THE EFFECT OF DEFICIT-REDUCTION LAWS ON REAL INTEREST RATES

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ABSTRACT

The periods preceding the passage of the Gramm-Rudman-Hollings law of 1985 and the Budget Enforcement Act of 1990 form excellent natural experiments for studying the effect of fiscal policy on financial markets. Financial markets should respond to *expected* changes in government spending and budget deficits, but those expectations are generally unobservable. This paper uses news reports about these two deficit-reduction laws to identify days when expected fiscal policy clearly became more or less expansionary. The paper also proposes a technique for identifying whether the real interest rate increased or decreased on those days, based on changes in the nominal interest rate, the exchange rate, commodity prices, and stock prices. The financial-market developments following news reports about the deficit-reduction laws are consistent with the predictions of economic theory. Higher expected government spending and budget deficits raised real interest rates and the value of the dollar, while lower expected spending and deficits reduced real rates and the value of the dollar.

1. Introduction

Ricardian theory predicts that temporary reductions in government spending should lower real interest rates.[1] Neoclassical and Keynesian theories predict that permanent reductions in government spending and permanent or temporary reductions in government budget deficits should also lower real interest rates.[2] There is little empirical evidence supporting any of these predictions, however. Almost a decade ago, Barro (1987) noted that "there is little evidence from U.S. time series that verifies a positive effect of temporary government purchases on real interest rates" (p. 224), and Bernheim (1987) wrote that "studies using time-series data ... often fail to identify systematic short-run relationships between deficits and ... interest rates" (p. 264). Unfortunately, these statements apply almost as well today as they did when they were written.

One critical problem in testing the relationship between fiscal policy and interest rates is that interest rates should respond to *expected* government spending and *expected* budget deficits, and those expectations are generally unobservable. As reviewed briefly in the next section, past researchers have tried to measure such expectations in several ways, none of which is completely convincing. Given the shortcomings of these previous approaches, it is probably worthwhile to explore alternative ones. Thus, this paper uses news reports about deficit-reduction laws to identify changes in expected fiscal policy, an approach that has not been used before, to the best of my knowledge.[3]

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[1] See Barro (1987, pp. 318-321).

[2] See Blanchard and Fischer (1989, pp. 130-135).

[3] Evans (1987) examines the residuals from an interest-rate forecasting equation during periods preceding the passage of major tax legislation. He does not try to identify specific pieces of news that affect the likelihood of the legislation being enacted, as I do in this paper.

I study the periods prior to the passage of the Gramm-Rudman-Hollings balanced budget law of 1985 and the passage of the Budget Enforcement Act of 1990.[4] These events have several strengths for this analysis. First, each law represented a significant change in expected fiscal policy. Newspaper accounts at the time treated these laws as turning points in the deficit outlook (while recognizing that this expectation might be disappointed), and both laws apparently did make the budget deficit smaller than it otherwise would have been.[5] Second, news about the prospects for each law was disseminated widely, which suggests that financial markets probably responded to the news fairly quickly. Third, each law travelled a rocky road to enactment, which created occasions on which expected fiscal policy became more expansionary as well as occasions when it became less expansionary. Specifically, news indicating that a law was more likely to be enacted presumably reduced expected budget deficits and government spending, while news indicating that a law was less likely to be enacted presumably raised expected budget deficits and government spending.

By observing the reaction of financial markets to each piece of news, I can evaluate whether movements in financial variables confirm the predictions of economic theory. The paper focuses on changes in real interest rates, although it also examines changes in nominal interest rates and in the exchange rate. Real interest rates are not directly observable, of course, but I show how movements in nominal interest rates, the exchange rate, commodity prices, and stock prices can be used together to deduce the *direction* of movements in real interest rates.

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[4] Similar analyses could be conducted of other deficit-reduction laws, such as the revision of the Gramm-Rudman-Hollings law in 1987, President Clinton's budget package in 1993, and the Republican budget proposals in 1995-96.

[5] See Reischauer (1990, p. 228) and Congressional Budget Office (1993, p. 85).

Unfortunately, this method provides no evidence about the *size* of these movements, a limitation which I discuss in the next section of the paper.

It is important to note that this paper provides no evidence on the validity of the Ricardian equivalence proposition.[6] That proposition concerns changes in the financing of government spending, *holding the amount of that spending constant.* In contrast, both the Gramm-Rudman-Hollings law and the Budget Enforcement Act were designed to affect the amount of spending as well as the budget deficit. Thus, the interest-rate effects of these laws are based on some combination of changes in expected deficits and changes in expected spending, and they do not yield information about the separate effect of either variable.

The main finding of this paper is that the response of real interest rates to changes in expected fiscal policy corresponds quite strongly to the response predicted by economic theory. When financial markets received encouraging news about a deficit-reduction law, changes in the nominal interest rate and various asset prices imply that the real interest rate generally declined. When markets received discouraging news about a deficit-reduction law, the same variables imply that the real interest rate generally rose. Overall, I can reject at the one-percent level the hypothesis that actual changes in the real interest rate were uncorrelated with predicted changes.

An additional finding of the paper is that the exchange rate also responds to changes in expected fiscal policy in the way that economic theory predicts. Contrary to some recent comments--which are discussed at greater length in the paper--more expansionary fiscal policy usually increased the value of the dollar, and less expansionary policy usually decreased its value. I can reject the hypothesis of no correlation between the actual and predicted changes at the five-

[6] See Barro (1974).

percent level. Finally, the paper produces weaker evidence that more expansionary fiscal policy tends to raise the nominal interest rate, and less expansionary policy tends to lower it.

The paper is organized as follows. Section 2 briefly reviews alternative approaches to measuring expectations of fiscal policy. Section 3 describes the methodology I use for identifying fiscal policy news and for deducing the change in the real interest rate that follows each piece of news. Section 4 summarizes the events leading up to the passage of the Gramm-Rudman-Hollings law and the Budget Enforcement Act. Section 5 documents the relationship between changes in expected fiscal policy and changes in the real interest rates, the nominal interest rate, and the exchange rate. Section 6 concludes.

2. Alternative Measures of Expected Fiscal Policy

The extensive literature on the effect of fiscal policy on interest rates includes several approaches to measuring fiscal-policy expectations. The most common approach is to estimate a vector autoregression (VAR) of key variables and then use the fitted values as proxies for actual expectations. This technique is first used for studying fiscal policy by Plosser (1982), and is later extended by Plosser (1987), Evans (1986, 1987), and others. VARs are popular proxies for expectations because they are among the simplest econometric models, require no structural assumptions, and can be applied to virtually any data series over any time period. Yet there are a number of features of individuals' thought processes that are not captured by the VAR technique, including non-quantitative information. Such information seems particularly important in forming expectations of government spending and budget deficits, and it is the type of information used in this study.

