USC FBE MACROECONOMICS AND INTERNATIONAL FINANCE WORKSHOP
presented by Aris Protopapadakis
FRIDAY, April 15, 2005
3:30 pm – 5:00 pm, **Room: HOH-601K**

BUDGET DEFICITS, CURRENT ACCOUNT DEFICITS AND INTEREST RATES: THE SYSTEMATIC EVIDENCE ON RICARDIAN EQUIVALENCE

by

Roger C. Kormendi*

and

Aris Protopapadakis**

April 9, 2005

Preliminary Draft, Not for Quotation without Permission

***Kormendi/Gardner Partners and University of Michigan Business School**
kormendi@kgpartners.com

****University of Southern California, Marshall School of Business, FBE**
aris.protopapadakis@marshall.usc.edu

BUDGET DEFICITS, CURRENT ACCOUNT DEFICITS AND INTEREST RATES: SYSTEMATIC EVIDENCE ON RICARDIAN EQUIVALENCE

Abstract

We examine the impact of budget deficits on real interest rates and the Current Account Balance. Even in a large open economy, "crowding out" effects of deficits are likely to appear primarily in the *CA*. We test the conventional "crowding out" hypothesis against the Ricardian Equivalence alternative.

Our tests on real interest rates and the *CA* find no substantial evidence in favor of the "crowding out" hypothesis from current or expected budget deficits. It should be easy to detect important economic effects if they exist because of the large variation in the data the natural experiment of the 80s and 90s generated.

BUDGET DEFICITS, CURRENT ACCOUNT DEFICITS AND INTEREST RATES: SYSTEMATIC EVIDENCE ON RICARDIAN EQUIVALENCE

by

Roger C. Kormendi
Aris Protopapadakis*

"Economists like to think of economics as a science. In a science, however, repeated contradictions of a paradigm lead to its abandonment if there is a sensible alternative. One paradigm in economics implies that large deficits produce high interest rates. This paradigm is not supported by the facts."
Paul Evans, AER (1985)

I. INTRODUCTION

Is the challenge in the above quote by Paul Evans as applicable today as it was in 1985? The long-standing conventional textbook paradigm implies that increasing budget deficits will raise real interest rates, the so-called "crowding out" effect. The alternative Ricardian paradigm implies that deficits should have no impact on real interest rates. The academic empirical debate of the mid-eighties produced strong evidence in favor of Ricardian "deficit neutrality". In the nineties, however, some authors began to find at least partial evidence in support of the conventional view. With the abrupt disappearance of the recent budget surplus and the looming large deficits, the idea that high deficits

* We wish to thank Phil Meguire for helpful discussions and Samantha Farley and Heajin Ryoo for research assistance on this paper.

produce high interest rates, and therefore “crowd out” private investment and economic growth, has reemerged.

However, in a fully open economy one should not expect budget deficits to have their principal impact on real interest rates, though deficits may impact *nominal* interest rates through related expectations of inflation. Rather, standard textbook effects should materialize primarily through the current account.

Following Rubin, Orszag, and Sinai (2003) and Reynolds (2004), we refer to the standard textbook paradigm as the “Conventional model”, and to the alternative as the “Ricardian model”. In this paper, we examine systematically evidence of the impact of budget deficits on both real interest rates and current account deficits, to test the Conventional against the Ricardian model. From the point of view of empirical research, it is fortunate that the period since the 1980s has generated a spectacular “natural experiment” that should allow any links between budget deficits and interest rates or current account deficits to be easily detected. Conversely, the absence of clear evidence would suggest strongly that the Ricardian model offers a better explanation of the effects of government budget deficits.

We present a series of tests that explore the impacts of both current and expected future budget deficits on real interest rates and on the current account deficits. We structure these tests across a variety of specifications that span those that have appeared in the literature over the past two decades. We account for issues of the non-stationarity and lag structure of the data, and we explore the sensitivity of the results to the inclusion of various auxiliary variables.

Our results are systematic and dramatic. Unlike previous results, our tests are valid regardless of whether the U.S. economy is fully closed, fully open or somewhere in between. Unlike previous results, our tests cover virtually the full structure of the relevant specification space and the full period of time over which a spectacular natural experiment has taken place. Unlike previous research, our results produce strong and consistent patterns.

We find no evidence in favor of conventional effects of budget deficits on either real yields or the current account deficits. And, because of the large variation in the data generated by the natural experiment, these results are not a manifestation of a lack of power in the tests. The standard errors are small, and economically significant effects can be clearly rejected. For real yields the typical statistically insignificant point estimate suggest that the permanent effect of a $100 billion permanent increase in the budget deficit would change real yields by less than2 basis points, and in the wrong direction! Similarly, a typical statistically insignificant point estimate suggest that a $100 billion permanent increase in the budget deficit would increase the current account by $20 billion. Given the spectacular nature of the natural experiment incorporated in our sample, this is convincing evidence that the Conventional model does not capture the important features of economic behavior in the US.

At the same time, we do find evidence of short run effects, primarily from the budget deficit forecasts. In that sense our results are consistent with the recent literature that finds forecasts to be statistically more significant than the deficits themselves. However, by taking account of the dynamic response of the real yields, we find that these temporary effects offset each other in the long run.

Moreover, when viewed over the full structure of the specification space, an interesting empirical regularity appears that has been hinted at in earlier work, but has not been observable as clearly as in these results. Namely, rather than a positive effect, there appears to be a relatively significant and systematic negative effect of budget deficits on real yields. This latter effect is consistent with either uncertainty or supply-side based augmentations to the Ricardian framework suggested by Barro (1974), Kormendi (1983) and others.

Some caveats are in order. Our tests assume that throughout the period government was expected to "live within its means", i.e., there was never a significant probability that it would violate its intertemporal budget constraint. In comparison, the possibility that the U.S. government might violate its intertemporal budget constraint, has been raised by Rubin et. al. (2004) as a reason to curb the current budget deficits. Furthermore, our tests cannot be interpreted as revealing that structurally the economy is Ricardian or Non-Ricardian (see Lucas & Stokey 1987). All we are entitled to conclude is that there is no evidence that the kind of budget deficits observed during this sample period had a meaningful permanent impact on U.S. real interest rates.

II. BACKGROUND AND ANALYTICAL ISSUES

A. The Emergence of the Ricardian Paradigm in the Eighties:

The Conventional Model that reaches back many decades prior to the 1970's, implies that government borrowing to cover budget deficits should compete in the capital markets with private sector borrowing for the private sector savings. The result is to bid up interest rates, "crowd out" private sector investment and thereby reduce future economic growth. For this reason, budget deficits were unambiguously viewed as being "bad" for the economy. This paradigm was so "obvious" and ingrained in economic thinking, and so totally reflected in the financial press and the general policy debate, that no one seriously questioned either its theoretical or empirical validity.

In 1974, in an article that shook the established views of economists, Robert Barro introduced the Ricardian Equivalence Proposition (REP), and at the same time laid out the technical conditions (related to generational linkages, non-distortionary taxes, rational expectations, no borrowing constraint, and the like) under which REP would be expected to hold exactly. According to the Ricardian paradigm, rational consumers are mindful of the present value of the future taxes implied by current deficits, and increase their savings accordingly to fully offset the new government borrowing. Thus, in a pure Ricardian world, budget deficits should be neutral and there should be no real interest rate effects.

In the early 1980's, the rapid and large increase in the size of the U.S. government budget deficits pushed these two competing paradigms to the forefront of both the policy debate and scientific academic research. While the theoretical foundations of Ricardian Equivalence were settled relatively quickly, over the course of the 1980's the debate turned to the empirical applicability of the Ricardian proposition in a real world of imperfect generational linkages, distortionary taxes and limited rationality.

This academic debate produced strong evidence that there is no positive relation either between budget deficits and interest rates or between budget deficits and private consumption. One strand of literature —led by Evans (1985, 1987, 1988), Plosser (1987) and others— examines the effects of budget deficits on interest rates. The results came down on the side of no interest rate effects of budget deficits, consistent with the Ricardian view.

In the other strand of this literature —Kormendi (1983), Kormendi and Meguire (1986, 1990, 1995), Feldstein and Elmendorf (1990), Modigliani and Sterling (1986, 1990), Graham (1995) and others— debated the empirical evidence on whether budget deficits had the wealth effect on private sector consumption required for the U.S economy to be non-Ricardian. Kormendi & Meguire were able to reject the Conventional Model specifications and the results of each of the critical papers in favor of the Ricardian alternative; they apply a consistent methodology of nesting the specifications of the critical papers along with their own into a joint structure, and they test the competing hypotheses in that fully nested specification.[1]

B. The Resurrection of the "Crowding Out" Paradigm in the Nineties:

Despite the evidence from the 1980's, the proposition that high deficits lead to high interest rates has returned to policy-making thought. With the looming large deficits of the 2000's, the importance of the budget deficits as a policy issue has intensified, and the idea that high deficits produce high interest rates and therefore "crowd out" private investment has resurfaced; see for example Rubin, Orzsag, and Sinai (2003)[2]. Moreover, a variety of simple tests that reexamine the interest rate effects and include long-term forecasts of deficits found some support for the "crowding out" view; see, for example, Gale and Orszag (2003), Laubach (2003) and the papers cited therein.

Ruben et. al. (2004) discuss the risk of financial disarray that stems from the market's concern that government may default on its debt obligations; they in effect examine the consequences of government violating its intertemporal budget constraint. Extensive discussion and modeling of these issues is found in the "financial crisis" literature. It is fairly clear however, that these considerations do not apply to any part of the U.S. historical record we (and the literature we cite) examine.

[1] It has been asserted at times that there are just as many or more articles in numbers showing positive results and that the issue should be decided on that basis. For example, Bernheim (1989) argued that his list of supporting papers was as big as the list of papers supporting the Ricardian paradigm. More recently, Gale (2001) has attempted to tabularize this "counting analysis" by showing many more papers in the "support crowding out" column than in the "support neutrality" column. However, if one paper nests all the others in a fully structured specification space then the results of the one would outweigh all the individual non-nested results. In essence, this is what Kormendi and Meguire (1986, 1990) did in the AER debate cited earlier. By nesting the specifications of the critical papers along with their own and testing the competing hypotheses in a fully nested form, KM were able to reject the specifications and results of the critical papers supporting "crowding out" in favor of the Ricardian "debt neutrality" alternative. Such a structured specification space approach has not been attempted with respect to the interest rate effects literature.

C. Open Economy Issues:

With the emergence of a large U.S. current account deficit by the 1980's, it is no longer possible to entertain the proposition that the U.S. economy is predominantly a closed economy. The "twin deficits" – simultaneous budget and current account deficits– were frequently noted in the literature but only sometimes in connection with the Ricardian proposition. The twin deficits of the 1980's might appear to be the natural outcome of a non-Ricardian economy experiencing a significant expansion of its budget deficits, as the U.S. did. However, as we shall see below, a more systematic investigation does not support this interpretation.[3]

In a fully open economy, the Conventional Model predicts that it is not interest rates but the current account that must respond to changes in the budget deficit. This flows directly from the accounting identity $SAV + CAD = INV + DEF$; if private savings (*SAV*) are unaffected by the deficits and private investment (*INV*) responds to the real worldwide interest rate, the current account deficit (*CAD*) must respond to the deficit (*DEF*) one-to-one.[4] If, however, savings respond one-to-one to the budget deficit according to the Ricardian paradigm, there will be no impact on the current account. Note that we follow the possibly confusing tradition of referring to "deficits" as positive quantities.

---

[2] See also Reynolds (2004) for a detailed critique of the Rubin, Orszag, and Sinai paper and its inability to explain the broad movements of key variables in question over the past two decades.

[3] Kormendi and Meguire's results on the neutrality of private sector consumption with respect to budget deficits, which arguably span both closed and open periods for the U.S economy, suggests that a different underlying cause of the observed "twin deficits" should be explored. One such explanation is that there was an unobservable "expectations of future returns" shock that induced contemporaneous intertemporal adjustment in both the public and private sectors towards increased borrowing against the greater future opportunities to support both increased consumption and investment. It is important to note that when the budget deficits turned into surpluses in the late nineties, the large current account deficits did not decline, as predicted by the Conventional Model.

[4] This statement is strictly true for a small economy. In the case of a large open economy, any potential effect of deficits would also show up in the world interest rate. But even the US contributes a relatively small fraction to world savings; thus this effect is unlikely to be large.

The following table summarizes the predictions of the competing paradigms across open and closed economies for interest rates and current account balance, when the budget deficit increases:

	Closed	**Partly Open**	**Open**
CAD			
Conventional Model	**n.a.**	(+)	(+)
Ricardian Model	**n.a.**	**0**	**0**
Real Interest Rates			
Conventional Model	(+)	(+)	**0**
Ricardian Model	**0**	**0**	**0**

The table shows that if the economy is closed, the appropriate distinguishing test is on real interest rates; if the economy is open, the appropriate distinguishing test is on the *CAD*. The real interest test has power only to the extent that the economy is closed, while the *CAD* test has power to the extent that the economy is open. Performing both tests is appropriate when there is uncertainty about the degree of openness.

The interest rate results of the 80's that are consistent with "debt neutrality" cannot be viewed as definitive or convincing in part because they do not have power in open economies. Since the beginning of the floating exchange rate period it has been hard to argue that the U.S. economy is not fully open. Thus, it is critical to structure tests over both interest rate and current account specifications in order to have validity regardless of the extent of the openness of the U.S. economy over the time period of the analysis.

D. A Natural Experiment:

Over the course of the 1990's and the early 2000's, the U.S. experience with budget deficits has been dramatic, to say the least. Early in the 1990's large deficits were expected to continue "as far as the eye can see." By 1998 large budget surpluses emerged unexpectedly, and once again they were expected to continue into the indefinite future. By 2002 large budget deficits unexpectedly reemerged, and again they are expected to continue into the (now perhaps less foreseeable) future.

Charts 1 - 3 present graphically the data on the federal budget balance, real interest rates and the current account balance for the period 1972 – 2002. From 1972 to 1980, federal budget balance is relatively small and negative, real interest rates are low, and the current account balance is small, both positive and negative.

Beginning in 1980, the federal budget balance declines rapidly and remains very large and negative, reaching a high in 1994. At the same time, real rates rise rapidly and then decline slowly and uniformly through 1994. The current account balance is in deficit and starts declining in 1984, reaches a low point in 1988, it then rises in 1991, when it goes briefly into surplus because of the Gulf War payments received. It subsequently reverts to large and growing deficits.

After 1994, the federal budget balance improves rapidly and becomes positive in 1999. But real interest rates rise somewhat and stay modestly high until 2001; the current account balance declines precipitously through this period. In 2002, the budget surplus declines abruptly and turns to deficit, with forecasts of very large deficits in the near future. Real rates decline, and the current account balance remains highly negative.

