FEDERAL BUDGET DEFICIT FINANCING EFFECTS ON
FIRM'S CHOICE OF DEBT AND EQUITY

by

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Thesis directed by Professor Bárbara J. Robles

Does debt financing of the deficit make equity financing for firms more attractive? Benjamin M. Friedman (1986) argues that it does. The model in this paper examined whether the predicted nominal quantity side of the financing story corresponds with the pricing results Friedman found. Without delving into substitutability and risk measurement issues, the thesis revealed the impact of the link between the government financing decision and the corporate financing decision.

Government deficits, by themselves, crowd out all corporate financial instruments. Financing that deficit and debt with long term government bonds increases the severity of the crowding out effect. In contrast, however, short term financing can more than overcome the crowding out effects of budget deficits. Further, with the proper mix of long and short term instruments, the Treasury can exactly offset the crowding effects of deficits, rendering them portfolio neutral.

The graphical depiction of the data examined suggested that Friedman's model should have failed. Friedman's model did not fail, but as he recognizes, the financial markets have changed. These changes make his model appear to fail. Adjusting his model by accounting for the changes in the financial markets, as this study has done,
reconciles the model with the graphical analysis and adds a nominal quantity result for the implications of the theory.

These results are significant on two fronts. First, the analysis avoided the thorny issue of prices and still made the case for the government's role in debt and deficit management. Secondly, in contrast to proponents of the crowding out argument, high deficits have not diminished the corporate sector's ability to pursue either equity or debt financing. The corporate sector and the financial markets have demonstrated their versatility in the way they have adjusted to the size of government deficits and to the financing mix employed.
I gratefully acknowledge the encouragement and support I received from my family, thesis advisor, and committee. My wife Sandy and my boys, Matt and Tim, provided a constant reminder that my most important role is that of a husband and father. I agree with a popular notion that an individual’s accomplishments partially define who they are and the standards by which they live. For me, however, an accomplishment means nothing if, in the process, I fail to devote time and energy to the people without whom I will surely lose my identity. I will have nothing if my children cease looking to me as their role model and my wife cannot find her best friend by simply casting her glance my way. My work, how I perform it, and what others make of it is important. It pales in comparison, however, to my first priorities. Only through the support of my family can I perform my work in such a manner that it merits recognition.

As for my work, I extend a heartfelt thanks to Professor Robles for her enthusiasm for my topic and for her seemingly boundless energy to review and criticize the countless revisions I submitted. Professor Zax and Professor Kaempfer, provided additional, insightful economic intuition that, together with the suggestions from Professor Robles, dramatically strengthened the model, arguments, and results.

Finally, I gratefully thank my parents and my brothers and sisters. My parents provided me with the thirst for seeking knowledge and the principles to proceed in a manner that dignifies the search. My brothers and sisters served as my own fan club, as we do for each other. We love to see each other succeed, but we also compete with each other enough to ensure that we push ourselves to our limits. Thanks!
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Introduction

Does debt financing of the deficit make equity financing for firms more attractive? Benjamin M. Friedman (1986) argues that it does. Based on the large increase in government deficits, the trend by corporations to use more debt financing, and the changing capital markets after 1979, more research must take place to better understand the relationship between the method the government uses to finance its deficits and the corresponding effect on firms' choice of debt and equity instruments to finance capital formation. This thesis examines the linkage between the borrowing activity of the federal government and the financing decision of the corporate sector. To do this, the study proposes a reduced form model to capture the linkage, without employing a microtheoretic optimizing model for the substitutability between the various instruments, per se. Instead, the linkages between government, the financial sector, and the corporate sector rely on the circular flow of the national income identity for the marcoeconomy.

The second question on which the paper focuses concerns an equally important issue: in financing federal budget deficits, do we experience portfolio crowding out, or any significant disruptions in the financial markets? One crowding out argument might proceed accordingly: since the government finances its large budget deficits primarily with debt instruments, this activity floods the financial market with bonds. The first thought is that this action by the government "dries up" the market for debt instruments. Corporations must respond by offering higher returns on their debt
instruments, or substitute into some other financial instrument to sustain their investment activity. The conclusion of this bond "portfolio crowding out" story rests on the assumption that investors must absorb all of the financial instruments to clear the market. As a result, corporations must pay a higher price to finance investment with debt versus equity.

This is only one such story. Other implications for the impact of government financing activity also exist. Because of the indeterminate conclusions of the crowding out argument, economists must obtain more concrete evidence before strongly advocating certain government policies with respect to the deficit and the method of financing that deficit? To entertain the questions raised in this introduction, the paper will focus on one specific government deficit financing issue: how do corporations respond to the method of financing the government chooses in financing its annual budget deficits?

The study will examine the annual level of new corporate debt issues relative to new corporate equity issues from 1947 through 1992. Based on the data and the model employed, this study finds evidence from a nominal quantity analysis that supports the price relationship Benjamin M. Friedman (1986) proposed. Friedman (1986) suggests that regardless of debt maturity, financing government budget deficits by issuing debt instruments (as opposed to printing new money), lowers the expected return on equity relative to the returns on long and short term corporate debt. This implies that during periods of debt financed deficits, financing corporate capital
formation should favor equity, including retained earnings, more than debt instruments. If this relationship holds, then how do we explain the increased reliance by corporations on debt versus equity financing during the 1980's? As Figure 1 shows, after 1980, corporations relied much more heavily on debt financing relative to equity financing, even when federal budget deficits exceeded $200 billion.¹

The large deficits, according to Friedman's result, should have made equity financing far more attractive to corporations than debt instruments. From the graph in Figure 1, the budget surplus as a percentage of GDP has a rather obvious downward trend. In contrast to Friedman's model, however, since 1983, corporations have tended to favor debt relative to equity in their financing activity. Since 1947 the chart in Figure 1 shows that the annual budget deficits have grown as a percentage of GDP, from a surplus of 4.53% in 1948 to a 6.1% deficit in 1983 (Johnson, 1993). Financing this growth in annual deficits with debt instruments should have made equity an increasingly more attractive financing instrument for corporations. Therefore, some other market force must have motivated this conflicting result.

Figure 1: Federal budget surplus (deficit) and corporate financing mix.
To critically study the issues presented in the introduction, Chapter 1 first reviews the pertinent literature. The literature review focuses most heavily on the work of Friedman (1978, 1983, 1985, 1986, and 1993), along with some other literature offering alternative arguments to Friedman's conclusions. Chapter 2 presents a basic theory to predict the ratio of new corporate debt issues to new equity issues. Chapter 3 describes the data employed, its source, and the collection method. Chapter 4 reports and critically interprets the empirical estimation of the theory. The thesis concludes with a summary of the results obtained and final comments on the direction in which future research should proceed.
Chapter 1: Literature Review

Crowding Out or Crowding In

Friedman introduced the issues confronting debt and deficit management in a seminal article published in 1978 in the Brookings Papers on Economic Activity. The motivation for his paper emanated from political rhetoric in the 1976 presidential race and in the prelude to the 1980 presidential campaign regarding large government deficits and a need for a balanced budget. In the paper, he looked for evidence of crowding out or crowding in resulting from annual government budget deficits from 1946 through 1977. His professed objective was to correct misunderstandings on how debt financed deficits affect the economy: “Debt-financed deficits need not crowd out any private investment, and may even crowd in some” (Friedman, 1978).

Friedman’s focus is with the financial aspects of government spending. He agrees with the central, full employment theory of crowding out. If the supply of goods and services is fixed, with full employment, the government can crowd out real private sector activity by increasing its share of the total supply of goods and services. This is the widely accepted “forced savings” crowding out story (Friedman, 1978). Crowding out occurs when there is a “reduction in investment that results when expansionary fiscal policy raises the interest rate” (Mankiw, 1992). On the other hand, with less than full employment, if the government increases its supply of goods and services, this increase “can stimulate investment in productive capacity and thereby increase real private spending” (Friedman, 1978). He remarks that the Congressional
Budget Office refers to this stimulus effect as crowding in. Neither of these arguments for real activity, crowding out or crowding in, discusses the financing decision to issue interest bearing debt versus printing money. Friedman argues that possible "financing crowding out' can take place independently of 'real crowding out,' and therefore can occur even if the economy is at less than full employment” (Friedman, 1978).

Presumably, when the government expands fiscal policy by deficit spending, it must finance that deficit in some manner. The financial crowding out story here is that when the government issues a certain maturity of bond, investors will first purchase these relatively less risky investment instruments. Any investment capital left over will be available to purchase corporate securities. A possible portfolio crowding in story would suggest that by issuing a certain type of debt instrument, the government could make corporate debt more attractive. The market would absorb both, and the government's debt issue actually encourages more corporate debt issue.

Friedman organizes his study into three sections. The first section focuses theoretically and empirically on the Hicks (1937) theory of transactions crowding out with familiar IS-LM analysis. In short, Friedman finds that with "unaccomodative monetary policy, transactions crowding out offsets some part of the effect of fiscal policy on income” (Friedman, 1978). If the interest elasticity of spending is perfectly inelastic, a vertical IS curve, then transactions crowding out will offset none of the effect of fiscal policy on income. Likewise, if the interest elasticity of money demand is perfectly inelastic, a vertical LM curve, then transactions crowding out offsets all of
the fiscal policy effect on income. In his empirical calculations, Friedman finds that the
long run offset is greater than the short run, and that the offset is greater when
monetary policy affects $M_2$ more than $M_1$. The long run versus short run results differ
due to varying the different interest rates employed (e.g., Treasury Bill versus
Treasury Bond), and the crucial sensitivity of the IS-LM model to the interest rate
employed.

In the second section, Friedman discusses the “portfolio crowding out” issue
central to Milton Friedman’s research. This is perhaps the most crucial section of the
paper, both theoretically and empirically. His findings conclude that portfolio
crowding out occurs when the “ratio of the substitution coefficient between bonds and
money to the substitution coefficient between bonds and capital” (Friedman, 1978) is
less than the ratio of the wealth coefficients of the demand for money and capital. In
short, portfolio crowding out occurs when the motivation for individuals to hold
money for portfolio purposes is stronger than holding money for transactions reasons.
If, however, individuals hold money more for transactions purposes, then portfolio
crowding in can occur. Empirical evidence provides little support for the notion that
money has a zero wealth elasticity, and therefore eliminates the possibility of portfolio
crowding out. Additionally, if bonds and capital are perfect substitutes, then portfolio
crowding in cannot occur.

In the third and final section, Friedman examines portfolio substitutability
measures. The aim of this analysis is to define the government’s role in partially
determining crowding in or crowding out based on the duration of the debt instrument chosen to finance its deficits. This third section makes a theoretical argument to define the conditions under which the government can influence the occurrence of portfolio crowding out or crowding in. Friedman's theoretical conclusions find that:

As long as there exists (or could be created) at least one government debt instrument (a short term bond) with a relative substitutability index greater than the key ratio of the respective wealth responses of money and capital and at least one (a long-term bond) less than the ratio, debt-management policy can determine which effect -- portfolio crowding out or crowding in -- results from financing deficits, and how much. Long term financing leads to crowding out, while short term financing leads to crowding in (Friedman, 1978, pp. 639-40).

Friedman recommends that the Treasury should "meet its financing requirements ... that it denies, not satisfies, the demands of investors for long-term securities, thereby stimulating the public to turn to the corporate business sector for more new [equity] issues" (Friedman, 1978). The object of a debt management policy should focus on "keeping the market hungry for long-term assets, not merely to avoid overfeeding it" (Friedman, 1978).

Many of his policy implications need updating, however, because the period Friedman examined witnessed its largest annual deficit of $70.6 billion (3.36% of GDP) in 1975, while during the 1980s, the federal government ran budget deficits in excess of $200 billion (Johnson, 1993). The largest deficit as a percentage of GDP was in 1983, 6.1% ($207.76 billion). The largest single annual budget deficit was in 1992 at $290.4 billion (4.81% of GDP) (Johnson, 1993).
Substitutability Measures

The empirical work for calculating the substitutability elasticity between debt and equity come from Friedman’s 1985 paper. In this paper, Friedman empirically investigates the degree of substitutability between debt and equity securities in the United States. His primary concern focused on the stability of the elasticity measures over time. Friedman examined quarterly, after tax, nominal return data from 1960 through 1980 in a utility maximizing model. In his discrete-time, single-period model, Friedman proposes a representative investor that attempts to maximize expected utility. The investor derives utility exclusively from wealth accumulation, and wealth increases as the representative household “correctly” adjusts its portfolio in response to changes in asset returns. Friedman inferred the substitutability measures from the portfolio changes the representative household made.