A second approach to measuring fiscal-policy expectations is to use the official projections of the Congressional Budget Office (CBO) or the Office of Management and Budget (OMB). This procedure is proposed by Wachtel and Young (1987) and extended by Quigley and Porter-Hudak (1994). Unfortunately, neither set of projections represents true forecasts of fiscal policy, although they may contain information that influences true forecasts. The CBO projections are extrapolations of current policies, while the OMB projections use Administration budget proposals and may be based on politically useful (i.e., optimistic) economic forecasts.

A third way of capturing expectations of fiscal policy is implemented by Elmendorf (in progress). This paper uses the time series of forecasts constructed by Data Resources, Inc., a commercial forecasting firm. The Data Resources forecasts are available for hundreds of variables since 1971, and they avoid many of the drawbacks of VARs. In particular, these forecasts incorporate non-quantitative information, and they do not assume that government spending or budget deficits follow stable time-series processes.

The present paper employs a fourth approach to measuring fiscal-policy expectations, which is to use news reports about the likelihood of enacting deficit-reduction laws. Because these laws' prospects improved or deteriorated many times, I can identify a number of days on which expected fiscal policy clearly became more or less expansionary. The paper also proposes a technique for identifying whether the real interest rate increased or decreased on those days, based on whether the nominal interest rate and various asset prices increased or decreased.

The event-study methodology used here is not without limitations, however. One drawback is that it provides information about changing expectations for only a small fraction of all days, and even that information depends on a subjective interpretation of newspaper reports. A second problem is that it assumes that news is absorbed fully by financial markets within a matter of hours. At the same time, of course, using the daily frequency makes it easier to separate changes in fiscal-policy expectations from all of the other events that influence interest rates. A third, and very important, shortcoming is that the methodology determines only the *direction* of the changes in fiscal policy and the real interest rate, not the *magnitude* of the changes. As a result, I can show whether changes in expected fiscal policy move real interest rates in the direction predicted by theory, but I cannot assess the magnitude of those movements.[7] Further, I cannot show whether expected fiscal policy is an important determinant of real interest rates in the sense of explaining a significant share of the total variation in those rates.

Given these limitations, the event-study methodology used in this paper cannot replace other approaches to measuring expectations. It does appear to be a useful complement to these approaches, however.[8]

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[7] The crucial problem is that one cannot observe the magnitude of changes in expected inflation. In any case, economic theories do not make quantitative predictions about the effect of fiscal policy on interest rates (absent a completely parameterized model of the economy), so examining the magnitude of rate changes would not be a test of these theories even if it were feasible.

[8] Leamer (1985) discusses the difficulty of modeling the formation of expectations, and concludes that economists should pursue "either (1) the study of historical episodes when it seems clear for exceptional reasons that expectations changed in a known direction ..., (2) an experimental approach ..., or (3) the direct measurement of expectations" (p. 281). Other issues for which the study of historical episodes has proven useful include the determination of taxable vs. tax-exempt bond yields (Poterba, 1986), the wealth effects of corporate disputes (Cutler and Summers, 1988), and the effect of sterilized interventions on exchange rates (Dominguez and Frankel, 1993).

3. Methodology

This paper links expected-fiscal-policy revisions to interest-rate changes in three steps. The first step is to identify specific news events that altered expectations, the second step is to deduce the change in the real interest rate that followed each piece of news, and the third step is to assemble this information in a form amenable to statistical testing. This section of the paper describes these three steps in turn.

Fiscal Policy News

The focus of this study is the periods preceding the passage of the Balanced Budget and Emergency Deficit Control Act of 1985--better known as the Gramm-Rudman-Hollings law (hereafter, GRH)--and the passage of the Budget Enforcement Act of 1990 (hereafter, BEA). GRH went from initial proposal to final passage in just over two months, while the BEA was the culmination of nine months of debate. I identify news about expected fiscal policy by reading the *New York Times* and the *Wall Street Journal* during those periods. On many days, there is no significant budget news. On other days, there is budget news, but its impact on expected fiscal policy is unclear: an example would be a day on which some Congressional leaders expressed support for the BEA while others announced their opposition. Finally, there are days with news that clearly increased or decreased the perceived likelihood of a bill becoming law. I identify 14 such days for GRH and 14 such days for the BEA.

I label as "event days" the days on which financial markets had their first opportunity to respond to these pieces of news. Thus, if news arrived early in a day, that same day is the event day, while if news arrived after markets closed (which was quite common), the next day becomes the event day. In a few cases, the timing of news is problematic; I make a reasonable assumption and then discuss these days at greater length in the results section. It is important to emphasize that I identify event days *before* examining financial-market developments, so that those developments can provide a true test of economic theory.

What financial-market developments are predicted by economic theory for the event days? I discuss interest rates first, and then turn to exchange rates.

Both GRH and the BEA were designed to reduce spending as well as the budget deficit. This point is explicit in the case of the BEA, which specified spending reductions as well as tax increases. It is not explicit for GRH, but there were two reasons to believe that the law would result in lower spending: first, there was significant political resistance to tax increases in the mid-1980s, and second, the bill mandated automatic spending cuts in the event that its deficit-reduction goals were not met through the normal budget process. At the same time, the changes in spending forced by these laws were presumably expected to be at least partly temporary.

Therefore, both Ricardian and non-Ricardian theory predict that favorable news regarding the passage of a law should have lowered real interest rates, while unfavorable news should have raised real interest rates.[9] Economic theory makes no specific predictions concerning nominal interest rates, although if there is little news about expected inflation on event days, nominal rates should generally move in the same direction as real rates.

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[9] The interest rate in a small open economy will always equal the world interest rate, and thus will be unaffected by the country's fiscal policy. The United States is not a small economy, however, so its interest rates are not determined solely by events elsewhere in the world.

Most open-economy models imply that expansionary fiscal policy boosts the value of a country's currency, while contractionary fiscal policy depresses the value of the currency.[10] These changes in the exchange rate are a result of the changes in the real interest rate described in the previous paragraph. The exchange-rate adjustments in turn change the trade balance in order to restore equilibrium between a country's output and the demand for that output. For example, a decline in the budget deficit implies reduced spending by either the government or households (due to higher taxes); the accompanying depreciation of the exchange rate produces an offsetting increase in spending by foreigners, which appears as a smaller trade deficit. In summary, standard economic analysis implies that favorable news regarding the passage of a deficit-reduction law should have caused a depreciation of the U.S. exchange rate, while unfavorable news should have caused an appreciation.