Taken by itself, the experience of the past decade has been as close to a natural experiment as one generally comes by in macroeconomics. And if one includes the 1970's and 1980's, it is hard to argue that the whole thirty plus years have been anything less than an ongoing natural laboratory in which to test the effects of deficits on the U.S. economy.

This initial look at the data does not reveal obvious systematic positive relations between budget deficits and either real interest rates or the current account deficit that would support the "crowding out" paradigm[5]. Nonetheless, it is possible that this ocular perusal misses underlying relations that are obscure but detectable by a more sophisticated analysis. Thus we proceed with formal tests.

In Section III, we discuss the data and our empirical methodology. In Section IV we follow the literature and reexamine the effects of federal budget deficits on real yields. In Section V we turn our attention to the deficits on the current account. In Section VI, we conclude with some conceptual and policy implications associated with understanding the Ricardian nature of the U. S. economy revealed by the evidence presented. More detailed set of results over the broad structure of the specification space, as well as results mentioned but not displayed are available upon request from the authors.

III. DATA AND EMPIRICAL METHODOLOGY

A. Data:

Data for all our quarterly macroeconomic variables are from DataStream, and they are defined below. Potential *GDP* is from the St. Louis Fed database.

The data for the CBO deficits forecasts are from various CBO publications. Data from 1976 through 2000 were kindly provided by Kevin Kliesen of the Federal Reserve Bank of St. Louis. Starting in 1981, there are fairly regular issues of the "Interim Economic and Budget Outlook" issued

[5] See Reynolds (2004) for a more comprehensive look at the first order variables in the relevant data series and how the Conventional view cannot account for such movements.

between July and September. Starting in 1986, there are also various issues of CBO's "Analysis of the President's Budgetary Proposals", issued between February and April of each year. We combine these sources to form a quarterly series of budget deficit forecasts. We assign each forecast to the quarter it is issued. For example, data for the main annual CBO report issued in January or February of each year are assigned to the 1st quarter of that year.[6] The data from the "Analysis of the President's Budgetary Proposal" are assigned to the 2nd quarter of the year, while the data from the interim report are assigned to the 3rd quarter.

Particularly in recent years, we have CBO forecast updates for 3 of the 4 quarters. We construct data for the missing quarters by simple interpolation. Given the amount of additional information we can include by using all the available quarterly data, interpolating when necessary seems a reasonable procedure.

We follow Gale & others and construct a 5-year forward CBO forecast, as a measure of the future forecast deficits. The deficit forecasts for the subsequent five years are highly correlated with each other, and each of the forecasts is also highly autocorrelated. The correlations of the annual forecasts range from 0.98 (year-1 with year-2) to 0.85 (year-1 with year-5). The 1st order autocorrelation of the year-1 forecasts is 0.69 and for year-5 it is 0.71. Using a single variable, rather than 5 highly correlated future forecasts, to capture the forecast information is likely to sharpen inference.[7]

---

[6] There are 2 early forecasts that were issued in December, and they are assigned to the 4th quarter.

[7] To aggregate the CBO forecasts: we first form simple trend forecasts of *NNP* and *GDPD* for the following 5 years, then we deflate each of the CBO forecasts with the appropriate *NNP* or *GDPD* forecast, and finally we sum over the current and the following 5 years. We deflate with the trend forecasts of *NNP* and *GDPD*, to avoid disproportionately representing the out-year values in a growing economy.

We also use 1-year ahead inflation forecasts from the "Survey of Professional Forecasters," SPF, consistently collected by the Federal Reserve Bank of Philadelphia. These forecasts are available from 1970.[8] Prior to 1992:1, the SPF forecasts are for the *GNP* deflator, between 1992 and 1995:4 they are for the *GDP* deflator, and after 1995:4 they are for the chain-weighted *GDP* price index. The forecasts are for average inflation over the 4 quarters, beginning with the quarter after the survey date.

The SPF forecasts seem rather efficient. The average inflation over the period is 4.32%, with a standard deviation of 2.59%. The average forecast inflation is 4.30% with a standard deviation of 1.98%. The correlation between the forecast and current inflation is 0.93, and the correlation between the forecast and the realized inflation is 0.79.

We subtract the SPF inflation forecast from the market yields to obtain the real rates. It would be desirable to have separate inflation forecasts for the different maturities of interest rates but these are not available. However, given the autocorrelation of inflation and the inflation forecasts, we feel that the 1-year forecast adequately represents future inflation prospects.

B. Methodology:

We use mainly quarterly data for our investigation. Compared to higher frequency data, quarterly data makes it possible to control for government expenditures and the level of economic activity. It also allows us to use the almost quarterly updates issued by the CBO. Particularly in the asset markets, this additional data should enhance our ability to detect significant effects. Using annual

---

[8] The survey also collects 10-year forecasts from 1979. However, those data are semiannual until 1991, and they are a mixture of the Blue Chip Indicators (1979 – 1991), occasionally the Livingston Survey, and the Professional Forecasters since 1991. For the matching dates, the correlation between the 1-year and the 10-year forecasts is 0.98.

data provides very few degrees of freedom, and it also makes it impractical to allow sufficient lagged influences in the regression models.

Some researchers have used daily announcement data. Their results suggest that the effects of deficit announcements on interest rates are at best temporary; see Quigley & Hudak (1994), Kitchen (1996). This may reflect a liquidity effect, information issues or it may be that market participants use the deficit announcements to infer the general state of the economy. Furthermore, with deficit surprises alone it is not possible to control for concurrent expenditure surprises, which should affect yields under all theories.

The preceding theoretical discussion is consistent with the following linear empirical model, with appropriate lag added.

$$\begin{aligned} LHS &= ß_{FED} FEDDEF + ß_{CBO} CBO5DEF + ß_{EXP} FEDEXP + ß_{NNP} NNP \\ &\quad + ß_{AUX,m} AUX_m + ß_0 + u, \end{aligned} \tag{1}$$

where,

LHS Stands for the
(i) *CAD*, the Current Account Deficit (+ current $s) or
(ii) the real yields, defined below

FEDDEF Federal Government Budget Deficit (+ current $s)

CBO5DEF CBO’s 5-year Federal Budget Deficit Forecast (+ current $s)

FEDEXP Federal Government Expenditures (current $s)

NNP Net National Product (current $s)

AUX Auxiliary variables: defined below.

For broad economic and policy purposes it is important to (i) identify all permanent effects of deficits, (ii) separate out the effect of federal expenditure changes from the effect of concurrent deficits, and (iii) separate the influence of general macroeconomic conditions from those of the deficits. To this end, we include both the current federal deficit and the *CBO*s 5-year estimate of future deficits. *FEDEXP* is included to separate out the economic effects of expenditures from those of the deficits. Finally, *NNP* accounts for the scale increases of *CAD* as the economy expands, and with *GDPGAP* they account for the level of economic activity.

The "auxiliary" variables we use to condition the model are:

$INVALL_{-1}$ — *Gross Private Investment* is intended to capture changes in investment demand that can affect the *CAD* and the yields, independent of fiscal policy. We use the lag value to avoid simultaneity issues.

GDPGAP — *GDPGAP* is an additional measure of the level of economic activity and an indicator of the state of the business cycle; it is the percent difference between current *GDP* and Potential *GDP*. [9]

$NYSE_{-1}$ — The *NYSE Index* is intended to capture the possible impact of wealth changes on the LHS variables; e.g., the highly negative *CAD* in the 1990s may have been a result of the high wealth levels experienced by the economy during that period. We use the lag value to avoid simultaneity issues.

M2 — A broad measure of the money supply, it is intended to capture the effect of monetary policy on real yields and possibly on the *CAD*

Most of our macroeconomic variables are known to be nonstationary. Therefore, we transform the regression model to be consistent with the OLS assumptions. We report results for two separate

[9] In an earlier draft of this paper we did not use the *GDP* gap, and we used the current values of *INVALL* and *NYSE*. We amended this specification based on comments we received. The results from this original specification were generally weaker for the Conventional model. In the results we present, *GDPGAP* is never statistically significant, while *NNP* and its lags were in the earlier specification. However, the presence of *GDPGAP* seems to reduce the standard errors of the deficit coefficients. However, our overall conclusion that we find no substantial support for the Conventional model is not affected by this change in specification.

transformations, both of which result in stationary variables. Generally these transformed variables have low autocorrelations as well as low contemporaneous correlations.

We deflate all the quantity variables by *NNP* and take 1st differences; the variables have the prefix *R* for ratios and *DR* for the difference in the ratios; we will refer to this as the *NNP*-deflated model.[10]

The reader may wonder: why not use growth rates? The main reason is the instability created by taking growth rates for variables that fluctuate between positive and negative values. The *CAD* and both measures of the deficit have this property.[11] The numerical instability resulting from taking growth rates around sign changes makes it much harder for the deficits to "explain" the *CAD*, particularly since their sign changes do not coincide in time. This same instability would make it very difficult to detect a relation between the deficits and the yields, which do not share such instability.[12] Our transformations result in a statistically well-behaved *CAD* variable, which retains the essential information of its evolution.[13] We use the same two transformations of the RHS variables for both the *CAD* and the interest rate investigation.

---

[10] We also estimated a specification in which all the quantity variables are deflated by the *GDPD*; these regressions are also estimated in 1st differences. The main reason was to check if such a specification change would have a major impact on inference. It does not: the comparable inferences are very similar for all the results we present. Generally the *GDPD*–deflated version of the model doesn't seem as well-specified. The estimates have lower p-values, and there are occasional signs of instability in the results. Furthermore, the specification itself is not entirely palatable, primarily because it doesn't have appropriate homogeneity properties. When relevant we discuss pertinent differences. More complete results from this specification are available from the corresponding author.

[11] The *CA Balance* is negative most of the time but up to 1982 it fluctuates between positive and negative, and it becomes positive again in 1992. The federal budget balance is often close to zero until the early 80s and it becomes positive between 1999 and 2001. The CBO deficit forecast has similar features.

[12] It is also possible that some spurious correlation from an outlier created by this numerical instability may contaminate our results, given the relatively small sample size.

[13] A general concern with estimating first differences or growth rates is that if the series are cointegrated, important information is lost. In our case, there is no theoretical or empirical reason to suggest that the *CAD* or real interest rates should be cointegrated with nonstationary variables like *NNP* and *Deficits*.

C. Construction Of the Implied Forward Real Yield:

For the yields, we report result for the 1-year T-Bill rate, the 9-year forward T-Bond rate 1 year out, the AAA rate, and the 10-year T-Bond rate.[14] This collection of rates spans the maturity spectrum, and it also allows us to assess any impact of deficits on firms' cost of debt. We investigate the forward rate because some researchers suggest that studying the long-term rate directly necessarily involves the short term rate, which may obscure the expected impact of deficits on future interest rates.[15]

We compute the 9-year forward rate from year 1, from the definition of long term yields: $(1+{}_0i_{10})^{10} = (1+{}_0i_1)(1+{}_1f_2)(1+{}_2f_3)\ldots(1+{}_9f_{10})$, where i is the spot interest rate and ${}_mf_n$ is the forward rate that applies between periods m and n; $n>m$. This can be written more compactly as $(1+{}_0i_{10}) = \left[(1+{}_0i_1)(1+{}_1f_{10})^9\right]^{1/10}$. The implied 9-year forward rate for year 1 then is:

$$1+{}_1f_{10} = \frac{(1+{}_0i_{10})^{10/9}}{(1+{}_0i_1)^{1/9}}.$$

---

[14] Clearly the 10-Year rate is a nonlinear combination of the 1 Year rate and the implied forward. We report its results for completeness.

[15] Laubach (2003) and Canzoneri, Cumby & Diba (2002) study the "term structure premium" and report significant results. They interpret their findings as evidence of a significant impact of deficits on long term interest rates. We believe that this interpretation is potentially very misleading. The following example will suffice to clarify: in an economic slowdown, short-term interest rates tend to fall and budget deficits to rise. Since in an efficient market the long-term rate must fall by less (if at all) because of this temporary decline in economic activity, it necessarily implies that the term premium rises. This behavior will result in a negative relation between deficits and short-term rates but a *positive* relation between deficits and the term premium –consistent with the Conventional Model hypothesis. Controlling for economic activity will account for the negative correlation *but not* for the positive correlation between the term premium and deficits. Interpreting this positive relation as evidence that deficits "cause" long-term rates to rise is incorrect.

D. Specification Of Lag Structures:

A balance is necessary between the desire to be as inclusive as possible and the need to preserve degrees of freedom and avoid fitting outliers, since we have very limited number of observations (~104 quarterly and ~ 26 annual observations). Accordingly, for both the *CAD* and the real yields, we first estimate bivariate regressions of the deficit and expenditure variables on the LHS variables and their lags. We base our choices of the number of lags on these bivariate regression results. We note here that the autocorrelations of the explanatory variables are quite low; the 1st order autocorrelations for *DRFEDEXP* and *DRFEDDEF* and *DRCBO5DEF* are respectively 0.30, -0.05, and 0.29; higher order autocorrelations are much smaller. We also discuss results with alternative lag structures.

In the next two sections we present the results for the *CAD*, followed by the results for the real yields.

E. Presentation Of the Results:

The main findings are presented in the following order:

(a) For both *CAD* and the real yields we first present bivariate regressions against our deficit measures (actual deficits and the CBO forecasts) with long lags. We use the information from these regressions to specify the lag structure of our main regressions.

(b) We present first results that use the fullest lag structure we specify. We also discuss but do not necessarily display results from models with intermediate numbers of lags, and highlight any inference differences that may exist.