The assets that composed the household’s portfolio included stocks, long term debt, short term debt, and cash balances. The debt categories included government debt instruments, but Friedman did not attempt to measure the effects of government deficit financing. In short, he found that there is little evidence to draw any strong conclusions about the sign of the substitutability between short term debt and equity (Friedman, 1985, p.225). Long term debt and equity register as substitutes, although the magnitudes are extremely small relative to the implied measures suggested by the variance-covariance matrix (Friedman, 1985). He remarks that this paper did find “sharply changed optimal substitution responses of the demand for debt and equity to
their respective expected returns" between the 1960s and 1970s. Perhaps the most perplexing result this study produced was that expected asset returns and variance-covariance structure do not correspond to household perceptions. Investors consistently anticipated more favorable returns than were actually realized (Friedman, 1985).²

In a 1986 paper, Friedman considers how the government deficit financing choice affects the structure of expected returns. In this study, he relies on his 1985 empirical methodology to predict price effects (reflected in the rates of return) resulting from government deficit financing activity. The model in the 1986 study, however, examines the empirical results by using three different methods of incorporating risk perceptions as well as adding the effects of government deficit financing. The three methods of measuring risk perceptions are simple inspection of returns (technique employed in his 1985 paper), continually updated forecasting regressions, and survey expectations.

Although the magnitudes differ slightly, Friedman reports results that are consistent across the three various measures of risk perception. In short, he finds that regardless of debt maturity, financing government budget deficits by issuing debt instruments (as opposed to printing new money), lowers the expected return on equity

² The specific elasticity measures from this particular paper are not extremely important for Friedman's work and this paper's focus on how government deficits impact the structure of returns. Rather, the primary purpose for reviewing this paper is the methodology Friedman used to measure substitutability elasticity reported in this paper. He uses the same methodology in a subsequent paper that attempts to model the impact of government deficits, as well as employing different techniques for measuring risk and return perceptions.
relative to the returns on long and short term corporate debt.\textsuperscript{3} Friedman's results suggest that by financing annual deficits by issuing short term debt lowers the return on long term corporate debt, but lowers the return on equity by even more. On the other hand, financing the deficits by issuing long term debt raises the return on long term corporate debt and lowers the return on equity. All of these relationships are relative to the return on short term corporate debt. As a result, with higher levels of government deficits, when the government issues debt to finance its deficits, the returns to equity fall in comparison to all other corporate financial instruments. This implies that debt financing of increasing annual budget deficits should influence corporations to use ever increasing amounts of equity relative to debt to finance their investment activity.

The results crucially depend on relative asset substitutability, which in turn depends on the perceived risk associated with the return on the various assets. Friedman readily admits that perceived risk is extremely difficult to measure, if not impossible. Nevertheless, he concludes that government deficit financing has a very definite effect on the market clearing expected returns to debt and equity. Debt financing of the deficit makes equity financing a more attractive instrument to corporations.

\textsuperscript{3} See Friedman (1986) for the parameter estimates. This paper is not so much concerned with the parameter values Friedman estimated, as it is with the statistical significance of the relationships that may, or may not exist, between the government's financing choice and how corporations' adjust their use of debt and equity in financing capital formation.
From the chart in Figure 2, it may not be so obvious, but the government has been financing its deficits with more short term than long term debt. According to Friedman's calculations, this should have made equity even more attractive than if the government had used longer term financing. As demonstrated in Figure 1, and again here in Figure 2, corporations have been issuing more debt than equity in their financing activity.

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Figure 2: Government financing mix and corporate financing mix.
Additionally, based on his data, Friedman (1986) proposed a linear relationship between the deficit financing level and the impact on the structure of returns. For example, his data imply that financing a $100 billion deficit with long term bonds lowers the return on equity by .24% and raises the return on long term debt instruments by .1% relative to short term debt instrument returns. Friedman then argues that to obtain the predicted results from financing a $200 billion deficit, you need only double the results indicated above: equity returns fall by .48% and long term debt returns increase by .2% relative to short term rates.

The predicted drop in the return to equity (rents the firm faces for equity financing) is an extremely large number when multiplied by the size of the average annual rate of gross private domestic investment. Most economists believe that it is a significant event when the Federal Open Market Committee decides that they need to adjust the discount or funds rate by .5%. By incurring a deficit of $200 billion, financed with short term debt, the federal government has just lowered the relative price of equity for corporations by approximately .5%. This should cause a noticeable shift to equity, especially when gross private domestic investment has averaged 16.26% (variance .02%) of GDP over the sample period (1947 - 1992). However, during the 1980s, a period of extremely high annual deficits, we did not witness the predicted corresponding increase in the tendency for corporations to favor equity financing. More research must be done before feeling comfortable about the linear relationship Friedman suggests.
Specifically, does Friedman's predicted relationship between the size of the deficit financed and the effect on the term structure of interest rates hold in the face of the size of the deficits we witnessed after 1979? After 1979, we saw a major breakdown in the traditional relationship between monetary aggregates and real economic activity (Friedman, 1993). Economists use seemingly important monetary aggregates in their models to explain money demand, capital accumulation, government, corporate, and market behavior. Since 1979, however, many of these previous models that employ monetary aggregates failed to accurately predict the observations witnessed. In fact, credit aggregates have proved to be as important as monetary aggregates in predicting economic activity (Friedman, 1983). Moreover, the increased use of junk bond financing during the 1980s supports evidence of a discrepancy between the observations during the 1980s and Friedman's (1986) predictions.

An increase in both government and corporate debt

Robert A. Taggart, Jr. (1988) studied the level of junk bond financing and its importance to capital markets. He concluded that junk bonds emerged in response to the forces of "interest rate volatility, competition in financial services, and industrial restructuring ... allowing corporations to raise funds more quickly and on better terms than would otherwise have been available" (Taggart, 1988). This occurred during an episode of large annual deficits where, according to Friedman's hypothesis, equity financing should have been more attractive to corporations. In addition, Taggart
reveals evidence that indicates the corporate debt to equity ratio has increased steadily when measured in terms of book value.

By adjusting the measure of debt to equity in market terms, however, Taggart also finds evidence that tends to support Friedman's equity preference result. When accounting for inflation and a changed perception regarding an asset’s ability to generate cash, the debt to equity ratio has decreased substantially since 1974 (Taggart, 1988). Taggart concludes his paper by demonstrating that junk bonds do not account for a major fraction of corporate debt, because some junk bond usage simply replaced "bank borrowing or private placements that corporations would otherwise have made" (Taggart, 1988). While the government’s reliance on debt issues to finance the large budget deficits increased, corporations increased their reliance on short term debt issues to finance transactions, as opposed to bank borrowing. For the graphical representation of the period in the study, the new issues of corporate debt contains all forms of corporate debt issues. If corporations did replace a portion of their bank borrowing by relying more heavily on short term debt instruments, then this innovation provides on explanation of why new corporate debt issues increased at the same time as the budget deficits, especially when the government chose to finance the budget deficits by using shorter term debt instruments of its own. However, the relevant question for this paper still remains: how do corporations respond to the choice the government makes to finance its annual budget deficits?
Summary

The motivation for Friedman’s research regarding federal budget deficits and the debt seem as valid today as he initially perceived these issues in 1978. Using various measures of risk perception, Friedman found evidence that the Treasury can influence the extent to which budget deficits crowd in or crowd out various private financial instruments. His models relied heavily on asset substitutability and rates of return. These rates of return depend on the perceived risk associated with the asset. Regardless of the risk measure used, however, when the government issues debt to finance its deficits, the returns to equity fall in comparison to all other corporate financial instruments. This implies that debt financing of increasing annual budget deficits should influence corporations to use ever increasing amounts of equity relative to long and short term debt to finance their investment activity. Friedman’s research suggests a distinct role for the Treasury in debt and deficit management.

Graphical evidence reviewed in this chapter shows that the government has been using more short term than long term debt to finance its deficits. This should have made equity a more attractive financing vehicle to corporations than debt. However, graphical evidence suggests that, during the 1980s, corporations have been issuing more debt than equity in their financing activity. Taggart’s explanation of the changed perception on the use of corporate debt may lend support to Friedman’s equity preference result. If corporations replaced a portion of their bank borrowing by issuing debt, then this financial innovation may explain why new issues of corporate
debt increased during episodes when the government financed its large budget deficits with more short term debt than long term debt.

The study attempts to reconcile the disparity between the graphical evidence reviewed and Friedman's pricing conclusions. It will employ the use of a dummy variable to control for the tremendous financial market innovations that have occurred since 1980. By controlling for the vast financial market innovations that occurred after 1980, the thesis expects the model to resolve the apparent conflict between the graphical evidence and the theoretical predictions. In the following chapter, I will develop the theory of how the thesis will analyze the relationships among the variables.
Chapter 2: Theory and Model

Model Design

The theory and model proposed in this study differs from Friedman’s work by using a nominal quantity analysis. The nominal quantity is the nominal dollar value of the financial instrument included in the study. By definition, the term “nominal quantity” implies the number of bonds, or shares, issued multiplied by the issued price. By using this approach, the analysis will examine whether the predicted quantity side of the financing story corresponds with the pricing results Friedman found. The theory of this study expects to find that if the relationship Friedman postulates holds, then we should be able to model and explain a statistically significant portion of the variation in the ratio of new corporate debt issues relative to new corporate equity issues (measured in dollars), as well as explaining the amount of new issues of corporate debt and equity separately. The thesis will examine, then, three equations: (1) modeling the ratio of new issues of corporate debt to corporate equity; (2) modeling new issues of corporate debt, by itself; and (3) modeling new issues of corporate equity, by itself.

Using a nominal quantity approach avoids the odious problem of assigning perceived risk measures to the various asset returns. Additionally, because this approach avoids price measures categorically, it avoids the nagging problem all

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5 From this point forward, when I mention that this is a “quantity” analysis, I mean “nominal quantities.”
monetary economist face: the problem of selecting among various interest rates during each time period to assign to the various assets. In this way the study forces no \( a \) priori bounds on the parameters. It strictly observes the choices economic agents made with respect to available financial instruments in order to clear the markets. The nominal quantities include the price in the dollar value. However, by measuring the dollar value only, the analysis does not have to wade through information asymmetries or other market imperfections to specifically identify the rates of return (prices) in a given year for a set of financial instruments. With careful analysis, then, it is possible to infer the pricing relationship that must have existed to clear the market for the assets under consideration.

**Specific Models Employed**

To examine the relationship of how the ratio of new issues of corporate debt to corporate equity varies, the study will examine the following model in a generalized least squares formulation:

\[
NICDTCE_t = f[STGD_t, LTGD_t, NNILTSTG_t, FBS_t, CHGFBS_t, SPRET_t, GDP_t, GDP\_DUMMY_t]
\]

Dependent Variables:

1. \( NICD_t \) = New issues of corporate debt in period \( t \).
2. \( NICE_t \) = New issues of corporate equity in period \( t \).
3. \( NICDTCE_t \) = Ratio of \( \frac{NICD_t}{NICE_t} \) in period \( t \).

Explanatory Variables:

1. \( STGD_t \) = Short term government debt outstanding in period \( t \).
2. \( LTGD_t \) = Long term government debt outstanding in period \( t \).

3. \( NNILTSTG_t \) = Net new issues of long term to short term government debt.

4. \( FBS_t \) = Federal budget surplus in period \( t \).

5. \( CNGFBS_t \) = Change in federal budget surplus between \((t-1)\) and \((t)\).

6. \( SPRET_t \) = Percentage Change in the S&P 500 Index between \((t-1)\) and \((t)\).

7. \( GDPi_t \) = Gross Domestic Private Investment in period \( t \).

8. \( GDP_t \) = Gross Domestic Product in period \( t \).

9. \( REGDUMMY_t \) = A dummy variable that changes to and stays at "1" beginning in 1980, the first year of the Reagan administration.

The same formulation of the model is used to regress \( NICD \) and \( NICE \) on the same collection of nine explanatory variables. To find evidence to support Friedman's conjectures, regression analysis should produce statistically significant parameter estimates with the following sign conventions:

\[
NICDICE_t = \alpha + \beta_1 STGD_t + \beta_2 LTGD_t + \beta_3 NNILTSTG_t + \beta_4 FBS_t + \beta_5 CNGFBS_t + \beta_6 SPRET_t + \beta_7 GDPi_t + \beta_8 GDP_t + \beta_9 REGDUMMY_t
\]

(1) \( \beta_1 \) \( \beta_2 \) \( \beta_3 \) \( \beta_4 \) \( \beta_5 \) \( \beta_6 \) \( \beta_7 \) \( \beta_8 \) \( \beta_9 \)

\((-)\) \((-)\) \((+)\) \((+)\) \((+)\) \((-)\) \((?)\) \((?)\) \((+)\)

**Theoretical Predictions**

According to Friedman's pricing story, the higher is short term government debt, then equity financing will be more attractive to corporations and drive down the ratio of new issues of corporate debt to corporate equity. Since Friedman’s theory
postulates that increasing long term government debt raises the return on corporate
debt and lowers the return on equity the theory proposed in this study expects long
term government debt to have a negative effect on the ratio of new issues of corporate
debt to corporate equity.