This standard conclusion has been challenged recently by analysts who argue that a reduction in budget deficits would cause an *appreciation* of the dollar. There appear to be two ways to justify this alternative view in the context of standard open-economy models. First, achieving better control over our fiscal policy might reduce risk premiums on U.S. assets and, in particular, investors' fear of a "hard landing" in which a sudden decline in investor confidence would sharply reduce the demand for those assets.[11] Second, smaller deficits might put less pressure on the Federal Reserve to pursue expansionary monetary policy, which would reduce expected U.S. inflation. If lower expected inflation were not accompanied by a corresponding

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[10] For example, see the explanation and extensions of the Mundell-Fleming model summarized by Dornbusch (1980, pp. 193-214).

[11] See Ball and Mankiw (1995, p. 99, footnote 2).

decline in nominal interest rates, the dollar would appreciate.[12]

Deducing Changes in Real Interest Rates

The *ex ante* real interest rate is the difference between the nominal interest rate and expected inflation. Because expected inflation cannot be observed, the *ex ante* real interest rate cannot be observed.[13] Fortunately, it is often possible to infer the direction of changes in the real interest rate by observing the direction of changes in the nominal interest rate, the exchange rate, commodity prices, and stock prices. (As noted above, the responses of the nominal interest rate and the exchange rate to changes in expected fiscal policy are interesting for their own sake as well.) This inference proceeds as follows.

First, changes in the exchange rate can be used to decompose changes in nominal interest rates into changes in real interest rates and expected inflation. Engel and Frankel (1984) develop this technique in order to interpret the effect of money announcements on interest rates. They present a simple open-economy model that they describe as "a generalization of Frankel's (1979) synthesis of the Frenkel (1976) and Dornbusch (1976) versions of the monetary approach to exchange rate determination" (p. 32). The critical assumption in this model is that goods prices are sticky but there is some force driving the economy toward purchasing power parity in the long run. In such a world, an increase in the U.S. real interest rate attracts a capital inflow and raises the exchange value of the dollar, while an increase in expected U.S. inflation lowers the

[12] See Feldstein (1995, pp. 404-405).

[13] It is possible to obtain measures of expected inflation from survey data or commercial forecasts. But this study is based on daily changes in expectations, and these measures of expected inflation are not available at a daily frequency.

nominal value of the dollar.

Therefore, an *increase* in the nominal interest rate accompanied by an *appreciation* of the currency implies an *increase* in the real interest rate. A *decrease* in the nominal interest rate combined with a *depreciation* of the currency implies a *decrease* in the real interest rate. This logic is summarized in Table 1A. Unfortunately, the methodology is not helpful for interpreting opposing movements in the nominal interest rate and the exchange rate. For example, an increase in the nominal rate together with a depreciation of the currency unambiguously implies an increase in expected inflation but could reflect either an increase or a decrease in the real interest rate.[14]

In addition, one can use movements in commodity prices to decompose changes in nominal interest rates into changes in real interest rates and expected inflation. If commodity prices are flexible and forward-looking, they should increase when expected overall inflation increases. This implies that an increase in the nominal interest rate accompanied by a fall in commodity prices probably reflects an increase in the real interest rate, while a decrease in the nominal interest rate together with a rise in commodity prices indicates a decrease in the real interest rate. Again, there are combinations of changes in nominal interest rates and commodity prices that are not informative about changes in real interest rates. If commodity prices move in the same direction as nominal interest rates, it is not possible to determine whether real interest

[14] One can deduce in this case that any increase in the real interest rate must have been smaller than the increase in expected inflation, or the exchange rate would have increased as well.

rates have moved, or in what direction.[15] Table 1B summarizes the relationship between nominal interest rates, commodity prices, and implied real interest rates.

Finally, one can infer the effect of expected fiscal policy on real interest rates by observing its effect on stock prices. This technique is based on the Blanchard (1981) model of the interaction between expected policy, interest rates, and stock prices. If, for example, fiscal policy becomes more expansionary, the aggregate demand for goods rises, which, *ceteris paribus*, raises the expected stream of returns from physical assets and thus the value of shares in their ownership. If real interest rates increase at the same time, however, they exert downward pressure on share prices because future returns are discounted at a higher rate. Thus, if one observes a decline in stock prices following an expansionary change in expected fiscal policy, one can infer that real interest rates have risen. Similarly, a gain in stock prices following a contractionary change in fiscal policy implies that real interest rates have fallen. This logic does not help to deduce the change in real interest rates if expansionary fiscal policy is accompanied by a rise in common stock prices, or if contractionary fiscal policy is accompanied by a fall in common stock prices. Table 1C summarizes the implications of the model.

Two problems arise in using the relationships shown in Table 1 to deduce changes in real interest rates. First, none of the relationships provides an infallible guide to changes in real interest rates, so the changes in real rates implied by the various relationships are not always consistent with each other. Second, each relationship includes ambiguous cases where the chosen

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[15] If one assumes that commodity prices change just as much as expected overall inflation changes, then one can determine the change in real interest rates by comparing the sizes of the movements in nominal interest rates and commodity prices. Because commodity prices are more flexible than the prices of other goods in the economy, however, such an assumption is not justified.

variables provide no information about the change in real interest rates. Therefore, the relationships in Table 1 are regarded as providing a definite indication of the change in real interest rates if at least one guideline offers an unambiguous prediction that is not contradicted by another guideline. The relationships are viewed as providing an uncertain indication if all three guidelines make ambiguous predictions, or if two guidelines make unambiguous but contradictory predictions. Of the 28 event days I identify in this paper, I obtain a definite indication of the change in real interest rates on 23 days, and an unclear indication on the remaining 5 days.

The data for this paper are as follows. The nominal interest rate is the end-of-day yield on Treasury securities with a constant seven-year maturity, constructed by the U.S. Treasury Department and drawn from the Federal Reserve Board's database. I focus on the seven-year notes because their maturity is close to the time period over which these laws were supposed to affect fiscal policy; using the yield on one-year notes or thirty-year bonds has little effect on the results, however. The exchange rate is the Federal Reserve Board's trade-weighted index of the dollar, recorded at 3 PM and reported in the following day's "Currency Markets" column in the *New York Times*. Stock prices are represented by the closing value of the Standard and Poor's Composite Index of 500 stocks, again drawn from the Federal Reserve's database. Finally, commodity prices are measured by the Commodity Research Bureau's futures index of commodity prices, reported in the following day's *Wall Street Journal.*

Statistical Significance

The methodology described to this point constructs two changes in real interest rates for each event day: a predicted change based on news events and economic theory, and an actual change based on movements in various asset prices. To judge whether the actual changes are systematically related to the predicted changes requires some formal statistical tests.