(c) We are mainly interested in the permanent or steady-state effect of a permanent change in the budget deficit. We also evaluate transitory effects. To this end, (i) We report F-tests on the effect of including some or all the deficit variables in regressions of the full model. These statistics reveal the explanatory power of the deficit variables but not their permanent effect. (ii) We report the value and significance of the permanent effect of the deficits, since the predictions of the alternative theories are only on the permanent effect. Transient disturbances of deficits in, say, the real interest rates, may provide useful information on how the market absorbs changes in the supply of government debt, but they do not constitute evidence in favor or against the Conventional Model. Evidence in favor of the Conventional Model is the existence of a significant permanent positive effect on real yields or on the *CAD*, as a result of a permanent increase in the deficit. We compute the maximum steady-sate impact of deficits as follows. Consider an anticipated *permanent* 1-unit increase in the deficit at t+5 –the horizon limit of our CBO forecast variable. Further assume that this forecast remains unchanged. The effect is to increase *DRCBO5DEF* at time t by 1 unit. Because *CBO5DEF* is a sum of the deficit forecasts, it will show an *increase* in each of the following 5 periods, as the deficit comes closer to realization. Furthermore, the lags of *DRCBO5DEF* will also show the same increases. When the deficit is realized, *DRFEDDEF* will change by 1 unit, as will its lags over time. Thus the total permanent effect then is, $\sum_{i=1}^{I}\left(b_{SURP,i}+6b_{CBO,i}\right)\Big/\left(1-\sum_{n=1}^{N}r_n\right)$, taking account of the effect of the I lags of the deficit variables and the N lags of the dependent variable. Consider now the opposite alternative: a complete *surprise* 1-unit increase in the current deficit. In this case, *DRFEDDEF* will increase but so will all the future deficit forecasts (because the change is permanent); the total permanent effect is the same. Thus, the total impact of a permanent change does not depend on when the market learns about the deficit; however, the effect does depend on the permanence of the deficit change; a less than permanent unit change will have a smaller overall effect. The impact we compute is maximal because it assumes that the unit change is permanent. We report P-values for this sum.[16]

IV. BUDGET DEFICITS AND REAL INTEREST RATES

A. Design:

We first reexamine the evidence on the effect of government deficits on real yields, for several reasons. One is that the debate has been cast most recently in terms of real yields, so that it makes sense to start there. With our quarterly data we hope to have more precise estimates of the relations

[16] An alternative approach is to estimate a VAR structure and to compute the effect of a 1-unit increase in the forecast deficit. Consider a simple structure in which deficits, *DEF*, are a random walk and the model also contains the CBO forecasts, *CBO*2, the sum of 2-year and 1-year forecasts. Denote growth rates by *Gx*:

$$DRLYIELD = a_1 GDEF + a_2 GDEF_{-1} + b_1 GCBO2 + b_2 GCBO2_{-1} + e_R,$$
$$GCBO = c_1 GDEF + c_2 GDEF_{-1} + e_c,$$
$$GDEF = e_D.$$

The long-run effect of a unit disturbance on $\Delta RLYIELD$ is $a_1 + a_2 + (2b_1 + 2b_2)(c_1 + c_2)$. Under the assumption that a 1-unit disturbance is fully integrated into the CBO forecast immediately (as it would under the random walk between the variables, we can examine any dynamic effects if they exist. The Conventional Model requires that an *increase* in the deficit should *increase* the real yields; its coefficients should be positive; there is no quantitative prediction associated with this model, since the magnitude of the effect would depend on the interest elasticity of savings and investment, at least in a closed-economy. The Ricardian Model predicts no significant impact of the deficit on real yields.

We use the framework in equation (1) with only slight adjustments. The *NNP*-deflated model from equation 1 becomes ($RX \equiv X/NNP$, and $DRX \equiv RX - RX_{-1}$),

$$\begin{aligned} DRLYIELD_t &= ß_{FED} DRFEDDEF_t + ß_{CBO} DRCBO5DEF_t + ß_{EXP} DRFEDEXP_t \\ &+ b_{NNP} GRLNNP_t + b_{GDPGAP} DRGDPGAP_t + b_{INV} DRINVALL_{t-1} \\ &+ b_{M2} DRM2_t + b_{NYSE} DRNYSE_{t-1} + b_0 + e_t , \end{aligned} \tag{2}$$

where *GRLNNP* is the growth rate of real *NNP* (*NNP*/*GDPD*).[17]

B. Lag Length:

To assess the required lag length we estimate bivariate regressions of our deficit and expenditure variables on the real yields, allowing 4 lags. The results are in Table Y.1. None of the real yield lags are significant at the 5% level; accordingly, we retain only the 1st lag of the dependent variable for the yield regressions. The deficit variables, *FEDDEF* or *CBO5DEF*, are significant at the 5% level only in isolated cases; the 1st lag of *FEDDEF* and the 3rd lag of *CBO5DEF*. Interestingly, in these bivariate regressions, the coefficients for *FEDDEF* are predominantly negative, and the sums are uniformly

assumption), c_1 = 1.0 and c_2 = 0.0. Then the maximal long-run effect is $a_1 + a_2 + 2b_1 + 2b_2$, the sum of all the deficit coefficients of the yield regression.

[17] The *GDPD*-deflated model is very similar, except that the ratios on the RHS are replaced by the real variables ($RLX \equiv X/GDPD$, and $DRLX \equiv RLX - RLX_{-1}$). The results from the two specifications are very similar

negative; this is opposite of the predictions of the Conventional Model. The signs of the *CBO5DEF* coefficient are more frequently positive than negative but the sums are uniformly positive.

We strike a balance between the need to exclude superfluous lags because of the limited number of observations, and the desire to capture all important lagged effects: we allow 2 lags for *FEDEXP*, 3 lags each for *FEDDEF* and *CBO5DEF*, and fewer lags for the other auxiliary variables.[18] As pointed out earlier, the autocorrelations of the explanatory variables are quite low.

C. Results On Permanent Impact:

Table Y.2 presents significance tests and estimates of the permanent effect of budget deficits on yields from OLS regressions. Table A-Y.1 in the appendix shows the coefficient estimates from key regressions.[19]

The first 3 rows of Table Y.2 show F-tests of the joint significance of *FEDDEF* and *CBODEF* jointly, and *FEDDEF* and *CBODEF* separately, all from the same full model regressions. The F-tests show that *CBO5DEF* and *FEDDEF* jointly, and *CBO5DEF* alone are highly significant (rows 1 & 3 in Table Y.2).[20] This suggests that changes in deficits and their forecasts have at least transitory effects on real yields. But this finding in itself does not imply that deficits have a permanent effect on real yields, because the signs of the coefficients are often negative, so that the temporary effects may be attenuated or completely reversed.

---

but the results from the *NNP*-deflated model are slightly better, in terms of overall fit and levels of significance for the variables of interest.

[18] The current values of *GRLNNP* and *GDPGAP*, and $INVALL_{-1}$, $NYSE_{-1}$, $M2$, and $M2_{-1}$

[19] The tables show coefficient estimates for the full model as well as regressions in which certain groups of variables have been eliminated.

[20] The coefficient estimates for the *FEDDEF* and *CBO5DEF* variables are sporadically significant in the full model. Interestingly, the 3rd lad of *CBO5DEF* is significant for all three yields but it has a negative sign in 2 cases. *FEDDEF*

The remaining rows of Table Y.2 show estimates of the permanent impact of deficits with their P-values for the full model, as well as for alternative more parsimonious specifications. We examine the results of these parsimonious specifications in order to be sure that results do not change dramatically if we omit or add auxiliary variables.

The results are quite uniform, and they tell a consistent story: there is no detectable permanent impact of federal deficits or their CBO forecasts on any of the real yields we examine. Interestingly, the permanent effect of *FEDDEF* is uniformly negative, while the effect of *CBO5DEF* is uniformly positive but smaller than that of *FEDDEF*.

Furthermore, the estimates imply a very small permanent effect. The largest absolute value for a permanent effect is -0.805. Using the sample averages for the deficit ratios, a $100 billion permanent increase in the deficit is predicted to decrease the real yield by 1.6 basis points, and the 2-standard deviation range of this prediction is –3.7 to +0.5 basis points.[21]

D. Joint and Constrained Estimation:

Panel A of Table Y.3 shows the results of jointly estimating the full model for all 4 yields. We are unlikely to see large gains in efficiency, because the RHS variables are the same, except for the lagged dependent variables. However, joint estimation makes it possible to test for the joint significance of the permanent impacts. The F-Tests show that the deficit coefficients are highly significant for each yield as well as jointly. But the permanent impact estimates are still are not significant, individually or jointly (shown in the far right column).

is significant and negative when the auxiliary variables are excluded. Coefficients have both positive and negative signs.

We also estimate the above system by restricting the *FEDEXP*, *FEDDEF*, and *CBO5DEF* coefficients to be the same for the 9-year forward, the AAA and the 10-year T-Bond real rates; the coefficients of the 1-year T Bill yield are not constrained. The idea is that since the three constrained yields have comparable maturities, it is likely that they will react in similar ways to the deficits. This restriction may increase the power of the tests we conduct.

Panel B of Table Y.3 shows the results of this constrained estimation. The coefficients in the constrained estimation gain significance. The F-Tests show again that deficits have significant explanatory power, individually and jointly. As before, the federal deficit has a negative permanent impact while the CBO forecast has a positive impact. However, even with the increased power, the permanent impacts are very insignificant, individually or jointly.[22]

E. Does the Lag Structure Matter?

Even though the 3-lag specification is based on our initial VAR estimation, superfluous lags may obscure the true effects of deficits. Accordingly, we also estimate the model with only 1 lag allowed for the RHS variables. The variable list is the same but all the 2nd and 3rd lags are excluded. The results of this estimation are in Table A-Y.2 of the Appendix. Reducing the lags to one is rejected at the 5% level for all the real yields.[23] Thus, the results must be interpreted with caution.

The Table shows that the permanent effects of both *FEDDEF* and *CBO5DEF* are measured with greater precision, and that the *CBO5DEF* precision increases relatively more. The impact

---

[21] A 1% increase in *RFEDDEF* is amounts to $126 billion, using the sample average, and if the regression coefficient was 1.00 it would produce a 2.56 bp increase in the real yield.

[22] The restrictions are rejected with a p-value of 4.7%.

[23] The F-Test P-values are 2.9%, 4.6%, 3.2% for the 1Y T Bill, the 9-Year Forward, and the AAA real yields, respectively. Log-likelihood tests all reject at below the 1% level.

estimates of either deficit variables by themselves almost always exceed the 10% level of significance. The impact of *FEDDEF* is uniformly negative and that of *CBO5DEF* uniformly positive and smaller. The results are otherwise similar to those with 3 RHS lags. The size of the permanent effect is similar to the earlier results. The combined effect is everywhere negative and very insignificant, except in isolated cases for the 1-Year T-Bill real yield in the absence of auxiliary variables and federal expenditures.[24]

We conclude that the results with the 3-lag specification are not specific to that structure, and the insignificance of the permanent effects is not due to poor estimating precision. Rather, our results suggest that markets respond in opposite ways to the forecasts of deficits than to the deficits themselves. The result is that the two responses effectively cancel each other out and there is no permanent effect.

F. Time-Varying Coefficients:

Our empirical specification assumes that the model coefficients are constant. Of course this is an auxiliary assumption and not an integral part of any theory. We relax this assumption and estimate a model in which the deficit coefficients vary in response to an exogenous variable, X_t. We modify the model specification so that just the coefficients associated with *FEDDEF* and *CBO5DEF* become, $(b_{DEF} + g_{DEF} X_t)$.[25] We use 5 different variables, one at a time, to model potential time variation: the lagged real 1-year T-Bill yield, the *GDP* gap variable, *GDPGAP*, the unemployment rate, *UNEM*, and the deficit ratio variables *RFEDDEF* and *RCBO5DEF*.

[24] The *GDPD*-deflated results are also very similar.

[25] We standardize X_t to zero mean and unit standard deviation, in order to simplify the interpretation of the coefficients. We allow only 1 RHS variable lag because of the limited available observations.

Table Y.4 displays the permanent effects of deficits for the full specification of the model. We show the combined permanent effect of deficits when $X_t = 0$ (at its the sample mean), and when X_t is 1 standard deviation above and 1 standard deviation below its mean.

There are many similarities between these results and those of the linear model. The permanent effects measured in this way have the same order of magnitude as those of the linear model. And just as before, the impact of *FEDDEF* is uniformly negative, and it dominates the positive impact of *CBO5DEF*. The permanent effects are quite insignificant when $X = 0$, but they are sometimes significant at the 10% level when $X = 1$ (+1 standard deviation). Frequently in these instances, the permanent effects of *FEDDEF* and *CBO5DEF* are highly significant and opposite in sign. Across these 5 variables, the total impact of deficits is consistently more negative at $X = 1$, than at $X = 0$. This implies, for instance, that the impact of the deficits is likely to be more negative (and significant at the 10% level) when the *GDP* gap is large, or when unemployment is high.[26] In all cases, when $X = -1$, the permanent effect is smaller and highly insignificant.

The quarterly results are uniform in showing that the overall permanent effect of deficits is small, negative, and far from conventional statistical significance. The underlying dynamic, however, seems rather complex. The deficits themselves have a strong and sometimes statistically significant and negative permanent impact, while the CBO forecasts of the deficits has a smaller and sometimes significant and positive permanent impact. Even when these impacts are individually significant, their combined effects are almost always negative and far from conventional statistical significance. At the

---

[26] It also implies that the impact is more negative and sometime significant when *RFEDDEF* is high. However, these three observations are related because *GDP*, unemployment, and the deficit-to-*NNP* ratio will all be high during a recession. The correlations of *GDPGAP* with *UNEM*, *RFEDDEF*, and *CBODEF* are 0.90, 0.66, and 0.52, respectively.

same time, abstracting from the issue of statistical significance, the estimates show the effect of a $100 billion permanent change in the federal deficit is under 2 basis points.

G. Results From Annual Data:

We also estimate a short-lag version of the model using annual data, like most of the recent literature. We allow one dependent variable lag, and no lags for any of the RHS variables. However, since there are only 26 observations and 9 variables, the results must be interpreted with great caution.

Table Y.5 presents the results in the same format as Table Y.2. The full model results in many ways are very similar to the quarterly results. The permanent impact of *FEDDEF* is negative, that of the *CBO5DEF* is positive and smaller. The combined effect is negative and far from conventional significance. The magnitude of the permanent effect is of the same order of magnitude and thus very small. But unlike the quarterly results, the permanent impact of *CBO5DEF* is significant at conventional significance levels for the long-term yields, while that of *FEDDEF* is considerably less significant.

However, this pattern breaks down when the model is estimated without the auxiliary variables but with federal expenditures included; there is no such instability in the quarterly results. When the auxiliary variables are excluded, sometimes it is *FEDDEF*, sometimes it is *CBO5DEF*, and sometimes it is the combined effect that is significant. This apparent instability in the estimates is likely to be caused by the almost 30% increase in degrees of freedom, gained from excluding the 5 or more auxiliary variables.[27]

[27] We also estimated the model allowing 1 lag only for the deficit and expenditure variables; in this case there are 25 observations and 13 variables. All the permanent effects are insignificant but the pattern of negative coefficients for *FEDDEF* and positive coefficients for *CBO5DEF* is clear here as well. However, adding the lags does not result in a significant improvement in the explanatory power of the regression, measured with a log likelihood or an F-test.

Overall, we can draw some strong conclusions. The evidence from the quarterly data clearly indicates that the permanent effect of budget deficits on real yields over all maturities is far from statistical significance. The results from the annual data are mixed but they suffer from very low degrees of freedom. Furthermore, even based on the largest estimates the permanent effect is clearly economically insignificant.[28] This even though the sample period encompasses a spectacular natural experiment, which should have yielded strong statistical results in favor of the Conventional model.