The study specifically chose stock measures of short and long term government
debt. The theory presumes a specific economic capacity for short and long term
financial instruments. Secondly, the economy must absorb all government financial
instruments first. Government instruments represent the safest (least risk, lowest
volatility) assets in their respective classes. Once the economy completely absorbs
these instruments, then corporate financial instruments can flow into the economy’s
unused capacity. The short and long term government debt measures represent year
end measures. Consequently, the flow of new government short and long term
securities for the year have already found their way into the existing capacity. The
only unmeasured parameter regarding the new stock of short and long term
government securities is how the mix between the government instruments issued, on
net, changed throughout the year. Composing a ratio of net new long term to short
term government debt fills this void.

Determining the effect of the ratio of government financing is somewhat more
difficult. From Friedman's work, we conjecture that more new issues of short term
government debt will drive down equity returns more than new issues of long term
government debt. As a result, when net new issues of long term to short term
government debt decreases, the government has issued more short term government debt, on net. This should cause new issues of corporate debt to corporate equity to decrease as well. Since the government chooses to finance deficits with debt, as the level of federal budget surplus gets more negative, then we should witness more equity financing by firms (*i.e.*, new issues of corporate debt to corporate equity should reduce). The same is true for the change in the federal budget surplus. The larger the change in the federal budget surplus in the direction of a deficit, the more corporations should favor equity, and new issues of corporate debt to corporate equity should fall.

Likewise, the more favorable is the market for equities, evidence by a high positive return on the S&P 500, the more corporations should favor equity financing and new issues of corporate debt to corporate equity should fall. Although the return on the S&P 500 represents a pseudo price, the variable serves as a proxy to indicate favorable equity market conditions. I could have used a dummy variable for this purpose, but since I had actual data that captures this condition, I thought that using the actual data would better serve the analysis than a dummy. Using a dummy would also have required the analysis to specify an *a priori* rate of return that suggests when the market is more favorable to new equity issues. Using actual data permits the model to identify how new equity and debt issues fluctuate with changes in equity market conditions.

Gross private domestic investment and gross domestic product are indeterminate. Both new issues of corporate debt and new issues of corporate equity
should increase as gross private domestic investment and gross domestic product rise, but which will rise faster is unknown. Unfortunately, we have no theory to help in signing these variables. The model should provide some evidence to sign the variables and perhaps help in revealing their contribution to explaining the dependent variables.

The Reagan dummy variable (REGDUMMY) is a special indicator. This is a dummy variable for the Reagan years and its legacy. Many dramatic financial market changes have occurred since 1979. These changes had a significant impact on the financial markets and the Reagan dummy indicates these changes by switching to a "1" in 1980 and remaining so through 1992. The change in Regulation Q (Reg Q), the tax changes in 1986, and the dramatically larger deficits are only a few of the changes that this dummy variable attempts to model. Eliminating Reg Q removed the price ceiling banks could pay to depositors. Banks then competed vigorously for deposits on a pricing basis, the rate they paid to depositors. To finance the higher rates, banks must increase their demand for some financial instrument that pays a sufficient return. The theory for this model is that since banks cannot own equity, they turned to the debt market. This increased the demand for bonds lowered the return that both corporations and the government must offer to sell their securities. This should influence higher new issues of corporate debt in the 1980s and suggest a positive coefficient on Reagan dummy.

In the tax change in 1986, the government eliminated the dividend exclusion. Tax payers could no longer exclude any portion of their dividend income, received by
holding corporate stocks in their portfolio, from their personal income tax filing. The result of this change favors more corporate debt demand. Since the government now taxes dividend and interest income equally, investors will opt for more debt. Creditors to corporations have a prior claim on profits and assets than do equity holders (Bodie, Kane and Marcus, 1989). Without the tax advantage, dividend income is less preferable than interest income received from holding bonds. This also influences more debt issue and implies a positive coefficient for Reagan dummy.

The increase in the size of the negative federal budget surplus and financing that negative federal budget surplus with shorter term debt implies corporations should prefer more equity to debt. This would influence the sign of the coefficient on Reagan dummy to be negative. Whether the two positive influences outweigh the one negative influence is uncertain, but the graphical evidence seems to suggest that the Reagan dummy coefficient should be positive, favoring new issues of corporate debt.

The Reagan dummy indicates more changes and innovations than the three changes previously reviewed. These three represent those changes with which I thought most people would have the greatest familiarity. In their paper entitled “The Integration of World Capital Markets” Michael Mussa and Morris Glodstein, from the World Bank, present a thorough review of the significant financial innovations that have occurred across all G7 nations since 1964. Of the seventeen they identified for the United States, twelve have occurred since 1979.
Summary

To find evidence that supports not only Friedman's conjectures, but also the graphical evidence presented earlier, regression analysis should produce statistically significant parameter estimates with the following sign conventions:

\[ \text{NICDTC}_t = \alpha + \beta_1 \text{STGD}_t + \beta_2 \text{LTGD}_t + \beta_3 \text{NNILTSTG}_t + \beta_4 \text{FBS}_t + \]

\[ \beta_5 \text{CNGFBS}_t + \beta_6 \text{SPRET}_t + \beta_7 \text{GPDI}_t + \beta_8 \text{GDP}_t + \beta_9 \text{REGDUMMY}_t \]

(1) 

Finding empirical results that support the theoretical predictions are important for various reasons. Foremost, using the nominal quantity approach places no \textit{a priori} bounds on the analysis. Producing results that align with theoretical predictions bolsters the theory Friedman developed independent of price specifications or restrictions. Secondly, it bolsters the theory while reconciling it with the graphical evidence from the 1980s, which seems to conflict with Friedman’s theory.

To briefly recap the theoretical predictions, the higher is short term government debt, then equity financing will be more attractive to corporations and thus drives down the ratio of new issues of corporate debt to corporate equity. Increasing long term government debt raises the return on corporate debt and lowers the return on equity and this suggests that long term government debt should have a negative effect on the ratio of new issues of corporate debt to corporate equity.

When net new issues of long term to short term government debt decreases, more short term government debt is being issued. This should cause the ratio of new
issues of corporate debt to corporate equity to decrease. Since the government chooses to finance deficits with debt, as the level of federal budget surplus gets more negative, then we should witness more equity financing by firms. The same is true for the change in the federal budget surplus. The larger the change in the federal budget surplus in the direction of a deficit, the more corporations should favor equity, and new issues of corporate debt to corporate equity should fall.

Additionally, a high positive return on the S&P 500 should influence corporations to favor equity financing over new issues of corporate debt. Gross private domestic investment and gross domestic product are indeterminate. Both new issues of corporate debt and new issues of corporate equity should increase as gross private domestic investment and gross domestic product rise, but which will rise faster is unknown. The model should provide some evidence to sign the variables and perhaps help in revealing their contribution to explaining the dependent variables.

Eliminating Reg Q removed the price ceiling banks could pay to depositors; this should influence higher new issues of corporate debt and suggest a positive coefficient on Reagan dummy. In the tax change in 1986, the government eliminated the dividend exclusion. Since tax laws now treat dividend and interest income equally, investors will opt for more debt. Without the tax advantage, dividend income is less preferable than interest income received from holding bonds. This influence for more debt issues also implies a positive coefficient for Reagan dummy. The increase in the size of the negative federal budget surplus and financing that negative federal budget
surplus with shorter term debt implies corporations should prefer more equity than debt. This would influence the sign of the coefficient on Reagan dummy to be negative. Whether the two positive influences outweigh the one negative influence is uncertain, but the graphical evidence seems to suggest that the Reagan dummy coefficient should be positive, favoring new issues of corporate debt.

The quantity approach avoids the problem of assigning perceived risk measures to the various asset returns. Additionally, because this approach avoids price measures, it avoids the problem of selecting among various interest rates during each time period to assign to the various assets. In this way the study forces no _a priori_ bounds on the parameters. It observes the choices made and infers the pricing relationship that must have existed to clear the market for the assets considered. This reduced form model permits an alternative method of investigation, not yet analyzed in the literature. Secondly, the use of a dummy to control for the changes in the financial markets, theoretically reconciles previous modeling results with the graphical evidence from the 1980s.
Chapter 3: Data Description

In order to facilitate a more complete understanding of the empirical results, reviewing the data gathering process will prove helpful. The paper analyzed annual data from the United States over the period from 1947 through 1992. The analysis did not seasonally adjust the data for business cycles. Lastly, all of the data collected and examined are in nominal terms. The analysis made no adjustments of the data for constant dollar or “real” dollar analysis.\(^6\) Adjusting the data into real terms introduces pricing information. Typically, the real adjustment parameter is something like the consumer price index or an interest rate. For this thesis, I specifically intend to examine nominal quantity data, and intentionally exclude information that may place artificial bounds on the results.

Dependent Variables

The empirical analysis examined three dependent variables, all of which were constructed. The first relationship examined used the ratio of new issues of corporate debt to new issues of corporate equity (NICTDCE) as the dependent variable. In constructing this variable, the analysis divided new issues of corporate debt (NICD) by new issues of corporate equity (NICE). To decompose the variables further, new issues of corporate debt is the amount, in billions of dollars, of all bonds and notes

\(^6\) Please reference Appendix A for a complete listing of the data analyzed, and statistical descriptions of the data. This section will focus exclusively on the source of the data and how the analysis constructed certain variables for empirical investigation.

This analysis focuses on the nexus between the government financing decision and its corresponding effect on domestic, public, financial markets. For this reason, the composition of new issues of corporate debt did not include private placements of corporate debt, nor did it incorporate debt placed abroad. Corporations do not have to make the same kind of public disclosure on privately or foreign placed corporate debt as they do for domestically issued, publicly traded debt. As a result, domestic financial markets cannot accurately incorporate this partially disclosed financial
information into the term structure of interest rates. This term structure critically drives the results Friedman obtained. Additionally, the amount of debt placed both privately and abroad reflects only a small percentage of the new total debt issued in any given year.

The new issues of corporate equity variable was constructed by summing the new issues of both preferred and common stock for the period from 1947 through 1992. Once again, I used the Historical Statistics source for data between 1947 and 1970, and the Federal Reserve Bulletin: Annual Statistical Digest for the period 1971 through 1992. Like the new issues of corporate debt variable, the new issues of corporate equity variable omits that portion of equity placed privately. The reason for omitting this portion of new equity issues corresponds to the reasons given for the debt variable. The privately placed new equity issues reflects an even smaller percentage of the total new equity placed than the percentage of privately and foreign placed debt of the total new debt issued.

Independent Variables

Of the nine independent variables employed in the model, I constructed five of them by combining individual pieces of raw data. The variable labeled short term government debt (STGD) is constructed by summing the total, public issues of marketable bills, certificates and notes outstanding for each year under examination.

Treasury Bills are those government debt instruments with a maturity of one year or less. Treasury Notes are those government debt instruments with a maturity of
ten years or less. Finally, Treasury Certificates, which the Treasury ceased issuing in 1963, were short term debt instruments, like Treasury Bills, but the certificates paid interest (Bodie, Kane and Marcus, 1989).

Treasury bills are simply sold at a discount. The only gain lies in the difference between the price paid and the stated face value. Most instruments that act in this manner call the return a “capital gain.” However, the government considers this return not as a short term capital gain, but rather as current interest income. As the tax code changes, this distinction can become important to the buyers of short term government debt.

Including all Treasury notes in the short term debt variable may seem inappropriate. Treasury notes include those debt instruments issued for one, three, five, seven and ten years. The analysis originally intended to characterize the short run as seven years or less. However, unless the analysis examined each individual bond issue during a particular year, no government publication this researcher reviewed itemized the Treasury notes issued annually at a summary level according to the issued duration. The most detailed level given was the general category of bill, note or bond.

The short term, regardless of the economic or financial study undertaken is always rather subjective. While the early years under consideration may have definitely classified ten years as the long run, certainly as we move through the 1980s and 1990s this perception changes. Ten years is no longer considered that far off that economists and corporations view ten years categorically as “the long run” for all
practical considerations. Therefore, the analysis determined the short run as ten years or less.

The source for the government debt data comes from the *Treasury Bulletin*. The United States Treasury Department issues these bulletins monthly. I gathered this data by pulling the October issue of every third year beginning in 1945 and recording the figures contained in the table entitled “Interest-Bearing Public Debt.” Some overlap exists from one bulletin pulled to the next bulletin pulled. This ensured data integrity over time, such that any data reporting changes (of which none were cited) would be immediately recognized. This is a table the Treasury consistently reported.