Unfortunately, the prospects for statistical testing are limited by the qualitative nature of the predictions and observations. As I explained earlier, the event-study methodology used in this paper determines only the *direction* of the changes in fiscal policy and the real interest rate, not the *magnitude* of the changes. Thus, the statistical tests must be based on the signs of the interest-rate changes rather than their sizes. An appropriate null hypothesis is that knowing whether expected fiscal policy is becoming more or less expansionary does *not* help to predict whether real interest rates will rise or fall. We can reject this null hypothesis if economic theory "gets the sign right" noticeably more often than would occur by pure chance.

The most direct way to test this hypothesis is to use a contingency table of the predicted and actual changes in real interest rates. Predicted changes are of two types: up and down. Actual changes come in three varieties: up, down, and uncertain (given the difficulties of inference noted above). So I create a 2-by-3 contingency table and compare the observed distribution of days with the expected random distribution. The test statistic equals $\Sigma_i(O_i-E_i)^2/E_i$, where O_i and E_i are the observed and expected number of days in cell i. This statistic follows a χ^2 distribution with (r-1)*(c-1) degrees of freedom, where r is the number of rows and c the number of columns in the table.[16]

I also use contingency tables to analyze the changes in nominal interest rates and the exchange rate. The actual changes in these variables are easily observed, so the ambiguity

[16] See Maddala (1977, pp. 46-47).

regarding real interest rates does not arise. Thus, contingency tables for these variables have dimension 2-by-2.

4. Chronology of Two Deficit-Reduction Laws

The months preceding the passage of the Gramm-Rudman-Hollings law of 1985 (GRH) and the Budget Enforcement Act of 1990 (BEA) form natural experiments for studying the effect of fiscal policy on financial markets. The GRH period is the cleaner experiment of the two because it is easier to isolate the changes in expectations during that period. First, the GRH proposal remained fairly stable during the debate, while the various proposals culminating in the BEA differed sharply. Second, the news concerning GRH was more explicit than the news about BEA, with comparatively more formal Congressional votes and comparatively fewer informal declarations of support or opposition.[17]

The Gramm-Rudman-Hollings Law

In late September 1985, as the federal debt was rising toward the legal debt ceiling, a bill to raise the ceiling was stalled in Congress. On Thursday October 3 (event 1), Republicans in the House and Senate proposed a "rider" to the bill, a plan designed by Senators Phil Gramm, Warren Rudman, and Ernest (Fritz) Hollings to balance the Federal budget by 1991. The *Wall*

[17] It also turns out that the changes in real interest rates were uncertain more often during the GRH period than during the BEA period.

Street Journal reported the next day that "there is a growing bipartisan consensus that without such a measure, neither house can find the majority needed to increase the government's borrowing authority" (p. 4). President Reagan voiced his support for the plan, and Speaker of the House Tip O'Neill directed House Democrats to create a plan of their own. Yet, it is not clear whether financial markets perceived the plan to be important at that point: the *New York Times* buried the story deep in the news and business sections.

Reports during the next several days indicated pessimism regarding the bill's prospects. The front-page *Times* headline on Saturday October 5 was "Plan to Balance U.S. Budget by '91 Delayed in Senate," as some senators blocked a vote on the bill. The *Journal*, which does not appear on weekends, reported on Monday October 7 (event 2): "Senate Remains Deadlocked on Debt Ceiling / Republican Majority Fails in Bid to Curb Debate on Crucial Amendment" (p. 3).

During the remainder of that week, the news concerning GRH was favorable. On Wednesday October 9 (event 3), the *Times* reported that Senate leaders had reached a compromise on the bill late the previous night. On Thursday October 10 (event 4), a *Journal* article stated that "the 75-24 roll call vote [late Wednesday night] ... reflected the strength of concern over the deficit" under the headline "Senate Votes to Set Curbs on U.S. Deficits" (p. 3). A front-page *Times* headline said "Senate Seeks Bar to Deficits by '91 in Bipartisan Vote." On Friday October 11 (event 5), the House voted to endorse the goals (though not the specifics) of the Senate plan. A *Journal* article the following Monday indicated that this was perceived as a serious effort to cut the deficit, reporting that "some mechanism for mandatory, across-the-board spending cuts seems certain to emerge in any final legislation" (p. 5).

After the initial flurry of activity, a House-Senate conference committee worked for several weeks with no reported progress. Then, with little warning, the House passed its own version of GRH on Friday November 1 (event 6). This version set a balanced budget deadline of 1990 and exempted more social programs from automatic cuts than did the Senate version. The action confirmed the House's commitment to reducing the deficit, and signalled an increased likelihood of the eventual passage of a GRH-style bill.

Several news stories concerning GRH appeared over the next few days, but they sent a mixed message regarding the probability that the bill would be passed. By mid-November there was still no Congressional agreement in sight. With the outstanding debt rapidly approaching its legal ceiling and additional pressure from an upcoming Presidential summit with the Soviet Union, some members of Congress proposed a one-month temporary increase in the debt limit with no GRH-type restrictions. This bill raised the perceived likelihood that the eventual permanent increase in the debt ceiling would involve no significant deficit or spending reductions. On Wednesday November 13 (event 7), newspapers reported that a House committee had approved the proposal late in the previous day. Both houses of Congress passed the bill late on Wednesday with a promised signature from President Reagan. This story appeared in newspapers on Thursday November 14 (event 8).

For several weeks, there was no major news concerning the debt limit or GRH. Then, on Monday December 2 (event 9), a *Journal* article contained discouraging news. Under the headline "Top Reagan Aides Signal New Unease Over Deficit-Reduction Bill in Congress," the article explained that "comments [by James Miller, the director of the Office of Management and Budget, and Donald Regan, Reagan's chief of staff] reflect rising concern about the deficit-spending issue at the White House, which has been backpedaling from its endorsement of

Gramm-Rudman as Congress has changed the measure. ... The comments ... raise the possibility that the president will veto any agreement House-Senate conferees reach" (p. 5).

The mood concerning the bill's prospects changed later in the week. On Wednesday December 4 (event 10), the front page of the *Times* business section reported "optimism that an agreement would be reached to reduce Federal budget deficits." Then, late on Friday December 6, a breakthrough was announced. Saturday's *Times* reported on the front page that House-Senate "Conferees Agree on a Plan to End Federal Deficits," and Monday's *Journal* reported on the front page that "a House-Senate compromise on landmark legislation to balance the budget cleared the way for passage of a $2 trillion debt-ceiling bill." The financial-markets columns were somewhat more cautious, though, with the *Journal* commenting that the legislation still faced "many hurdles in Congress" (p. 36), and the *Times* noting that there was still general skepticism about any actual cuts in spending (p. D9). Because it is not clear when financial markets became aware of Friday's agreement, I classify Friday December 6 as event 11 and Monday December 9 as event 12.