Our findings are consistent with the possibility that interest rise a little in anticipation of future deficits as a result of the forecasts but by the time the deficits materialize the market absorbs them without a net increase in the real rates.

There are two possible explanations of our results. One is that deficit changes are financed one-for-one by the rest of the world through the Current Account. The other is that the Ricardian model is by far the better description of private behavior. Thus, we turn to examining the effects of budget deficits on the current account deficit.

IV. BUDGET AND CURRENT ACCOUNT DEFICITS

A. Design:

The Conventional Model predicts that an *increase* in the federal deficit will *increase* the current account deficit, *CAD*; its coefficients should be positive. The "Ricardian" neutrality proposition predicts no significant impact of the deficit on the *CAD*.[29]

---

[28] The insignificant change in real yields implied by our estimates also implies that possible changes in private saving and investment behavior would not be measurably affected, given the relatively low measured elasticities of savings and investment.

[29] There are 2 caveats that must be mentioned. One is that if a change in government revenues is associated with changes in marginal tax rates, this may well have an effect on yields under both models, because it affects various

The *NNP*-deflated model in equation 1 is,

$$DRCAB_t = ß_{FED} DRFEDDEF_t + ß_{CBO} DRCBO5DEF_t + ß_{EXP} DRFEDEXP_t + \frac{ß_0}{NNP_t} + ß_{NNP,2} \frac{NNP_{t-1}}{NNP_t} + ß_{INV} DRINVALL_{t-1} + ß_{NYSE} DRNYSE_{t-1} + ß_{M2} DRM2_t + ß_{NNP,1} + e_t. \tag{3}$$

We define, $RX \equiv X/NNP$, and $DRX \equiv RX - RX_{-1}$.[30]

B. Lag Length:

To assess the lag lengths that may be required, we estimate bivariate regressions of our deficit and expenditure variables on *CAD*, allowing 8 lags. Table C.1 display the results.

For both specifications the *CAD* exhibits a 4-lag and an 8-lag seasonal (1 year and 2 years). The significance of the other variables depends somewhat on the specification. *FEDEXP* and a lag are significant at least at the 10% level, lag 5 of *FEDDEF* is highly significant, and other lags of *FEDDEF* and *CBO5DEF* are significant, at least at the 10% level. The sums of the coefficients (next to the last row) of the deficits and expenditures all have the "correct" sign according to the Conventional Model, but many individual coefficients have the "wrong" sign. The tables report F-tests of the significance of the deficit and expenditure variables in the presence of the *CAD* lags. Each set of variables is significant at the 5% level.[31] This statistical significance is encouraging because it shows that there is explanatory

economic tradeoffs. The other is that in our empirical investigation we use projected CBO deficits without using any matching projected government expenditures. Thus, we are unable to control for expenditures as uniformly as we would like.

[30] Again, we also estimate a model where the variables are deflated by the *GDOP* deflator. The results are similar but the estimates are not as precise. Since this normalization has undesirable properties (as discussed above), we do not report these results. They are available upon request from the corresponding author.

[31] None of these variables are significant as a group in the *GDPD*-deflated model.

power in the chosen variables. All the adjusted R^2s are above 50% (not shown). All further tests associated with the *CAD* include its 2nd, 4th, and 8th lags.

C. The Permanent Impact:

Table C.2 shows results from regressions that include 2 lags of *FEDEXP*, 3 lags of *CBO5DEF*, and 5 lags of *FEDDEF*, as well as the auxiliary variables with no more than 1 lag, using quarterly data.[32] This specification is informed by the results of Table C.1, and it is constrained by the desire to preserve degrees of freedom.

There is at best modest evidence that either deficit variable influences *CAD* in the direction required by the Conventional Model. *FEDDEF* is significant only at the 10% level, but it has generally the correct sign. *CBO5DEF* is not significant in the full model, and it is significant at the 10% level but its coefficients are frequently negative. In contrast, *FEDEXP* is frequently significant and it has the expected positive sign. The remaining auxiliary variables are not significant; the exception is $DRNYSE_{-1}$ and its lag, which are highly significant and have the expected positive sign. The explanatory power of the model (R^2) is quite high. Overall, the model seems to "explain" a significant proportion of the changes in the *CAD* (ratio or real). Of course, the relevant information is the size and significance of the permanent impact of the deficits.

The first row of Panel A of Table C.3 shows F-test results for the explanatory power of the deficit measures in the full model. The remaining rows of Panel A show the estimates of the permanent impact of deficits on *CAD* in the full model as well as in parsimonious versions of it.

[32] The current value of 1/*DNNP* and its 1st lag, *GDPGAP* and its 1st lag, $INVALL_{-1}$, *M*2, $NYSE_{-1}$ and $NYSE_{-2}$.

The F-tests show that neither measure of the deficit has explanatory power at conventional significance levels. Furthermore, none of the permanent effect estimates are statistically significant at conventional levels. From the components of the permanent effect we see that *FEDDEF* seems to have a positive impact but that *CBO5DEF* has a much smaller and frequently negative impact on *CAD*. We compiled a simple measure for all the estimating runs with quarterly data, whether or not we report them here. We find that 76% of *FEDDEF* coefficients (including their lags) are positive, while only 33% of the *CBO5DEF* coefficients are positive. At the same time, 4.2% of *FEDDEF* and 3.6% of *CBO5DEF* coefficients are individually significant at the 5% level.

A possible explanation of these results is regressor multicollinearity. However, the contemporaneous correlations between the expenditure and deficit variables are not particularly high, which makes this an unlikely explanation for the uniform lack of significance.

	DRFEDEXP	*DRFEDDEF*
DRFEDDEF	0.73	--
DRCBO5DEF	0.11	0.13

A second possible explanation is that since the measure of the permanent effect includes the lagged *CAD* coefficients, the precision of their estimates may be determining the results. Panel B of Table C.3 shows just the sum of the coefficients and their P-values.[33] It is evident that though the P-values of the sums are often slightly lower, the lack of statistical significance of the permanent impacts cannot be generally attributed to poorly estimated *CAD* lagged coefficients.

[33] The *CBO5DEF* coefficients are still multiplied by 6.

D. Does the Lag Structure Matter?

A third possibility is that the large number of lags included in our specification masks the permanent effect and makes it insignificant. We estimate parsimonious models that (i) allow only 3 lags of *FEDDEF* and *CBO5DEF*, and (ii) that allow only one lag of all the RHS variables. Reducing the lags to 3 and to 1 is not rejected at the 5% level by the appropriate F-test, unlike the yield results. The estimates of the permanent effect of deficits from these models are in the Appendix Table A-C.1, Panels A and B.

The results are quite similar. For the 3-lag case, there is no meaningful difference in the full model, though estimates of the joint impact and of *FEDDEF* alone are significant at the 10% level when the auxiliary variables are omitted. For the 1-lag case, the *CBO5DEF* effect is significant at the 10% level when the auxiliary variables are excluded but the effect is negative.[34] We conclude that the lag structure is not critical to the conclusion that budget deficits don't have a significant permanent or even transient effect on the current account.

Setting aside the question of significance, what is the point estimate of the permanent effect of budget deficits? The largest permanent effect in Table C.3 is 0.269, and the average (excluding the small and negative *CBO5DEF* effects) is 0.234. Thus, the point estimates imply that somewhere between 23% and 27% of the budget deficit may show up as current account deficit; but of course, none of these point estimates are statistically significant.[35] At the same, for all the estimates, we can reject at better than 1% level of significance that the permanent impact is 1.0.

[34] The results from the *DRLxxx* specification are similar with slightly smaller P-values in some cases.

E. Time-Varying Coefficients:

As we do for the yields, we relax the constant-coefficient assumption and estimate a model in which the deficit coefficients vary in response to an exogenous variable, X_t. The coefficients associated with *FEDDEF* and *CBO5DEF* become, $(b_{DEF} + g_{DEF} X_t)$, where X_t is standardized to (0,1).[36]

Table C.4 displays the permanent effects of deficits for the full specification of this model. We show the permanent impact of *FEDDEF* and *CBO5DEF* combined, when $X_t = 0$ (at its the sample mean), and when X_t is 1 standard deviation above and 1 standard deviation below its mean.

The results are very similar to those results the linear model. The permanent effects have the same order of magnitude but are somewhat smaller compared to the linear model. And just as before, the effect of *FEDDEF* is uniformly positive, and it dominates the often negative but small effect of *CBO5DEF*. None of the permanent effects are significant even at the 10% level.[37] Across the 5 X variables, the total impact of budget deficits on the current account is consistently more positive at X = 1, than at X = 0. This implies, for instance, that the impact of the deficits is likely to stronger when the *GDP* gap is large, or when unemployment is high.[38] In all cases, when X = -1, the total permanent effect is smaller and more insignificant.

The quarterly results are uniform in showing that the overall permanent effect of deficits is positive. The point estimates imply that well under 20% of a permanent budget deficit translates into a

---

35 Using a typical standard deviation, the 2 standard deviation band around the 23.4% point estimate is 68.0% and -21.2%.

36 We again use the same 5 variables we use for the yields, one at a time: the lagged real 1-year T-Bill yield, *GDPGAP*, *UNEM*, *RFEDDEF*, and *RCBO5DEF*.

37 For the *DLRxxx* specification, two estimates are significant at the 10% level when $X_t = 0$, and three estimates that are significant at the 10% level when $X = 1$.

38 It also implies that the effect is more positive and when *RFEDDEF* is high. However, these three observations are related because *GDP*, unemployment, and the deficit-to-*NNP* ratio will all be high during a recession. The correlations of *GDPGAP* with *UNEM*, *RFEDDEF*, and *CBODEF* are 0.90, 0.66, and 0.52, respectively.

current account deficit. At the same time these estimates are far from conventional statistical significance.

F. Results From Annual Data:

We also estimate the model using annual data, like most of the recent literature. We allow one dependent variable lag, one lag each for *FEDDEF*, *CBO5DEF*, and *FEDEXP*, and no lags for the auxiliary variables. However, since there are only observations 26 observations and 13 variables, one must be very cautious in interpreting these results.

Table C.5 presents the results in the same format as Table C.2. The results are quite similar to the quarterly ones, except for the surprising negative, small (insignificant) permanent effect of the deficit in the full model.[39] Similar to the annual estimated for yield, this apparent instability in the estimates is likely to arise from the roughly 50% increase in degrees of freedom, gained from excluding the 5 or more auxiliary variables.[40]

Overall, we find on significant evidence that budget deficits reliably affect the current account, in the quarterly and annual data, with few and with many lags!

VI. CONCLUSIONS AND POLICY IMPLICATIONS

We find results that range from Ricardian to the opposite of the conventional textbook model using fully replicable data and structures that carve out a very large and important part of the

---

[39] The *DRLxxx* specification has somewhat different results. In the full model there is a significant (5% level) and negative permanent effect of the deficits. The significance disappears when the auxiliary variables are removed but the sign remains negative.

specification space. We do not attempt to undertake micro-structural tests, but stake out the basic reduced form/correlation structure approach.

We first examine short and long term real yields. We cannot find evidence that supports the Conventional model. First, the combined effect of federal deficits and their forecasts seem to have a perverse but insignificant impact on real yields; a permanent increase in the federal budget deficit is associated with a steady-state reduction in real yields. The component of this overall negative effect is a small and positive impact of the forecasts, offset by a larger and negative impact of the deficits themselves. This finding is consistent with the possibility that the expectation of higher deficits disturbs the market, but by the time these deficits materialize, the market does not require a higher real rate to finance them. This is also supported by our result that the deficit variables "explain" a significant share of the variance of real yields. Second, the point estimates suggest that the impact of deficits on real yields is trivially small; $100 billion permanent increase in the deficit has a less than 2 basis-point effect on real yields!

Though these findings are consistent with the Ricardian model, they are also consistent with the Conventional model in a fully open economy. We argue that if the economy is fully open, then increases in deficits would be financed by offsetting changes in the current account, if the Conventional model is a good description of economies. However, this position requires a substantial impact of budget deficits on the current account.

Our investigation of the current account leads us to conclude that there no is significant evidence that the current account responds to government budget deficits in a way consistent with the

---

[40] We also estimated the model allowing no lags for the deficit and expenditure variables; in this case there are 25 observations and 9 variables. Deleting the RHS lags does not result in significant differences.

Conventional model. The point estimates of the impact are positive, unlike for real yields. However, the estimates of permanent impact are uniformly far from conventional significance levels. Nor do the deficits variables seem to explain a significant portion of the variance of the current account. The typical point estimate suggests that around 20% - 25% of government deficits might be financed by current account changes.

Given the clarity of the natural experiment of the late 90s, we conclude that the evidence on the current account overwhelmingly does not support the Conventional model. Rather, our evidence provides strong support for the Ricardian model.

We would argue that no one can do research in this area without encompassing these most straightforward data and results. That is, one would fundamentally have to nest the full structure of our specification space results into whatever augmented analysis they are doing and show that not only in a small corner of the space but over the full structure of the space they can overturn our neutrality/supply side results. The space we have staked out is the most straightforward and massive part. It encompasses:

- stationary and non-stationary structures
- lag structure specification
- auxiliary variables specifications
- both interest rate and current account structures to accommodate variable openness

To overturn our results, one or more of the following strategies must be utilized.

- Better auxiliary variables that work systematically better across the whole specification space structure not only in a little corner of the space.
- A micro-structural approach that shows why the reduced-form results are overturned by the structural approach, again over the whole of the space.
- More data, the addition of which shows why this particularly strong and interesting natural experiment timeframe generated spurious results.

Our results are too clear, too systematic, too stable, too strong, over too important a period of analysis to be overturned with anything else. We started by asking: is the challenge in the above quote by Paul Evans as applicable today as it was in 1985? Our answer is an unequivocal *yes*! These results suggest that it is time for the profession as a whole to recognize that Ricardian “debt neutrality” is the default paradigm for the profession.

As a result of this research, one cannot argue that deficits such as those that have emerged recently are a reason to roll back tax cuts or to fail to make the existing tax cuts permanent. The results fully support, however, reducing the level of growth of government spending to bring down the deficit to more traditional levels that are more reasonable in the long run.

REFERENCES

Barro, Robert J. (1974) "Are Government Bonds New Worth?" *Journal of Political Economy* 82, 6, pp. 1095-1117.

Bernheim, B. Douglas (1989) "A Neoclassical Perspective on Budget Deficits," *Journal of Economic Perspectives* 3, pp. 55-72.

Canzoneri, Matthew, Robert Cumby, and Behzad Diba (2002) "Should the European Central Bank and the Federal Reserve Be Concerned About Fiscal Policy?" Working Paper *Georgetown University.*

Cebula, Richard (1988) "Federal Government Budget Deficits and Interest Rates: A Brief Note," *Southern Economic Journal* 55, 1, pp: 206-210.