The data composing the variable labeled long term government debt (LTGD) came from the same source, the *Treasury Bulletin*. The long term government debt variable is composed by summing the total outstanding publicly issued, marketable bonds. Treasury bonds are those government debt instruments issued with a maturity of more than ten years. For the data set examined in this paper, the long term government debt from 1947 through 1954 included both bank eligible and bank restricted bonds. After 1954, all bonds issued were bank eligible bonds. Bank restricted bonds were issues which commercial banks were prohibited from acquiring prior to a specified date. The long term government debt variable does not include

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bonds labeled as “Other” in the tables. The Treasury marketed this category of bond for specific projects, such as the Panama Canal during the 1950s.  

I constructed the variable net new issues of long term to short term government debt (NNILTSTG) by taking the first difference between the long term government debt and short term government debt outstanding from 1947 through 1992. To complete the construction of NNILTSTG, I divided the first difference of long term government debt by the first difference of short term government debt. The information that the ratio of the net new issues variable introduced to the model included not only how the maturity level of government debt issues changed, but also how the mix between long and short term government financing changed over time. The source for constructing this variable was the Treasury Bulletins, previously cited.

The data for the federal budget surplus (FBS) variable came from Finding & Using Economic Information: A Guide to Sources and Interpretation by David B. Johnson. Johnson’s source, which I confirmed, was the President’s Economic Report (annual). This report references the data appearing in the monthly Treasury Bulletin. The change in the federal budget surplus (CNGFBS) was constructed by taking the first difference of the FBS data from Johnson (1993) from 1947 through 1992.

The data for the annual return on the Standard & Poor (S&P) 500 index (SPRET) was constructed by calculating the percentage change in the S&P 500 composite index for each year. Standard & Poor’s corporation reported the year

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ending values for their composite stock index. From this, I took the difference between the beginning year value (last year's ending value) and the current year's ending value and divided it by the beginning year value. Source for the S&P 500 data was the *Economic Report of the President*, 1993, "Table B-94. - Common stock prices and yields."

The data on the gross private domestic investment (GPDI) and the gross domestic product (GDP) come from various issues of the *Survey of Current Business*, published by the United States Department of Commerce in the national income and product accounts (NIPA).

Finally, I constructed a typical (0, 1) dummy variable for the Reagan years, labeled REGDUMMY. It reflects a change occurring in not only the Reagan years, but also in all of the years since 1979. The year 1979 marked the beginning of dramatic change in the financial markets of the United States. The elimination of Regulation Q marked the beginning of the changes that continue today in the financial markets of the United States and the financial markets around the world. The combined effect of these changes presumes that current financial markets adjust far more rapidly than any time in the past. In order to capture this effect, I constructed a dummy variable that switches from zero (0) to one (1) in 1980 and remains one through 1992. This variable captures the sweeping changes in the financial markets in the United States, as well as the dramatic increase in the federal budget deficits that began under President Reagan.
Summary


I defined the short term government debt variable as government debt issued with a maturity of ten years or less. Debt with a duration of greater than ten years was classified as long term debt. The study used data from those corporate securities that were issued publicly in the United States.

The data collected for this thesis accurately represents the quantity information that pertains to the pricing variables contained in Friedman's work on this topic. The data selection and collection methodology remained as true to the principles of Friedman's theory as the data permitted. The results summarized in the next chapter reflect the integrity of the data and provide detailed information on the nature of the
relationship between the government’s deficit financing policy and the economy’s response.
Chapter 4: Estimation and Results

Investigation of the relationship between the government deficit financing mix and the mix of new corporate security issues begins with an ordinary least squares modeling technique. I followed a similar modeling approach that Friedman employs in his study of this topic. By employing this technique, the analysis assumes a linear relationship among the quantity variables employed. The nominal quantity approach avoids the problem of assigning perceived risk measures to the various asset returns. Additionally, because this approach avoids price measures, it avoids the problem of selecting among various interest rates during each time period to assign to the various assets. In this way the study forces no \textit{a priori} bounds on the parameters. It observes the choices made and infers the pricing relationship that must have existed to clear the market for the assets considered.

The first model examines the ratio of new issues of corporate debt relative to new equity. The results will provide the most direct evidence of how the mix of corporate financial instruments changes in response to the financing mix the government chooses. The results of this modeling technique should produce statistically significant coefficients on the variables with the following sign conventions:

\[ NICDTCE_t = \alpha + \beta_1 STGD_t + \beta_2 LTGD_t + \beta_3 NLSTGD_t + \beta_4 FBS_t + \]
\[ + \beta_5 CNGFBS_t + \beta_6 SRET_t + \beta_7 GPDI_t + \beta_8 GDP_t + \beta_9 REGDUMMY_t \]

\[ (1) \quad \begin{array}{cccc}
\alpha & \beta_1 & \beta_2 & \beta_3 \\
(-) & (-) & (+) & (+) \\
\beta_4 & \beta_5 & \beta_6 & \beta_7 \\
(+) & (-) & (?) & (?) \\
\beta_8 & \beta_9 & \beta_9 \\
(+) & (+) & (++)
\end{array} \]
The higher is short term government debt, then equity financing will be more attractive to corporations and drive down the ratio of new issues of corporate debt to corporate equity. Increasing long term government debt raises the return on corporate debt and lowers the return on equity and this suggests that long term government debt should have a negative effect on the ratio of new issues of corporate debt to corporate equity.

When net new issues of long term to short term government debt decreases, more short term government debt is being issued. This should cause the ratio of new issues of corporate debt to corporate equity to decrease. Since the government tends to finance deficits with debt, as the level of federal budget surplus gets more negative, then we should witness more equity financing by firms. The same is true for the change in the federal budget surplus. The larger the change in the federal budget surplus in the direction of a deficit, the more corporations should favor equity, and new issues of corporate debt to corporate equity should fall.

Additionally, a high positive return on the S&P 500 should influence corporations to favor equity financing over new issues of corporate debt. Gross private domestic investment and gross domestic product are indeterminate. Both new issues of corporate debt and new issues of corporate equity should increase as gross private domestic investment and gross domestic product rise, but which will rise faster is unknown. The model should provide some evidence to sign the variables and perhaps help in revealing their contribution to explaining the dependent variables.
Eliminating Reg Q removed the price ceiling banks could pay to depositors; this should influence higher new issues of corporate debt and suggest a positive coefficient on Reagan dummy. In the tax change in 1986, the government eliminated the dividend exclusion. This influence also implies a positive coefficient for Reagan dummy. The increase in the size of the negative federal budget surplus and financing that negative federal budget surplus with shorter term debt implies corporations should prefer more equity than debt. This would influence the sign of the coefficient on Reagan dummy to be negative. Whether the two positive influences outweigh the one negative influence is uncertain, but the graphical evidence seems to suggest that the Reagan dummy coefficient should be positive, favoring new issues of corporate debt.

To uncover the empirical behavior of the separate variables composing the ratio, I designed two additional models to separately explain new issues of corporate debt and new issues of corporate equity. These separate models prove extremely informative. Simply modeling the ratio only explains how the mix changed relative to the explanatory variables. Examining each piece separately and calculating point elasticity measures tells us how fast each piece of the mix adjusted relative to the explanatory variables. Additionally, through the point elasticity measures, the analysis identifies how sensitive each piece of the ratio is to the various explanatory variables. Viewed in absolute terms, the results may appear surprising, but they do conform to the relationship Friedman identified in his price based model.
Initial Generalized Least Squares Estimation

In the estimation of equation (1), presented in chapter 2, the ordinary least squares (OLS) estimation reveals several data problems. The following table summarizes the results from the first least squares regression.\(^9\)

\[
NICDTCE_i = \alpha + \beta_1 STGD_i + \beta_2 LTGD_i + \beta_3 NNILTSTG_i + \beta_4 FBS_i + \\
\beta_5 CNGFBS_i + \beta_6 SPRET_i + \beta_7 GPDI_i + \beta_8 GDP_i + \beta_9 RGDDUMMY_i
\]

Table 1: Regression results from NICDTCE on entire explanatory variable set.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Stat</th>
<th>Alpha Level</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.7563</td>
<td>1.0843</td>
<td>0.2856</td>
<td></td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0051</td>
<td>-1.023</td>
<td>0.3108</td>
<td></td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0135</td>
<td>1.8115</td>
<td>0.0787</td>
<td></td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>-0.0904</td>
<td>2.0826</td>
<td>0.0447</td>
<td>*</td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0059</td>
<td>-0.548</td>
<td>0.5870</td>
<td></td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.0223</td>
<td>0.2289</td>
<td>0.8203</td>
<td></td>
</tr>
<tr>
<td>SPRET</td>
<td>-0.4305</td>
<td>-0.496</td>
<td>0.6226</td>
<td></td>
</tr>
<tr>
<td>GPDI</td>
<td>-0.0022</td>
<td>-0.035</td>
<td>0.7235</td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>0.0017</td>
<td>0.9544</td>
<td>0.3464</td>
<td></td>
</tr>
<tr>
<td>RGDDUMMY</td>
<td>-1.3770</td>
<td>-1.776</td>
<td>0.0844</td>
<td></td>
</tr>
</tbody>
</table>

* significant at the α = 05 level  ** significant at the α = .01

The explanatory power is extremely weak, and the model produced only one significant variable. Furthermore, the analysis uncovered several data problems. Aside from not being stationary, the most significant problems were heteroscedasticity and multicollinearity. The White test showed a near singular matrix and the

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\(^9\) Appendix B presents the full regression results summarized in Chapter 4. The analysis utilized Micro TSP.
covariance matrix indicated a high degree of multicollinearity. In addition, unit root tests on each of the variables indicated that the data was not stationary.\textsuperscript{10}

Weighted Least Squares Estimation

To correct for the data problems, I employ a weighted least squares technique for all subsequent regression calculations. Econometric theory suggests the weighted least squares technique as a method for correcting multicollinearity problems.\textsuperscript{11} With this technique, the variable suspected of causing the multicollinearity problems is used as the weighting variable. Then, both the dependent variable and all the independent variables are weighted (multiplied) by the observation of the suspected variable divided by its mean, $\left(\frac{X_i}{\bar{X}}\right)$.\textsuperscript{12} For this analysis the suspected variable is GDP. By making this modification to the regression analysis, the problems with multicollinearity and heteroscedasticity disappeared from the results.

Additionally, the unit root problem solved itself when the analysis employed the weighted least squares technique. Most time series data relating to economic information exhibit unit roots. To make time series data stationary, the typical solution lies in taking a first difference of the data, or by adjusting the data into real versus nominal terms. Using GDP as the weighting variable to correct for

\textsuperscript{10} See Appendix B for unit root test results.
\textsuperscript{11} See Basic Econometrics by Damodar Gujarati, pp. 207, 217-218. and; Econometric Models & Economic Forecasts by Pindyck and Rubenfeld, pp. 142-144.
multicollinearity problems placed the data into a form of real, as opposed to nominal, terms. Hence, the weighting technique solved the unit root problems as well.\textsuperscript{13}

The following equation and table summarize the results of this second regression analysis of NICDTCE in a weighted least squares format. The sign conventions beneath the parameters represent hypothesized signs that the theory suggests the model should produce.

\[
\begin{align*}
\text{NICDTCE}_t &= \alpha + \beta_1 \text{STGD}_t + \beta_2 \text{LTGD}_t + \beta_3 \text{NNILTSTG}_t + \beta_4 \text{FBS}_t + \\
&\quad \beta_5 \text{CNGFBS}_t + \beta_6 \text{SPRET}_t + \beta_7 \text{GPDI}_t + \beta_8 \text{REGDUMMY}_t \\
(1a) &\quad \text{(+)} \quad \text{(+) \space (+) \space (+) \space (+) \space (+) \space (+) \space (+) \space (+)}
\end{align*}
\]

Table 2: Regression results of NICDTCE using weighted least squares.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Stat</th>
<th>Alpha Level</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.0558</td>
<td>2.6658</td>
<td>0.0114</td>
<td>*</td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0052</td>
<td>-2.7629</td>
<td>0.0090</td>
<td>**</td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0209</td>
<td>3.7009</td>
<td>0.0007</td>
<td>**</td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>-0.0195</td>
<td>-0.0161</td>
<td>0.8728</td>
<td></td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0112</td>
<td>-2.4494</td>
<td>0.0193</td>
<td>*</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.0020</td>
<td>0.6390</td>
<td>0.5268</td>
<td></td>
</tr>
<tr>
<td>SPRET</td>
<td>-1.7653</td>
<td>-2.2349</td>
<td>0.0317</td>
<td>*</td>
</tr>
<tr>
<td>GPDI</td>
<td>0.0040</td>
<td>2.8644</td>
<td>0.0069</td>
<td>**</td>
</tr>
<tr>
<td>REGDUMMY</td>
<td>-1.2046</td>
<td>-2.4210</td>
<td>0.0206</td>
<td>*</td>
</tr>
</tbody>
</table>

* significant at the $\alpha = .05$ level  ** significant at the $\alpha = .01$

As expected, the weighting technique produced not only stable data, but also eliminated indications of heteroscedasticity and multicollinearity problems. The sign on STGD agrees with the hypothesized direction. The theory asserts that as the level

\textsuperscript{13} Unit root tests on the weighted variables indicates greater stability across all variables.
of STGD increases, it drives down the return on both corporate debt and corporate equity. If however, NICE increase faster relative to NICD when STGD increases, then the entire ratio would appear to decrease. This appears to be the case, and hence the negative sign.

