BUDGET DEFICITS, REAL YIELDS AND CURRENT ACCOUNT DEFICITS: THE EVIDENCE ON DEFICIT NEUTRALITY FOR THE U.S.*

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This research is not the result of any on-pay consulting relationship.

† Roger Kormendi and I started this paper some years ago, and the paper has undergone many iterations, as well as data and methodology updates. Roger's untimely and unexpected death in February 2009 has been a personal loss to me as well as a professional loss to all. He actively participated and was a full partner in the creation of the paper. I take full responsibility for any errors and omissions.

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ABSTRACT

We examine the impact of government budget deficits on real yields and the current account. Examining the effects of deficits only on real yields is incomplete in open economies, because "crowding out" effects are likely to appear primarily in the current account. Empirical tests are likely to be precise because of the deficit's large variation over the sample. We find no evidence that current or expected budget deficits materially influence real yields, or that deficits affect the trend growth of the current account. We do find a significant and positive transitory impact of the deficit on the current account.

KEYWORDS
Ricardian equivalence, real yields, current account, the budget deficit, inflation expectations, CBO (Congressional Budget Office) projections.

JEL: E21, E31, E32, E43, E44, F21, F32, H60, H62

To what extent do budget deficits affect the economy? There is no general consensus among academics even though the theoretical conditions under which the government budget deficit has no effect on the economy (i.e., Ricardian Equivalence) have been examined thoroughly. At the same time, the debates surrounding U.S. and European fiscal policy initiatives during the 2007-09 recession show that policymakers and practitioners act as if they believe the economy's behavior is characterized by the "conventional" or Keynesian model, where deficits boost consumption and reduce national savings.

We use U.S. data from 1976 to 2008 in a unified reduced-form framework to reexamine the effects of the deficit on both interest rates and the current account. Unlike most of the "debt neutrality" literature, we also examine the current account because in an open economy, the effect of the deficit shifts from the real yields to the current account in the conventional model.

We address and help resolve two open questions related to deficit neutrality. The first is, do government budget deficit influence real yields in the U.S? We find that the budget deficit has had neither a steady-state nor a transitory influence on real yields in our sample period; the deficit has small, sometimes negative, but statistically insignificant transitory and long-term impacts on both short- and long-term real yields. We examine both quarterly and annual data, and we include actual and forecasted deficits along with an extensive list of conditioning variables in the analysis.

The second question is whether the government budget deficit is responsible for the current account deficit, the so called “twin deficits” hypothesis? The literature suggests that the government budget deficit strongly affects the current account but it offers virtually no formal neutrality tests. Yet, even a casual perusal of the U.S. data reveals that the federal and current account deficits are not particularly congruent; there are almost as many instances when the two deficits move together as when they move in opposite directions. Notable instances of this behavior are the government surplus period of 1998-2001 when the current account deficits grew rapidly, and the 2007-09 recession, where government deficits grew rapidly but the current account deficit shrank.

We find that the U.S. government budget deficit is a stationary process and therefore it does not influence the trend growth of the U.S. current account, which is a first-order integrated process; this explains the lack of congruence between the two series and is strong evidence against the twin deficits hypothesis. However, we also find a positive transitory effect from the budget deficit to the current account. Our estimates suggest that up to 43 percent of transitory deficits are financed through the current account.

In Section I we survey the literature. In Section II, we discuss the data and the variables, and take a preliminary look at the data. In Section III, we survey important analytical issues, explain our empirical methodology and determine the order of integration of key variables. In Section IV we examine the effects of the government budget deficit on real yields, and in Section V we examine the effect of the government deficit on the current account. We offer concluding remarks in Section VI.

I. LITERATURE REVIEW

The empirical investigation of Ricardian Equivalence (REQ) has followed two main avenues. One is to test whether the budget deficit has wealth effects. Kormendi (1983), Kormendi and Meguire (1986, 1990, 1995), Feldstein and Elmendorf (1990), Modigliani and Sterling (1986, 1990), and Graham (1995), among others, examined whether the budget deficit has a wealth effect on private consumption. Kormendi and Meguire reject the conventional model in favor of REQ. They rebut the results of a series of critical papers by applying a consistent methodology of nesting the specifications. More recently, Blanchard and Perotti (2002) find some non-Ricardian effects (crowding out) on investment in a VAR model that focuses on identifying spending and tax "shocks" and their effects on GDP but they do not report tests of REQ.

A seemingly unrelated literature reports cross-sectional tests of the Life-Cycle-Permanent Income Hypothesis (LCPIH) by measuring the extent to which individual consumption increases in ways that are inconsistent with the LCPIH, when predictable lumps of income arrive, mainly in the form of tax rebates. This literature is relevant because LCPIH is a building block of REQ; REQ implies a zero marginal propensity to consume (MPC) out of such income. These studies neither report direct tests of REQ nor do they control for offsetting government polices related to the rebates or other economic conditions. Souleles (1999) reports statistically significant MPCs of around 10 percent for strictly non-durables out of predictable tax refunds and finds much higher MPCs for total consumption, which includes durables. Johnson et al. (2007) report MPCs of 20 to 40 percent for non-durables consumption from the 2001 income tax rebate, while Parker et al. (2011) find that households spent 12 to 30 percent of the spring 2008 stimulus payments on non-durables and most of the rest on durable goods; Agarwal et al. (2007) report similar results. These papers, as well as others, find that the MPCs are higher for apparently liquidity-constrained households. Sahm, Shapiro, and Slemrod (2009) use the Reuters/University of Michigan survey and report a marginal propensity to consume of about one-third from the payments households received from the 2008 stimulus package.[1]

The second avenue pursued was to trace the effects of budget deficits on asset prices, in particular on interest rates. Evans (1985, 1987a&b, 1988) and Plosser (1987a,b), among others, examine the effects of budget deficits on interest rates. Their find no budget deficit effects on interest rates, consistent with REQ. Barro (1987) finds no significant increase in interest rates to "exogenous" deficit increases in the U.K. between 1701 and 1920. However, Wachtel and Young

[1] Their "spending" includes durables and non-durables consumption.

(1987) find a positive effect of deficits on interest rates by using CBO forecasts of the deficits, and Nicoletti (1988) rejects in most cases full debt neutrality across eight OECD countries but finds that "fiscal illusion" is lowest in countries with explosive public debt. Evans (1993) finds weak evidence for non-Ricardian effects (none for the U.S.) in a panel of nineteen countries but the effect becomes strong in the pooled sample. Miller and Russek (1996) find mixed support for non-Ricardian effects, using U.S. data.

In the 1990s, and particularly with the looming large deficits of the 2000s, the importance of the budget deficit as a policy issue was revived, and the idea that high deficits produce high real yields and therefore "crowd out" private investment has resurfaced, despite the evidence from the 1980s [e.g., Rubin, Orzsag, and Sinai (2004)].[2] A variety of simple tests that reexamine the interest rate effects and include long-term deficit forecasts find some support for the "crowding out" view. Campbell and Mankiw (1989, 1990) and Graham and Himarios (1996) find non-Ricardian effects on interest rates; the former use CBOs expenditure forecasts. Laubach (2009) finds that a one percentage point increase in the deficit-to-GDP ratio increases the long-term rate by 25 bps. Gale and Orszag (2003) report a very similar result; they introduce household wealth into the analysis, and find evidence that national savings decline by 50 to 80 percent of an increase in budget deficits. Engen and Hubbard (2004) report significant but much smaller effects, a one percent increase in the deficit-to-GDP results in a 3 bps increase in the long-term real rate. Giavazzi et al. (2000) in a panel of 18 OECD countries find that non-Keynesian responses are more likely when fiscal actions are large and persistent, consistent with Evans (1993).

Chinn and Frankel (2005) use U.S. and European data to conclude that ex-post real interest rates depend on current and expected levels of debt. Dai and Philippon (2006) build a structural VAR model that includes no-arbitrage term structure restrictions and estimate that a one percentage point increase in the deficit-to-GDP ratio increases the long-term rate by 35 bps after three years. In a related paper, Corsetti and Muller (2006) in a VAR framework and a sample of four industrialized countries find evidence that household savings increase with budget deficits but not by enough to fully offset the deficit increase. Supplementary tests on the effect of deficits on long-term bond yields are inconclusive. In contrast to the finding reported above, Soyoung and Roubini (2008) analyze U.S. data with a structural VAR and find that an increase in the primary budget deficit increases private savings *more than proportionally* but that ex-post real interest rates increase at the same time. Aisen and Hauner (2008) examine a large panel of international data and find strong effects from budget

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

deficits to interest rates mostly in countries where financial openness and financial depth are low and when the deficit is mostly financed domestically. Castro and Luis (2009) find weak support for a non-Ricardian effect of deficits on interest rates for Spain.

A large literature closely related to REQ investigates the effect of the budget deficit on the current account. The goal in this literature is typically to describe the determinants of the current account rather than test the REQ, but there is often passing mention of the issue. It is fair to say that the authors focus on the "twin deficits" and implicitly assume that REQ does not hold.

Piersanti (2000) examines the relation between the current account and expected future budget deficits for 17 countries and finds evidence that expected budget deficits affect the current accounts. Chinn and Prasad (2003) assemble panel data for 18 developed and 71 developing countries and find evidence that increases in budget deficits reduce national saving, and that in developing countries increases in budget deficits increase the current account deficit. Gruber and Kamin (2005) investigate the global savings "glut" using five-year averages of data for 61 countries. They report that although the data suggest a one-to-one pass-through of budget deficits to the current account, their coefficient is not statistically significant. Chinn and Ito (2008) again using panel data report that a one percent increase in the budget deficit leads to a 0.10 to 0.49 percent increase

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decades.

in the current account deficit. Marinheiro (2008) finds a weak relation between budget and current account deficits and a causation that runs from the current account to the budget deficits for Egypt. In related research, Warnock and Warnock (2005) find that the U.S. interest rate is significantly lower than it would have been in the absence of foreign financing of U.S. debt.

Finally, in a calibrated two-country model with constrained and unconstrained consumers, habit persistence, costly investment, rational expectations, and a Taylor rule for monetary policy, Erceg, Guerrieri, and Gust (2005) find that a one percent increase in unfunded government expenditures would worsen the current account deficit by about 0.2 percent.

Overall, the early literature favors deficit neutrality for interest rates while the later literature tends to not; the international literature frequently finds effects from the budget deficit to the current account but does not report neutrality tests.

II. THE DATA

Data for the macroeconomic variables are from the CBO, the Bureau of Economic Analysis (BEA), the Federal Reserve Banks of St. Louis and Philadelphia, the Board of Governors, and DataStream. Precise variable definitions and sources are in appendix table A-1, statistical properties in table A-2.

We use mainly quarterly data but we report analogous results for annual data. Quarterly data allows use of the almost quarterly deficit forecasts issued by the CBO; higher frequency and more observations should enhance our ability to detect significant effects and possible dynamic responses to budget deficits. In contrast, using annual data provides very few degrees of freedom; it severely limits the lags that can be allowed, and may be too coarse a time frame, particularly for the dynamic response of yields.[3] Our sample is from 1976 through 2008 because the CBO's deficit forecast data start in 1976.[4]

Starting in 1981, there are fairly regular "Interim Economic and Budget Outlook" reports issued between July and September. Starting in 1986, there are also various "Analysis of the President's Budgetary Proposals," issued between February and April of each year by the CBO. 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 from the main annual CBO report issued in January or February of each year are assigned to the first quarter of that year.[5] The data from the "Analysis of the President's Budgetary Proposal" are assigned to the

[3] 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 and Hudak (1994) and 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 government expenditure surprises, which should affect yields under all theories. Flannery and Protopapadakis (2011) find no effect of deficit announcement surprises on the U.S. short-term interest rate or the DM/$ exchange rate between 1980 and 1998.

[4] The inability to use earlier post-war data is unlikely to be a serious loss, because the volatility of the current account to GDP ratio in our sample (all post-Bretton Woods II) is more than four times larger than its volatility from 1960 to 1973, a period characterized by severe capital controls.

second quarter of the year, while the data from the interim reports are assigned to the third quarter. These interim reports often provide analyses of alternative initiatives and tax proposals. In order to maintain uniformity, we always use the accompanying baseline forecasts.[6]

Particularly in recent years, there are CBO forecast updates for three of the four 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 the CBO forecasts when necessary seems a reasonable procedure.

We follow Gale and Orszag (2003) & others and construct *CBO5DEF*, which is the average of the current and the subsequent five-year forward CBO forecasts. This is done because deficit forecasts for consecutive five years are highly correlated with each other, and each forecast is highly autocorrelated (additional details are in appendix I).

For expected inflation, we use one-year-ahead inflation forecasts from the Survey of Professional Forecasters (SPF), consistently collected by the Federal Reserve Bank of Philadelphia since 1970.[7] We subtract the SPF inflation forecast from the market yields to obtain ex-ante real yields (additional details are in

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[5] There are two early forecasts that were issued in December, and they are assigned to the fourth quarter.
[6] Laubach (2009) uses both annual and semi-annual data that include the CBO forecasts.
[7] Ang, Bekaert, and Wei (2007) show that the SPF survey forecast consistently outperforms model based ones.

appendix I).