Elmendorf, Douglas (1996) "The Effect of Deficit-Reduction Laws on real Interest Rates," Federal Reserve Board, Working Paper.

Elmendorf, Douglas and David Reifschneider (2002) "Short-Run Effects of Fiscal Policy With Forward-Looking Financial Markets," Working paper, *Board of Governors of the Federal Reserve System*.

Entin, Steven and Paul Evans (2002) "Deficits, Tax Cuts, Interest Rates and Investment: Do Large Deficits Raise Interest Rates?" *Institute for Research on the Economics of Taxation Congressional Advisory* (October 23, 2002).

Evans, Paul (1985) "Do Large Deficits Produce High Interest Rates?" *The American Economic Review* Vol. 75, No. 1, March; pp: 68-87.

Evans, Paul (1987a) "Interest Rates and Expected Future Budget Deficits in the United States," *Journal of Political Economy* Vol. 95, No. 1, February; pp. 34-58.

Evans, Paul (1988) "Are Consumers Ricardian? Evidence for the United States," *Journal of Political Economy* 96, 5, pp. 983-1004.

Evans, Paul (1987b) "Do Budget Deficits Raise Nominal Interest Rates? Evidence from Six Countries," *Journal of Monetary Economics* 20, 2, pp. 281-300.

Evans, Paul (1986) "Is the Dollar High Because of Large Budget Deficits?" *Journal of Monetary Economics* 18, 3, pp. 227-250.

Feldstein, Martin and Douglas W. Elmendorf (1990) "Government Debt, Government Spending, and Private Sector Behavior Revisited: Comment," *The American Economic Review* 80, pp. 589-599.

Gale, William and Peter Orszag (2003) "The Economic Effects of Long-Term Fiscal Discipline," Working paper *Tax Policy Center* (2002).

Gale, William G. and Peter R. Orszag (2003) "Economic Effects of Sustained Budget Deficits," *National Tax Journal*, September 2003 p.473.

Graham, Fred C. (1995) "Government Debt, Government Spending, and Private-Sector Behavior: Comment," *American Economic Review* 85, pp. 1348-1356.

Kitchen, John (1996) "Domestic and International Financial Market Responses to Federal Deficit Announcements," *Journal of International Money and Finance* 15, 2, pp. 239-254.

Kormendi, Roger (1983) "Government Debt, Government Spending, and Private Sector Behavior," *American Economic Review* 73, pp: 994-1010.

Kormendi, Roger and Philip Meguire (1986) "Government Debt, Government Spending, and Private Sector Behavior: Reply," *American Economic Review* 76, pp: 1180-1187.

Kormendi, Roger and Philip Meguire (1990) "Government Debt, Government Spending, and Private Sector Behavior: Reply and Update," *American Economic Review* 80, pp: 604-617.

Kormendi, Roger and Philip Meguire (1995) "Government Debt, Government Spending, and Private Sector Behavior: Reply," *American Economic Review* 85, pp: 1357-1361.

Laubach, Thomas (2003) "New Evidence on the Interest Rate Effects of Budget Deficits and Debt," Working Paper *Board of Governors of the Federal Reserve System*.

Lucas, Robert, and Nancy Stokey (1987) "Money and Interest In a Cash-in-Advance Economy," *Econometrica* 55, 3 pp. 491-513.

Modigliani, Franco and Arlie G. Sterling (1986) "Government Debt, Government Spending, and Private Sector Behavior: A Comment," *American Economic Review* 80, pp. 1168-1179.

Modigliani, Franco and Arlie G. Sterling (1990) "Government Debt, Government Spending, and Private Sector Behavior: A Further Comment," *American Economic Review* 80, pp. 600-603.

Plosser, Charles (1987) "Fiscal Policy and the Term Structure," *Journal of Monetary Economics* 20, 2, pp. 343-368.

Plosser, Charles (1987) "Government Financing Decisions and Asset Returns," *Journal of Monetary Economics* 9, 2, pp. 325-352.

Poterba, James and Lawrence Summers (1987) "Finite Lifetimes and the Effects of Budget Deficits on National Savings," *Journal of Monetary Economics* 20, 2, pp. 369-392.

Quigley, Michael R. and Susan Porter-Hudak (1994) "A New Approach in Analyzing the Effect of Deficit Announcements of Interest Rates," *Journal of Money, Credit and Banking* 26, 4, pp: 894-902.

Reynolds, Alan (2004) "The 'Conventional' Hypothesis: Deficit Estimates, Savings Rates, Twin Deficits and Yield Curves," presented at The Treasury's Roundtable on the Federal Budget, Taxes, and Economic Growth (February 12, 2004).

Reynolds, Alan (2002) "Do Budget Deficits Raise Long-Term Interest Rates?" *Tax & Budget Bulletin*, Cato Institute. (February 2002).

Rubin, Robert E., Peter R. Orszag and Allen Sinai (2004) "Sustained Budget Deficits: Longer-Run U.S. Economic Performance and the Risk of Financial and Fiscal Disarray," presented at the AEA-NAEFA Joint Sessions (January 5, 2004).

Seater, John (1993) "Ricardian Equivalence," *Journal of Economic Literature*. March 1993 p.176.

Thorbecke, Willem (1993) "Why Deficits News Affect Interest Rates," *Journal of Policy Modeling* 15, 1, pp:1-11.

Wachtel, Paul and John Young (1987) "Deficit Announcements and Interest Rates," *American Economic Review* 77, 5, pp:1007-1012.

CHART 1

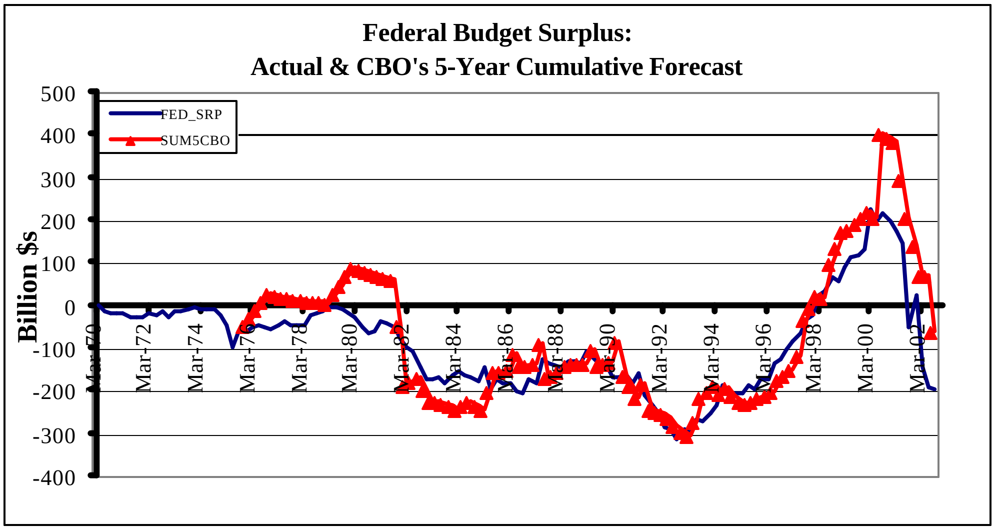

CHART 2

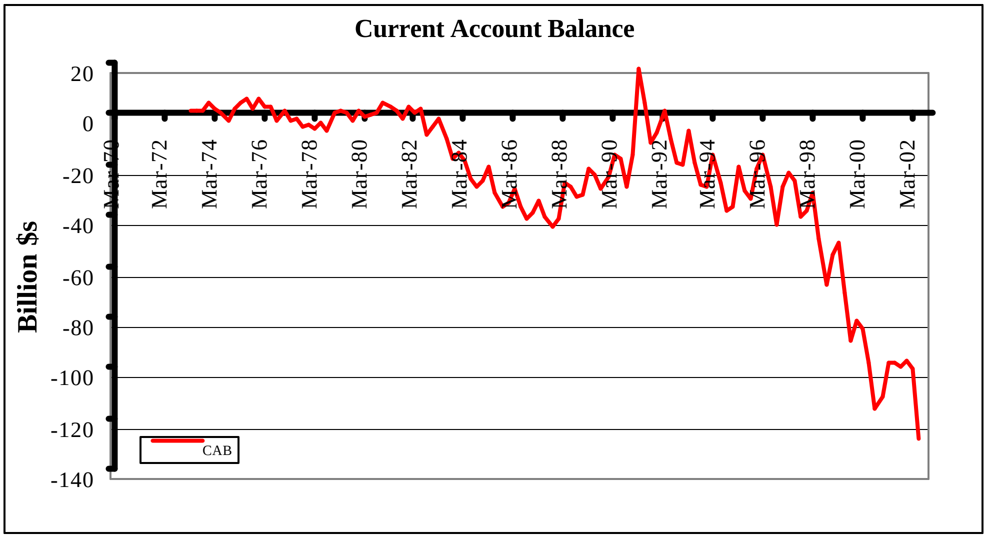

CHART 3

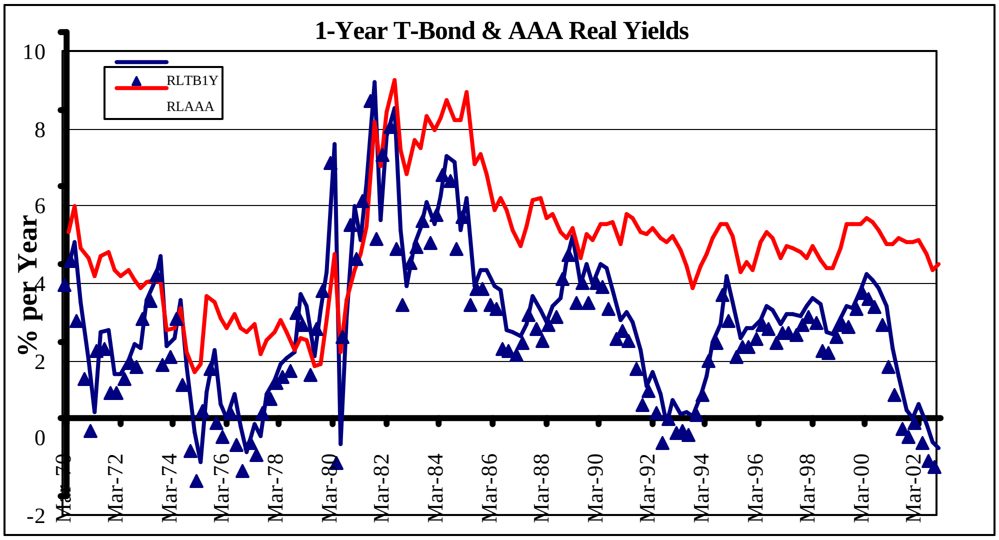

TABLE Y.1

BIVARIATE REGRESSIONS
YIELDS ON FEDERAL EXPENDITURES, ACTUAL AND PROJECTED DEFICITS

PANEL A
DRLTB1Y; Quarterly Data

Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value
C	0.002	[.986]		0.0211	[.858]		-0.003	[.978]		0.294	[.124]
DRLTB1Y(-1)	-0.392	[.091]		-0.4818	[.059]		-0.402	[.084]		-0.441	[.087]
DRLTB1Y(-2)	-0.257	[.192]		-0.3276	[.144]		-0.238	[.234]		-0.308	[.182]
DRLTB1Y(-3)	0.088	[.629]		0.0650	[.757]		0.082	[.657]		0.037	[.867]
DRLTB1Y(-4)	0.053	[.750]		0.0668	[.689]		0.034	[.838]		0.030	[.867]
			DRFED_DEF	**-0.607**	**[.007]**	DRCBO5DEF	-0.020	[.556]	DRFED_EXP	-0.838	[.052]
			DRFED_DEF(-1)	-0.447	[.145]	DRCBO5DEF(-1)	0.019	[.425]	DRFED_EXP(-1)	-0.429	[.341]
			DRFED_DEF(-2)	-0.349	[.261]	DRCBO5DEF(-2)	0.004	[.879]	DRFED_EXP(-2)	**-0.805**	**[.044]**
			DRFED_DEF(-3)	0.120	[.633]	DRCBO5DEF(-3)	-0.048	[.113]	DRFED_EXP(-3)	0.314	[.442]
			DRFED_DEF(-4)	0.250	[.394]	DRCBO5DEF(-4)	-0.004	[.837]	DRFED_EXP(-4)	0.580	[.131]
Coeff Sum			**DRFED_DEF**	**-1.033**		**DRCBO5DEF**	**-0.049**		**DRFED_EXP**	**-1.178**	
F-Test					**[.003]**			**[.390]**			**[.002]**

PANEL B
DRLF1_10; Quarterly Data

Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value
C	-0.003	[.942]		0.004	[.960]		-0.002	[.980]		0.010	[.896]
DRLF1_10(-1)	-0.185	[.138]		-0.141	[.292]		-0.220	[.126]		-0.186	[.154]
DRLF1_10(-2)	-0.099	[.651]		-0.031	[.798]		-0.062	[.647]		-0.024	[.840]
DRLF1_10(-3)	0.068	[.452]		0.114	[.384]		0.076	[.602]		0.111	[.389]
DRLF1_10(-4)	0.069	[.653]		0.088	[.607]		0.046	[.763]		0.144	[.342]
			DRFED_DEF	**-0.305**	**[.037]**	DRCBO5DEF	0.010	[.603]	DRFED_EXP	-0.409	[.111]
			DRFED_DEF(-1)	0.065	[.661]	DRCBO5DEF(-1)	0.016	[.325]	DRFED_EXP(-1)	0.130	[.599]
			DRFED_DEF(-2)	-0.097	[.657]	DRCBO5DEF(-2)	0.008	[.679]	DRFED_EXP(-2)	-0.342	[.135]
			DRFED_DEF(-3)	0.008	[.963]	DRCBO5DEF(-3)	**-0.035**	**[.036]**	DRFED_EXP(-3)	0.230	[.246]
			DRFED_DEF(-4)	0.095	[.664]	DRCBO5DEF(-4)	-0.004	[.748]	DRFED_EXP(-4)	0.347	[.253]
Coeff Sum			**DRFED_DEF**	**-0.234**		**DRCBO5DEF**	**-0.006**		**DRFED_EXP**	**-0.044**	
F-Test					**[.228]**			**[.210]**			**[.108]**