In part, though, the results do not seem to agree with our theory. The sign on the long term government debt parameter is positive, where the theory predicts a negative sign. Friedman's research (1985) has shown that long term government debt is a weak substitute for corporate equity. As a result, this influence may have overshadowed other pricing effects and thus produced a positive parameter estimate where theory predicts a negative. Prior to examining each piece of the ratio separately, the analysis cannot draw a definite conclusion regarding this anomalous result.

The estimated parameter signs on FBS and the REGDUMMY seem to run counter to theoretical predictions as well. Although the separate pieces of the ratio may respond in the theoretically predicted direction, the speed of movement may have caused the sign reversals. Future regressions will attempt to disentangle this problem in order to make more definite conclusions for the perplexing results obtained.

The sign on NNILTSTG also runs counter to the theoretical predictions. However, since this parameter is not statistically significant, strong conclusions regarding the sign of the parameter estimate cannot be drawn. Overall, however, this model appears to support Friedman's pricing theory.
The explanatory power seems so strong, that examining the fitted values from the model with the actual data on the ratio may prove instructive. Figure 3 suggests that the model seems to have more prediction power during the 1980s. Inspecting the predictive power further reveals that during certain periods, the prediction seems incredibly erratic. The episodes where the predictions are the most erratic occur during periods around the specially drawn vertical lines. The vertical lines added for the years 1955, 1966, 1968, 1974, 1978, 1979, and 1988 represent the Romer dates and the credit crunch of 1966. Except for the 1980s, the model does not adequately capture the effects, or over predicts the impact of the tight money episodes. The actual data, as witnessed by the ratio, does not react as dramatically as the model predicts during the tight money episodes.

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14 Christina and David Romer (1993) reported episodes of post war tight money as inferred from published decisions from the Federal Open Market Committee and from the FOMC meeting minutes. They identified October 1947, September 1955, December 1968, April 1974, August 1978, October 1979, and December 1978.
In concluding this analysis of new issues of corporate debt to equity, it is interesting to note that in this regression neither the change in the size of the federal budget surplus (CNGFBS) nor the ratio of new issues of long to short term government debt (NNILTSTG) seem important in explaining the variation in the ratio of new issues of corporate debt to equity. Not surprisingly, the REGDUMMY is significant, but it is in the opposite direction from what the theory predicts. The empirical results suggest that the Reagan years favored new issues of corporate equity, whereas graphical evidence from the introduction and from Chapter 1 suggests the Reagan years favored new issues of corporate debt. Perhaps the significant deficits outweighed the effects of both Regulation Q and the tax change that eliminated the tax favored treatment of dividends for individuals. Corporations holding stock in another corporation, not their own subsidiary, still receive a dividend exclusion for the corporation's tax filing. Perhaps eliminating the dividend exclusion for individuals only was insufficient to cause a major demand shift for corporate bonds. To examine this relationship in more detail, and attempt to unravel some of the conflicting results, the analysis will examine each piece of the ratio separately.

**Explaining NICD Observations**

To uncover more information on this relationship, the analysis regressed each piece of the ratio of new issues of corporate debt to corporate equity on the same set of regressors in a weighted least squares estimation technique. The model and the results are summarized by the following equation and table. The sign conventions
beneath the parameters represent hypothesized signs the theory suggests the model should produce.

\[ N_{ICD_t} = \alpha + \beta_1 STGD_t + \beta_2 LTGD_t + \beta_3 NNILTSTG_t + \beta_4 FBS_t + \beta_5 CNGFBS_t + \beta_6 SPRET_t + \beta_7 GPDI_t + \beta_8 REGDUMMY_t \]

Table 3: Regression results from NICD using weighted least squares.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Stat</th>
<th>Alpha Level</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>34.2809</td>
<td>1.7977</td>
<td>0.0806</td>
<td>**</td>
</tr>
<tr>
<td>STGD</td>
<td>0.3926</td>
<td>4.3058</td>
<td>0.0001</td>
<td>**</td>
</tr>
<tr>
<td>LTGD</td>
<td>-0.4275</td>
<td>-1.5704</td>
<td>0.1251</td>
<td></td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>-1.1112</td>
<td>-0.0191</td>
<td>0.8495</td>
<td></td>
</tr>
<tr>
<td>FBS</td>
<td>0.1944</td>
<td>0.8860</td>
<td>0.3815</td>
<td></td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.5130</td>
<td>3.4129</td>
<td>0.0016</td>
<td>**</td>
</tr>
<tr>
<td>SPRET</td>
<td>51.7368</td>
<td>1.3604</td>
<td>0.1822</td>
<td></td>
</tr>
<tr>
<td>GPDI</td>
<td>-0.3416</td>
<td>-5.0474</td>
<td>0.0000</td>
<td>**</td>
</tr>
<tr>
<td>REGDUMMY</td>
<td>3.0678</td>
<td>0.1281</td>
<td>0.8988</td>
<td></td>
</tr>
</tbody>
</table>

* significant at the \( \alpha = 0.05 \) level  ** significant at the \( \alpha = 0.01 \) level

The results seem robust in terms of the explanatory power, but there are only three significant variables. Where they are significant, however, they are significant at the \( \alpha < 0.01 \). Even more confounding is that for new issues of corporate debt, the change in the budget surplus has significant power. In the analysis of the ratio of new issues of corporate debt to corporate equity, however, this variable was insignificant. In this regression, it appears as though an increasing deficit (a negative value for CNGFBS) discourages new issues of corporate debt. This result tends to support a portfolio crowding out story. Considering the sign of STGD, however, it seems as though short term government debt does not crowd out, but in fact crowds in,
corporate debt issues. Therefore, if the government runs higher budget deficits from year to year, then financing the deficits with short term debt offsets some of the negative effects on NICD that the increasing deficit seems to have caused.

All of the parameter estimates align with the theoretically postulated signs, except for the investment parameter. The results obtained imply that higher levels of investment seem to favor lower levels of corporate debt. This problematic result will be the subject of a later section of this chapter.

The results for the regression on new issues of corporate debt are a little perplexing in light of what the regression for the ratio suggests. Perhaps using the same technique to analyze new issues of corporate equity would shed some more light on the relationship and the ratio. Before examining new issues of corporate equity, it may prove interesting to compare the fitted with the actual values for new issues of corporate debt, since the explanatory power for the regression on new issues of corporate debt is so high. Figure 4, on the following page, depicts this relationship. As in figure 3, the vertical lines represent the Romer dates and the credit crunch of 1966.

As with explaining new issues of corporate debt to corporate equity, the model seems to perform better during the 1980s. For all other periods, the model seems to fit values with the actual data better than the model for new issues of corporate debt to corporate equity. Like the model for new issues of corporate debt to corporate equity, the model for new issues of corporate debt has problems adequately modeling tight monetary episodes.
Figure 4: Actual versus Fitted NICD.
Explaining NICE Observations

The analysis next turned to the NICE part of the ratio. The following equation and table show the formulation and the results of a weighted least squares analysis of NICE on the set of explanatory variables. The sign conventions beneath the parameters represent hypothesized signs the theory suggests the model should produce.

\[
NICE_t = \alpha + \beta_1 STGD_t + \beta_2 LTGD_t + \beta_3 NNILTSTG_t + \beta_4 FBS_t + \\
\beta_5 CNGFBS_t + \beta_6 SPRET_t + \beta_7 GPDI_t + \beta_8 REGDUMMY_t
\]

(3)

Table 4: Regression results from NICE using weighted least squares.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Stat</th>
<th>Alpha Level</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>20.5095</td>
<td>4.3625</td>
<td>0.0001</td>
<td>**</td>
</tr>
<tr>
<td>STGD</td>
<td>0.1609</td>
<td>7.1595</td>
<td>0.0000</td>
<td>**</td>
</tr>
<tr>
<td>LTGD</td>
<td>-0.3441</td>
<td>-5.1271</td>
<td>0.0000</td>
<td>**</td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>0.0137</td>
<td>0.0095</td>
<td>0.9924</td>
<td></td>
</tr>
<tr>
<td>FBS</td>
<td>0.2006</td>
<td>3.7090</td>
<td>0.0007</td>
<td>**</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.0828</td>
<td>2.2334</td>
<td>0.0318</td>
<td>*</td>
</tr>
<tr>
<td>SPRET</td>
<td>53.5005</td>
<td>5.7060</td>
<td>0.0000</td>
<td>**</td>
</tr>
<tr>
<td>GPDI</td>
<td>-0.1135</td>
<td>-6.8050</td>
<td>0.0000</td>
<td>**</td>
</tr>
<tr>
<td>REGDUMMY</td>
<td>19.6139</td>
<td>3.3208</td>
<td>0.0021</td>
<td>**</td>
</tr>
</tbody>
</table>

* significant at the \( \alpha = 0.05 \) level   ** significant at the \( \alpha = 0.01 \)

Like the previously reviewed weighted least squares regressions, the model of new issues of corporate equity has an extremely high explanatory power. The D-W statistic looks a little suspicious, but the test places the statistic in the uncertain range;
it does not reject $H_0$. Reexamining the model with an AR(1) process for the error terms produced estimation results with a lower R-squared, fewer significant variables, sign reversals, and an AR(1) coefficient that was extremely low and insignificant ($\alpha$-level = .7642). It appears as though this is not an AR(1) process. An AR(2) and higher [AR(p) with $p = 2, 3$, and 4] estimation produced less informative results.

The results from the empirical analysis, summarized in Table 4, lead to the conclusion that short term government debt crowds in new issues of corporate equity while long term government debt crowds out new issues of corporate equity. The sign implication for long term government debt runs counter to Friedman’s pricing model result (1985). The substitutability influences seem to overpower the relative pricing relationship. This result aligns with his 1978 gross substitute assessment of long term government debt and corporate equity (Friedman, 1978). If the model correctly predicts the sign of long term government debt, then the current trend of the government that favors financing the deficits with shorter term debt instruments supports the encouragement of new issues of corporate equity. However, the results also suggest, by the sign on federal budget surplus, that when the government runs a deficit, it tends to discourage the use of equity by corporations. In sum, the results suggest that although running budget deficits discourages the use of equity, financing the deficits with short term versus long term debt tends to abate, to a certain degree,

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15. The test range runs from 0 - 1.139, reject; 1.139 - 1.958, uncertain; 1.958 - 2.042, do not reject; 2.042 - 2.861, uncertain; and 2.861 - 4, reject. The D-W test statistic falls in the uncertain range. The null hypothesis is no autocorrelation.
the negative effects of the deficits on new issues of corporate equity. This result is strikingly similarly to the results obtained in the previous analysis of new issues of corporate debt. In sum, the results suggest that budget deficits may cause portfolio crowding out of any variety of private financial instrument, but financing that deficit with short term debt instruments tends to abate the crowding out effect.

The results suggesting that an increase in the return on the S&P 500 index encourages more issues of equity is no surprise. However, the implications regarding investment, once again, seem peculiar. The empirical estimate for the coefficient on gross private domestic investment indicates that as the investment level increases, firms tend to reduce the amount of new equity they issue. This was the same result exhibited in the regression for new issues of corporate debt. Equally perturbing is the result that while deficits tend to discourage equity issues, the Reagan years, as a group, seem to favor new equity issues. As previously mentioned, later sections of this chapter will focus exclusively on the confounding effects implied for investment and the Reagan dummy.