A. Constructed Variables

Measures of the Government Deficit

Theory implies that a "deficit" is a result of funds borrowed to supplement government consumption in excess of tax receipts. The standard measure of the deficit used in virtually all studies is that reported for only the federal government in the unified budget or in the National Income and Product Accounts (NIPA) data. This measure leaves out all "off-budget" borrowing, as well as state and local deficits, and it includes federal borrowing for government investment. This measure does not seem to match well with the theoretical construct.

We create and test four measures of the "deficit;" accounting-based federal and all government deficits, and debt-based federal and all government deficits. We adjust expenditures to match the deficit definitions. The two accounting-based measures (NIPA) are:

FEDDEF_AC =	- Net Federal Saving (the standard definition),
FEDEXP_AC =	Federal Expenditures (the standard definition),
GOVDEF_AC =	- Net Government Saving,
GOVEXP_AC =	All Government Expenditures.

The two debt-based measures are:[8]

FEDDEF_DT =	Change in the Federal Debt – Changes in Fed's Holdings of Federal Debt – Federal Investment,
FEDEXP_DT =	Federal Expenditures – Federal Investment,

[8] Unlike the federal budget, state & local investment is outside their current budget, so the adjustment for federal investment makes the federal and state measures directly comparable.

GOVDEF_DT = *FEDDEF_DT* + State and Local Deficit,
GOVEXP_DT = All Government Expenditures – Federal Investment.

The Implied Real Forward Yield

To investigate the long-term yield, we construct a nine-year forward real yield from the one- and ten-year government bond yields. The nine-year forward yield, unlike the term structure premium, is not mechanically dependent on the short-term yield.[9] We report results for the one-year Treasury bill yield, the nine-year forward Treasury bond yield from year-one, and the AAA bond yield. The one- and nine-year forward yields span the maturity spectrum, while the AAA yield allows the assessment of any impact of deficits on a direct measure of firms' cost of debt.

We compute the nine-year forward yield as follows: let ${}_0i_n$ be the spot yield for maturity *n*; ${}_mf_n$ are the forward yields that applies between periods *m* and *n*; *n*>*m*. By definition, $(1+{}_0i_{10})^{10} = (1+{}_0i_1)(1+{}_1f_2)(1+{}_2f_3)...(1+{}_9f_{10})$. This can be written more compactly as $(1+{}_0i_{10}) = \left[(1+{}_0i_1)(1+{}_1f_{10})^9\right]^{1/10}$, and the implied

[9] Canzoneri, Cumby, and 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 a temporary 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 follows that the simple term premium rises. This behavior will result in a *positive* relation between deficits and the term premium. Interpreting this positive relation as evidence that deficits "cause" long-term rates to rise is incorrect.

year-one nine-year forward yield is $1+{}_1f_{10} = \frac{\left(1+{}_0i_{10}\right)^{10/9}}{\left(1+{}_0i_1\right)^{1/9}}$.

Finally, it is possible that the tax rates themselves affect the relations we are examining. We use two measures of marginal tax rates: (a) the "Average Marginal Tax Rates" on interest received, maintained by the NBER, and (b) an effective marginal tax rate estimated from financial market data by comparing tax-exempt municipal yields to AAA taxable yields, as suggested in Miller (1977).[10]

B. Normalizations

To normalize a variable by the level of economic activity, we deflate by the lagged GDP to avoid introducing simultaneity and form *RVariable* ≡ *Variable*/*GDP*(-1). The normalized first difference of the variable is *DRVariable* ≡ Δ*Variable*/*GDP*(-1). To create real variables we form *RLVariable* ≡ *Variable*/*CPI*(-1). All the "real" variables are created in this way, except for real yields, where we subtract expected inflation from market yields.

C. Properties of the Real Yields, Budget and Current Account Deficits

In figure 1, panels A through D show the time pattern of two real yields,

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[10] Our estimate of this effective marginal tax rate is $Mtax = 1 - \frac{MuniYield}{AAAYield}$. The average marginal tax rate by this estimate is 22.5 percent, with a standard deviation of 6 percent. By comparison, the average marginal tax from the NBER data is 29.7 percent, with a standard deviation of 2.6 percent. The "Miller" measure is a point estimate, and it is likely subject to undue noise. For that

two normalized deficit measures, and the current account deficit. Panel A does not reveal any consistent association between the one-year real yield and *RFEDDEF_AC*; the raw correlation is -0.04. The pattern of AAA real yields in panel B seems to be more closely related to *RFEDDEF_AC* particularly until around 1994; the raw correlation is 0.35. Panel C shows the relation between *FEDDEF_AC* and the current account deficit (*CAD*). Note that we follow the possibly confusing tradition of referring to "deficits" as positive numbers. If anything they seem to be moving in opposite directions much of the time; the raw correlation of *RFEDDEF* and *RCAD* is -0.11. Panel D shows the relation between *RFEDDEF_AC* and *RFEDDEF_DT*. Their correlation is modest (0.54), and *RFEDDEF_AC* seems to be a highly smoothed version of *RDEFFED_DT*; *RFEDDEF_DT* reaches much higher values at the end of the sample.[11]

III. ANALYTICAL ISSUES AND METHODOLOGY

We discuss briefly some important analytical issues, the conditioning variables, and the order of integration of key variables.

A. Analytical Issues

The simple (textbook) version of the conventional model relies on the "Keynesian consumption function," driven by current disposable income and not derived from

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reason, in the regressions we use its four-quarter moving average. Comparisons suggest that this works slightly better than the raw measure.

[11] The first order autocorrelation of *RDEFFED_DT* is 0.44 compared to 0.92 for *RFEDDEF_AC*.

utility maximization. Any tax reduction increases consumption through disposable income. Consequently, savings do not increase by enough to offset the increased borrowing demand of the government caused by the tax reduction, and private investment is "crowded out."

The REQ hypothesis assumes utility-maximizing consumers with rational expectations. Faced with a current tax reduction without an offsetting decrease in expenditures, consumers calculate that they will have to pay higher taxes in the future, because the present values of government spending and revenues must be equal. Thus, under appropriate conditions, these consumers save all the tax reduction. This provides the funds for the increased borrowing demand of the government, national savings remain unchanged, and there is no crowding-out.

The Ricardian conclusion depends on various restrictive assumptions, discussed in Barro (1974) and elaborated by others. Critical assumptions are:

1. There must exist sufficiently strong intergenerational linkages to overcome the effect of short-horizon decisions of finite-lived individuals.
2. Taxes must be non-distortionary, so that the changes in taxes that accompany a higher or lower deficit do not change work and investment incentives.
3. Consumers must have rational expectations, so that they can anticipate the future economic consequences of tax changes.
4. There cannot be borrowing constraints on individuals. Borrowing-constrained consumers will want to consume a tax reduction, because that will bring them closer to their optimal choices.
5. The borrowing rate for government and consumers must be the same. If there is a premium on personal compared to government borrowing, a tax reduction to currently borrowing consumers is equivalent to giving them better terms on additional borrowing. Such a reduction in borrowing costs

will increase their current consumption, even if they are not borrowing-constrained.

6. Markets ought to be complete, so that idiosyncratic private risk can be fully insured. If this is not possible, the repayment of debt in the form of higher taxes falls disproportionately on those who have encountered "good" private states, while those who have encountered "bad" private states pay less or none at all. Such redistribution may not preserve neutrality.

REQ is generally taken to mean that deficits have no effect on the economy. We prefer to say that we test "deficit neutrality" (or debt neutrality) rather than the Ricardian against the conventional model, because we cannot distinguish between non-neutrality due to violations of one or more of the above assumptions and non-neutrality due to a non-optimal consumption rule. In our tests, evidence against neutrality is not evidence in favor of the Keynesian consumption function or against rationality.

In an open economy, the conventional model predicts that the current account rather than real yields most likely responds to changes in budget deficits, because the government can borrow from the rest of the world at prevailing rates. Thus, the appropriate distinguishing test is on real yields if the economy is closed but it is on the current account if the economy is open.

B. Empirical Methodology

We use a reduced-form single-equation model to study deficit neutrality for several reasons. One is that prior research uses this methodology; using the same methodology provides comparability. The alternative methodology is a structural

VAR.[12] Its main advantage is its ability to identify "shocks" in the variables of interest and to trace their effects through the system. It is well-known that this identification is conditional on the "correct" causality ordering of the variables. So, to the extent that the causality structure is misspecified, the implied coefficient restrictions can lead to biased estimates. Furthermore, we are only interested in the effect of deficits on real interest rates and the current account. Finally, we use a series of "auxiliary" variables, such as wealth and others, which would need to be modeled in a structural VAR framework.

We use the following general empirical model to test the effects of the budget deficit on both real yields and the current account:[13]

(1) LHS = *Function* (*DEF*, *EXP*, *CBO5DEF*, *CBO5EXP*, *COND*),

where LHS is a real yield or the current account deficit, *CAD*, *DEF* is the federal or government budget deficit (one of four definitions), *EXP* is the federal or government expenditures (definition consistent with *DEF*), *CBO5DEF* is the CBO's average five-year Federal Budget Deficit Forecast, *CBO5EXP* is the CBO's average five-year Federal Expenditures Forecast (all in current $s), and

[12] See Ramey (2011) for a discussion of such models.

[13] An important issue is whether the specification should be the debt-to-GDP or the deficit-to-GDP ratio. The Ricardian model is silent on this point because government debt is an inside asset and does not affect prices. The conventional model is a flow model, and it is based on the idea that new deficits need to be financed from savings or from a reduction in private investment, which suggest that the deficit is the prime variable of interest. Gale and Orzag (2004) show that a debt-to-GDP specification is not an improvement on a deficit-to-GDP specification.

COND are the conditioning variables.[14]

To isolate the economic effects of the budget deficit, it is important to control for the influence of general macroeconomic circumstances; omitting important conditioning variables may produce misleading conclusions. The variables below include most of the conditioning variables used in prior research:[15]

GrGDP	The growth rate of real GDP.
GDPGap	The *GDP* gap is an indicator of the state of the business cycle; it is the percent difference between current GDP and potential GDP.
UNEM	The unemployment rate is a third measure of current economic activity. *GrGDP*, *GDPGap*, and *UNEM* together are intended to control for the state of economic activity.
OilPr	The price of crude oil, intended to capture possible effects of the price of oil, mainly on the current account deficit.
M2	A broad measure of the money supply, intended to capture the effect of monetary policy on real yields and on the current account deficit.
INVPriv	Gross private investment, intended to capture changes in investment demand that can affect the current account deficit and the yields, independent of fiscal policy.
GulfDum	A dummy for the Gulf War repayments in 1991:1 and 2; used only for the current account regressions.
Cons	Personal consumption expenditures; used only in the search for cointegrating vectors for the current account deficit.

We also use three related measures of wealth because wealth is likely to affect savings and/or investment behavior, and therefore real yields and the current account deficit:

[14] Ideally we would like to have forecasts of state and local (S&L) deficits and expenditures but such data are not available. For deficits such data are unlikely to matter because S&L deficits are small, although the same is not true for the associated S&L expenditures.

NYSE	The Composite NYSE Index.
HsWealth	The market value of household wealth.
HousePr	The average price of housing over the nine regions reported, by the OFHEO.

C. Order of Integration

To implement equation (1) correctly, it is important to determine the order of integration of the key variables. We report Augmented Dickey-Fuller (ADF), Weighted Symmetric (WS), and KPSS unit root tests for the variables of interest. The null hypothesis for the ADF and WS tests is that the series has a unit root – I(1) – while the null for the KPSS test is that the series is stationary – I(0). Agreement between the ADF and WS tests [I(1) null] and the KPSS test [I(0) null)] would increase confidence in conclusions about the order of integration of a series.[16] When possible, we use not-seasonally adjusted data for the tests, because the government's seasonal adjustment procedures may falsely induce I(1) properties.[17]

Table 1, panel A shows that I(1) is rejected for the real yields, either by the ADF or the WS test, at the 5 percent level of significance (the one-year at the

[15] The conditioning variables generally are not highly correlated with each other, as is seen in appendix table A-2, panel B, so that multicollinearity ought not to be a serious difficulty.
[16] The KPSS test is described in Kwiatkowski, Phillips, Schmidt, and Shin (1992). We do not report the Phillips-Peron test because it has been shown to have poor small sample properties.
[17] Davidson and MacKinnon (1993) and Greene (2003) discuss these and related cointegration issues extensively.

10 percent level); the rejections are more emphatic for the after-tax real yields.[18] At the same time, the KPSS test does not reject the hypothesis (one rejection at the 10 percent level) that real yields are I(0) even at the 10 percent level, which corroborates the I(1) tests.