Some complications arose over the following days, but during the night of December 10, the conferees agreed on a final plan to balance the budget by 1991(!). On Wednesday December 11 (event 13), the *Journal* quoted President Reagan as saying: "I strongly endorse this measure."

On Thursday December 12 (event 14), the *Journal* announced: "Congress Approves Debt-Ceiling Rise, Plan for Major Reductions in Deficits." The *Times* front-page headline read "Bill to End Budget Deficits Voted by House and Senate"; the subhead was "President to Sign Plan." These events had occurred the previous evening, but it is not clear whether market participants regarded them as news.

The Budget Enforcement Act

In January 1990 President Bush presented his budget proposal for the fiscal year that would begin in October 1990. Bush predicted that his proposal would yield a deficit of $63 billion, just under the revised GRH limit of $64 billion.[18] The proposal received a cool reception in Congress, where both the House and the Senate were controlled by Democrats. Over the next several months, the budget made little progress through Congress but was not a prominent national issue.

On Monday May 7 (event 1), both the *New York Times* and the *Wall Street Journal* reported that President Bush and Congressional leaders had agreed the previous evening to hold budget talks. On Tuesday May 8 (event 2), the *Journal*'s headline confirmed earlier indications that Bush would take part "Without Preconditions" (p. A8); both papers said this meant that taxes were "on the table" in the negotiations.

In the following days there was concern among Congressional Democrats that the White House would blame them for any tax increases that resulted from the talks. This fear was confirmed on Thursday May 10 (event 3) when Bush's chief of staff John Sununu said that all Bush meant by 'no preconditions' was that "the Democrats could propose tax increases but that he would reject them" (*Times*, 5/11/90, p. A1). This discouraging news for deficit reduction was countered on Friday May 11 (event 4). The *Times* reported: "Trying to quell the storm caused by the remarks of his chief of staff, President Bush insisted today [May 11] that he was willing

[18] The original GRH law was revised in 1987 when the deficit target for fiscal year 1988 proved politically impossible to meet. The revised law gave Congress two additional years to reach budget balance, and also modified the enforcement mechanism in order to satisfy Constitutional objections to its original structure.

to discuss everything, including taxes, in the upcoming budget negotiations" (5/12/90, p. A1).

During the next month and a half, the budget talks proceeded quietly, without any noteworthy accomplishments or breakdowns. Then, on the morning of Tuesday June 26 (event 5), President Bush released a statement in which he acceded to tax increases as part of a broader budget package. "President Bush gave new life to the moribund budget talks by eating his 'no new taxes' rhetoric and declaring 'tax revenue increases' are needed to shrink the deficit" (p. A3), reported the *Journal*, and the *Times* ran a three-column headline on the front page labelling Bush's statement a "watershed" in the budget debate.

Congressional Democrats responded positively at first, but budget talks soon dropped off the major news pages again. The growing possibility of tax increases energized the House Republicans, however, who "defied" President Bush on Wednesday July 18 (event 6) by voting overwhelmingly to oppose any tax increases (*Times*, 7/19/90, p. A20). The *Journal* quoted a prominent Congressional Democrat as saying that the vote would have a "chilling" effect on the budget talks (7/19/90, p. A12).

On August 1, Iraq invaded Kuwait, and the Mideast conflict became an all-consuming policy issue and news story for that month. Financial markets were strongly affected as well. Oil prices surged, rising fifty percent in the first week and more in the weeks that followed. This shock increased the probability of both higher inflation and a recession, and recession worries were accentuated by a jump in the unemployment rate reported on August 3.[19] Stocks and bonds fell sharply as a result. The only budget development during August was a growing sense that

[19] The National Bureau of Economic Research later selected July 1990 as the business cycle peak. The runup in inflation in 1990 turned out to be largely temporary.

economic conditions called for less deficit reduction in the coming year than previously desired, but made a credible long-term plan more important than ever.

Budget talks were still making little progress in early September. Then negotiators revealed late on September 11 that they were "converging on a compromise" (*Journal*, 9/12/90, p. A1) and that "agreement was likely within days" (*Times*, 9/12/90, p. A1). This news would have reached financial markets on Wednesday September 12 (event 7).

The following days involved more haggling but little progress. Suddenly, on Friday September 28 (event 8), the *Times* reported that negotiators were "in substantial agreement on most elements of a budget deal" (p. A1), and the *Journal* concurred. Finally, the crucial compromises were forged between the evening of Friday September 28 and the afternoon of Sunday September 30. On Monday October 1 (event 9), both the *Times* and the *Journal* ran front-page headlines announcing that the President and Congressional leaders had agreed to a five-year budget plan including both spending cuts and tax increases.

Opposition to the plan emerged quickly, among both Democrats and Republicans. The House voted down the budget package by a wide margin in the early morning hours of Friday October 5 (event 10). This failure of the long-term budget deal created a short-term problem as well: a temporary appropriations bill lapsed Friday evening, shutting down most of the government going into the long Columbus Day weekend. Under pressure from the shutdown, Congress approved on Monday evening a new outline for a long-term budget plan, in which total deficit reduction was set at $500 billion over 5 years, but the specifics of how to reach that total were left to various committees to decide. (Congress and the President also agreed on a stopgap measure to reopen the government.) Because financial markets were mostly closed on Monday, this limited good news was absorbed by the markets on Tuesday October 9 (event 11).

On October 9, President Bush said that he would accept higher tax rates on ordinary income if they were combined with lower rates on capital gains, but he reversed course later in the day, and then declared the following day that he had no public position on whether such an arrangement was a good idea. These developments received a lot of attention in the press, but it is hard to know whether they were taken as good news or bad news for deficit reduction.

Several weeks of squabbling and shifting coalitions ensued. Then, on Sunday October 21, the front-page headline in the *Times* declared "Bush Termed Open to Tax Rate Rise on Upper Income," based on statements by Treasury Secretary Nicholas Brady. Monday's *Journal* termed a small setback in the talks on Sunday "a ripple in the sea of change in the President's position" over the weekend (p. A3). Financial markets would have responded to this news on Monday October 22 (event 12).

Generally optimistic news over the following several days was followed by an agreement late on Wednesday afternoon. On Thursday October 25 (event 13), the *Journal* headline read "Lawmakers Embrace Plan To Reduce Budget Deficit" (p. A3), and the *Times* ran a similar three-column headline on the front page. Some final snags appeared, but Congress voted final approval for the package over the weekend. It is not clear whether the markets viewed this action as news when they opened on Monday, October 29 (event 14).