To conclude this section, looking at actual versus fitted values for new issues of corporate equity may prove helpful in better understanding and reconciling the results of the three models examined. Figure 5 compares the actual observations of new issues of corporate equity versus the values the model predicts for each observation. The model for new issues of corporate equity, like the others, seems more efficient during the 1980s. Like the other models, the model for corporate
equity also seems particularly inefficient during the early episodes of tight money. The model reacts more erratically than the actual observations during these periods.
Figure 5: Actual versus Fitted NICE.
The models perform extremely well and correspond with the theory espoused by Friedman. However, the models do not seem to correspond too well with the graphical evidence from the 1980s. In an attempt to reconcile the theory and the graphical evidence I will refine the original model to control for the 1986 tax reform act. In this act, Congress eliminated the personal income tax dividend exclusion. The theory argues that this change in the tax law should have caused a significant shift to debt. By controlling for this effect apart from the Reagan dummy, I expect the results of the modeling to maintain its adherence to the theory, while improving its correspondence with the graphical analysis.

A Refinement of the Basic Model

To further investigate and reconcile the empirical results with the graphical analysis, I refined the basic model to include a second dummy variable. I will initially set this second dummy variable to zero and change it to a one beginning in 1986 through 1992. This marks the 1986 tax change that I argue should favor a significant switch to debt. Teasing this information from the REGDUMMY should help to produce a model that more closely aligns with the graphical analysis. The empirical results previously reviewed suggest that the large deficits witnessed since 1980 swamped the effects of other policy changes that would tend to favor new corporate debt issues. Controlling for the 1986 tax reform act should demonstrate that the tax change did favor new issues of corporate debt. Additionally, if this parameter has statistical significance, and the REGDUMMY has statistical significance, then the
analysis supports the argument that, in the previous models, the equity preference effect of the deficits swamped the other debt preference effects.

The estimation equations are extremely similar, with the exception of the additional dummy variable. The theoretical prediction suggests that the empirical calculations should produce positive parameter estimates for this dummy variable in the regression on the ratio of new issues of corporate debt to equity and for new issues of corporate debt. The theory does not permit definitive signing of the TAXDUMMY for the regression on new issues of corporate equity. Because the theory argues that the tax change favored new debt issues, it does not necessarily follow that it should simultaneously discourage new equity issues.
The following table summarizes the results from the three regressions.\(^{16}\)

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>NICDTCE</th>
<th>NICD</th>
<th>NICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.2854</td>
<td>**</td>
<td>55.8173</td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0055</td>
<td>**</td>
<td>0.3688</td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0189</td>
<td>**</td>
<td>-0.6175</td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>0.0090</td>
<td></td>
<td>0.8016</td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0138</td>
<td>**</td>
<td>-0.0548</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.0017</td>
<td></td>
<td>0.4859</td>
</tr>
<tr>
<td>SPRET</td>
<td>-2.1576</td>
<td>*</td>
<td>14.9463</td>
</tr>
<tr>
<td>GPD</td>
<td>0.0036</td>
<td>*</td>
<td>-0.3813</td>
</tr>
<tr>
<td>REGDUMMY</td>
<td>-1.1688</td>
<td>*</td>
<td>6.4202</td>
</tr>
<tr>
<td>TAXDUMMY</td>
<td>0.7302</td>
<td></td>
<td>68.4830</td>
</tr>
</tbody>
</table>

Number of Observations | 45 | 45 | 45 |
Weighting Series | GDP | GDP | GDP |
R-Squared | 0.9705 | 0.9897 | 0.9925 |
D-W Stat | 2.1731 | 1.6355 | 2.3631 |
F-Stat | 127.8256 | 375.0978 | 514.4035 |

* significant at the \( \alpha = 0.05 \) level  
** significant at the \( \alpha = 0.01 \)

These results prove extremely valuable to the original model. By adding the tax dummy, the explanatory power, as evidenced by the R-Squared value, has increased across all three regressions. This is a reasonable result because we added another explanatory variable. However, the Adjusted R-squared also increased when using the revised model versus the original model.\(^{17}\) Further, for the regression on new issues of corporate debt, the tax dummy is significant. In the prior model of new corporate debt issues, the regression produced only three significant variables (STGD,

\(^{16}\) Because the three regression equations are so similar to the previously estimated equations, I thought it would not prove extremely helpful to again write out the full equations. For a complete review of the regression analysis, please refer to Appendix B.

\(^{17}\) The Adjusted R-squared measure, in theory, controls for the number of parameters in an estimation. Direct comparison of raw R-squared measures from equations with a different number of explanatory variables violates the theoretical use and meaning of the R-squared measurement.
CNGFBS, and GPD), and the REGDUMMY was not one of those. In the revised new corporate debt issues regression, the results produced five significant variables, and the TAXDUMMY is highly significant. Perhaps even more informative is the long term government debt variable. In the original specification, this parameter estimate fell outside the bounds, albeit narrowly, of traditionally accepted measures of significance. In the revised model, this variable is of the correct sign, negative, and significant. This permits us to conclude that increasing the stock of outstanding long term government debt does reduce the corporate sector’s ability to use either debt or equity to finance its activities. Financing the debt and deficits with long term debt crowds out the use of all corporate financial instruments. In contrast, financing the debt and deficits with short term instruments crowds in the use of both corporate debt and equity.

The tax dummy introduced no strange anomalies. All parameter estimates that proved significant in the original models, maintained their significance and the same sign convention. The introduction of the tax dummy cleared some of the fog surrounding how the level of long term government debt affects new issues of corporate debt. A deficit and an increasing deficit tend to discourage new issues of corporate equity and debt instruments. The analysis clearly demonstrates that the Treasury can exactly offset this effect with the proper mix of long and short term financing of the deficits. The Treasury can actually cause crowding in of all corporate financial instruments by exclusively financing the deficits with short term debt
instruments. Exclusive short term financing of the deficits more than compensates for the crowding out of the deficits.

The results of this revised model maintain all of the same inferences regarding the financing method the government chooses and the implications for corporations. Federal budget deficits tend to crowding out new corporate debt and equity issues, but short term financing of the deficits can more than offset this effect. Additionally, the tax change favored new corporate debt issues by more than three to one over new equity issues. When accounting for the constant in the estimation of the ratio of new issues of corporate debt to equity (approximately 1.2), this produces a ratio of new issues of corporate debt to equity of about 4.0. This is precisely the result witnessed in the earlier graphical analysis. Beginning in about 1986, corporations issued almost four times as much debt annually as they did equity. As a result, the revised model not only improves the performance of the original model and bolsters the inferences permitted by the original model, but also corresponds with the graphical analysis where the original model did not. To follow the format of the models previously reviewed, the following three figures graph the actual versus fitted data for the revised models. In each of the figures, the model demonstrates better performance after 1980.
Figure 8: Actual versus Fitted; NICE, Revised Model.
Other Perturbations of the Basic Model

Following the successful modification of the original model by adding the tax dummy, I experimented with other modifications in an attempt to draw out even more information. The other modifications included:

a) using the federal budget surplus squared to capture any second order effects of this important variable;

b) separating the net new issues of long term to short term government debt parameter to identify any independent effects the ratio may not disclose; and

c) eliminating the REGDUMMY because if it only captured the effects of the large deficits, then the budget surplus parameter already directly captures this information.
The following tables provide a summary of the results:

### Table 6: FBS Squared; WLS Regression Results.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>NICDTC</th>
<th>NICD</th>
<th>NICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parameter Estimate</td>
<td>Parameter Estimate</td>
<td>Parameter Estimate</td>
</tr>
<tr>
<td>Constant</td>
<td>1.0591</td>
<td>*</td>
<td>30.2402</td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0052</td>
<td>*</td>
<td>0.3840</td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0210</td>
<td>**</td>
<td>-0.5169</td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>-0.0188</td>
<td></td>
<td>-1.9070</td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0119</td>
<td></td>
<td>1.0748</td>
</tr>
<tr>
<td>FBS^2</td>
<td>2.007E-06</td>
<td>x</td>
<td>0.0024</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.0021</td>
<td></td>
<td>0.4336</td>
</tr>
<tr>
<td>SPRET</td>
<td>-1.7775</td>
<td>*</td>
<td>66.5872</td>
</tr>
<tr>
<td>GPDI</td>
<td>0.0039</td>
<td>*</td>
<td>-0.2102</td>
</tr>
<tr>
<td>REGDUMMY</td>
<td>-1.2162</td>
<td>*</td>
<td>17.1690</td>
</tr>
</tbody>
</table>

| Number of Observations | 45 | 45 | 45 |
| Weighting Series       | GDP | GDP | GDP |
| R-Squared              | 0.9680 | 0.9868 | 0.9871 |
| D-W Stat               | 1.9953 | 2.0613 | 2.5866 |
| F-Stat                 | 117.8179 | 291.9385 | 296.6426 |

* significant at the $\alpha = 0.05$ level  
** significant at the $\alpha = 0.01$

- $x$ = insignificant new parameter.
- * = indicates insignificant in modified regression, when previously significant in the original model.
- ° = indicates significance in modified regression, when previously insignificant in the original model.
Table 7: Separated flow variables, with REGDUMMY, WLS Regression Results.

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>NICDTC</th>
<th>NICODE</th>
<th>NICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td><strong>Parameter Estimate</strong></td>
<td><strong>Parameter Estimate</strong></td>
<td><strong>Parameter Estimate</strong></td>
</tr>
<tr>
<td>Constant</td>
<td>1.8089</td>
<td>32.4236</td>
<td>20.9151</td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0031</td>
<td>0.3842</td>
<td>0.1598</td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0154</td>
<td>-0.4022</td>
<td>-0.3388</td>
</tr>
<tr>
<td>NNILTGD</td>
<td>0.0121</td>
<td>-0.1362</td>
<td>-0.0588</td>
</tr>
<tr>
<td>NNISTGD</td>
<td>-0.0068</td>
<td>-0.0093</td>
<td>-0.0221</td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0134</td>
<td>0.1519</td>
<td>0.1686</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>-0.0003</td>
<td>0.5211</td>
<td>0.0829</td>
</tr>
<tr>
<td>SPRET</td>
<td>-2.5322</td>
<td>52.5582</td>
<td>53.0190</td>
</tr>
<tr>
<td>GPDI</td>
<td>0.0007</td>
<td>-0.3366</td>
<td>-0.1161</td>
</tr>
<tr>
<td>REGDUMMY</td>
<td>-0.7722</td>
<td>3.3408</td>
<td>20.1869</td>
</tr>
</tbody>
</table>

| **Number of Observations** | 45 |
| **Weighting Series**       | GDP |
| **R-Squared**               | 0.9689 |
| **D-W Stat**                | 2.0508 |
| **F-Stat**                  | 121.0478 |

* significant at the $\alpha = 0.05$ level  
** significant at the $\alpha = 0.01$  

$x$ = insignificant new parameter.  
$\cdot$ = indicates insignificant in modified regression, when previously significant in the original model.  
$\circ$ = indicates significance in modified regression, when previously insignificant in the original model.
Table 8: Separated flow variables, without REGDUMMY, WLS Regression Results.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>NICDTC Parameter Estimate</th>
<th>NICD Parameter Estimate</th>
<th>NICE Parameter Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.5520</td>
<td>29.2088</td>
<td>1.4896</td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0034</td>
<td>0.3766 **</td>
<td>0.1136 **</td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0113</td>
<td>-0.3841</td>
<td>-0.2296 *</td>
</tr>
<tr>
<td>NNILTGD</td>
<td>0.0240 x</td>
<td>0.1876 x</td>
<td>-0.3698 x</td>
</tr>
<tr>
<td>NNISTGD</td>
<td>-0.0120 *</td>
<td>0.0132 x</td>
<td>0.1138 x</td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0138</td>
<td>0.1541</td>
<td>0.1815 *</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>-0.0017</td>
<td>0.5273 **</td>
<td>0.1200 *</td>
</tr>
<tr>
<td>SPRET</td>
<td>-3.2630 **</td>
<td>55.7196</td>
<td>72.1214 **</td>
</tr>
<tr>
<td>GPDI</td>
<td>0.0028</td>
<td>-0.3216 **</td>
<td>-0.0256 *</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Weighting Series</td>
<td>GDP</td>
<td>GDP</td>
<td>GDP</td>
</tr>
<tr>
<td>R-Squared</td>
<td>0.9676</td>
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<td>0.9846</td>
</tr>
<tr>
<td>D-W Stat</td>
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<td>1.9885</td>
<td>2.2664</td>
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<tr>
<td>F-Stat</td>
<td>134.4786</td>
<td>307.1503</td>
<td>288.2434</td>
</tr>
</tbody>
</table>

* significant at the α = 0.05 level  ** significant at the α = 0.01

x = insignificant new parameter.

* = indicates insignificant in modified regression, when previously significant in the original model.

° = indicates significance in modified regression, when previously insignificant in the original model.
Table 9: Original Model, without REGDUMMY; WLS Regression Results.