Panel B in table 1 shows the same tests for the alternative definitions of the government deficit. I(1) is decidedly rejected by the WS test for $ deficits; rejections are slightly stronger when there is no trend. The rejection of I(1) is equally strong for real deficits, with or without a time trend. Rejections are sparser for the seasonally-adjusted series (not reported), which underscores the importance of using not-seasonally adjusted data for such tests. Further, the KPSS test does not reject the hypothesis that the deficits are I(0) at the 5 percent or 10 percent level (with one exception), which is consistent with the I(1) tests.

Panel C in table 1 shows that I(1) is not rejected for either the $ or the real current account. In this instance, the KPSS test rejects the hypothesis that the current account deficit is I(0) at least at the 2.5 percent level, again consistent with the I(1) tests.[19,20] We conclude that in the forthcoming tests, we need to treat the real yields and the government deficit as stationary variables, and the *CAD*

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[18] We show results that include a time trend. The absence of trend results in weaker rejections for the before-tax yields but equally strong rejections for the after-tax real yields. Also OLS autoregressions show that the AR1 coefficients are much lower than unity. The same tests performed on the corresponding nominal yields generally fail to reject I(1) for any of them, at the 5 percent level.

[19] None of the conditioning variables, except for *GrGDP* and *UNEM*, reject I(1), whether real or $ values, with or without trend, seasonally adjusted or not.

and the remaining conditioning variables, as integrated processes.

Comment [A1]: The Unit root tests for the conditioning variables are in: CAD_QT_C_Cond Var_Unit Tests_03-17-11.tsp

IV. THE BUDGET DEFICIT AND REAL YIELDS[21]

The conventional model predicts that an *increase* in the deficit will *increase* real yields, while debt neutrality predicts no significant impact.

In a model of real yields quantity variables will be scale-independent, because along a balanced growth path, a constant real yield is consistent with proportional growth in *GDP*, federal expenditures, debt, and deficits. We scale such variables by the size of the economy, i.e., *GDP*; recall that the prefix "*R*" (*RL* stands for real) denotes that the variable has been deflated by *GDP*(-1); this also renders these RHS variables stationary. The empirical model then is,

$$\begin{aligned} RLYIELD_t &= \beta_0 + \varepsilon_t + \rho_1 RLYIELD(-1) + \sum_{k=0}^{K} \beta_{COND,k} RCOND_{t-k} \\ &+ \sum_{j=0}^{J} \left\{ \beta_{DEF,j} RDEF_{t-j} + \beta_{CDEF,j} RCBO5DEF_{t-j} + \beta_{EXP,j} REXP_{t-j} + \beta_{CEXP,j} RCBO5DEXP_{t-j} \right\}. \end{aligned} \tag{2}$$

Since both the real yields and the RHS variables are stationary, the steady-state impact is the adjusted sum of the coefficients of the deficits and their lags. The steady-state impact measures the effect on the real yield of a permanent

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[20] It is not surprising that the CA is I(1); it is likely to be cointegrated with GDP or consumption.
[21] Any results discussed but not shown are available from the corresponding author.

increase in the deficit-to-GDP ratio, and it is $\sum_{j=0}^{J}\left(\beta_{DEF,j}+\beta_{CDEF,j}\right)\Big/\left(1-\rho_1\right)$[22].

Comment [A2]: This is NOT the maximum impact as I had thought; it is the SS impact in general. The reason is that even a totally unexpected deficit will have the same SS impact, because once it is known, it will also be incorporated in *CBO5DEF*. The dynamic timing if the response will be different but that is because the "shock" will be 0 at t+n, whereas in the expected case the shock will be +1 starting at t+n.

The transitory effects of deficits can be measured by an *F*-test that compares the R^2 of the complete model to the R^2 of the same model from which the deficits and their lags have been removed.

A. Preliminary Results for Deficits and Expenditures Only

First, we present results from regressions (equation 2) that include *only* deficits and expenditure measures. Panel A of table 2 shows that the steady-state impact of deficits is *uniformly negative* for all four definitions of the deficits, and for before- and after-tax real yields.[23] The steady-state impacts are significant only for one definition of deficits and expenditures, *FEDDEF_AC* and *FEDEXP_AC*; the results are strongest for before-tax yields.

This negative effect is in sharp contrast with the results reported in the literature. Neither the conventional nor the Ricardian model predicts such an outcome, so these results must be attributed to missing variables.[24] In contrast,

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[22] This relation is computed 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 *CBO5DEF* at time *t* by 1 unit. Because *CBO5DEF* is a sum of the deficit forecasts, it will be higher in each of the following five periods, as the deficit comes closer to realization. Furthermore, the lags of *CBO5DEF* will also show the same increases. When the deficit is realized, *DEF* will change by 1 unit, as will its lags over time.

[23] This is not the result of an inadvertent sign switch in the data. The number of observations in the tables vary between 128 and 130 (starting dates from 1976:3 to 1977:1), depending on the number of lags of *CBO5DEF*. We use the 128-observations versions when we make comparisons across specifications of different lags.

[24] It is theoretically possible that changes in government revenues are associated with changes in effective marginal tax rates, which in turn may affect real yields; in particular, a decline in the

table 2, panel B shows that the steady-state impacts of expenditures on real yields have the "correct" sign, in that increases in government expenditures increase real yields. Here as well there is very little difference between the before- and after-tax results.

Before proceeding it is important to explore the sensitivity of the results to reasonable changes in specification and to the use of quarterly data. Briefly, the results are unchanged in quality or significance when we: (a) increase the number of lags for deficits and expenditures from two to three and to four, (b) exclude the CBO forecasts of deficits and expenditures, (c) use annual data with no RHS lags (due to data constraints –only 33 observations), and (d) estimate the regressions in first differences. Reducing the sample to only until 2001 or even 1998 also produces very similar results.

Based on these results we pare down the number of deficit and real interest rate definitions we will examine. The government deficit doesn't seem to yield additional useful information; this is not too surprising, since S&L deficits are very small. The substantive difference between them is the accompanying expenditure definitions, *GOVEXP* and *FEDEXP*. The table shows that *GOV*

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effective marginal tax rate is likely to reduce the before-tax real rate. However, it is hard to see how this effect, even unmitigated by other accompanying equilibrium changes in the economy, would be powerful enough to produce these results.

definitions do worse than *FED* ones.[25] The results for after-tax real yields also don't provide any additional information. Therefore, in the rest of the paper we will use only two definitions of deficits, *FEDDEF_AC* and *FEDDEF_DT*, and before-tax real yields.

B. Preliminary Examination of the Conditioning Variables

We examine the effect of only the conditioning variables on real yields (details are in appendix table A-3). In these and in subsequent regressions, we omit the current values of *INVPriv*, *NYSE*, *HsWealth*, *HousePr*, and *CAD* because of the possibility of simultaneity; entering the current values does not seem to affect conclusions. The results show that *GDPGap*, *UNEM*, *INVPriv*, and all three wealth measures (*NYSE* index, *HsWealth*, and *HousePr*) have significant steady-state impacts, in at least one of the three real yields. In contrast, *GrGDP*, *RLOilPr*, *RM*2, and the *RCAD* are never significant.[26] Oil prices are never significant except when all the wealth variables or *RINVPriv* are excluded, and then mainly for the AAA yield. None of the coefficients of the *RCAD* are significant in any of the regressions. We retain only 19 conditioning variables

[25] The results from pairing NIPA *federal* expenditures (*FEDEXP_AC*) with *government* deficits (*GOVDEF_AC*) are indistinguishable from those where *FEDEXP_AC* and *FEDDEF_AC* are paired (as in the table).

[26] We substituted the growth rate of *M*2 for *RM*2 in the final regressions but the results were unchanged. We also inserted lagged values of actual inflation on the RHS, though the coefficients were sometimes marginally significant there was no impact on the main results.

(including lags) of the original 25, to conserve degrees of freedom.[27]

Comment [A3]: The 8 "experiments" are in *RYield_QT_AUX_Experiments_07-12-09.xls*.

C. Results from the Complete Empirical Model

We combine the 19 conditioning variables with the measures of federal deficits and expenditures, and estimate again the steady-state impact of deficits on the real yields (equation 2). We estimate this full model with two, three, and four lags for the deficit and expenditures measures. Compared to the four-lag specification the three-lag one is not rejected but the two-lag one is strongly rejected (see appendix table A-4). Panel A of table 3 shows the estimates of the steady-state impact for the three-lag specification for all three real yields and for both definitions of deficits. Unlike the regressions with the deficits and expenditures alone, the steady-state impacts are always positive but not statistically significant, with one exception at the 10 percent level.[28]

Comment [A4]: RYield_QT_DEF_All Model_Experiments_3L_AUGM-Final_04-05-10.xls

We also find no evidence of a transitory effect of deficits on real yields. In table 3, panel B shows that none of the deficit measures have statistically significant explanatory power in the full model for either version of the deficit measures, compared to a regression that includes all other variables, including

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[27] The procedure we use to eliminate conditioning variable is: (a) the model is identical for all the yields, and (b) we remove a variable only if the removal is not rejected by the data at the 10 percent level (X^2 tests) for all three yields. From the list in the table we eliminate the growth rate of *GDP* and its lags (*GDPGAP* and *UNEM* remain as indicators of the level of economic activity), the second lag of *UNEM*, and the first and second lags of *RLOilPr*.

[28] The main reason for the decline in significance seems to be the changes in coefficients' magnitude rather than increases in their standard errors. For example the average standard errors of the steady state impacts in the deficits-and-expenditures-only specification (13 variables) for *DEF_AC* are only 3% lower than for the full model (37 variables).

federal expenditures. Appendix table A-5 of the shows the coefficient estimates and their *p*-values for the complete model. Almost 40% of the deficit coefficients are negative. Only *FEDDEF_DT*(-1) is significant at least at the 10 percent level, and it is so across all three yields.

Deficits have not had a significant steady-state or transitory impact on real yields over our sample period. In contrast, several conditioning variables have statistically significant and plausible steady-state impacts at the 5 percent level for one or more yields; *HousePr* is the most consistently significant across all three yields, followed by *HsWealth* and *INVPriv*.

D. Sensitivity Analysis

We conduct a series of statistical experiments to gauge robustness.

Annual Data: We estimate the same model with annual data with the same set of variables but without a lag structure because of degrees-of-freedom considerations.[29] The steady state impact estimates are positive but far from statistical significance.

First Differences Specification: We estimate the quarterly model in first differences, using the same variable list as in table 3. The data support the one-lag version of the model. For the one-lag version, the results are somewhat different for *FEDDEF_AC*, compared to the results in table 3. For the one-year T-bill and

10-year forward yield, the overall impact is negative but not statistically significant. However, the partial impact of actual deficits is significant and negative while the partial impact of *CBO5DEF* is significant and positive.[30] The results for *FEDDEF_DT* are very similar to the corresponding "levels" results.

Comment [A5]: The data for these statements are in: *DRYields_DEF-ALL_1&2Lg_07-20-09.xls*

The Role of the Conditioning Variables: For *FEDDEF_AC*, when *UNEM*, *GDPGap*, *M*2, *OilPr*, *InvPriv*(-1), *NYSE*(-1), *HousePr*(-1), *HsWealth*(-1), or *CAD*(-1) with their lags are removed from the full model, one-variable-at-a-time, the steady-state impact of the deficits remains insignificant but more than half of the impact coefficient estimates become negative. For the one-year real yield only, the steady-state impact of deficits becomes significant and negative at the 10 percent level when *INVPriv* is removed from the regression. A less pronounced pattern of negative but not significant coefficients emerges for *FEDDEF_DT*.

Omitting groups of variables together produces very similar results. Negative and statistically significant steady-state impact coefficients for *FEDDEF_AC* are obtained, (a) for all three real yields by removing together

[29] There are only 33 observations. The RHS variables are: *RLYield*(-1), *GDPGap*, *UNEM*, *RINVPriv*(-1), *RM*2, *RLOilPr*, *RNYSE*(-1), *RHSWealth*(-1), *RHousePr*(-1), *RCAD*(-1), *RFEDEXP*, *RCBO5EXP*, *RFEDDEF*, and *RCBO5DEF*.

[30] In contrast to the one-lag case, when second lags are allowed, the overall steady-state impact is *negative* and statistically significant for the all three yields at the 10 percent level. In comparison to the one-lag case, the partial positive impact of the CBO forecasts is weaker, and the partial negative impact of the actual deficits is stronger in each case. Furthermore, if only the actual deficits are allowed in the regression, the steady-state impact is significant and *negative* for all the yields.

NYSE(-1), *HousePri*(-1), *HsWealth*(-1), and *CAD*(-1), and (b) only for the one-year yield by removing together *INVPriv*(-1), *NYSE*(-1), and *HousePr*(-1) and their lags. No significant coefficients are found for *FEDDEF_DT*.

Our findings are not very sensitive to specific conditioning variable configurations. Further, there is no single variable that reliably renders deficits insignificant and no variable that make the impact estimates significantly positive.