5. Fiscal Policy News and Financial-Market Developments

This section describes the results of the analysis. I begin by summarizing the changes in real interest rates on event days, and then discuss several event days for which the link between the fiscal policy news and the financial-market developments is particularly tenuous. I conclude the section by showing that actual changes in real interest rates, nominal interest rates, and the exchange rate are correlated with predicted changes in a statistically significant way.

Summary of Changes in the Real Interest Rate

Table 2 shows changes in the real interest rate following news about the Gramm-Rudman-Hollings law. The first column of the table briefly describes each event, and the second through fifth columns show the key financial-market developments on event days. The next four columns show the changes in the real interest rate implied by the observed changes in financial markets, using the relationships discussed earlier and summarized in Table 1. Thus, column A gives the change implied by the seven-year Treasury yield and the exchange rate, column B gives the change implied by the seven-year Treasury yield and commodity prices, column C gives the change implied by fiscal policy and stock prices, and the "Overall" column combines the information from columns A through C. As noted earlier, this set of relationships generally provides a definite indication of the change in the real interest rate (shown by an up or down arrow in the overall column), but sometimes provides an uncertain indication instead (shown by a question mark). The next-to-last column of the table shows the change in the real rate predicted by the news event and economic theory. The final column indicates whether the actual change in the real interest rate matched the predicted change: the answer can be "yes," "no," or "unclear" if the actual change is uncertain.

I identify fourteen GRH events, of which four represented discouraging news about GRH and implied more expansionary fiscal policy in the future, and ten represented encouraging news and implied more less expansionary fiscal policy in the future. Of these fourteen events, the change in the real interest rate matched the predicted change twelve times, was contrary to the predicted change once, and was uncertain once.

Table 3 presents corresponding information about the changes in the real interest rate following news about the Budget Enforcement Act. I identify fourteen BEA events, of which three represented bad news for the BEA and implied more expansionary fiscal policy in the future, and eleven represented good news and implied less expansionary fiscal policy in the future. Of these fourteen events, the change in the real interest rate matched the predicted change nine times, was contrary to the predicted change once, and was uncertain four times.

The BEA results are less dramatic than the results for GRH, largely because my techniques for discerning the change in real interest rates are less effective during the BEA period. Nevertheless, the BEA results still appear fairly supportive of economic theory. I present formal tests of both the GRH and BEA results shortly.

Events with Complications

The basic strategy of this paper is to link developments in financial markets to changes in expected fiscal policy. Establishing this link can be complicated by two factors: first, the timing of fiscal-policy news may be unclear, and second, important non-fiscal-policy news may occur simultaneously with important fiscal-policy news. These complications are particularly evident on three event days.

Events 11 and 12 of GRH involve both of the complicating factors. Late in the day on Friday December 6, Congressional conferees reached an "agreement in principle" on GRH. It is unclear how quickly this agreement became known or appreciated by financial markets, so I classify Friday as event 11 and the following Monday as event 12. Over the weekend, however, OPEC reached a formal agreement to maintain its market share even if lower oil prices were needed to accomplish this.

Financial-market developments on that Friday imply that real interest rates increased, which contradicts the prediction of economic theory given the positive news about GRH. Yet, it is possible that financial markets were unaware of the conferees' agreement, or its importance, until the weekend and could not trade on it until Monday. Financial-market developments on Monday were consistent with expectations of less expansionary fiscal policy, as real rates seem to have fallen. Yet, the determination that real rates declined is based on the increase in stock prices, which could also be a result of the reduction in expected inflation caused by the OPEC announcement.[20] I count event 11 as a failure of theory and event 12 as a success, but this discussion suggests that either or both of these classifications could be wrong.

Event 9 of the BEA involves both complicating factors as well. During the weekend preceding Monday, October 1, President Bush and Congressional leaders reached final agreement on a five-year deficit-reduction plan, so I label Monday as event 9. Financial-market

[20] Monday's declines in nominal interest rates and commodity prices confirm the view that expected inflation declined. (In fact, oil prices fell more than five percent during the following week.) If there is any tendency toward purchasing power parity, lower expected inflation would have increased the value of the dollar if nominal rates did not adjust proportionately. Because other industrialized countries generally benefit more than the U.S. from a decline in oil prices, however, one might expect the dollar to decrease in value against a trade-weighted average of other currencies, which is what happened.

developments on that day imply that real interest rates declined, as predicted by economic theory. But the Credit Markets column in the *New York Times* said that the agreement "had been expected and discounted late last week by the credit markets" (10/1/90, p. D9). Moreover, President Bush's speech at the United Nations that Monday offered "a hint of conciliation" to Iraq (*Times*, 10/2/90, p. A1), which the *Journal* identified as the cause of the runup in stocks and bonds and the sharp decline in oil prices. I count event 9 as a success of theory, although it could be classified as an unclear event instead.

Statistical Significance of Changes in the Real Interest Rate

Tables 2 and 3 show the predicted and actual changes in real interest rates following news about deficit-reduction laws. It is clear from the discussion of those tables that the actual interest-rate changes are positively correlated with the predicted ones. It is not yet clear whether that correlation is statistically significant, or whether it could have arisen by chance.

In the third section of the paper, I describe the contingency-table analysis that I use to address this issue. Table 4A is a contingency table for real interest rates that combines events from the Gramm-Rudman-Hollings and Budget Enforcement Act episodes. Of the twenty-eight total event days, the real rate moved in the direction implied by economic theory on twenty-one days, in the opposite direction on two days, and in an uncertain direction on five days. The χ^2-statistic for the null hypothesis that actual changes are uncorrelated with predicted changes is 14.0, which is significant well beyond the 1 percent level. Thus, the response of real interest rates to changes in expected fiscal policy corresponds quite strongly to the response predicted by economic theory: more expansionary fiscal policy raises real rates, and less expansionary policy lowers them.

Table 4B includes only events from GRH, and table 4C includes only events from the BEA. The χ^2-statistic for the null hypothesis that actual changes are uncorrelated with predicted changes is 10.1 for GRH, which is significant at the 1 percent level, and 5.1 for the BEA, which is significant at the 8 percent level. As noted earlier, the results for GRH are stronger than the results for the BEA, but even the BEA episode alone provides solid evidence of the predictive power of economic theory.

Changes in the Nominal Interest Rate and the Exchange Rate

Tables 5 and 6 present the contingency-table analysis for changes in the nominal interest rate and the exchange rate, respectively. Because there is no uncertainty about the movements in these nominal rates (as there is for the implied movements in real interest rates), these tables have only two columns rather than the three columns of table 4.