PANEL C
DRLAAA; Quarterly Data

Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value
C	0.016	[.796]		0.013	[.849]		0.010	[.869]		0.019	[.773]
DRLAAA(-1)	-0.218	[.173]		-0.179	[.271]		-0.260	[.157]		-0.195	[.230]
DRLAAA(-2)	-0.077	[.631]		-0.050	[.750]		-0.098	[.560]		-0.035	[.822]
DRLAAA(-3)	0.179	[.205]		0.178	[.214]		0.149	[.341]		0.145	[.290]
DRLAAA(-4)	0.048	[.774]		0.076	[.701]		0.051	[.760]		0.093	[.591]
			DRFED_DEF	-0.170	[.203]	DRCBO5DEF	0.014	[.411]	DRFED_EXP	-0.248	[.281]
			DRFED_DEF(-1)	0.073	[.579]	DRCBO5DEF(-1)	0.020	[.160]	DRFED_EXP(-1)	0.209	[.319]
			DRFED_DEF(-2)	-0.126	[.514]	DRCBO5DEF(-2)	-0.006	[.698]	DRFED_EXP(-2)	-0.279	[.159]
			DRFED_DEF(-3)	-0.053	[.692]	DRCBO5DEF(-3)	-0.024	[.081]	DRFED_EXP(-3)	0.079	[.635]
			DRFED_DEF(-4)	0.080	[.665]	DRCBO5DEF(-4)	-0.005	[.641]	DRFED_EXP(-4)	0.307	[.250]
Coeff Sum			**DRFED_SRP**	**-0.196**		**DRCBO5DEF**	**-0.001**		**DRFED_EXP**	**0.067**	
F-Test					**[.446]**			**[.173]**			**[.222]**

TABLE Y.2

SIGNIFICANCE AND PERMANENT IMPACT OF DEFICITS ON REAL YIELDS
P-Values For Selected Tests --3 RHS Variable Lags; Quarterly Data

	1-Yr	Forward	AAA	10-Yr
F-Test P-Values From the Full Model				
Joint Significance of *FED&CBO Deficits*	**[.050]**	**[.033]**	**[.019]**	**[.029]**
Joint Significance of *FED Deficits*	[.663]	[.577]	[.413]	[.614]
Joint Significance of *CBO Deficits*	**[.017]**	**[.017]**	**[.015]**	**[.012]**
Permanent Effects and Their P-Values				
Full Model:	**Coeff [P-Value] 1-Yr**	**Coeff [P-Value] Forward**	**Coeff [P-Value] AAA**	**Coeff [P-Value] 10-Yr**
Permanent impact of deficits: *FED + CBO*	-0.102 [.748]	-0.107 [.768]	-0.213 [.462]	-0.090 [.788]
Permanent impact of *FED Deficit*	-0.201 [.659]	-0.276 [.547]	-0.389 [.315]	-0.253 [.561]
Permanent impact of *CBO Deficit*	0.099 [.696]	0.169 [.336]	0.176 [.278]	0.162 [.363]
No Auxiliary Variables; Federal Expenditures Included:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of deficits *FED* & *CBO*	-0.406 [.301]	-0.204 [.596]	-0.316 [.271]	-0.215 [.561]
Permanent impact of *FED Deficit*	-0.511 [.280]	-0.335 [.460]	-0.458 [.194]	-0.347 [.427]
Permanent impact of *CBO Deficit*	0.105 [.729]	0.131 [.496]	0.142 [.404]	0.132 [.511]
No Auxiliary Variables; Federal Expenditures Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of deficits *FED* & *CBO*	**-0.687 [.011]**	-0.202 [.250]	-0.151 [.256]	-0.244 [.165]
Permanent impact of *FED Deficit*	-0.805 [.121]	-0.335 [.262]	-0.279 [.276]	-0.380 [.223]
Permanent impact of *CBO Deficit*	0.118 [.712]	0.133 [.489]	0.128 [.456]	0.135 [.504]
All Auxiliary Variables; Federal Deficits Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of *CBO Deficit*	0.040 [.847]	0.100 [.455]	0.083 [.513]	0.097 [.482]
All Auxiliary Variables; CBO Deficits Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of *FED Deficit*	-0.235 [.497]	-0.211 [.598]	-0.310 [.329]	-0.196 [.599]

TABLE Y.3

SIGNIFICANCE AND PERMANENT IMPACT OF DEFICITS ON REAL YIELDS FROM JOINT ESTIMATION
3 RHS Variable Lags; Quarterly Data

PANEL A: Unconstrained Joint Estimation

	1-Yr	Forward	AAA	10-Yr	Joint Significance
F-Test P-Values From the Full Model					
Joint Significance of *FED&CBO Deficits*	**[.024]**	**[.004]**	**[.000]**	**[.006]**	**[.000]**
Joint Significance of *FED Deficits*	[.364]	[.228]	[.111]	[.236]	[.113]
Joint Significance of *CBO Deficits*	**[.006]**	**[.001]**	**[.022]**	**[.001]**	**[.004]**
Permanent Effects and Their P-Values					
Full Model	**Coeff [P-Value]**	**Coeff [P-Value]**	**Coeff [P-Value]**	**Coeff [P-Value]**	
Permanent impact of deficits: *FED + CBO*	-0.120 [.742]	-0.084 [.805]	-0.213 [.458]	-0.087 [.790]	[.579]
Permanent impact of *FED Deficit*	-0.228 [.674]	-0.252 [.560]	-0.388 [.312]	-0.249 [.560]	[.363]
Permanent impact of *CBO Deficit*	0.108 [.752]	0.168 [.311]	0.175 [.278]	0.162 [.359]	[.391]

PANEL B: Constrained Joint Estimation

	1-Yr	Constrained Coefficients	Joint Significance
F-Test P-Values From the Full Model			
Joint Significance of *FED&CBO Deficits*	**[.000]**	**[.000]**	**[.000]**
Joint Significance of *FED Deficits*	[.147]	[.148]	[.083]
Joint Significance of *CBO Deficits*	**[.000]**	**[.000]**	**[.000]**
Permanent Effects and Their P-Values			
	Coeff [P-Value]	**Coeff [P-Value]**	**[P-Value]**
Permanent impact of deficits: *FED + CBO*	-0.351 [.192]	-0.353 [.192]	[.753]
Permanent impact of *FED Deficit*	-0.544 [.112]	-0.547 [.111]	[.573]
Permanent impact of *CBO Deficit*	0.194 [.117]	0.194 [.113]	[.483]

TABLE Y.4

PERMANENT IMPACT OF *FED* & *CBO* DEFICITS; NONLINEAR SPECIFICATION
1 RHS Variable Lag; Quarterly Data

Linear Model:	**Coeff [P-Value] 1-Yr**	**Coeff [P-Value] Forward**	**Coeff [P-Value] AAA**	**Coeff [P-Value] 10-Yr**
Linear specification	-0.285 [.285]	-0.155 [.468]	-0.141 [.481]	-0.159 [.432]
Time Variation Modeled By: *RLTB 1Y*(-1)	**1-Yr**	**Forward**	**AAA**	**10-Yr**
0 Standard deviation	-0.316 [.250]	-0.183 [.420]	-0.170 [.352]	-0.191 [.372]
+1 Standard deviation	-0.576 [.106]	-0.375 [.147]	-0.340 [.113]	-0.391 [.116]
- 1 standard deviation	-0.056 [.818]	0.009 [.970]	0.001 [.997]	0.010 [.963]
RGDPGAP	**1-Yr**	**Forward**	**AAA**	**10-Yr**
0 Standard deviation	-0.355 [.197]	-0.123 [.565]	-0.153 [.371]	-0.137 [.492]
+1 Standard deviation	-0.507 [.075]	-0.375 [.086]	-0.339 [.062]	-0.375 [.071]
- 1 standard deviation	-0.203 [.494]	0.130 [.585]	0.034 [.856]	0.100 [.651]
UNEM	**1-Yr**	**Forward**	**AAA**	**10-Yr**
0 Standard deviation	-0.397 [.121]	-0.210 [.340]	-0.216 [.199]	-0.219 [.281]
+1 Standard deviation	-0.559 [.054]	-0.427 [.067]	-0.367 [.050]	-0.427 [.051]
- 1 standard deviation	-0.236 [.328]	0.007 [.975]	-0.064 [.698]	-0.011 [.958]
RFEDDEF	**1-Yr**	**Forward**	**AAA**	**10-Yr**
0 Standard deviation	-0.351 [.222]	-0.260 [.255]	-0.200 [.267]	-0.258 [.233]
+1 Standard deviation	-0.564 [.158]	**-0.647 [.038]**	-0.407 [.113]	**-0.612 [.040]**
- 1 standard deviation	0.139 [.576]	0.127 [.570]	0.006 [.970]	0.104 [.619]
RCBO5DEF	**1-Yr**	**Forward**	**AAA**	**10-Yr**
0 Standard deviation	-0.367 [.237]	-0.243 [.312]	-0.223 [.246]	-0.248 [.122]
+1 Standard deviation	-0.435 [.317]	-0.471 [.113]	-0.347 [.170]	-0.460 [.122]
- 1 standard deviation	-0.298 [.234]	-0.015 [.950]	-0.099 [.579]	-0.035 [.871]

TABLE Y.5

SIGNIFICANCE AND PERMANENT IMPACT OF DEFICITS ON REAL YIELDS
No RHS Variable Lags; Annual Data

	1-Yr	Forward	AAA	10-Yr
F-Test P-Values				
Joint Significance of *FED&CBO Deficits*	[.835]	[.122]	[.339]	[.164]
Joint Significance of *FED Deficits*	[.568]	[.927]	[.580]	[.863]
Joint Significance of *CBO Deficits*	[.671]	[.103]	[.329]	[.136]
T-Test P-Values				
Full Model:	**Coeff [P-Value] 1-Yr**	**Coeff [P-Value] Forward**	**Coeff [P-Value] AAA**	**Coeff [P-Value] 10-Yr**
Permanent impact of deficits: *FED + CBO*	-0.622 [.286]	-0.129 [.747]	-0.364 [.376]	-0.185 [.648]
Permanent impact of *FED Deficit*	-0.857 [.158]	-0.472 [.276]	-0.639 [.155]	-0.518 [.239]
Permanent impact of *CBO Deficit*	0.235 [.254]	**0.343 [.007]**	**0.274 [.029]**	**0.333 [.011]**
No Auxiliary Variables; Federal Expenditures Included:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of deficits *FED* & *CBO*	**-0.912 [.046]**	-0.305 [.325]	**-0.350 [.007]**	-0.374 [.231]
Permanent impact of *FED Deficit*	**-1.170 [.013]**	-0.613 [.082]	**-0.401 [.034]**	-0.677 [.052]
Permanent impact of *CBO Deficit*	0.257 [.152]	**0.308 [.017]**	0.051 [.678]	**0.303 [.021]**
No Auxiliary Variables; Federal Expenditures Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of deficits *FED* & *CBO*	-1.313 [.315]	-0.009 [.959]	-0.029 [.910]	-0.057 [.781]
Permanent impact of *FED Deficit*	-1.188 [.127]	-0.303 [.262]	-0.236 [.509]	-0.353 [.222]
Permanent impact of *CBO Deficit*	-0.125 [.879]	**0.312 [.037]**	0.207 [.328]	0.297 [.078]
All Auxiliary Variables; Federal Deficits Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of *CBO Deficit*	-1.619 [.536]	0.208 [.509]	0.070 [.848]	0.174 [.606]
All Auxiliary Variables; CBO Deficits Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of *FED Deficit*	**-0.861 [.039]**	-0.461 [.267]	-0.578 [.139]	-0.507 [.222]

TABLE C.1
BIVARIATE REGRESSIONS
***CAD* ON FEDERAL EXPENDITURES, ACTUAL AND PROJECTED DEFICITS**
Quarterly Data

Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value	Variable	Coeff	P-value
C	-0.011	[.399]		-0.016	[.222]		-0.009	[.503]		-0.010	[.457]
DRCAD(-1)	-0.002	[.991]		0.047	[.735]		0.055	[.694]		0.080	[.521]
DRCAD(-2)	**-0.202**	**[.017]**		**-0.252**	**[.003]**		**-0.228**	**[.018]**		**-0.193**	**[.026]**
DRCAD(-3)	0.029	[.764]		0.001	[.991]		0.043	[.715]		-0.061	[.502]
DRCAD(-4)	**0.376**	**[.001]**		**0.344**	**[.000]**		**0.284**	**[.007]**		**0.479**	**[.000]**
DRCAD(-5)	-0.119	[.161]		-0.129	[.153]		-0.140	[.122]		-0.143	[.136]
DRCAD(-6)	0.007	[.929]		0.072	[.407]		0.005	[.948]		0.046	[.636]
DRCAD(-7)	-0.121	[.184]		-0.083	[.349]		-0.090	[.342]		-0.015	[.890]
DRCAD(-8)	**0.292**	**[.007]**		**0.316**	**[.002]**		**0.383**	**[.000]**		0.214	[.053]
			DRFED_DEF	0.009	[.739]	DRCBO5DEF	-0.001	[.834]	DRFED_EXP	0.077	[.077]
			DRFED_DEF(-1)	-0.026	[.225]	DRCBO5DEF(-1)	-0.005	[.055]	DRFED_EXP(-1)	**-0.089**	**[.009]**
			DRFED_DEF(-2)	0.024	[.368]	DRCBO5DEF(-2)	0.003	[.358]	DRFED_EXP(-2)	0.037	[.415]
			DRFED_DEF(-3)	0.039	[.087]	DRCBO5DEF(-3)	0.006	[.162]	DRFED_EXP(-3)	0.039	[.221]
			DRFED_DEF(-4)	-0.006	[.723]	DRCBO5DEF(-4)	-0.004	[.213]	DRFED_EXP(-4)	-0.035	[.242]
			DRFED_DEF(-5)	**0.031**	**[.007]**	DRCBO5DEF(-5)	0.005	[.118]	DRFED_EXP(-5)	0.046	[.116]
			DRFED_DEF(-6)	-0.007	[.666]	DRCBO5DEF(-6)	-0.001	[.620]	DRFED_EXP(-6)	0.016	[.647]
			DRFED_DEF(-7)	0.022	[.268]	DRCBO5DEF(-7)	-0.000	[.961]	DRFED_EXP(-7)	-0.003	[.919]
			DRFED_DEF(-8)	0.034	[.085]	DRCBO5DEF(-8)	0.003	[.091]	DRFED_EXP(-8)	0.036	[.235]
Coeff Sum			**DRFED_DEF**	**0.120**		**DRCBO5DEF**	**0.007**		**DRFED_EXP**	**0.125**	
F-Test					**[.042]**			**[.035]**			**[.018]**