Sample Size: We investigate the effect of reducing the sample size either by starting later or ending earlier.[31] As dates from the beginning of the full sample are eliminated, the steady-state impact coefficients become negative but still insignificant. As dates from the end of the sample are eliminated, the coefficients become negative and remain insignificant. The shortest samples are a little different. For 1986:4 – 2008:4 almost all the coefficients for the longer maturities are negative and most of them are significant at the 5 percent level; for 1976:4–1998:4 the coefficients are negative and statistically significant at least at the 10 percent level for all three yields, for *FEDDEF_AC*. We find no evidence that higher deficits are associated with higher real yields in any of these smaller subsamples.

Comment [A6]: The data for this are in: RYield_QT_DEF_All Model_Experiments_3L_AUGM-Final_04-05-10.xls

Surprises Only: Plosser (1987b) shows that in a rational expectations setting, interest rates innovations depend on the innovations of the relevant explanatory variables, such as government deficits, expenditures, *GDP* growth etc.[32] Though this approach has not been used in the literature recently, we implement it to see if it might modify our conclusions.

We use the same model (equation 2) with the following modifications. The interest rate innovations are computed by subtracting the three-month T-bill yield from the holding period returns of the one-year, ten-year, and AAA bonds.[33] These variables replace their counterpart *RLYIELD* variables. We also estimate a two-lag VAR system of all the explanatory variables and compute the in-sample innovations.[34] These innovations replace the corresponding variables in equation (2). We allow one lag of the dependent variable and no lags for the explanatory variables in the regressions.

The steady-state impacts of the deficit innovations are never significant. The overall impact is positive; that of the actual deficits is generally negative and that of the CBO forecasts is generally positive and often smaller. We also estimate the same model using the changes in the real yields as the yield

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[31] We investigate the following samples: 1978:4–2008:4, 1980:4–2008:4, 1986:4–2008:4, 1976:4–2006:4, 1976:04–2004:4, and 1976:4–1998:4, with 121, 113, and 89 observations, respectively.

[32] Also see Evans (1986, 1987a).

[33] To compute the holding period returns, we assume that the AAA bond has 20 years to maturity, and that each bond is issued at par at time *t*. We compute its price at the end of the quarter based on the then-prevailing yield. The holding period return then is the sum of the capital gains plus the accrued coupon payments.

[34] There are 30 variables in each regression. Plosser (1987b) shows that this two-step approach is asymptotically equivalent to the more cumbersome simultaneous estimation of the interest rate model and the innovations of the RHS variables. Even though the two-step approach is only

innovations and the results are very similar.

Our findings are strong and robust to numerous variations of the model.[35] We find no instances of positive and significant steady-state impact of deficits on real yields. Depending on the conditioning variables, the data frequency (quarterly or annual), and on whether we first-difference the data, we find statistically significant but *negative* steady-state impact estimates or statistically insignificant steady-state impact estimates of either sign.

The behavior of real yields provides no support for the conventional model according to which higher deficits cause higher real yields. Possibly deficit neutrality is the better description of the U.S. economy. Alternatively, deficit changes may be financed by the rest of the world through the current account with no meaningful impact on yields, consistent with the open economy version of the conventional model.

V. BUDGET AND CURRENT ACCOUNT DEFICITS

We already established that a steady-state impact of the budget deficit on the current account is rejected by the data. The federal deficit cannot be influencing current account's trend growth because the deficit is an I(0) process while the current account is I(1). However, it is still possible that budget deficits

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asymptotically equivalent to simultaneous estimation, it is more robust to the possible non-normality of any one variable than the simultaneous equation FIML approach.

have transitory effects on the current account. Such transitory effects must be estimated in first-differences in an error-correction framework. Thus, the first step is to find appropriate cointegrating vectors for the current account.

A. The Search for Cointegrating Vectors

We test for cointegration between the *CAD* and the I(1) variables that could plausibly be cointegrated with it.[36] We estimate each candidate cointegrating vector for four specifications: real and $ values with and without a time trend.[37] For three of the four specifications, we find only one vector with a *p*-value of 5 percent or less, and a couple between 5 percent and 10 percent. For the "$ values with trend" specification, there is no vector with a *p*-value of 5 percent or less, so we use the best fitting vector. The table below shows the cointegrating vectors and the associated *p*-value that the residuals are I(1).[38]

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[35] Though our results are not consistent with much of the literature, they are consistent with more recent results, as in Aisen and Huaner (2008), among others.
[36] We use seasonally-adjusted data in this instance to gain degrees of freedom; as of the winter of 2010, the BEA's not-seasonally-adjusted data had been updated only to 2007 and in some cases only to 2006. However, some estimation with the shorter NSA sample suggests that our conclusions are unlikely to be affected.
[37] We estimated two-element cointegrating vectors for *CAD* with *FEDEXP*, *GDP*, *Cons*, *INVPriv*, *HsWealth*, *HousePr*, *NYSE*, *Consumption*, *M*2, and *OilPr*, many promising three-variable and some more-than-three-variable combinations, for a total of 30 candidate vectors for each of the four categories. We also included the deficit measures in the cointegrating vectors but cointegration with those was uniformly rejected, consistent with the unit-root tests we report in table 1.
[38] The table shows the elements of the cointegrating vector used for each category, and the *p*-value of the hypothesis that the residuals are I(1), i.e., that it is not a cointegrating vector. All estimations include seasonal dummies.

Variables	Real Value Trend	Real Value No Trend	$ Value Trend	$ Value No Trend
LHS	*HsWealth*	*HsWealth*	*HsWealth*	*HsWealth*
RHS	*CAD*	*CAD*	*CAD*	*CAD*
RHS	*Cons*	*Cons*	*GDP*	*GDP*
***p*-value**	0.027**	0.011**	0.067*	0.025**

B. The Empirical Specification of the Complete Model

To test for transitory effects of the budget deficit on the *CAD*, we estimate the following two versions of a linear error-correction model, where we exclude the current value of *FEDDEF* from the RHS of the model to avoid simultaneity difficulties. *EC* is the error-correction term — the residual of the applicable cointegrating vector discussed above — *COND* represents the conditioning variables, and the prefix "*DR*" denotes first-differences of the nominal variables deflated by lagged *GDP*.[39,40] The "real" specification (deflated by *CPI*(-1)) is identical, except that the prefix "*DRL*" replaces "*DR*" and *RLREC* replaces *REC*.

(3)
$$DRCAD_t = \varepsilon_t + \beta_0 + \sum_{i=1}^{I} \rho_i DRCAD_{t-i} + \sum_{m=1}^{M} \beta_{EC,m} REC_{t-m} + \sum_{k=0}^{K} \beta_{COND,k} DRCOND_{t-k} + \sum_{j=0}^{J} \left\{ \begin{array}{l} \beta_{DEF,j} DRFEDDEF_{t-j-1} + \beta_{CDEF,j} DRCBO5DEF_{t-j} \\ + \beta_{EXP,j} DRFEDEXP_{t-j} + \beta_{CEXP,j} DRCBO5DEXP_{t-j} \end{array} \right\}.$$

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[39] We use the residuals from the vectors without a time trend as those cointegrating vectors reject I(1) slightly more strongly. The residuals from the vectors with and without a time trend are highly correlated; 0.94 and 0.91 for the $ and real variables respectively.

[40] An alternative specification would be to use the growth rates of *RCAD* and consistently defined versions of the RHS variables. However, in several instances the current account and the budget deficit measures fluctuate between positive and negative values, making growth rates unsuitable.

We report two tests of transitory effects of the budget deficit on the *CAD*. One is an *F*-test of excluding only the deficit variables from each of the above regressions; it computes the joint significance of the deficit coefficients. The second test computes the statistical significance of the sum of the deficit coefficients, $\sum_{j=0}^{J}\left(\beta_{DEF,j} + \beta_{CDEF,j}\right)$; it measures the cumulative effect of a deficit on the *CAD* and allows the detection of possibly small individual effects that cumulate over time.[41]

C. Preliminary Results for Deficits and Expenditures

We present first results from regressions that include *only* deficits, expenditures, and the error-correction terms. As a starting point we allow four own lags (of *CAD*) and four lags of *FEDDEF*, *FEDEXP*, *CBO5DEF*, *CBO5EXP*, and *EC*.[42] Panels A and B of table 4 show quarterly data results for the two versions of the normalized variables (*DR* and *DRL*) and for the accounting- and debt-based definitions of deficits and expenditures. The results, shown in the top three rows, support the three-lag model (no rejections against the four-lag model); the two-lag model is rejected in one instance at the 10 percent level and the remaining *p*-values hover close to the 10 percent level.[43]

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[41] In this case there is no AR coefficient adjustment because there is no "long run" effect.

[42] We start with more lags than for the real yields because it is commonly held that quantities adjust slower than asset prices.

[43] The three-lag model includes three lags of the *CAD*, three lags of *EC*, three lags of *FEDDEF*, and the current values and three lags of *FEDEXP*, *CBO5EXP*, and *CBO5DEF*, and a constant, for

The remaining rows in table 4 show the effects of eliminating (a) simultaneously both deficit measures from the models, (b) only *FEDDEF* and (c) only *CBO5DEF*. For *FEDDEF_AC*, there is no significant evidence of a transitory impact of deficits on the *CAD*; however, for the *DRL* specification of the *FEDDEF_DT* definition, the hypothesis that deficits have no transitory impact on the *CAD* is rejected strongly. Removing both deficits variables (and their lags) and either the *CBO5DEF* or *FEDDEF* alone are rejected by both the four- and three-lag models.

Comment [A7]: The data are in: CAB_QT_DEF_Experiments_05-23-10.xls

Panel B of table 4 shows the coefficient sums for the three-lag model; the first set of two rows show the sum of the combined coefficients of *FEDDEF* and *CBO5DEF*, while the subsequent set of two rows show the sum of the *FEDDEF* and *CBO5DEF* coefficients separately but from the same model. There is evidence that the sums may be statistically significant for the *DRLCAD* specification of the *FEDDEF_AC* definition. But for the *FEDDEF_DT* definition, only the sum of the *CBO5DEF* coefficients is significant and positive for both specifications.

D. Preliminary Examination of the Conditioning Variables

We examine the effects of just the conditioning variables on the *CAD* including the error-correction term. We start by estimating a model where each conditioning

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a total of 22 parameters. We also test the model with eight lags of *FEDDEF* and *CBO5DEF* but the additional lags are not significant. Including the current value of *FEDDEF* increases the

Comment [A8]: The data for this stuff is in: CAB_QT_AUX_Experiments_05-21-10_Exp.xls

variable is allowed four lags, for a total of 47 RHS variables and the constant. We eliminate several insignificant variables, so that we are left with 14 conditioning variables for the full model; the details of the procedure we use are in appendix II. Overall, there is a strong tendency for the values of the lagged coefficients to alternate signs, so the sums are smaller in magnitude than many of the individual coefficients; the R^2 values are respectable.

E. Results from the Complete Empirical Model

In table 5, panel A contains the results from the complete model for quarterly data; "lags" here refer to the lags of *CAD*, *FEDDEF*, *FEDEXP*, *CBO5DEF*, *CBO5EXP*, and *EC*. The first three rows of panel A show that the three-lag version of the model is not rejected compared to the four-lag version, while the two-lag version is rejected. The subsequent rows of panel A show that the proposition that the budget deficit has no transitory impact on the *CAD* is rejected only for the *DRLCAD* specification of the *FEDDEF_AC* definition, at just above the 5 percent confidence level. The deficit itself, rather than its CBO forecasts seem to be the important explanatory variable. However, in panel B the sum of the coefficients is significant at slightly higher than the 1 percent level for both specifications of the *FEDDEF_AC* definition. Once again, the actual deficits

regression R^2s but does not alter the results.

rather than their CBO forecasts drive the results.[44] The estimates suggest that a deficit will increase the *CAD* by 41 - 43 percent of its value within three quarters of its occurrence.

Neither specification for the *FEDDEF_DT* shows a significant impact of the deficit on the *CAD*. For the *DRLCAD* specification, the sum of the *CBO5DEF* coefficients is significant but its measured effect is very small (0.4 percent of the deficit).

F. Sensitivity Analysis

We conduct a series of statistical experiments to gauge robustness.

Annual Data: The results are much stronger than in the quarterly data, which is not surprising since the annual frequency means that the coefficient represents similar time span to the three-quarter sum we compute in the quarterly model (details in appendix table A-7). The zero-lag version of the model is weakly rejected compared to both the one- and two-lag versions. The hypothesis that the budget deficits have no transitory impact is rejected for both models and for both definitions of deficits (panel A). Once again, removing *FEDDEF* is rejected firmly while *CBO5DEF* does not seem to be important. Panel B shows that the coefficient sums are almost uniformly statistically significant at no less

Comment [A9]: Data for this are in: CAB_ANN_DEF&AUX_Experiments_01-15-10.xls

[44] Appendix table A-6 shows the coefficients and their *p*-values for the complete three-lag model. The *FEDDEF* coefficients are generally not significant, save for the second lag for *DRCAD* (*p*-value 7.9%) and lag 1 for *DRLCAD* (*p*-value 0.6%). Several auxiliary variable coefficients are significant for both specifications, and the R^2s are over 50 percent. For variables with more than

than a 6 percent level of significance, and generally much lower (panel B). However, the values of the sums are smaller than those obtained from the quarterly data.