As I explain in section 3, economic theory makes no specific predictions concerning nominal interest rates. Table 5 is constructed on the view that nominal interest rates should move in the same direction as real interest rates, which simply ignores any changes in expected inflation. Table 5A combines events from GRH and the BEA. Of the twenty-eight total event days, the nominal rate moved in the expected direction on eighteen days and in the opposite direction on ten days. The χ^2-statistic for the null hypothesis that actual changes are uncorrelated with expected changes is 2.4, which is significant at the 12 percent level. The χ^2-statistic for GRH from table 5B is 4.2, which is significant at the 5 percent level, and 0.01 for the BEA from table 5C, which is not significant at all. Thus, nominal interest rates tend to rise when fiscal policy becomes more expansionary, and fall when it becomes less expansionary, and this relationship is marginally statistically significant. All of the power of this test derives from the GRH episode, however, as the BEA experience provides no support for this relationship.

As I describe in section 3, most open-economy models imply that the value of the currency should move in the same direction as the real interest rate. The exchange rate could move in the opposite direction, however, if there is a change in the perceived likelihood of a "hard landing," or a change in expected inflation that is not accompanied by a corresponding change in nominal interest rates. Nevertheless, table 6 classifies predicted changes according to economists' standard models.

Table 6A combines events from GRH and the BEA. Of the twenty-eight total event days, the exchange rate moved in the expected direction on eighteen days and in the opposite direction on ten days. The χ^2-statistic for the null hypothesis that expected changes are uncorrelated with actual changes is 3.9, which is significant at the 5 percent level. The χ^2-statistic for GRH from table 6B is 2.4, which is significant at the 12 percent level, and 2.1 for the BEA from table 6C, which is significant at the 15 percent level. Thus, the response of the exchange rate to changes in expected fiscal policy generally matches the response predicted by economic theory: more expansionary fiscal policy usually causes the dollar to appreciate, and less expansionary policy usually causes the dollar to depreciate. The statistical significance of this result is based on the combined experience of GRH and the BEA.

6. Conclusion

The periods preceding the passage of the Gramm-Rudman-Hollings law of 1985 and the Budget Enforcement Act of 1990 form excellent natural experiments for studying the effect of fiscal policy on financial markets. Financial markets should respond to *expected* changes in government spending and budget deficits, but those expectations are generally unobservable. This paper uses news reports about these two deficit-reduction laws to identify days when expected fiscal policy clearly became more or less expansionary. The paper also proposes a technique for identifying whether the real interest rate increased or decreased on those days, based on changes in the nominal interest rate, the exchange rate, commodity prices, and stock prices.

The financial-market developments following news reports about the deficit-reduction laws are consistent with the predictions of economic theory. First, higher expected government spending and budget deficits raised real interest rates, while lower expected spending and deficits reduced real rates. The hypothesis that actual changes in real interest rates are uncorrelated with predicted changes can be rejected at the one-percent level. Second, higher expected government spending and budget deficits raised the value of the dollar, while lower expected spending and deficits reduced the value of the dollar. This relationship is statistically significant at the five-percent level. Third, more expansionary expected fiscal policy tended to raise nominal interest rates, while less expansionary policy tended to lower them, although this relationship is significant only at the twelve-percent level.

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Table 1A

Deducing Real Interest Rate Changes from Changes in the Nominal Interest Rate and in the Exchange Rate

Nominal Interest Rate	Exchange Rate	Implied Real Interest Rate
↑	↑	↑
↑	↓	?
↓	↑	?
↓	↓	↓

Note: An increase in the exchange rate denotes an appreciation of the currency, and a decrease denotes a depreciation.

Table 1B

Deducing Real Interest Rate Changes from Changes in the Nominal Interest Rate and in Commodity Prices

Nominal Interest Rate	Commodity Prices	Implied Real Interest Rate
↑	↑	?
↑	↓	↑
↓	↑	↓
↓	↓	?

Table 1C

Deducing Real Interest Changes from Changes in Fiscal Policy and in Stock Prices

Fiscal Policy	Stock Prices	Implied Real Interest Rate
Expansionary	↑	?
Expansionary	↓	↑
Contractionary	↑	↓
Contractionary	↓	?

Table 2

News about the Gramm-Rudman-Hollings Law and Changes in the Real Interest Rate

Event and Date (in 1985)	One-Day Change in: Yield on 7-yr Treasury note	One-Day Change in: Exchange Rate Index	One-Day Change in: Commodity Price Index	One-Day Change in: Stock Price Index	One-Day Change in Real Interest Rate — Implied by Financial Mkt. Changes: A	B	C	Overall	Predicted by Theory	Actual = Predicted?
1. October 3 GRH bill is proposed	+0.02	-1.34	+1.2	+0.3	—	—	↓	↓	↓	Yes
2. October 7 Senate is deadlocked	+0.09	+0.89	-0.6	-1.4	↑	↑	↑	↑	↑	Yes
3. October 9 Senate leaders compromise	+0.02	-0.03	0.0	+0.7	—	↑	↓	?	↓	Unclear
4. October 10 Senate votes for GRH	-0.01	+0.74	-0.8	+0.3	—	—	↓	↓	↓	Yes
5. October 11 House endorses GRH "goal"	-0.01	-0.37	-0.4	+1.5	↓	—	↓	↓	↓	Yes
6. November 1 House passes version of GRH	-0.03	-0.81	+1.0	+1.7	↓	↓	↓	↓	↓	Yes
7. November 13 House committee votes temporary debt ceiling rise	+0.08	+0.29	-1.1	-1.0	↑	↑	↑	↑	↑	Yes

Table 2 (cont.)