TABLE C.2
CAD ON ACTUAL AND PROJECTED DEFICITS AND FEDERAL EXPENDITURES

3 RHS Variable Lags, 5 for *FEDDEF*; Quarterly Data

Variable	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	-0.001	[.939]	0.011	[.390]	0.009	[.445]	0.011	[.377]	0.010	[.569]
DRCAD(-1)	0.007	[.922]	-0.010	[.916]	-0.065	[.393]	-0.018	[.831]	-0.029	[.669]
DRCAD(-2)	-0.074	[.359]	**-0.168**	**[.032]**	**-0.154**	**[.038]**	-0.143	[.062]	-0.128	[.103]
DRCAD(-4)	**0.493**	**[.000]**	**0.402**	**[.001]**	**0.374**	**[.003]**	**0.402**	**[.001]**	**0.486**	**[.000]**
DRCAD(-8)	**0.278**	**[.004]**	**0.287**	**[.009]**	**0.311**	**[.004]**	**0.300**	**[.005]**	**0.236**	**[.020]**
DINNP	-141.092	[.965]							1832.26	[.565]
DINNP(-1)	-1.637	[.448]							-2.860	[.132]
DRGDPGAP	0.008	[.798]							-0.010	[.723]
DRGDPGAP(-1)	-0.065	[.118]							-0.076	[.059]
DRFED_EXP	0.129	[.076]							**0.177**	**[.003]**
DRFED_EXP(-1)	**-0.104**	**[.042]**							-0.040	[.286]
DRFED_EXP(-2)	-0.008	[.856]							0.051	[.203]
DRINV_ALL(-1)	-0.015	[.580]							-0.008	[.751]
DRM2	-0.019	[.280]							-0.010	[.519]
DRNYSE(-1)	**0.009**	**[.003]**							**0.008**	**[.004]**
DRNYSE(-2)	**0.008**	**[.019]**							0.005	[.079]
DRFED_DEF	0.008	[.794]	0.010	[.681]			0.010	[.659]		
DRFED_DEF(-1)	0.057	[.092]	-0.019	[.271]			-0.011	[.559]		
DRFED_DEF(-2)	0.057	[.097]	0.021	[.434]			0.033	[.263]		
DRFED_DEF(-3)	0.025	[.317]	0.044	[.101]			0.047	[.082]		
DRFED_DEF(-4)	-0.044	[.151]	-0.010	[.708]			-0.023	[.421]		
DRFED_DEF(-5)	0.010	[.680]	0.027	[.120]			0.021	[.319]		
DRCBO5DEF	-0.001	[.799]			-0.001	[.576]	-0.003	[.436]		
DRCBO5DEF(-1)	-0.004	[.144]			-0.004	[.074]	-0.005	[.054]		
DRCBO5DEF(-2)	0.004	[.184]			0.003	[.523]	0.002	[.596]		
DRCBO5DEF(-3)	0.001	[.796]			0.005	[.206]	0.003	[.423]		
R^2 -- D.W.	**74.4%**	**1.90**	**60.4%**	**1.92**	**60.4%**	**1.78**	**64.1%**	**1.87**	**70.1%**	**1.83**

ADD THE 1 RHS RESULTS?

TABLE C.3

SUM OF COEFFICIENTS ANF THE PERMANENT IMPACT OF BUDGET DEFICITS ON THE CURRENT ACCOUNT

Alternative Specifications --3 RHS Variable Lags, 5 for *FEDDEF*; Quarterly Data

PANEL A -- PERMANENT IMPACT

F-Test P-Values for Joint Significance of:	*FED + CBO Deficit*	*FED Deficit*	*CBO Deficit*
	[.138]	[.261]	[.373]
Permanent Effects and Their P-Values			
Permanent Impact Of	**Coeff [P-Value]** *FED + CBO Deficit*	**Coeff [P-Value]** *FED Deficit*	**Coeff [P-Value]** *CBO Deficit*
Full Model:	0.269 [.229]	0.266 [.274]	0.004 [.961]
No Auxiliary Variables; Federal Expenditures Included:	0.219 [.155]	0.277 [.110]	-0.058 [.433]
No Auxiliary Variables; Federal Expenditures Excluded:	0.130 [.321]	0.167 [.275]	-0.036 [.581]
All Auxiliary Variables; Federal Deficits Only:	n.a.	0.310 [.157]	n.a
All Auxiliary Variables; CBO Deficits Only:	n.a.	n.a.	0.047 [.406]

PANEL B -- SUM OF COEFFICIENTS

Sum Of Coefficients	**Coeff [P-Value]** *FED + CBO Deficit*	**Coeff [P-Value]** *FED Deficit*	**Coeff [P-Value]** *CBO Deficit*
Full Model:	0.084 [.177]	0.083 [.227]	0.001 [.961]
No Auxiliary Variables; Federal Expenditures Included:	0.084 [.191]	0.106 [.115]	-0.022 [.387]
No Auxiliary Variables; Federal Expenditures Excluded:	0.061 [.339]	0.077 [.276]	-0.017 [.565]
All Auxiliary Variables; Federal Deficits Only:	n.a.	0.107 [.096]	n.a
All Auxiliary Variables; CBO Deficits Only:	n.a.	n.a.	0.019 [.387]

TABLE C.4

PERMANENT IMPACT OF BUDGET DEFICITS ON THE CURRENT ACCOUNT: NONLINEAR MODEL
1 RHS Variable Lag; Quarterly Data

	Coeff [P-Value]	Coeff [P-Value]	Coeff [P-Value]
Linear Model:	0.127 [.348]	n.a.	n.a.
Time Variation Modeled By:	**0 Standard deviation**	**+1 Standard deviation**	**- 1 standard deviation**
TB 1Y(-1)	0.118 [.249]	0.135 [.283]	0.100 [.306]
GDP GAP	0.144 [.359]	0.196 [.249]	0.093 [.584]
UNEM	0.162 [.219]	0.200 [.193]	0.124 [.341]
RFEDDEF	0.178 [.159]	0.253 [.140]	0.103 [.375]
RCBO5DEF	0.154 [.179]	0.220 [.135]	0.088 [.410]

TABLE C.5

PERMANENT IMPACT OF BUDGET DEFICITS ON THE CURRENT ACCOUNT
Alternative Specifications --1 RHS Lags; Annual Data

F-Test P-Values for Joint Significance of:	***FED + CBO***	***FED Deficit***	***CBO Deficit***
	[.890]	[.768]	[.834]
Permanent Effects and Their P-Values			
Permanent Impact Of	**Coeff [P-Value]** ***FED + CBO***	**Coeff [P-Value]** ***FED Deficit***	**Coeff [P-Value]** ***CBO Deficit***
Full Model:	-0.040 [.469]	-0.021 [.743]	-0.019 [.255]
No Auxiliary Variables; Federal Expenditures Included:	0.159 [.160]	0.155 [.214]	0.004 [.927]
No Auxiliary Variables; Federal Expenditures Excluded:	0.085 [.110]	0.095 [.197]	-0.009 [.828]
All Auxiliary Variables; Federal Deficits Only:	n.a.	0.119 [.388]	n.a
All Auxiliary Variables; CBO Deficits Only:	n.a.	n.a.	0.036 [.469]

NOTES FOR TABLE C.1

Table C.1 shows the results of bivariate regressions using quarterly data. The LHS variable is the 1st difference of the ratio *CAD/NNP –DRCAD* (Current Account Deficit). All the regressions include 8 lags of the LHS variable, and a constant. The leftmost columns show an 8-lag AR regression, while the columns to the right show regressions that include the 8 LHS lags, and the contemporaneous value and 8 lags of *FEDDEF*, *CBODEF*, and *FEDEXP*, respectively. We report the coefficient and the associated small-sample P-values. The standard errors are robust to heteroscedasticity.

The last two rows of each panel show the sum of the lagged coefficients (without significance levels) and the P-Value of a F-test that the added variables are significant in the presence of the lagged real yields.

NOTES FOR TABLE C.2

Table C.2 shows results of a series of regressions for *DRCAD* (*CAD/NNP*), using quarterly data. All the regressions include lags 1, 2, 4, and 8 for the LHS variable, a constant, and lags of the RHS variables. The results are for the following models in order from left to right: (1) the complete model, (2) only the actual federal deficit, (3) only the CBO's forecast federal deficit, (4) both actual and forecast deficits, (5) all the auxiliary variables without the deficit variables. We report the coefficient and the associated small-sample P-values. The standard errors are robust to heteroscedasticity.

The last row shows the R^2 of each regression and the Durbin-Watson coefficient. There are 103 observations and 25 variables plus the constant in the full model.

NOTES FOR TABLE C.3

Table C.3, Panel A shows significance tests and estimates of the permanent impact of the deficits for a series of regressions for *DRCAD*, using quarterly data. The list of regressors is identical to those in Table C.2 for the full model.

The first row reports the P-Value of F-tests on the significance of combinations of the deficit variables in the full model. The first column reports the joint significance of *FEDDEF*, *CBODEF* and their lags, the 2nd column the significance of *FEDDEF*, and the 3rd column the significance *CBODEF*.

The remaining rows report estimates of the permanent effects and their P-Values for the three possible combinations of the deficit variables, for the specifications described in the left hand column of the table. The standard errors are robust to heteroscedasticity.

Table C.3, Panel B is structured the same way as Panel A, but it shows the sums of coefficients rather than the permanent impact, for the same regressions. Also, it does not report the F-Tests, since they are identical to those of Panel A.

NOTES FOR TABLE C.4

Table C.4 shows estimates of the permanent impact of the deficits when the coefficients of *FEDDEF* and *CBO5DEF* are allowed to be time-varying; data are quarterly (*FEDEXP* is not accorded the same latitude). The list of regressors is: a constant, *DRCAB* lags 1, 2, 4, 8, *DINNP*, *DRGDPGAP*, *DRFEDEXP*, $DRNYSE_{-1}$, with 1 lag each, $DRINV\_ALL_{-1}$, with no lags, and the deficit variables *DRFEDDEF* and *DRCBO5DEF* with 1 lag each. The coefficient for *DRFEDDEF* and *DRCBO5DEF* take the form $(b + gX_t)$, where X_t is in turn the 1-year real T-Bill yield (*RLTB1Yr*), *GDPGAP*, *UNEM*, and the ratios of the deficit measures to *NNP*), *RFEDDEF*, and *RCBO5DEF*. These variables are transformed to have mean 0 and standard deviation 1, to facilitate interpretation. We report the results of *all* the variables we tried.

We report the permanent effect and it P-value for each of the yields, only for the full specification of the model, for each of the 5 X_t variables. The "0 standard deviation" row, shows the permanent effect when $X_t = 0$. The "+1 standard deviation" and "-1 standard deviation" rows show the permanent effect of deficits when $X_t = 1$, and $X_t = -1$, respectively. The standard errors are robust to heteroscedasticity.

NOTES FOR TABLE C.5

Table C.5 shows significance tests and estimates of the permanent impact of the deficits for a series of regressions for *DRCAD*, using annual data.

The list of regressors for the full model is: $DRCAD_{-1}$, *DINNP*, *DRGDPGAP*, *DRFEDEXP* and 1 lag, $DRINV\_ALL_{-1}$, *DRM*2, $DRNYSE_{-1}$, *DRFEDDEF* and 1 lag, *DRCBO5DEF* and 1 lag, and a constant. The full model has 25 observations and 13 variables. In all other respects the table has the same information as Table C.3. The standard errors are robust to heteroscedasticity.

NOTES FOR TABLE Y.1

The three panels of Table Y.1 show bivariate regressions using quarterly data, where the LHS variables are the changes in the real yields (T-Bill 1-Year –*DRTB1Y*, the implied forward rate from year 1 to 10 –*DRLF1-10*, and the AAA rate –*DRLAAA*, in Panels A, B, and C, respectively). The leftmost columns show a 4-lag AR regression, while the columns to the right show regressions that include the 4 LHS lags, and the contemporaneous value and 4 lags of *FEDDEF*, *CBODEF*, and *FEDEXP*, respectively. We report the coefficient and the associated small-sample P-values. The standard errors are robust to heteroscedasticity.

The last two rows of each panel show the sum of the lagged coefficients (without significance levels) and the P-Value of a F-test that the deficit and expenditure variables are significant in the presence of the lagged real yields.

NOTES FOR TABLE Y.2

Table Y.2 shows significance tests and estimates of the permanent impact of the deficits for a series of regressions for the changes in real yields, *DRLYield*, using quarterly data. We report results for the same three real yields as Table Y.1. All the RHS variables are deflated by *NNP* and then 1st differenced. The list of regressors for the full model is: $DRLYield_{-1}$, *GRLNNP*, *DRGDPGAP*, *DRFEDEXP* and 2 lags, $DRINV\_ALL_{-1}$, *DRM*2 and 1 lag, $DRNYSE_{-1}$, *DRFEDDEF* and 3 lags, *DRCBO5DEF* and 3 lags, and a constant. The coefficient estimates are in the Appendix. The standard errors are robust to heteroscedasticity. There are 104 observations and 19 variables in the full model.

The first three rows report the P-Value of F-tests on the significance from regressions fro the full model (includes all the above variables). The first row reports the significance of *FEDDEF* and *CBODEF*, the 2nd row the significance of *FEDDEF*, and the 3rd row the significance of *CBODEF*, always including the lags.

The remaining rows report estimates of the permanent effects and their P-Values for the three possible combinations of the deficit variables, for the specifications described in the left hand column of the table. The standard errors are robust to heteroscedasticity.

NOTES FOR TABLE Y.3

Table Y.3 Panel A shows significance tests and estimates of the permanent impact of the deficits for a series of regressions for the changes in real yields, *DRLYield*, using quarterly data. The specification is the same as in Table Y.2, except that the equations are estimated simultaneously. We report permanent impact coefficients only for the full model. The far right column of the table reports the joint significance test.

Panel B reports the same significance tests for a model identical to that of Panel A, except that the coefficients of each of *FEDDEF*, *CBO5DEF*, and *FEDEXP* are restricted to be the same for the 3 long-term real yields (*DRLF1-10*, *DRLAAA*, *DRLTB10Y*). The corresponding coefficients for the 1-Year real yield are not constrained. We note that the permanent impact values we report are not exact, because even though the coefficients on the deficit measures are the same, the lagged *yield* coefficients are not constrained to be the same. However, since the numerical differences are in the 3rd decimal place and their P-Values are the same, we report average values. The standard errors are robust to heteroscedasticity.

NOTES FOR TABLE Y.4

Table Y.4 shows estimates of the permanent impact of the deficits when the coefficients of *FEDDEF* and *CBO5DEF* are allowed to be time-varying, using quarterly data (*FEDEXP* is not accorded the same latitude). The list of regressors is: $DRLYield_{-1}$, then *GRLNNP*, *DRGDPGAP*, $DRINV\_ALL_{-1}$, $DRNYSE_{-1}$ with no lags, *DRFEDEXP*, *DRM*2 and the deficit variables *DRFEDDEF* and *DRCBO5DEF* with 1 lag each, and a constant. The coefficient for *DRFEDDEF* and *DRCBO5DEF* take the form $(b + gX_t)$, where X_t is in turn the 1-year real T-Bill yield (*RLTB1Yr*), *GDPGAP*, *UNEM*, and the ratios of the deficit measures to *NNP*), *RFEDDEF*, and *RCBO5DEF*. These variables are transformed to have mean 0 and standard deviation 1, to facilitate interpretation. We report the results of *all* the variables we tried.