The Role of the Conditioning Variables: We compute *F*-tests of the transitory importance of the deficit on the *CAD* while removing each conditioning variable and its lags from the full model, one at a time. The results, with small variations in significance levels are as reported for the full model, for both definitions of the deficits. The only variable whose omission renders the effect of *FEDDEF_AC* insignificant is *UNEM*; *FEDDEF_AC* and *UNEM* have strong and opposite correlations with *CAD* (-0.57 and +0.72 respectively) while *FEDDEF_AC* and *UNEM* are negatively correlated (-0.15). Thus, the absence of *UNEM* masks the effect of *FEDDEF_AC* on the *CAD*.[45]

Comment [A10]: The results are in CAB_QT_DEF&AUX_SMP EXP_05-15-10.xls.

Sample Size: We estimate the quarterly model for the same set of sample sizes we use for the yields, with observations deleted from the beginning and end of the sample. The results are fairly stable and very similar to those in table 5. Transitory impact is not significant only for the 76:4 – 98:4 sample. The results for the *FEDDEF_DT* definition are much weaker than for the *FEDDEF_AC* definition; nonetheless there is a significant transitory effect of *FEDDEF_DT* in

Comment [A11]: Data for this is in: CAB_QT_DEF&AUX_SMP EXP_05-26-10.xls

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one lag, the coefficients alternate signs. The big exceptions to this pattern are the *FEDDEF* coefficients.

[45] Removing all three "wealth variables" *HsWealth*, *NYSE*, and *HousePr* simultaneously reduces somewhat the statistical significance of *FEDDEF_AC*s.

some of the samples (78:04-08:4, 80:04-08:4, and 86:04-08:4, mostly for the *DRLFEDDEF_DT* specification).

The sensitivity analysis shows that the results of the full model are robust to sample size changes, to the omission of conditioning variables, and to the frequency of the data. The government deficit measured by *FEDDEF_AC* has a statistically important transitory effect on the current account deficit. We find that 41- 43 percent of a deficit is borrowed from abroad in the subsequent three quarters, while the annual data results suggest somewhat lower proportion of borrowing, 24 – 38 percent of a deficit. This suggests that deficit neutrality does not characterize the U.S. economy; real yields do not respond to the budget deficit not because of neutrality but because the U.S. is an open economy, though large. These results are consistent with the finding of research on the Permanent Income hypothesis, that households use a substantial proportion of windfall income for durables and non-durables consumption.

VI. CONCLUDING REMARKS

Our sample period includes unusually large changes in the U.S. budget deficit and thus provides a rich "natural experiment" which allows for relatively accurate estimates.

Using both quarterly and annual data in a one-equation reduced-form setting, we find no evidence that the federal budget deficit has either a long-run or a transitory effect on real yields in the U.S. over our sample period; we cannot reject debt neutrality as it applies to real interest rates. We also find that the budget deficit is not responsible for the trend growth of the current account deficit, because the budget deficit is a stationary process, while the current account is non-stationary. Thus our results also reject the “twin deficits” proposition for the U.S.

However, we also find that the budget deficit has a transitory but significant positive impact on the current account. We estimate that the U.S. borrows up to 43 percent of its transitory budget deficits from abroad. These results help resolve the apparent contradiction between the observation that the budget deficit and the current account do not appear to move together very frequently and the findings in the empirical literature that the federal deficit tends to be a significant explanatory variable for the current account.

There is no a-priori reason to assume that the government deficit process is similar across countries, so our findings suggest that any cross-country test must consider the possibility that the government deficit and the current account do not have the same order of integration, and make appropriate adjustments. It also exposes a difficulty for current account models estimated in first-differences. Though the exclusion of an error-correction term may not have a substantial impact on the deficits’ coefficient estimates, the subsequent step of assigning a commensurate role to the federal deficit in the steady-state evolution of the current account and the other I(1) variables in the model is clearly inappropriate, at least for the U.S.

It is important to stress that the stationary nature of the budget deficit is a result of the complex political process that guides government revenues and expenditures in the U.S., so that this conclusion applies only to the U.S. data we examine. Furthermore, our conclusions cannot be extrapolated to conclude that if the U.S. deficit were to become an integrated process, the economy would continue to borrow from abroad to finance such deficits at the same or similar rate. This is because our estimates are reduced-form, and they dependent on the underlying structure remaining the same over the sample period. Indeed we discuss evidence that non-neutrality is not observed, differentially, in countries with high government deficit- or debt-to-GDP ratios.

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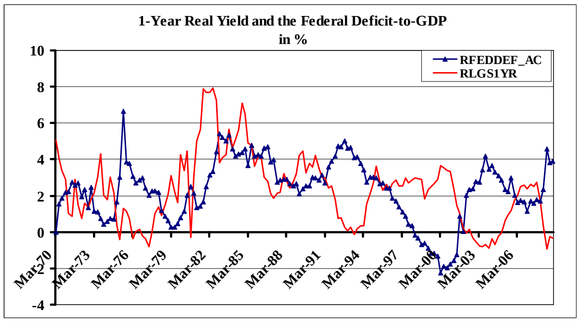
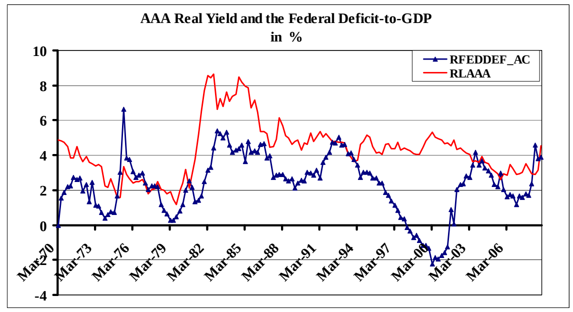
FIGURE 1

Real Yields, Deficits-to-GDP, and the Current Account-to-GDP

Panel A



Panel B



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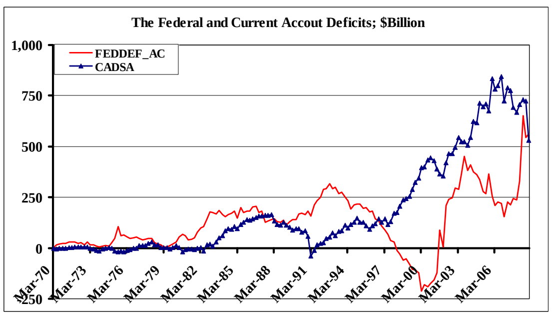

Panel D

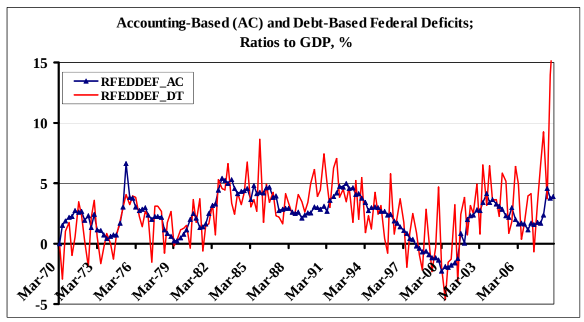

TABLE 1: UNIT ROOT TESTS[a]

PANEL A: Real Yields[b]

With time trend

	1-Year T-Bill	9-Year Forward Before-Tax	AAA
WS	0.072*	0.522	0.688
ADF	0.154	0.017**	0.023**
KPSS	> 0.10	> 0.10	> 0.10
	[0.051]	[0.094]	[0.096]
		After-Tax; Miller	
WS	0.077*	0.743	0.551
ADF	0.016**	0.000**	0.000**
KPSS	> 0.10	> 0.10	> 0.10
	[0.064]	[0.108]	[0.108]
		After-Tax; NBER	
WS	0.026**	0.649	0.355
ADF	0.053*	0.008**	0.003**
KPSS	> 0.10	> 0.10	> 0.10
	[0.079]	[0.140]	[0.142]

PANEL B: Budget Deficits[c]

Not Seasonally-Adjusted Data

	FEDDEF_DT	GOVDEF_DT	FEDDEF_AC	GOVDEF_AC
		$ Values, with time trend		
WS	0.002**	0.010**	0.000**	0.000**
ADF	0.381	0.351	0.172	0.173
KPSS	> 0.10	> 0.10	> 0.10	> 0.10
	[0.111]	[0.105]	[0.085]	[0.080]
		Real Values, with time trend		
WS	0.009**	0.034**	0.001**	0.000**
ADF	0.381	0.370	0.260	0.252
KPSS	> 0.10	> 0.10	> 0.10	> 0.10
	[0.111]	[0.105]	[0.095]	[0.091]
		$ Values; no time trend		
WS	0.002**	0.008**	0.000**	0.000**
ADF	0.258	0.228	0.056*	0.057*
KPSS	> 0.05*	> 0.10	> 0.10	> 0.10
	[0.363]	[0.316]	[0.122]	[0.105]
		Real Values; no time trend		
WS	0.000**	0.008**	0.000**	0.000**
ADF	0.144	0.141	0.089*	0.079*
KPSS	> 0.10	> 0.10	> 0.10	> 0.10
	[0.141]	[0.137]	[0.105]	[0.095]

PANEL C: Current Account Deficits
Alternative Specifications

	$ Current Account Deficit			
	Not Seasonally Adjusted		Seasonally Adjusted	
	Trend	**No Trend**	**Trend**	**No Trend**
WS	0.971	0.994	0.975	0.995
ADF	0.987	0.999	0.956	0.991
KPSS	< 0.010** [0.260]	< 0.010** [0.970]	< 0.010** [0.258]	< 0.010** [0.967]
	Real Current Account Deficit			
	Not Seasonally Adjusted		**Seasonally Adjusted**	
	Trend	**No Trend**	**Trend**	**No Trend**
WS	0.874	0.900	0.983	0.979
ADF	0.935	0.908	0.977	0.967
KPSS	< 0.025** [0.206]	< 0.010** [0.930]	< 0.025** [0.204]	< 0.010** [0.928]

NOTES

"**" stands for 5% and "*" for 10% significance level.

[a] The tables report *p*-values for the Weighted Symmetric (WS) and the ADF tests; the null hypothesis is that the series is I(0). All the results are for the optimal lag length, capped at 12.

For the KPSS test, we report the *p*-values and the associated test value in parentheses, for the null hypothesis that the series is I(0). Critical values for the KPSS test are given below and are reproduced from table 1 in Kwiatkowski, Phillips, Schmidt, and Shin (1992).

Upper Tail of the Distribution Without Time Trend; η_μ				
Critical Level	10%	5%	2.5%	1%
Critical Value	0.347	0.463	0.574	0.739
Upper Tail of the Distribution With Time Trend; η_τ				
Critical Level	10%	5%	2.5%	1%
Critical Value	0.119	0.146	0.176	0.216

[b] The real yields are the 1-year T-bill, the 9-year implied forward rate from the 1-year T-Bill and the 10-year T-note, and the AAA rate. All are adjusted by the one-year expected inflation. The after-tax real yields and the after-tax nominal yields minus expected inflation. We label the tax rates we use "Miller" and "NBER." The "Miller" tax rate is computed from the ratio of tax-exempt municipal and AAA bonds. The "NBER" tax rate is the average marginal tax rate on wages and interest received, computed by the NBER.

[c] The definitions of the budget deficits and the associated expenditures are in the text.