News about the Gramm-Rudman-Hollings Law and Changes in the Real Interest Rate

Event and Date (in 1985)	One-Day Change in				One-Day Change in Real Interest Rate					
					Implied by Financial Mkt. Changes					
	Yield on 7-yr Treasury note	Exchange Rate Index	Commodity Price Index	Stock Price Index	A	B	C	Overall	Predicted by Theory	Actual = Predicted?
8. November 14 Congress votes temporary debt ceiling rise	+0.06	-0.46	-0.3	+2.0	—	↑	—	↑	↑	Yes
9. December 2 Reagan signals doubts	+0.08	+0.44	+0.2	-1.7	↑	—	↑	↑	↑	Yes
10. December 4 Optimism about negotiations is reported	-0.05	-0.52	+0.9	+3.4	↓	↓	↓	↓	↓	Yes
11. December 6 Conferees reach agreement	+0.02	+0.21	+0.2	-0.9	↑	—	—	↑	↓	No
12. December 9 Conferees reach agreement	-0.17	+0.49	-1.0	+1.3	—	—	↓	↓	↓	Yes
13. December 11 Conferees reach final agreement	-0.18	-0.10	-0.6	+1.9	↓	—	↓	↓	↓	Yes
14. December 12 GRH is approved	+0.10	-0.61	+1.7	+0.4	—	—	↓	↓	↓	Yes

Notes: Data sources are described in the text. Columns A, B, and C show the changes in the real interest rate implied by, respectively, the changes in the 7-year Treasury yield and the exchange rate, the changes in the 7-year Treasury yield and commodity prices, and the changes in fiscal policy and stock prices. The "Overall" column is the combination of columns A, B, and C. An "↑" denotes an increase in the real rate, a "↓" denotes a decrease in the real rate, and a "—" denotes an uncertain change in the real rate.

Table 3
News about the Budget Enforcement Act and Changes in the Real Interest Rate

Event and Date (in 1990)	One-Day Change in				One-Day Change in Real Interest Rate					
					Implied by Financial Mkt. Changes					
	Yield on 7-yr Treasury note	Exchange Rate Index	Commodity Price Index	Stock Price Index	A	B	C	Overall	Predicted by Theory	Actual = Predicted?
1. May 7 Bush and Congr. leaders agree to negotiate	+0.03	-0.38	+1.9	+2.1	—	—	↓	↓	↓	Yes
2. May 8 Bush will talk "without preconditions"	-0.03	+0.10	-1.2	+1.5	—	—	↓	↓	↓	Yes
3. May 10 Sununu says Bush will reject tax increase	-0.06	+0.17	-0.2	+1.0	—	—	—	?	↑	Unclear
4. May 11 Bush says taxes are on the table	-0.18	-0.20	-1.9	+8.2	↓	—	↓	↓	↓	Yes
5. June 26 Bush agrees to tax increases	-0.03	-0.63	-0.5	-0.3	↓	—	—	↓	↓	Yes
6. July 18 House Repubs vote against tax increases	+0.05	+0.09	-0.6	-3.3	↑	↑	↑	↑	↑	Yes
7. September 12 Negotiators report much progress	-0.01	-0.36	+0.3	+1.5	↓	↓	↓	↓	↓	Yes

Table 3 (cont.)
News about the Budget Enforcement Act and Changes in the Real Interest Rate

Event and Date (in 1990)	One-Day Change in: Yield on 7-yr Treasury note	Exchange Rate Index	Commodity Price Index	Stock Price Index	One-Day Change in Real Interest Rate — Implied by Financial Mkt. Changes: A	B	C	Overall	Predicted by Theory	Actual = Predicted?
8. September 28 Negotiators reach agreement	-0.09	+0.18	-0.6	+5.1	—	—	↓	↓	↓	Yes
9. October 1 Bush and Congr. leaders agree on budget package	-0.10	-0.66	-2.2	+8.9	↓	—	↓	↓	↓	Yes
10. October 5 House rejects budget package	-0.04	+0.05	+0.6	-1.2	—	↓	↑	?	↑	Unclear
11. October 9 Congress votes for BEA "goal"	+0.18	-0.99	+0.4	-6.4	—	—	—	?	↓	Unclear
12. October 22 Bush agrees to higher taxes on rich	+0.01	+0.55	-2.3	+2.3	↑	↑	↓	?	↓	Unclear
13. October 25 Congress agrees to a plan	-0.05	+0.37	+0.1	-2.4	—	↓	—	↓	↓	Yes
14. October 29 BEA is approved	+0.06	+0.36	+0.0	-2.8	↑	—	—	↑	↓	No

Notes: Data sources are described in the text. Columns A, B, and C show the changes in the real interest rate implied by, respectively, the changes in the 7-year Treasury yield and the exchange rate, the changes in the 7-year Treasury yield and commodity prices, and the changes in fiscal policy and stock prices. The "Overall" column is the combination of columns A, B, and C. An "↑" denotes an increase in the real rate, a "↓" denotes a decrease in the real rate, and a "—" denotes an uncertain change in the real rate.

Table 4A

Two Deficit-Reduction Laws and Changes in the Real Interest Rate

Predicted Change	Actual Change		
	Increase	Unknown	Decrease
Increase	5	2	0
Decrease	2	3	16

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 14.0 with two degrees of freedom, implying a significance level below .001.

Table 4B

The Gramm-Rudman-Hollings Law and Changes in the Real Interest Rate

Predicted Change	Actual Change		
	Increase	Unknown	Decrease
Increase	4	0	0
Decrease	1	1	8

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 10.1 with two degrees of freedom, implying a significance level of .01.

Table 4C

The Budget Enforcement Act and Changes in the Real Interest Rate

Predicted Change	Actual Change		
	Increase	Unknown	Decrease
Increase	1	2	0
Decrease	1	2	8

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 5.1 with two degrees of freedom, implying a significance level of .08.

Table 5A

Two Deficit-Reduction Laws and Changes in the Nominal Interest Rate

Predicted Change	Actual Change	
	Increase	Decrease
Increase	5	2
Decrease	8	13

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 2.4 with one degree of freedom, implying a significance level of .12.

Table 5B

The Gramm-Rudman-Hollings Law and Changes in the Nominal Interest Rate

Predicted Change	Actual Change	
	Increase	Decrease
Increase	4	0
Decrease	4	6

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 4.2 with one degree of freedom, implying a significance level of .05.

Table 5C

The Budget Enforcement Act and Changes in the Nominal Interest Rate

Predicted Change	Actual Change	
	Increase	Decrease
Increase	1	2
Decrease	4	7

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 0.01 with one degree of freedom, which is not significant at all.

Table 6A

Two Deficit-Reduction Laws and Changes in the Exchange Rate

Predicted Change	Actual Change	
	Increase	Decrease
Increase	6	1
Decrease	9	12

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 3.9 with one degree of freedom, implying a significance level of .05.

Table 6B

The Gramm-Rudman-Hollings Law and Changes in the Exchange Rate

Predicted Change	Actual Change	
	Increase	Decrease
Increase	3	1
Decrease	3	7

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 2.4 with one degree of freedom, implying a significance level of .12.

Table 6C

The Budget Enforcement Act and Changes in the Exchange Rate

Predicted Change	Actual Change	
	Increase	Decrease
Increase	3	0
Decrease	6	5

Notes: The χ^2-statistic for the null hypothesis that predicted changes are uncorrelated with actual changes is 2.1 with one degree of freedom, implying a significance level of .15.