for GO bonds. Research on the impact of political structures, legal constraints, and the willingness of the state officials to issue debts therefore is needed.

The question of what type of state financial management structure ensures the most effective and efficient operations of state debt has not been examined. Whether states should adopt a centralized or decentralized debt management system obviously is a political decision where further research can help policy-makers. It is recommended that states cooperate through the Council of State Governments to undertake the needed survey and to determine effective ways to plan and implement capital budgets, issuance of bonds, and debt management of states.

## APPENENDIX A

## EFFECTIVE STATE TAX DIFFERENTIAL (%)

State Name	(%)	State Name	(%)
Alabama (AL)	3.67	Montana (MT)	9.12
Alaska (AK)	*	Nebraska (NE)	4.25
Arizona (AZ)	5.94	Nevada (NV)	*
Arkansas (AR)	5.04	New Hampshire (NH)	3.60
California (CA)	6.70	New Jersey (NJ)	2.52
Colorado (CO)	3.60	New Mexico (NM)	*
Connecticut (CT)	8.64	New York (NY)	6.03
Delaware (DE)	5.54	North Carolina (NC)	7.41
Florida (FL)	0.99	North Dakota (ND)	2.82
Georgia (GA)	5.08	Ohio (OH)	4.97
Hawaii (HA)	6.48	Oklahoma (OK)	**
Idaho (ID)	5.90	Oregon (OR)	6.48
Illinois (IL)	**	Pennsylvania (PA)	5.41
Indiana (IN)	1.13	Rhode Island (RI)	4.63
Iowa (IA)	**	South Carolina (SC)	5.04
Kansas (KS)	4.39	South Dakota (SD)	*
Kentucky (KY)	6.67	Tennessee (TN)	4.32
Louisiana (LA)	4.42	Texas (TX)	*
Maine (ME)	5.76	Utah (UT)	*
Maryland (MD)	5.40	Vermont (VT)	5.04
Massachusetts (MA)	7.20	Virginia (VA)	4.14
Michigan (MI)	3.60	Washington (WA)	*
Minnesota (MN)	6.12	West Virginia (WV)	4.68
Mississippi (MS)	5.83	Wisconsin (WI)	**
Missouri (MO)	4.32	Wyoming (WY)	*

Note: \* State that do not tax interest income in municipal.

\*\* State that do not tax interest income on in-state and out-of-state municipal.

Source: Burcato, Peter F., Ronald W. Forbes, and Paul A. Leonard. 1991. "The Effect of State Tax Differentials on Municipal Bond Yields." Municipal Finance Journal 12:59-69. Exhibit 2.

## APPENDIX B



## STATE CODES

State Name	Code	State Name	Code
Alabama (AL)	1	Montana (MT)	28
Alaska (AK)	2	Nebraska (NE)	29
American Samoa (AS)	3	Nevada (NV)	30
Arizona (AZ)	4	New Hampshire (NH)	31
Arkansas (AR)	5	New Jersey (NJ)	32
California (CA)	6	New Mexico (NM)	33
Colorado (CO)	7	New York (NY)	34
Connecticut (CT)	8	North Carolina (NC)	35
Delaware (DE)	9	North Dakota (ND)	36
District of Columbia(DC)	10	Ohio (OH)	37
Florida (FL)	11	Oklahoma (OK)	38
Georgia (GA)	12	Oregon (OR)	39
Hawaii (HI)	13	Pennsylvania (PA)	40
Idaho (ID)	14	Puerto Rico (PR)	41
Illinois (IL)	15	Rhode Island (RI)	42
Indiana (IN)	16	South Carolina (SC)	43
Iowa (IA)	17	South Dakota (SD)	44
Kansas (KS)	18	Tennessee (TN)	45
Kentucky (KY)	19	Texas (TX)	46
Louisiana (LA)	20	Utah (UT)	47
Maine (ME)	21	Vermont (VT)	48
Maryland (MD)	22	Virginia (VA)	49
Massachusetts (MA)	23	Virginia Island (VI)	50
Michigan (MI)	24	Washington (WA)	51
Minnesota (MN)	25	West Virginia (WV)	52
Mississippi (MS)	26	Wisconsin (WI)	53
Missouri (MO)	27	Wyoming (WY)	54

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