TABLE 2: STEADY-STATE EFFECT ON REAL YIELDS
DEFICITS & EXPENDITURES ONLY
Quarterly Data, 1977:1 - 2008:4, 2 RHS Lags

PANEL A: Effects of Deficits

Before Tax	***GOVDEF_DT***	***FEDDEF_DT***	***GOVDEF_AC***	***FEDDEF_AC***
RLTB1Y	-0.745	-1.391	-1.392	-1.939**
	[.574]	[.222]	[.270]	[.004]
RLF1_10	-2.224	-1.860	-2.803	-1.758**
	[.497]	[.244]	[.350]	[.029]
RLAAA	-3.020	-2.140	-2.805	-1.735**
	[.521]	[.239]	[.200]	[.009]
After-Tax NBER	***GOVDEF_DT***	***FEDDEF_DT***	***GOVDEF_AC***	***FEDDEF_AC***
RLTB1Y	-0.074	-0.357	-0.580	-0.805**
	[.900]	[.504]	[.146]	[.001]
RLF1_10	-0.356	-0.451	-0.690	-0.601
	[.600]	[.444]	[.215]	[.105]
RLAAA	-0.560	-0.643	-0.843	-0.716*
	[.505]	[.376]	[.133]	[.081]
After-Tax MILLER	***GOVDEF_DT***	***FEDDEF_DT***	***GOVDEF_AC***	***FEDDEF_AC***
RLTB1Y	-0.849	-1.163	-1.338	-1.399**
	[.518]	[.210]	[.359]	[.015]
RLF1_10	-1.734	-1.372	-2.054	-1.154*
	[.481]	[.241]	[.378]	[.081]
RLAAA	-1.789	-1.334	-1.747	-1.032**
	[.455]	[.204]	[.237]	[.045]

PANEL B: Effects of Expenditures

Before Tax	*GOVEXP_DT*	*FEDEXP_DT*	*GOVEXP_AC*	*FEDEXP_AC*
RLTB1Y	-0.393	1.353	0.285	2.091*
	[.765]	[.507]	[.827]	[.059]
RLF1_10	1.723	3.599	2.513	2.986**
	[.533]	[.229]	[.344]	[.022]
RLAAA	2.430	4.333	2.739	3.085**
	[.526]	[.202]	[.172]	[.003]
After-Tax NBER	***GOVEXP_DT***	***FEDEXP_DT***	***GOVEXP_AC***	***FEDEXP_AC***
RLTB1Y	-0.020	0.775	0.545	1.224**
	[.976]	[.445]	[.224]	[.005]
RLF1_10	0.904	1.968	1.227**	1.707**
	[.245]	[.127]	[.043]	[.009]
RLAAA	1.221	2.563*	1.492**	1.991**
	[.191]	[.099]	[.013]	[.004]
After-Tax MILLER	***GOVEXP_DT***	***FEDEXP_DT***	***GOVEXP_AC***	***FEDEXP_AC***
RLTB1Y	0.448	2.125	1.006	2.212**
	[.728]	[.221]	[.472]	[.027]
RLF1_10	2.237	3.940	2.747	3.002**
	[.378]	[.117]	[.273]	[.015]
RLAAA	2.491	4.223*	2.587	2.962**
	[.330]	[.069]	[.111]	[.002]

NOTES

Comment [A12]: From: *Yields_DEFs_06-20-09_G&FDT.xls* & *Yields_DEFs_06-20-09_G&FAC.xls*

1. "**" stands for 5% and "*" for 10% significance level.
2. The results are from the regressions reported in the appendix table A-4.
3. We report the value of the steady-state effect and its *p*-value for the combined effect of the actual and the CBO projected deficits. In panel B it is the value of the steady-state effect of expenditures and its *p*-value.
4. The results are for the four definitions of deficits, and for the before- and after-tax real yields. *GOV* stands for government while *FED* stands for federal government. *DT* stands for our debt-based measure of deficits while *AC* stands for the accounting- (or NIPA) based measure of deficits. Thus *GOV-DT* stands for all government deficit calculated from the changes of debt (see text for details). The expenditure definitions are consistent with the deficit definitions (see the data section).
5. *RLTB1Y* is the one-year real T-bill yield, *RLF1_10* is the nine-year implied forward yield one-year in the future, and *RLAAA* is the AAA bond real yield.
6. After-tax NBER and MILLER refer to our two measures of average marginal tax rates.
7. The (13) RHS variables are: *RLYield*(-1), *RDEF*, *RDEF*(-1), *RDEF*(-2), *RCBODEF*, *RCBODEF*(-1), *RCBODEF*(-2), *REXP*, *REXP*(-1), *REXP*(-2), *RCBOEXP*, *RCBOEXP*(-1), *RCBOEXP*(-2), and a constant.

TABLE 3: THE EFFECTS OF DEFICITS ON REAL YIELDS
STEADY-STATE COMPLETE MODEL
3 Lags for Deficits& Expenditures; 1976:4 - 2008:4, Quarterly Data

PANEL A: Steady-State Effects

Steady-State Impact of:	DEF_AC			DEF_DT		
	FED+CBO Deficits	***FED Deficits***	***CBO Projections***	***FED+CBO Deficits***	***FED Deficits***	***CBO Projections***
RLTB1Y	0.053 [.914]	0.098 [.854]	0.092 [.762]	0.210 [.421]	0.290* [.090]	0.115 [.694]
RLF1_10	0.247 [.809]	0.389 [.699]	-0.042 [.930]	0.091 [.814]	0.264 [.340]	-0.043 [.923]
RLAAA	0.341 [.705]	0.488 [.601]	0.067 [.859]	0.243 [.438]	0.405 [.111]	0.093 [.791]

Panel B: Transitory Effects

Transitory Effect of:	DEF_AC			DEF_DT		
	FED+CBO Deficits	***FED Deficits***	***CBO Projections***	***FED+CBO Deficits***	***FED Deficits***	***CBO Projections***
RLTB1Y	0.716	0.397	0.994	0.205	0.477	0.195
RLF1_10	0.800	0.403	0.982	0.403	0.332	0.354
RLAAA	0.648	0.268	0.968	0.175	0.254	0.168

Comment [A13]: From RYield_QT_DEF_All Model_Experiments_3L_AUGM-Final_04-05-10.xls

NOTES

1. "**" stands for 5% and "*" for 10% significance level.
2. The table displays the steady-state impact statements and their *p*-value in brackets.
3. The regressions include all the conditioning variables and actual and CBO projections of federal expenditures (*FEDEXP* and *CBO5EXP*).
4. The first row for each real yield shows the value of the steady-state impact of deficits and the row below shows its *p*-value in brackets. The coefficient estimates of the regressions are in appendix table A-4.
5. The 1st three columns show the results for the *DEF_AC* definitions, while the next three are for *DEF_DT*.
6. The 1st column shows the impact of the combined actual deficits and the CBO projections of federal deficits (*FEDDEF* and *CBO5DEF*) and 3 lags each.
7. The 2nd column shows the effects of *only* the actual deficits and their 3 lags (*CBO* projections are excluded); all other variables are the same.
8. The 3rd column shows the effect of *only* the CBO projections of federal deficits and their 3 lags (actual deficits are excluded); all other variables are the same.
9. The 4th, 5th, and 6th columns contain the same information for the *DEF_DT* definitions.
10. Panel B shows the *p*-values of the F-test of *excluding only* the deficits and their lags indicated in the column headers. The columns correspond exactly to those of panel A.

TABLE4: TRANSITORY IMPACT OF DEFICITS ON THE *CAD*
DEFICITS & EXPENDITURES ONLY
Quarterly Data, 1977:2 - 2008:4

Comment [A14]: These data are from: CAB_QT_LSQ_LGDEF_Experiments_01-25-11.xls; NOT same as above. The results are a mixture of OLS results that don't change, and LSQ results that compute the sums.

PANEL A: *P*-Values of *F*-Tests

Comment [A15]: Current values of the deficit are excluded. The data are from: CAB_QT_LGDEF_Experiments_05-23-10.xls..This stuff checks out exactly with the LSQ estimations. Stays the same; augment with LSQ estimates for the coeff sums!

	FEDDEF_AC		FEDDEF_DT	
	DRCAD	DRLCAD	DRCAD	DRLCAD
Lag Length Tests; All Variables				
3 Lags vs. 4 Lags	32.58%	36.24%	56.82%	36.18%
2 Lags vs. 4 Lags	10.74%	18.54%	27.74%	23.53%
2 Lags vs. 3 Lags	7.63%*	14.17%	13.83%	19.92%
Remove Both DEFs				
4-Lag Model	39.35%	11.80%	34.69%	2.92%**
3-Lag Model	50.35%	15.31%	21.34%	2.76%
Remove FEDDEF				
4-Lag Model	31.59%	36.92%	24.34%	7.27%*
3-Lag Model	48.67%	36.81%	12.38%	4.03%**
Remove CBO5DEF				
4-Lag Model	97.97%	47.08%	54.75%	6.40%*
3-Lag Model	78.28%	27.72%	38.86%	9.93%*

PANEL B: Sums of the Deficits Coefficients for the 3-Lag Model

Variable	FEDDEF_AC		FEDDEF_DT	
	DRCAD	DRLCAD	DRCAD	DRLCAD
SUM ALL	0.242 [.105]	0.257* [.091]	-0.036 [.336]	-0.052 [.256]
SUM FED	0.242 [.107]	0.256* [.094]	-0.038 [.315]	-0.055 [.230]
SUM CBO5DEF	0.000 [.859]	0.001 [.727]	0.002* [.095]	0.003** [.031]

NOTES

1. "**" stands for 5% and "*" for 10% significance level.
2. The first three rows of panel A display *p*-values of *F*-tests between models in which 4, 3, and 2 lags are allowed for *CAD*, *EC*, *FEDDEF*, *FEDEXP*, *CBO5DEF*, and *CBO5EXP*; the current value of *FEDDEF* is excluded from the regressions.
3. The following three sets of two rows in panel A show *p*-values of *F*-tests of eliminating simultaneously from the model with the specified lags, (a) both deficit measures from the models, (b) only *FEDDEF*, and (c) only *CBO5DEF*.
4. Panel B shows the values and of the sums of deficit coefficients and their *p*-values. *SUM ALL* is the sum of all the deficit coefficients (actual and forecast), *SUM DEF* is the sum of only the *FEDDEF* coefficients, and *SUMCBO5DEF* is the sum of only the *CBO5DEF* coefficients. The sums are computed from the corresponding model with all the deficit variables present.

TABLE 5: TRANSITORY IMPACT OF DEFICITS ON THE *CAD*
FULL MODEL
Quarterly Data, 1977:2 - 2008:4

Comment [A16]: These data are from: CAB_QT_LSQ_LGDEF&AUX_Experiments_01-17-11.xls; same as above.

PANEL A: *P*-Values of *F*-Tests

Lag Length Tests	FEDDEF_AC DRCAD	FEDDEF_AC DRLCAD	FEDDEF_DT DRCAD	FEDDEF_DT DRLCAD
All Variables				
3 Lags vs. 4 Lags	53.58%	49.37%	61.52%	47.21%
2 Lags vs. 4 Lags	5.24%*	12.88%	4.71%**	8.02%*
2 Lags vs. 3 Lags	1.53%**	6.10%*	1.03%**	3.39%**
Remove Both DEFs				
4-Lag Model	64.20%	12.94%	77.66%	24.74%
3-Lag Model	53.25%	5.05%*	48.99%	14.08%
Remove FEDDEF				
4-Lag Model	21.97%	10.23%	33.36%	25.15%
3-Lag Model	19.74%	5.23%*	16.08%	12.22%
Remove CBO5DEF				
4-Lag Model	94.95%	76.88%	98.25%	35.17%
3-Lag Model	81.48%	75.71%	85.24%	21.53%

Comment [A17]: These data are from the latest runs: CAB_QT_LSQ_LGDEF&AUX_Experiments_01-17-11.xls. The SMPL was 77:2 - 08:4, for comparison across different lags. The subsequent SMP experiments we did are with a slightly bigger SMPL for the full sample, and they are in: CAB_QT_DEF&AUX_SMP EXP_05-15-10.xls. Here the 4-lag model is actually 77:2 - 08:4.

PANEL B: Sums of the Deficits Coefficients; the 3-Lag Model

Variable	FEDDEF_AC DRCAD	FEDDEF_AC DRLCAD	FEDDEF_DT DRCAD	FEDDEF_DT DRLCAD
SUM ALL	0.410	0.430**	-0.039	-0.056
	[.014]	[.010]	[.253]	[.148]
SUM FED	0.411	0.430**	-0.040	-0.060
	[.015]	[.011]	[.242]	[.124]
SUM CBO5DEF	-0.001	0.001	0.001	0.004**
	[.613]	[.611]	[.294]	[.005]

NOTES

1. "**" stands for 5% and "*" for 10% significance level.
2. The first three rows of panel A display *p*-values of *F*-tests between models in which 4, 3, and 2 lags are allowed for all the variables; the current value of *FEDDEF* is excluded from all regressions.
3. The following three sets of two rows in panel A show *p*-values of *F*-tests of eliminating simultaneously from the model with the specified lags, (a) both deficit measures from the models, (b) only *FEDDEF*, and (c) only *CBO5DEF*.
4. We retain only the 14 conditioning variables selected above. If the specified lag length is less than the lag length of a conditioning variable, we eliminate that lag. The first column shows the comparison being made.
5. Panel B shows the values and of the sums of deficit coefficients and their *p*-values. *SUM ALL* is the sum of all the deficit coefficients (actual and forecast), *SUM DEF* is the sum of only the *FEDDEF* coefficients, and *SUMCBO5DEF* is the sum of only the *CBO5DEF* coefficients. The sums are computed from the corresponding model with all the deficit variables present.

APPENDIX I: DATA DETAILS

Appendix table A-1 lists the precise sources of the data. Appendix table A-2, panels A and B display basic statistical properties and the cross-correlations of the variables. The correlation between federal and the government deficit (which is not displayed) measures are 0.99 and 0.98, because S&L deficits are small. However, the correlation between the debt-based and accounting-based government deficits is 0.60. By contrast, the expenditure measures are highly correlated (average 0.91, lowest 0.80).

A. The Treatment of the CBO Forecasts

Data for the CBO deficit forecasts from 1976 through 2000 were provided by Kevin Kliesen of the Federal Reserve Bank of St. Louis; we extend these data to Q:4 2008, and also collect analogous CBO expenditure forecasts for the whole period.