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>NICDTC Parameter Estimate</th>
<th>NICO Parameter Estimate</th>
<th>NICE Parameter Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<td>33.4351</td>
<td>15.1022</td>
</tr>
<tr>
<td>STGD</td>
<td>-0.0052 *</td>
<td>0.3926 **</td>
<td>0.1614 **</td>
</tr>
<tr>
<td>LTGD</td>
<td>0.0222 **</td>
<td>-0.4308</td>
<td>-0.3657 **</td>
</tr>
<tr>
<td>NNILTSTG</td>
<td>0.0374</td>
<td>-1.2562</td>
<td>-0.9125</td>
</tr>
<tr>
<td>FBS</td>
<td>-0.0099 *</td>
<td>0.1912</td>
<td>0.1804 **</td>
</tr>
<tr>
<td>CNGFBS</td>
<td>0.0034</td>
<td>0.5095 **</td>
<td>0.0606 *</td>
</tr>
<tr>
<td>SPRET</td>
<td>-2.1207 *</td>
<td>52.6420</td>
<td>59.2881 **</td>
</tr>
<tr>
<td>GDI</td>
<td>0.0019</td>
<td>-0.3362 **</td>
<td>-0.0789 **</td>
</tr>
</tbody>
</table>

| Number of Observations | 45                        | 45                      | 45                      |
| Weighting Series       | GDP                       | GDP                     | GDP                     |
| R-Squared              | 0.9628                    | 0.9856                  | 0.9831                  |
| D-W Stat               | 1.7227                    | 2.0080                  | 1.9612                  |
| F-Stat                 | 136.9545                  | 360.9198                | 306.8894                |

* significant at the $\alpha = 0.05$ level  ** significant at the $\alpha = 0.01$

$x$ = insignificant new parameter.

$\bullet$ = indicates insignificant in modified regression, when previously significant in the original model.

$\circ$ = indicates significance in modified regression, when previously insignificant in the original model.

None of these modifications proved fruitful. Adding the square of the federal budget surplus weakened the significance of the federal budget surplus variable in all of the models. Separating the ratio of the net new issues of long term to short term government debt provided weaker results and the separate “flow” variables of government debt had no significance in any of the models. From this information, it appears as though the original specification of the model more closely corresponds to the actual relationships among the data. The important information regarding the government’s participation in the financial markets is not its annual contribution to the
pool of financial instruments. Rather, the important information is how much of the economy's capacity for absorbing additions to the pool of long and short term financial instruments has the government already consumed by its existing stock of long and short term instruments. This information will then determine the extent to which new corporate financial instruments can flow into the economy's capacity. Finally, dropping the REGDUMMY caused alpha significance level for the budget surplus and investment parameters to increase (i.e. decrease in significance) across all three models and the explanatory power to decrease. This results lends support to the notion that the Reagan dummy does not specifically measure the effects of the increased budget deficits. Rather, it is a broad measure that indicates a significant change in the financial markets since 1980.

Analysis of Fitted Data

From the graphical analysis of the fitted to actual data, the fit seems far more accurate after 1979, than before 1979. In the following charts, I will decompose the actual versus fitted graphs for the revised model of new issues of corporate debt and new issues of corporate equity over the time period from 1980 through 1992. In the graphs, the solid, bold type lines represent the actual data and the dashed, bold type lines represent the fitted data. I identified the $\beta_i X_i$ combinations with markers on solid, thin lines.
Since the REGDUMMY and TAXDUMMY coefficients are large and positive in both of these regressions, this graphical analysis will attempt to identify a statistically significant $\beta_i \hat{X}_i$ that is large and consistently negative during the same time period. This finding would provide evidence of a counteracting parameter and variable combination to balance the large positive influence of the REGDUMMY and TAXDUMMY. The empirical analysis immediately identifies the investment $\beta_i \hat{X}_i$ combination as a possibility for both the new issues of corporate debt and equity. Further, in the analysis of corporate equity, the budget surplus combination also appears suspect.

From the analysis of Figure 9, the investment $\beta_i \hat{X}_i$ combination does shift more negative close to the time when the tax law changed. Equally interesting is the graphical representation that short term government debt and long term government debt serve as upper and lower conical bounds to the data actual and fitted data. Their counter balancing effects alone could drive the tighter fit witnessed during the 1980s. Asserting this argument implies that fiscal policy and the Treasury’s financing decision have increased in importance to the financial markets since 1980. Perhaps the REGDUMMY implies that the combined effects of the policy changes and financial market innovations since 1980 have made the government’s financing decision more important to the corporate financing choice.
In Figure 10, both the budget surplus and the investment $\beta_i \hat{X}_i$ combination have large negative influences on new corporate equity issues. Like the decomposition of new corporate debt issues, short term government debt and long term government debt serve as upper and lower conical bounds to the data actual and fitted data. The analysis of these figures leads to the conclusion that the increased size of the debt and how the mix of instruments change to finance that debt drive the better fit more than any one or more particular $\beta_i \hat{X}_i$ combinations. This decomposition analysis also lends support to the notion that the dummy indicators signify an increasing importance of fiscal and debt management policy to the financial markets. The financial market innovations have not caused this increase in importance. Rather, I posit a symbiotic relationship. When the government consumed a greater percent of the economy's capacity to absorb the various financial instruments, market innovations and pressures uncovered new methods to expand its capacity. At the same time, the government recognized its role and carefully monitored its debt and deficit financing choices to remain close to neutral as possible with respect to crowding out or crowding in of certain financial instruments. If anything, the evidence shows that the government has been to wary of the crowding out concern, and it has actually encouraged more new debt issues by the way it has pursued fiscal, tax and debt management policy.

From the graphical decomposition, only the investment $\beta_i \hat{X}_i$ combination meets the criteria for counter balancing the large positive effects of the dummy
variables. In the corporate equity analysis the budget surplus $\beta_i X_i$ combination also meets the criteria. By the shape and boundary nature of the government debt $\beta_i X_i$ combinations, the fit may simply reflect an increase in importance of government fiscal and debt management policies. The dummy variables may serve to identify the set of financial market innovations that occurred in order to accommodate the large debt and increased importance of government policies. In the next section of this chapter, the analysis turns to elasticity of substitution measures to identify more support for the conclusions reached thus far.
Figure 9: Decomposition of Fit; NICD, Revised Model.
Figure 10: Decomposition of Fit; NICE, Revised Model.
Other Methods of Investigation

From the analysis of the original and revised model, the revised model yields the same information, but produces stronger results. The discussion that follows will focus on the results from the revised model. Both models suggest that when the level of short term government debt changes, then new issues of corporate debt changes more dramatically than new issues of corporate equity. The model of the separate pieces of the ratio suggests that for every one dollar increase in the level of short term government debt, new issues of corporate debt increase by thirty-six cents, while new issues of corporate equity increase by only fifteen cents. This would cause the ratio to increase, not decrease. However, the regression results on the ratio do not reflect this result.

Additionally, the point elasticity measures suggest that new issues of corporate debt adjusts faster to changes in short term government debt than does new issues of corporate equity. The following two tables depict the point elasticity of substitution between the dependent variable and selected independent variables \( \left( \frac{\partial Y}{\partial X} \cdot \frac{X}{Y} \right) \). The years displayed represent the Romer dates and the credit crunch of 1966. Because graphical analysis indicated that the model was generally less efficient during these episodes of tight money, the analysis wanted to examine whether the elasticity
measures varied markedly during these episodes, relative to the mean and variance of the elasticity measure.\textsuperscript{18}

<table>
<thead>
<tr>
<th>Romer Dates</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>1968</td>
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<td>1974</td>
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<td>1978</td>
<td>8.2241</td>
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<tr>
<td>1979</td>
<td>6.4609</td>
</tr>
<tr>
<td>1988</td>
<td>2.8975</td>
</tr>
<tr>
<td>Mean</td>
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<tr>
<td>Variances</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>5.9516</td>
</tr>
<tr>
<td>Max</td>
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<td></td>
<td>2.2050</td>
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<tr>
<td></td>
<td>12.7882</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Romer Dates</th>
<th>Dependent Variable</th>
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</thead>
<tbody>
<tr>
<td></td>
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<tr>
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<td>4.2273</td>
</tr>
<tr>
<td>1966</td>
<td>6.8666</td>
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<td>1979</td>
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<tr>
<td>1988</td>
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<td>Variances</td>
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From the tables presenting elasticity measures, short term government debt and long term government debt are the only two variables that show consistent elasticity measures over time. Additionally, the elasticity measures for the tight money episodes

\textsuperscript{18} The full elasticity measures for each year, along with descriptive statistics, are provided in Appendix B.
do not widely differ from the mean of the measures. The separate elasticity of substitution results on new issues of corporate equity and new issues of corporate debt do not support the parameter estimates in the regression on the ratio of new issues of corporate debt to equity. The parameter estimate for long term government debt from the regression on new issues of corporate equity is negative and significant. The results from the regression on new issues of corporate debt indicate a larger, more negative parameter value for long term government debt. These results support a negative parameter value for long term government debt in the regression on the ratio of corporate securities. Actual regression results on the ratio of corporate securities produced a positive parameter value. As the level of long term government debt increased, new issues of corporate equity decreased while new issues of corporate debt decreased faster. This would influence the ratio to decrease, not increase. The elasticity measures support the inverse relationship, and compel a conclusion that the results from the analysis of the ratio are anomalous.

In comparing the results of the three regressions, most of the action in the regression on the ratio of corporate securities seems to come from the equity portion of the ratio. Short term government debt seems to crowd in both corporate debt and equity. Long term government debt seems to crowd out corporate equity, but it crowds out corporate debt to a greater extent. This is an extremely important result for policy prescriptions. If the government insists on spending more than it receives in revenue, it can avoid crowding out the demand for all private financial instruments by
financing its deficits with short term debt instruments. Therefore, this study finds support for the notion that the Treasury can influence portfolio crowding in of certain private financial instruments by financing its deficits with shorter term government debt instruments.

Federal Budgets Deficits and Crowding-Out

The traditional crowding out argument which states that running a deficit crowds out private investment implies that debt financing should crowd out private debt issues. This study contributes more conclusive results. A deficit tends to crowd out all corporate financial instruments. However, financing that deficit with short term debt can more than compensate for this effect to cause portfolio crowding in of all corporate financial instruments. Additionally, reducing the budget deficit from one year to the next better enables corporations to use debt instruments to finance their investments. The results for new issues of corporate equity are even more informative. A positive level of budgetary surplus and a positive change in the surplus from one year to the next influences more corporate equity use.

From these results, it seems that an increase in the deficit causes new corporate equity issues to decrease. If new corporate equity issues decrease faster than new corporate debt issues decrease, then it would cause the ratio of the two to increase. Considering the size of the parameter coefficients, the model supports this conjecture, especially when the coefficient on the budget surplus for new issues of corporate debt is not statistically different from zero. Point elasticity of substitution measures further
emphasize this conclusion. Although the range of elasticity measures switches from negative to positive over the years examined, the mean elasticity of the budget surplus with respect to new corporate equity issues is more negative than the elasticity with respect to new corporate debt issues. It is hard to put much emphasis on the elasticity measure for corporate debt since the partial derivative piece of the calculation, the parameter estimate, is statistically insignificant, implying no response.

The normative policy question resulting from this analysis is whether crowding in corporate equity and corporate debt is welfare increasing for the economy. If it is, then is the increase in welfare worth the cost of repeatedly refinancing the outstanding debt by rolling over maturing short term instruments with new short term government debt? The motivation for Taggart's paper, reviewed in the literature section, considered the issue of whether corporations assumed too much debt during the 1980s and that the balance sheets were no longer "healthy." He found that by adjusting the analysis for the types of debt used, and the changing role of debt instruments, balance sheets have become more conservative (Taggart, 1986). By traditional measures of corporate healthiness, increasing the amount of corporate equity relative to debt improves the firm's healthiness rating or measure. To the extent that financing government deficits with short term debt instruments crowds in the use of equity by private firms, is this welfare increasing? Is it possible to crowd in too much use of equity, especially when you incorporate the cost of refinancing (rolling over) the short term debt? To examine this question in more detail, future research should develop a
representative agent, utility maximizing model. Research can then empirically examine the optimal level of short versus long term government debt financing of the deficit that yields the greatest "social" utility, incorporating refinancing costs and some measure of corporate healthiness into the model.