We report the permanent effect and it P-value for each of the yields, only for the full specification of the model, for each of the 5 X_t variables. The "0 standard deviation" row, shows the permanent effect when $X_t = 0$. The "+1 standard deviation" and "-1 standard deviation" rows show the permanent effect of deficits when $X_t = 1$, and $X_t = -1$, respectively. The standard errors are robust to heteroscedasticity.

NOTES FOR TABLE Y.5

Table Y.5 shows significance tests and estimates of the permanent impact of the deficits for the changes in real yields, *DRLYield*, using annual data. We report results for three real yields: 1-year T-Bill rate (*DLRTB1Y*), the implied 9-year forward rate (*DRLF1-10*), derived from the 1-year and 10-year rates, and the AAA corporate bond rate (*DLRAAA*). The RHS variables are all deflated by *NNP* and then 1st differenced. The list of regressors is: $DRLYield_{-1}$, *GRLNNP*, *DRGDPGAP*, *DRFEDEXP*, $DRINV\_ALL_{-1}$, *DRM*2, $DRNYSE_{-1}$, *DRFEDDEF*, *DRCBO5DEF*, and a constant. The standard errors are robust to heteroscedasticity. There are 26 observations and 10 variables in the full model.

In all other respects, the table is analogous to Table Y.2.

APPENDIX

TABLE A-Y.1

YIELDS ON ACTUAL AND PROJECTED DEFICITS AND FEDERAL EXPENDITURES
Three RHS Variable Lags; Quarterly Data

DRLTB1Y; *NNP*-Deflated Variables

Variable	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	0.341	[.333]	-0.014	[.908]	-0.015	[.899]	-0.020	[.867]	0.388	[.315]
DRLTB1Y(-1)	**-0.456**	**[.015]**	-0.366	[.080]	-0.334	[.070]	-0.386	[.086]	**-0.434**	**[.019]**
GRLNNP	-57.515	[.190]							-58.66	[.237]
DRGDPGAP	-0.905	[.103]							-0.749	[.185]
DRFED_EXP	-0.048	[.922]							-0.612	[.186]
DRFED_EXP(-1)	0.278	[.680]							0.298	[.572]
DRFED_EXP(-2)	-0.663	[.118]							-0.455	[.184]
DRINV_ALL(-1)	0.012	[.965]							0.067	[.808]
DRM2	**-0.750**	**[.010]**							**-0.734**	**[.021]**
DRM2(-1)	0.083	[.686]							0.201	[.377]
DRNYSE(-1)	**0.057**	**[.033]**							0.028	[.183]
DRFED_DEF	-0.168	[.477]	**-0.693**	**[.018]**			-0.677	[.054]		
DRFED_DEF(-1)	0.083	[.830]	-0.245	[.363]			-0.285	[.424]		
DRFED_DEF(-2)	0.142	[.667]	-0.045	[.854]			-0.121	[.681]		
DRFED_DEF(-3)	-0.350	[.232]	0.034	[.845]			-0.033	[.881]		
DRDEF5CBO	0.009	[.710]			-0.027	[.416]	-0.004	[.906]		
DRDEF5CBO(-1)	**0.052**	**[.042]**			0.037	[.118]	0.045	[.116]		
DRDEF5CBO(-2)	0.021	[.334]			0.001	[.990]	0.018	[.619]		
DRDEF5CBO(-3)	**-0.058**	**[.030]**			**-0.053**	**[.032]**	-0.032	[.314]		
R^2 -- D.W.	**48.4%**	**2.16**	**20.6%**	**2.27**	**16.2%**	**2.16**	**25.3%**	**2.26**	**38.4%**	**2.26**

DRLF1_10; ***NNP*-Deflated Variables**

Variable	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	0.066	[.758]	-0.002	[.978]	-0.004	[.952]	-0.008	[.911]	0.117	[.611]
DRLAAA(-1)	-0.151	[.193]	-0.127	[.339]	-0.200	[.098]	-0.160	[.243]	-0.167	[.161]
GRLNNP	-14.228	[.604]							-16.337	[.586]
DRGDPGAP	-0.379	[.239]							-0.241	[.443]
DRFED_EXP	0.413	[.275]							-0.176	[.578]
DRFED_EXP(-1)	0.123	[.740]							0.398	[.116]
DRFED_EXP(-2)	-0.284	[.391]							-0.236	[.318]
DRINV_ALL(-1)	-0.012	[.951]							0.140	[.436]
DRM2	-0.251	[.121]							-0.275	[.117]
DRM2(-1)	0.077	[.541]							0.181	[.210]
DRNYSE(-1)	**0.042**	**[.028]**							0.019	[.294]
DRFED_DEF	-0.268	[.157]	**-0.319**	**[.028]**			**-0.321**	**[.038]**		
DRFED_DEF(-1)	0.161	[.542]	0.110	[.459]			0.066	[.695]		
DRFED_DEF(-2)	-0.001	[.997]	-0.018	[.915]			-0.095	[.589]		
DRFED_DEF(-3)	-0.210	[.297]	-0.030	[.846]			-0.039	[.825]		
DRDEF5CBO	0.028	[.096]			0.008	[.618]	0.017	[.326]		
DRDEF5CBO(-1)	0.023	[.109]			0.021	[.191]	0.021	[.211]		
DRDEF5CBO(-2)	0.023	[.170]			0.009	[.618]	0.017	[.371]		
DRDEF5CBO(-3)	**-0.041**	**[.018]**			**-0.036**	**[.021]**	-0.029	[.087]		
R^2 -- D.W.	**31.4%**	**1.87**	**9.7%**	**1.99**	**10.7%**	**2.01**	**17.2%**	**2.01**	**17.0%**	**1.99**

***DRLAAA*; *NNP*-Deflated Variables**

Variable	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
C	0.110	[.462]	0.011	[.867]	0.013	[.841]	0.006	[.921]	0.157	[.403]
DRLAAA(-1)	-0.185	[.189]	-0.169	[.278]	-0.237	[.105]	-0.216	[.190]	-0.155	[.295]
GRLNNP	-18.671	[.319]							-20.79	[.376]
DRGDPGAP	-0.422	[.085]							-0.294	[.242]
DRFED_EXP	0.352	[.275]							-0.127	[.633]
DRFED_EXP(-1)	0.275	[.383]							**0.430**	**[.041]**
DRFED_EXP(-2)	-0.159	[.553]							-0.254	[.216]
DRINV_ALL(-1)	-0.059	[.728]							0.029	[.852]
DRM2	-0.171	[.195]							-0.173	[.228]
DRM2(-1)	0.009	[.932]							0.086	[.494]
DRNYSE(-1)	**0.040**	**[.010]**							0.022	[.073]
DRFED_DEF	-0.182	[.303]	-0.180	[.187]			-0.183	[.209]		
DRFED_DEF(-1)	0.089	[.717]	0.140	[.290]			0.083	[.589]		
DRFED_DEF(-2)	-0.095	[.689]	-0.055	[.688]			-0.114	[.448]		
DRFED_DEF(-3)	-0.273	[.124]	-0.109	[.385]			-0.127	[.380]		
DRDEF5CBO	0.025	[.110]			0.010	[.446]	0.016	[.336]		
DRDEF5CBO(-1)	**0.031**	**[.019]**			0.026	[.071]	0.028	[.063]		
DRDEF5CBO(-2)	0.007	[.604]			-0.007	[.684]	0.000	[.994]		
DRDEF5CBO(-3)	-0.028	[.058]			**-0.024**	**[.046]**	-0.018	[.194]		
R^2 -- D.W.	**31.5%**	**1.85**	**9.1%**	**2.01**	**12.2%**	**2.06**	**17.1%**	**2.03**	**14.5%**	**2.06**

TABLE A-Y2

SIGNIFICANCE AND PERMANENT IMPACT OF DEFICITS ON REAL YIELDS
1 RHS Variable Lags; Quarterly Data

	1-Yr	**Forward**	**AAA**	**10-Yr**
F-Test P-Values From the Full Model				
Joint Significance of *FED&CBO Deficits*	[.294]	[.147]	[.095]	[.155]
Joint Significance of *FED Deficits*	[.613]	[.380]	[.416]	[.447]
Joint Significance of *CBO Deficits*	[.224]	[.150]	[.090]	[.138]
Permanent Effects and Their P-Values				
Full Model:	**Coeff [P-Value] 1-Yr**	**Coeff [P-Value] Forward**	**Coeff [P-Value] AAA**	**Coeff [P-Value] 10-Yr**
Permanent impact of federal deficits: *FED + CBO*	-0.285 [.285]	-0.155 [.468]	-0.141 [.418]	-0.159 [.432]
Permanent impact of *FED Deficit*	-0.480 [.068]	-0.380 [.092]	-0.359 [.051]	-0.381 [.071]
Permanent impact of *CBO Deficit*	0.195 [.115]	**0.225 [.005]**	**0.218 [.005]**	**0.222 [.006]**
No Auxiliary Variables; Federal Expenditures Included:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of federal deficits *FED & CBO*	-0.594 [.086]	-0.255 [.251]	-0.230 [.207]	-0.283 [.202]
Permanent impact of *FED Deficit*	**-0.750 [.022]**	**-0.444 [.044]**	**-0.411 [.021]**	**-0.470 [.029]**
Permanent impact of *CBO Deficit*	0.156 [.234]	**0.189 [.025]**	**0.181 [.022]**	**0.188 [.030]**
No Auxiliary Variables; Federal Expenditures Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of federal deficits *FED & CBO*	**-0.605 [.004]**	-0.132 [.358]	-0.019 [.873]	-0.176 [.221]
Permanent impact of *FED Deficit*	**-0.790 [.003]**	-0.326 [.072]	-0.209 [.192]	**-0.372 [.044]**
Permanent impact of *CBO Deficit*	0.185 [.160]	**0.194 [.024]**	**0.189 [.017]**	**0.196 [.026]**
All Auxiliary Variables; Federal Deficits Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of *CBO Deficit*	0.157 [.201]	**0.187 [.014]**	**0.184 [.016]**	**0.185 [.018]**
All Auxiliary Variables; CBO Deficits Excluded:	**1-Yr**	**Forward**	**AAA**	**10-Yr**
Permanent impact of *FED Deficit*	-0.332 [.217]	-0.249 [.289]	-0.227 [.246]	-0.246 [.265]

TABLE A-C.1
PERMANENT IMPACT OF BUDGET DEFICITS ON THE CURRENT ACCOUNT: FEWER LAGS
PANEL A: 3 RHS Lags; Quarterly Data

F-Test P-Values for Joint Significance of:	***FED + CBO***	***FED Deficit***	***CBO Deficit***
	[.355]	[.279]	[.373]
Permanent Effects and Their P-Values			
Permanent Impact Of	**Coeff [P-Value]** ***FED + CBO***	**Coeff [P-Value]** ***FED Deficit***	**Coeff [P-Value]** ***CBO Deficit***
Full Model:	0.330 [.112]	0.331 [.138]	-0.001 [.984]
No Auxiliary Variables; Federal Expenditures Included:	0.221 [.087]	0.269 [.085]	-0.048 [.488]
No Auxiliary Variables; Federal Expenditures Excluded:	0.129 [.160]	0.158 [.170]	-0.029 [.663]
All Auxiliary Variables; Federal Deficits Only:	n.a.	0.340 [.108]	n.a
All Auxiliary Variables; CBO Deficits Only:	n.a.	n.a.	0.047 [.406]

PANEL B: 1 RHS Lags; Quarterly Data

F-Test P-Values for Joint Significance of:	***FED + CBO***	***FED Deficit***	***CBO Deficit***
	[.659]	[.405]	[.872]
Permanent Effects and Their P-Values			
Permanent Impact Of	**Coeff [P-Value]** ***FED + CBO***	**Coeff [P-Value]** ***FED Deficit***	**Coeff [P-Value]** ***CBO Deficit***
Full Model:	0.127 [.348]	0.131 [.342]	-0.004 [.547]
No Auxiliary Variables; Federal Expenditures Included:	0.088 [.484]	0.099 [.436]	-0.011 [.078]
No Auxiliary Variables; Federal Expenditures Excluded:	0.077 [.342]	0.091 [.285]	-0.014 [.072]
All Auxiliary Variables; Federal Deficits Only:	n.a.	0.105 [.386]	n.a
All Auxiliary Variables; CBO Deficits Only:	n.a.	n.a.	-0.003 [.615]

NOTES FOR TABLE A-Y.1

Table A-Y.1 shows results of a series of regressions for our three real yields (*DRLTB1Y*, *DRLF1-10*, *DRLAAA*), using quarterly data. All the regressions include the 1st lag of the LHS variable, a constant, and lags of the RHS variables. The results are for the following models in order from left to right: (1) the complete model, (2) only the actual federal deficit, (3) only the CBO's forecast federal deficit, (4) both actual and forecast deficits, (5) all the auxiliary variables without the deficit variables. We report the coefficient and the associated small-sample P-values. The standard errors are robust to heteroscedasticity. Table Y.2 reports significance tests and permanent impact estimates for the complete model shown on the left columns.

The last row shows the R^2 of each regression and the Durbin-Watson coefficient. There are 103 observations and 25 variables plus the constant in the full model.

NOTES FOR TABLE A-Y.2

Table A-Y.2 is identical to Table Y.2 in the text, except that the results are for a specification that allows only 1 lag for the RHS variables. The list of regressors for the full model is: $DRLYield_{-1}$, then *GRLNNP*, *DRGDPGAP*, $DRINV\_ALL_{-1}$, $DRNYSE_{-1}$, and *DRM*2 with no lags, *DRFEDEXP* and the deficit variables *DRFEDDEF* and *DRCBO5DEF* with 1 lag each, and a constant.

The last row shows the R^2 of each regression and the Durbin-Watson coefficient. There are 106 observations and 13 variables plus the constant in the full model.

NOTES FOR TABLE A-C.1

Panels A and B of Table A-C.1 are identical to Panel A of Table C.3 in the text, except that Panel A shows the results of a 3-lag specification, i.e., it eliminates lags 4 and 5 for *CBO5DEF*. Panel B shows the results of a 1-lag specification. The list of regressors is: *DRCAD* with lags 2, 4, 8, then $DRINV\_ALL_{-1}$, $DRNYSE_{-1}$, and *DRM*2 with no lags, *DINNP*, *DRGDPGAP*, *DRFEDEXP* and the deficit variables *DRFEDDEF* and *DRCBO5DEF* with 1 lag each, and a constant.

There are 105 observations and 14 variables plus the constant in the full model.