To aggregate the CBO forecasts: for each sample date, we deflate each of the six CBO forecasts with the appropriate GDP forecast, and sum over the current and the following five years. We deflate with the GDP forecasts, to avoid disproportionately representing the out-year values in a growing economy. We use the average value rather than the sum as in Gale & others, so that the coefficients of this variable are comparable to those of the deficits themselves. We also constructed regression-based GDP forecasts from annual data; these turned out to be very close to the CBO forecasts; we use only the CBO forecasts in the paper.

The correlations of the annual forecasts range from 0.98 (year-1 with year-2) to 0.85 (year-1 with year-5). The first-order autocorrelation of the year-1 forecasts is 0.69 and for year-5 it is 0.71. Using a single forecast variable, rather than five highly correlated forecasts to capture the forecast information, is likely to sharpen inference and conserve degrees of freedom.

B. Inflation Forecasts

We use the GNP deflator forecast from 1970:Q2 to 1981:Q3, when the CPI forecast becomes available. The forecasts are for average inflation over the four quarters, beginning with the quarter after the survey date.

It would be desirable to have separate inflation forecasts for the different yield maturities but these are not available. The survey does collect 10-year forecasts from 1979, but they 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.

APPENDIX II:

CULLING CONDITIONING VARIABLES FOR THE CAD MODEL

The list of the starting conditioning variables and their lags (48 total) is: *CDA*(1), *EC*(1-4), *GrGDP*(0-4), *GDPGAP*(0-4), *UNEM*(0-4), *INVPriv*(1-4), *M*2(0-4), *NYSE*(1-4), *HsWealth*(1-4), *HousePr*(1-4), *OilPr*(0-4), and *GulfDum*. The current values of *INVPriv*, *NYSE*, *HsWealth*, and *HousePr* are omitted as in the real yields because of possible simultaneity; *INVPriv* is also part of the current account identity. Though we use the four-lag model, the hypothesis that the third and second lags in turn are statistically insignificant for either *DRCAD* or *DRLCAD* is not rejected at the 5 percent level. This suggests that, at least on average, the third and fourth lags are unlikely to be critically important.

In the first step, we eliminate 23 of the 47 RHS conditioning variables that are not significant in any of six regressions (four-, three-, and two-lag regressions for *DRCAD* and *DRLCAD*); this leaves 24 variables plus the constant. We consider "not significant" any variable whose *p*-value is above 20 percent across the regressions. The *p*-values of the *F*-tests for the hypothesis that the deleted variables are jointly statistically significant compared to the full four-lag model are 95.5 percent and 74.6 percent for *DRCAD* and *DRLCAD*, respectively.

We then re-estimate the regression and delete an additional seven variables that are not significant in either of the regressions (for *DRCAD* and *DRLCAD*); the *p*-values that these seven variables are significant are 52.1% and

81.4% for *DRCAD* and *DRLCAD*, respectively, relative to the 24-variable model. The *p*-values of the hypothesis that the 30 eliminated variables are jointly significant compared to the 47-variable model are 94.7 percent and 85.3 percent. Three additional variables became highly insignificant when we re-estimated the 24-variable model and were dropped, to obtain a final model with 14 conditioning variables.

The *p*-values of the hypothesis that the 33 variables eliminated (to get the 14-variable model) are jointly significant are 96.0% and 78.9% respectively, for the *DRCAD* and the *DRLCAD* specifications. Compared to the 24-variable model, the corresponding *p*-values are 65.1% and 19.8%, respectively. The 14 retained conditioning variables and their lags are: *EC*(1), *UNEM*(2-4), *NYSE*(1), *HsWealth*(1), *HousePr*(1-3), *OilPr*(0-3), and *GulfDum*.

APPENDIX TABLES
TABLE A-1: DATA AND SOURCES

Variable Name	Data Source
CPI	Federal Reserve Bank of St. Louis (FRBStL) FRED II. Consumer Price Index for All Urban Consumers (all items) reported by the BLS.
Crude Oil Prices	FRBStL FRED II. The price of West Texas Intermediate crude as reported by Dow Jones & Co.
Current Account Deficit	BEA; Table 1, Main Int'l Transactions, line 77.
Deficit Forecasts	The data are obtained from the Budget Outlook and interim CBO reports available on the CBO website.
Expected Inflation	CPI forecast from the Survey of Professional Forecasters. FRB of Philadelphia.
Federal Debt Held by FRBs	FRBStL FRED II. Reported by the U.S. Department of Treasury.
Federal Expenditures	BEA; NIPA Table 3.2, line 19.
Federal Government Debt	Total Public Debt. FRBStL FRED II. Reported by the U.S. Department of Treasury.
Federal Investment	BEA; NIPA Table 3.2, line 41.
GDP	BEA; NIPA Section 1, Table 1.1.5, line 1.
Government and Corp Bond Yields	FRBStL FRED II. From the BOG H.15 release: selected interest rates.
Government Expenditures	BEA; NIPA Table 3.1, line 15.
Gross Private Investment	BEA; NIPA Section 1, Table 1.1.5, line 6.
Household Wealth	The market value of household wealth, from the Flow of Funds Accounts; Z1 Statistical Release.
Housing Price Index	FRBStL FRED II. Reported by the Office of Federal Housing Enterprise.
Marginal Tax Rate for Interest Received	From the NBER website. Since the data are annual and start in 1979. We transpose to quarterly by simple interpolation, and we use the 19879 data for backfill to 1976, since major changes in the tax laws occurred after 1979.
*M*2	FRBStL FRED II. From the BOG H.16 release: Money Stock Measures.
Municipal Bond Yields	FRBStL FRED II. From the BOG H.15 release: selected interest rates, 20-Bond Municipal Bond Index.
Net Federal Savings	BEA; NIPA Table 3.2, line 33.
Net Government Saving	BEA; NIPA Table 3.1, line 27.
NYSE	NYSE Composite Index from DataStream.
Potential *GDP*	FRBStL, FRED II database. Data compiled by the CBO.
State & Local Expenditures	Difference between Government and Federal expenditures.
Unemployment Rate	FRBStL FRED II. Reported by the BLS.

TABLE A-2: STATISTICAL PROPERTIES OF THE VARIABLES[a]

PANEL A: Basic Statistics

	Mean	**Std. Dev.**	**Minimum**	**Maximum**
GrGDP	2.94	3.13	-8.08	15.74
RGDPGap	0.81	2.16	-4.54	7.67
UNEM	6.16	1.39	3.80	10.40
RINVALL	16.59	1.61	13.23	20.24
RM2	54.52	3.89	47.58	61.86
RLOILPr	0.22	0.11	0.08	0.62
RNYSE	43.64	16.14	20.91	75.59
RCADSA	2.40	1.94	-0.68	6.64
RHsWealth	370.73	47.42	306.18	476.37
RHousePr	1.41	0.24	1.16	2.02
RFEDEXP_DT	20.21	0.96	18.28	22.65
RGOVEXP_DT	30.67	1.24	27.55	32.96
RFEDEXP_AC	21.45	1.18	19.09	24.19
RGOVEXP_AC	31.90	1.37	28.76	34.44
RFEDDEF_DT	2.95	2.90	-4.62	17.72
RGOVDEF_DT	2.70	3.06	-5.23	18.39
RFEDDEF_AC	2.39	1.74	-2.23	5.41
RGOVDEF_AC	2.14	1.89	-2.82	5.54
RDEFF5CBO	9.08	13.36	-21.73	34.59
REXPY5CBO	126.50	10.98	101.13	153.37
RLGS1YR	2.36	2.03	-0.93	7.94
RLF1_10	3.58	1.73	0.85	8.56
RLAAA	4.46	1.64	1.17	8.64

PANEL B: Cross-Correlations[b]

	GrGDP	RGDP Gap	UNEM	RINV ALL	RM2	RLOILPr	RNYSE	RCADSA	RHs Wealth	RHousePr	RFED EXP_DT	RGOV EXP_DT
GrGDP	**1**											
RGDPGap	-0.24	**1**										
UNEM	0.06	0.84	**1**									
RINVALL	0.28	-0.42	-0.06	**1**								
RM2	0.14	0.48	0.61	0.16	**1**							
RLOILPr	-0.23	0.43	0.32	0.18	0.29	**1**						
RNYSE	0.01	-0.55	-0.76	-0.18	-0.71	-0.23	**1**					
RCADSA	-0.02	-0.31	-0.57	-0.09	-0.30	-0.01	0.71	**1**				
RHsWealth	-0.04	-0.41	-0.70	-0.22	-0.62	-0.09	0.94	0.82				
RHousePr	-0.16	-0.15	-0.55	-0.17	-0.20	0.26	0.62	0.83	0.78	**1**		
RFEDEXP_DT	0.09	0.73	0.69	-0.44	0.23	0.19	-0.43	-0.22	-0.30	-0.25	**1**	
RGOVEXP_DT	0.02	0.57	0.37	-0.73	-0.04	0.01	-0.05	0.09	0.07	0.03	0.88	**1**
RFEDEXP_AC	0.10	0.71	0.74	-0.34	0.38	0.18	-0.57	-0.31	-0.44	-0.36	0.97	0.80
RGOVEXP_AC	0.05	0.62	0.49	-0.65	0.13	0.03	-0.24	-0.03	-0.11	-0.10	0.93	0.97
RFEDDEF_DT	-0.20	0.44	0.25	-0.43	0.24	0.27	-0.16	0.11	-0.07	0.20	0.44	0.48
RGOVDEF_DT	-0.23	0.47	0.25	-0.49	0.21	0.27	-0.14	0.13	-0.04	0.23	0.45	0.52
RFEDDEF_AC	0.03	0.78	0.72	-0.43	0.52	0.17	-0.55	-0.11	-0.42	-0.15	0.85	0.74
RGOVDEF_AC	-0.04	0.81	0.68	-0.53	0.46	0.19	-0.49	-0.10	-0.35	-0.08	0.84	0.78
RDEFF5CBO	0.10	0.61	0.57	-0.37	0.31	-0.03	-0.40	-0.10	-0.27	-0.16	0.81	0.75
REXPY5CBO	0.13	0.68	0.81	0.00	0.69	0.25	-0.79	-0.58	-0.74	-0.46	0.60	0.30
RLGS1YR	-0.09	0.10	0.26	0.39	0.03	0.23	-0.34	-0.30	-0.27	-0.39	0.24	0.00
RLF1_10	0.01	0.35	0.51	0.04	0.15	0.02	-0.41	-0.23	-0.34	-0.48	0.56	0.39
RLAAA	-0.04	0.32	0.43	-0.08	0.04	-0.05	-0.26	-0.10	-0.20	-0.41	0.53	0.44

	RFED EXP_AC	RGOV EXP_AC	RFED DEF_DT	RGOV DEF_DT	RFED DEF_AC	RGOV DEF_AC	RDEFF 5CBO	REXPY 5CBO	RLGS1YR	RL F1_10	RLAAA
RFEDEXP_AC	**1**										
RGOVEXP_AC	0.90	**1**									
RFEDDEF_DT	0.41	0.49	**1**								
RGOVDEF_DT	0.41	0.51	1.00	**1**							
RFEDDEF_AC	0.86	0.81	0.54	0.55	**1**						
RGOVDEF_AC	0.83	0.83	0.57	0.60	0.99	**1**					
RDEFF5CBO	0.82	0.81	0.46	0.46	0.85	0.82	**1**				
REXPY5CBO	0.68	0.43	0.26	0.24	0.70	0.63	0.66	**1**			
RLGS1YR	0.32	0.10	-0.14	-0.16	-0.04	-0.07	0.19	0.20	**1**		
RLF1_10	0.63	0.50	0.09	0.08	0.41	0.37	0.58	0.40	0.78	**1**	
RLAAA	0.57	0.52	0.12	0.13	0.35	0.35	0.54	0.24	0.70	0.96	**1**

NOTES

[a] The table shows the important statistics including cross-correlations of the variables used in the analysis. Concise definitions of the variables are:

GrGDP	The growth rate of real *GDP*; BEA seasonally adjusted.
RGDPGap	The *GDP* gap, measured as the % difference between actual real *GDP* and potential *GDP*.
UNEM	Unemployment rate.
RINVALL	Gross private investment; ratio to lagged *GDP*.
RM2	M2; ratio to lagged *GDP*.
RLOilPr	The price of oil; ratio to lagged *CPI*.
RNYSE	The value of the composite NYSE index; ratio to lagged *GDP*.
RCADSA	The seasonally-adjusted current account deficit; annualized ratio to lagged *GDP*.
RHsWealth	The market value of household wealth from the flow of funds accounts; ratio to lagged *GDP*.
RHousePr	The average price of houses over the nine U.S. regions as reported by the Office of Federal Housing Enterprise Oversight; ratio to lagged *GDP*.
RFEDEXP_DT	Federal Expenditures – Federal Investment; ratio to lagged *GDP*.
RGOVEXP_DT	*RFEDEXP_DT* + State & Local current expenditures; ratio to lagged *GDP*.
RFEDEXP_AC	Federal Expenditures; ratio to lagged *GDP*.
RGOVEXP_AC	*RFEDEXP_AC* + State & Local current expenditures; ratio to lagged *GDP*.
RFEDDEF_DT	Change in the federal debt – Changes in Fed's holdings of Federal debt – Federal Investment; ratio to lagged *GDP*.
RGOVDEF_DT	*RFEDDEF_DT* - State & Local current surplus; ratio to lagged *GDP*.
RFEDDEF_AC	- Net federal savings; ratio to lagged *GDP*.
RGOVDEF_AC	*RFEDDEF_AC* - State & Local current surplus; ratio to lagged *GDP*.
RDEFF5CBO	CBO's Cumulative 5-year Federal Budget Deficit Forecast; ratio to lagged *GDP* (each year is deflated by a forecast of *GDP* for the previous year to avoid overweighting the out years).
REXPY5CBO	CBO's Cumulative 5-year Federal Expenditures Forecast; ratio to lagged *GDP* (each year is deflated by a forecast of *GDP* for the previous year to avoid overweighting the out years).
RLGS1YR	The 1-year real T Bill yield; the market yield adjusted by the 1-year inflation expectations from the Survey of Professional Forecasters.
RLF1_10	The 9-year real forward yield, computed from the 1-year T Bill and 10-year T Note yields; the market yield adjusted by the 1-year inflation expectations from the Survey of Professional Forecasters.
RLAAA	The real AAA yield; the market yield adjusted by the 1-year inflation expectations from the Survey of Professional Forecasters.