Confounding Investment Implications

The parameter estimate on gross private domestic investment (GPDI) is another extremely intriguing result. Overall, an increase in investment increases the ratio of new corporate debt to equity. The empirical evidence borne out by the data does support the notion that an increase in investment is financed more by debt than by equity. However, an increase in investment decreases both new issues of corporate debt and equity. These results imply that an increase in investment causes new corporate equity issues to fall faster than new corporate debt issues. The signs for the parameter estimates on investment from regressions on the separate pieces of the ratio do not support this notion. The results suggest that when investment increases, new corporate debt issues fall by more that new corporate equity issues fall. The results from the separate regressions imply that the parameter sign on investment in the regression on ratio of the corporate financial instruments should be negative. The results from the elasticity measures provide no better insight to reconcile the disparate results on how corporations finance investment. For further research on this inexplicable result, analysis should, perhaps, employ a less broad category for investment than gross private domestic investment.
What does the REGDUMMY Variable Imply?

Equally interesting is the sign on the REGDUMMY coefficient. The paper makes a logical argument for a positive parameter estimate for the REGDUMMY in the ratio of new issues of corporate debt to corporate equity regression. The empirical results, however, indicate a significant negative coefficient. The Reagan years actually favor new corporate equity issues evidenced by the positive coefficient in the regression on this model. The variable is insignificant for the regression on new corporate debt issues. This suggests that the power of the short term financed deficits, which make equity more attractive, is greater than other implications from financial market innovations which influence more debt issues. Unraveling the various financial market innovations that have occurred since 1980 will prove invaluable to policy makers. Future research should focus on the empirical implications of the financial innovations that have occurred since 1980 and that continue to rapidly change the ground rules of current financial markets.

Summary

In this chapter estimation results identified support for Friedman’s pricing theory using a nominal quantity approach to the analysis. Furthermore, using the revised model produced results that not only support Friedman’s theory, but also reconciled the theory with the graphical evidence from the 1980s. The empirical results suggest that the Reagan years favored new issues of corporate equity, whereas graphical evidence from the introduction and from Chapter 1 suggests the Reagan
years favored new issues of corporate debt. Including a tax dummy in the revised model produced results to explain the significant shift to debt in the 1980s. The 1986 tax change explained the dramatic shift towards new corporate debt issues, while the financial innovations since 1980 seemed to favor more new corporate equity issues.

The significance of the findings in this study lie in the modeling methodology employed. The analysis examined the government and corporate financing relationship using nominal quantity measures, thereby avoiding the problem of making a priori restrictions on prices. Considering the relationships found in this paper, the analysis confirms that the pricing relationship Friedman found must hold, otherwise the quantity results would have been drastically different. Additionally, through the use of dummy variables to identify important policy shifts, the model reconciles the disparate results from the pricing theory with the graphical analysis of the 1980s.

In sum, the modeling results suggest that although running budget deficits discourages the use of equity, financing the deficits with short term versus long term debt more than compensates for the crowding out effects of the deficits on new issues of corporate equity and debt. The results support the notion that budget deficits cause portfolio crowding out of private debt instruments. Financing the deficit with short term debt, however, can fully overcome the crowding out effect. If the government insists on spending more than it receives in revenue, it can avoid crowding out the demand for private financial instruments by financing its deficits with short term debt instruments. This study, therefore, supports the notion that the Treasury can influence
portfolio crowding in of certain private financial instruments by exclusively financing its deficits with short term government debt instruments.

The most important result from the analysis of new issues of corporate debt was that by reducing the budget deficit from one year to the next, then corporations are better able to use debt instruments to finance their investments. Adjusting the mix of long and short term government debt financing can neutralize the crowding out effects resulting from the government's debt and deficits.

Determining the effects on social welfare is the next important question, and the direction in which future research should proceed. If the Treasury can exactly undo the crowding out effects of deficits, could the Treasury increase social welfare by crowding in all corporate financial instruments? If it would increase social utility to crowd in corporate financial instruments, is it worth the expense of the refinancing costs involved in rolling over the short term debt?

Investment and how corporations finance their investment decision continues to elude definitive empirical conclusions. The results that show both new corporate debt issues and new corporate equity issues decreasing as the investment level increases seem perplexing, at best. One possible explanation for the result obtained may lie in the definition of the investment variable employed. Gross private domestic investment includes all investment (i.e., housing, plant, equipment, etc.). Perhaps an increase in the investment parameter identifies increases in housing purchases, which could serve as a substitute for "investing" in the financial instruments employed in this
model. Subsequent research will decomposing this investment variable into just corporate investment and redress the implications for investment.

The results for the REGDUMMY are equally perturbing. The analysis anticipated a finding that would support Friedman's theory. While supporting the theory, the analysis anticipated that the Reagan Presidency and its legacy caused such a shift in the financial markets that corporations now categorically favor debt instruments. The empirical results, however, show that the years since 1980 actually favor new corporate equity issues. Incorporating the tax dummy into the analysis reconciles the empirical results with the graphical representations. With that conflict ostensibly resolved, future research will review the cornucopia of financial market innovations since 1980 and endeavor to identify the important innovations that favored equity and those which favored debt financing by corporations.

The elasticity of substitution analysis and the analysis of the fit confirm the empirical analysis. Government deficits, by themselves, crowd out all private financial instruments. Financing that deficit and debt with long term government bonds increases the severity of the crowding out effect. In contrast, however, short term financing can more than overcome the crowding out effects of budget deficits. Further, with the proper mix of long and short term instruments, the Treasury can exactly off set the crowding effects of deficits, rendering them portfolio neutral.
Chapter 5: Conclusions and Final Comments

Does debt financing of the deficit make equity financing for firms more attractive? Benjamin M. Friedman (1986) argued that it does. The theory and model employed in this thesis provides evidence that supports the relationship Friedman proposed. Friedman (1986) suggested that regardless of debt maturity, financing government budget deficits by issuing debt instruments (as opposed to printing new money), lowers the expected return on equity relative to the returns on long and short term corporate debt. This implies that during periods of debt financed deficits, financing corporate capital formation should favor equity, including retained earnings, more than debt instruments.

The model in this thesis examined whether the predicted nominal quantity side of the financing story corresponds with the pricing results Friedman found. The thesis supported its conclusions with evidence from three separate estimations: (1) modeling the ratio of new issues of corporate debt to corporate equity; (2) modeling new issues of corporate debt, by itself; and (3) modeling new issues of corporate equity, by itself. Without delving into substitutability and risk measurement issues, the thesis revealed the impact of the link between the government financing decision and the corporate financing decision.

Government deficits, by themselves, crowd out all private financial instruments. Financing that deficit and debt with long term government bonds increases the severity of the crowding out effect. In contrast, however, short term
financing can more than overcome the crowding out effects of budget deficits. Further, with the proper mix of long and short term instruments, the Treasury can exactly offset the crowding effects of deficits, rendering them portfolio neutral.

The information gained from the coefficient estimates and elasticity measures provides even greater insight. Regardless of specific prices, when the government issues more short term debt, then corporations tend to issue more debt versus equity. This finding runs counter to the intuition provided by Friedman’s pricing theory. His theory implies that when short term government debt increases, then the return corporations must pay to issue equity lowers, relative to the return on debt. This change in the return structure should influence more new issues of corporate equity than corporate debt.

This study enables researchers to draw some very definite conclusions about quantity relationships in public and private financing that supports the pricing relationship Friedman found. Additionally, the model in this paper can account for the significant increase in corporate debt since the 1980s, where Friedman's theory did not. The graphical depiction of the data suggested that Friedman's model should not only have failed, but that during the episodes of extremely "high" deficits (1980s), new corporate debt actually increased relative to new corporate equity issues. Friedman’s model did not fail, but as he recognizes, the financial markets have changed. These changes make his model appear to fail. Adjusting his model by accounting for the changes in the financial markets, as this study has done, reconciles the model with the
graphical analysis and contributes a nominal quantity analysis that supports the implications of the pricing theory initially developed.

In sum, the quantity analysis reviewed in this thesis supports Friedman's pricing story. The federal debt and deficit do have a significant relationship with private sector financing variables, and the government can play a significant role in influencing private financing instruments. The crowding out story holds, somewhat, when the government issues longer term government debt. However, the most interesting result is that the government can actually crowd in both corporate debt and equity by financing the deficit and debt with shorter term debt instruments.

These results are significant on two fronts. First, the analysis avoided the thorny issue of prices and still made the case for the government's role in debt and deficit management. Secondly, in contrast to proponents of the crowding out argument, high deficits have not diminished the corporate sector's ability to pursue either equity or debt financing. The corporate sector and the financial markets have demonstrated their versatility in the way they adjust to the size of government deficits and to the financing mix employed.

Future research on this topic should attempt to address the normative questions of social utility, deficits and crowding in. In additions, future research should attempt to unravel the confounding investment implications and the REGDUMMY indicator. Since the impact of the investment variable seemed so perplexing, future research should attempt to separate and analyze the corporate
investment level from the aggregate investment numbers employed in this study. The model employed does not delve into which structural changes make the period since 1980 favor equity. Future research should review the profusion of financial market innovations since 1980 and identify the important innovations that favored equity and those which favored debt financing by corporations.
References


Appendix A: Data Description
Table A-1: Data analyzed and used in model employed in Chapter 4.

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<th>Year</th>
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<th>NICE</th>
<th>STGD</th>
<th>LTGD</th>
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<th>FBS</th>
<th>CNFGFS</th>
<th>SPRET</th>
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Appendix B:  Regression Results

The following pages contain the full regression results; actual versus fitted data; residual measures; residual plots; and elasticity calculations. Chapter 4 presented summary information on this data in support of the thesis.
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SMPL range: 1948 - 1992
Number of observations: 45

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<p>| R-squared   | 0.470054    | Mean of dependent var | 2.408744 |
| Adjusted R-squared | 0.333783 | S.D. of dependent var | 1.029427 |
| S.E. of regression | 0.840240 | Sum of squared resid | 24.71014 |
| Log likelihood | -50.36463  | F-statistic | 3.449389 |
| Durbin-Watson stat | 1.890661 | Prob(F-statistic) | 0.003885 |</p>
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Figure B-1: Residual Plot: NICDTCE.
Augmented Dickey-Fuller Unit Root Test,  
With a Constant and One Lag Period

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Table B-3: Unit Root Tests.

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LS: Dependent Variable is NICDTCE
Date: 2-12-1995 / Time: 18:51
SMPL range: 1948 - 1992
Number of observations: 45
Weighting series: GDP

Table B-4: Weighted Least Squares (WLS) Regression Results: NICDTCE.

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<th>T-STAT.</th>
<th>2-TAIL SIG.</th>
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Weighted Statistics

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Unweighted Statistics

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Figure B-2: WLS Residual Plot: NICDTCE.
LS // Dependent Variable is NCD  
Date: 2-12-1995 / Time: 18:51  
SMPL range: 1948 - 1992  
Number of observations: 45  
Weighting series: GDP

Table B-6: Weighted Least Squares Regression Results; NCD.

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<th>2-TAIL SIG.</th>
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Weighted Statistics

- R-squared: 0.985573
- Adjusted R-squared: 0.982367
- S.E. of regression: 35.00607
- Log likelihood: -218.8300
- Durbin-Watson stat: 2.015448
- Mean of dependent var: 125.6161
- S.D. of dependent var: 263.6196
- Sum of squared resid: 44115.30
- F-statistic: 307.4115
- Prob(F-statistic): 0.000000

Unweighted Statistics

- R-squared: 0.953813
- Adjusted R-squared: 0.943549
- S.E. of regression: 20.81407
- Durbin-Watson stat: 1.732710
- Mean of dependent var: 52.96784
- S.D. of dependent var: 87.60362
- Sum of squared resid: 15596.12
<table>
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<th>obs</th>
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<th>ACTUAL</th>
<th>FITTED</th>
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Figure B-3: WLS Residual Plot: NICD.
LS // Dependent Variable is NICE
Date: 2-12-1995 / Time: 18:50
SMPL range: 1948 - 1992
Number of observations: 45
Weighting series: GDP

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Figure B-4: WLS Residual Plot, NICE.
LS // Dependent Variable is NICDTCE
Date: 3-10-1995 / Time: 11:16
SMPL range: 1948 - 1992
Number of observations: 45
Weighting series: GDP

Table B-10: Regression Results; NICDTCE; Revised Model.

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Figure B-5: Residual Plot; NICDTCE Revised Model.
LS // Dependent Variable is NICO
Date: 3-10-1995 / Time: 11:16
SMPL range: 1948 - 1992
Number of observations: 45
Weighting series: GDP

Table B-12: Regression Results; NICO; Revised Model.

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Figure B-6: Residual Plot; NICD; Revised Model.
LS // Dependent Variable is NICE
Date: 3-10-1995 / Time: 11:16
SMPL range: 1948 - 1992
Number of observations: 45
Weighting series: GDP

Table B-14: Revised Regression Results; NICE.

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Table B-17: Summary Statistics, Elasticity Measures; NICD; Revised Model.

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