[b] In the cases of *RCADSA* (when a RHS variable), *RINVALL*, *RNYSE*, *RHsWealth*, and *RHousePr*, we enter only their lagged values on the RHS of the regressions, to avoid simultaneity difficulties. However, to improve clarity and save space we report only the contemporaneous cross-correlations here. For these variables there are very small differences in their cross-correlations with the other variables.

TABLE A-3
STEADY-STATE EFFECTS OF CONDITIONING VARIABLES ON REAL YIELDS
NO DEFICITS & EXPENDITURES VARIABLES
Quarterly Data; 1976:3 - 2008:4, 2 RHS Lags

Comment [A18]: This was Table 3 in the earlier version.

Permanent Impact of:	***GrGDP***	***GDPGap***	***UNEM***	***RLOilPr***	***RM2***	***RINVPriv***	***RNYSE***	***RHsWealth***	***RHousePr***	***RCAD***
RLTB1Y	0.405	0.510	-1.484**	8.160	-0.136	0.694**	-0.301**	0.112**	-8.912**	-0.391
	[.751]	[.201]	[.014]	[.124]	[.173]	[.046]	[.000]	[.000]	[.034]	[.245]
RLF1_10	-0.809	1.437*	-2.286*	8.438	0.082	0.612	-0.115	0.066*	-17.370**	0.437
	[.585]	[.061]	[.056]	[.227]	[.614]	[.205]	[.205]	[.058]	[.001]	[.301]
RLAAA	-1.591	1.327	-2.172	11.588	0.085	0.674	-0.069	0.067*	-20.131**	0.543
	[.400]	[.147]	[.146]	[.196]	[.672]	[.250]	[.525]	[.074]	[.003]	[.305]

Comment [A19]: From: *Yields_Aux Vars Only_QT_07-12-09.xls*

NOTES

1. "**" stands for 5% and "*" for 10% significance level.
2. We report the value of the steady-state effects and their *p*-values.
3. *RLTB1Y* is the one-year real T-bill yield, *RLF1_10* is the nine-year implied forward yield one-year in the future, and *RLAAA* is the AAA bond real yield. The results are for the before-tax real yields.
4. The (26) RHS variables and their lags are: Yield(1), *GrGDP*, *GrGDP*(1), *GrGDP*(2), *RGDPGap*(0-2), *UNEM*(0-2), *RLOilPr*(0-2), *RM2*(0-2), *RINVPriv*(1-2), *RNYSE*(1-2), *RHsWealth*(1-2), *RLHousePr*(1-2), *RCAD*(1-2), and a constant. We do not use the current values of the last five variables to minimize possible simultaneity issues.

TABLE A-4:
TESTS OF THE LAG SPECIFICATION FOR DEFICITS AND EXPENDITURES
REAL YIELDS
***P*-Values of Regression F-tests**
128 Observations, Quarterly Data

	DEF_AC			DEF_DT		
	FED+CBO Deficits	***FED Deficits Only***	***CBO Deficits Only***	***FED+CBO Deficits***	***FED Deficits Only***	***CBO Deficits Only***
4- vs. 3-lag Specification						
RLTB1Y	0.528	0.383	0.387	0.110	0.162	0.225
RLF1_10	0.221	0.187	0.162	0.094*	0.129	0.150
RLAAA	0.424	0.422	0.408	0.238	0.398	0.365
4- vs. 2- lag Specification						
RLTB1Y	0.015**	0.003**	0.004**	0.001**	0.000**	0.002**
RLF1_10	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
RLAAA	0.005**	0.002**	0.002**	0.001**	0.001**	0.002**
3- vs. 2-lag Specification						
RLTB1Y	0.144	0.053*	0.072*	0.130	0.042**	0.081*
RLF1_10	0.020	0.008**	0.007**	0.014**	0.004**	0.009**
RLAAA	0.097*	0.043**	0.045**	0.049**	0.019**	0.047**

Comment [A20]: From RYield_QT_DEF_All Model_Experiments_4L_03-27-10.xls

NOTES
1. "**" stands for 5% and "*" for 10% significance level.
2. Each regression includes all the conditioning variables and varying lags of the actual values and the CBO projections of federal expenditures and deficits.
3. The table displays the *p*-values of regression *F*-test that assess the statistical impact of deleting deficit and expenditure lags from the model.
4. The first three columns show the results for the *DEF_AC* definitions, while the next three are for *DEF_DT*.

TABLE A-5
THE COMPLETE MODEL FOR REAL YIELDS
3-Lags
Quarterly Data; 129 Observations

	FEDDEF_AC			FEDDEF_DT		
	1 YTBill	**F1_10**	**AAA**	**1 YTBill**	**F1_10**	**AAA**
CONST	-13.824* [.067]	-0.406 [.930]	-2.073 [.606]	-17.453* [.027]	-2.176 [.664]	-4.092 [.353]
***Yield*(-1)**	0.583** [.000]	0.836** [.000]	0.827** [.000]	0.569** [.000]	0.813** [.000]	0.805** [.000]
FEDDEF	-0.045 [.834]	0.022 [.887]	0.012 [.928]	0.050 [.185]	0.020 [.458]	0.035 [.136]
***FEDDEF*(-1)**	0.087 [.690]	-0.002 [.988]	-0.009 [.948]	0.082** [.043]	0.055* [.055]	0.056** [.029]
***FEDDEF*(-2)**	-0.007 [.972]	0.088 [.552]	0.096 [.472]	-0.008 [.846]	0.004 [.895]	0.006 [.817]
***FEDDEF*(-3)**	-0.049 [.816]	-0.042 [.777]	-0.033 [.803]	0.019 [.619]	-0.004 [.894]	0.008 [.746]
CBO5DEF	0.185 [.333]	0.080 [.553]	0.087 [.479]	0.155 [.380]	0.094 [.468]	0.085 [.466]
***CBO5DEF*(-1)**	0.083 [.740]	0.098 [.574]	0.118 [.453]	-0.002 [.992]	0.032 [.850]	0.043 [.776]
***CBO5DEF*(-2)**	-0.069 [.789]	-0.234 [.180]	-0.227 [.153]	-0.074 [.759]	-0.227 [.170]	-0.214 [.151]
***CBO5DEF*(-3)**	-0.162 [.374]	0.031 [.806]	0.015 [.896]	-0.132 [.436]	0.044 [.713]	0.029 [.786]
FEDEXP	-0.175 [.642]	-0.299 [.252]	-0.184 [.433]	-0.216 [.477]	-0.244 [.261]	-0.176 [.365]
***FEDEXP*(-1)**	0.086 [.841]	0.211 [.485]	0.254 [.348]	-0.071 [.861]	-0.049 [.867]	0.039 [.880]
***FEDEXP*(-2)**	0.034 [.928]	-0.265 [.304]	-0.242 [.299]	0.252 [.477]	-0.034 [.889]	-0.033 [.882]
***FEDEXP*(-3)**	0.423 [.159]	0.521** [.013]	0.357* [.058]	0.408 [.132]	0.527** [.006]	0.381** [.025]
CBO5EXP	-0.078 [.718]	-0.030 [.840]	-0.014 [.920]	-0.086 [.685]	-0.053 [.723]	-0.022 [.868]
***CBO5EXP*(-1)**	0.035 [.898]	0.005 [.977]	-0.059 [.724]	0.103 [.699]	0.046 [.806]	-0.014 [.932]
***CBO5EXP*(-2)**	0.009 [.974]	0.093 [.632]	0.107 [.542]	0.018 [.947]	0.132 [.487]	0.129 [.443]
***CBO5EXP*(-3)**	-0.159 [.478]	-0.293* [.059]	-0.220 [.114]	-0.185 [.390]	-0.311** [.039]	-0.239* [.075]

Comment [A21]: Data are from: Kormendi\Out-09\Yields\RYield_QT_DEF_All Model_Experiments_3L_AUGM-Final_04-05-10.xls
In the table, the CBO DEF & EXP coeffs are multiplied by 6!

TABLE A-5 (continued)

	FEDDEF_AC			FEDDEF_DT		
	1 YTBill	F1_10	AAA	1 YTBill	F1_10	AAA
RGDPGap	0.094 [.527]	0.061 [.547]	0.105 [.248]	0.089 [.523]	0.072 [.447]	0.111 [.189]
RGDPGap(-1)	-0.282 [.335]	-0.224 [.270]	-0.205 [.259]	-0.215 [.400]	-0.262 [.147]	-0.211 [.190]
RGDPGap(-2)	0.380 [.127]	0.406** [.020]	0.259* [.098]	0.410* [.079]	0.466 [.005]	0.309 [.035]
UNEM	-1.175** [.005]	-0.413 [.161]	-0.339 [.201]	-1.129** [.006]	-0.340 [.242]	-0.292 [.259]
UNEM(-1)	0.644 [.145]	0.084 [.778]	0.131 [.622]	0.466 [.283]	-0.019 [.948]	0.047 [.857]
RINVPriv(-1)	-0.188 [.474]	-0.242 [.158]	-0.141 [.358]	-0.304 [.212]	-0.345** [.034]	-0.240* [.097]
RINVPriv(-2)	0.682** [.005]	0.401** [.016]	0.294* [.050]	0.913 [.000]	0.524** [.002]	0.434** [.004]
RM2	-0.315 [.147]	-0.130 [.377]	-0.074 [.575]	-0.476** [.034]	-0.219 [.154]	-0.175 [.205]
RM2(-1)	0.780** [.006]	0.248 [.210]	0.137 [.440]	1.013** [.001]	0.379* [.072]	0.280 [.135]
RM2(-2)	-0.470** [.008]	-0.091 [.456]	-0.041 [.708]	-0.540 [.001]	-0.135 [.249]	-0.088 [.403]
RNYSE	-0.046 [.374]	-0.007 [.852]	-0.018 [.580]	-0.053 [.285]	-0.013 [.719]	-0.027 [.383]
RNYSE(-1)	-0.041 [.462]	-0.002 [.964]	0.017 [.615]	-0.059 [.282]	-0.012 [.760]	0.009 [.801]
RHsWealth(-1)	0.022 [.302]	0.010 [.511]	0.004 [.767]	0.025 [.217]	0.011 [.427]	0.008 [.536]
RHsWealth(-2)	0.016 [.499]	-0.004 [.820]	0.002 [.864]	0.026 [.252]	0.001 [.951]	0.006 [.655]
RLHousePr(-1)	-11.901* [.071]	-7.138 [.117]	-7.090* [.085]	-10.897* [.081]	-6.205 [.151]	-5.896 [.131]
RLHousePr(-2)	9.409 [.133]	5.604 [.196]	5.474 [.159]	6.780 [.269]	3.849 [.369]	3.288 [.389]
RLOilPr	1.212 [.457]	1.145 [.314]	0.933 [.363]	0.454 [.783]	0.797 [.494]	0.434 [.677]
RCAD(-1)	0.107 [.672]	0.116 [.512]	0.026 [.870]	0.125 [.592]	0.168 [.307]	0.075 [.612]
RCAD(-2)	-0.396 [.113]	-0.199 [.247]	-0.087 [.575]	-0.434* [.071]	-0.226 [.175]	-0.113 [.446]
R^2	0.909	0.939	0.945	0.914	0.941	0.948
Durbin Watson	2.23	2.13	2.26	2.25	2.13	2.26

NOTES

The table shows the coefficient estimates and their associated *p*-values (immediately below in brackets and in italics), for the one-year, nine-year forward, and the AAA real yields.
"**" stands for 5% and "*" for 10% significance level.

TABLE A-6
THE COMPLETE 3-LAG MODEL FOR THE *CAD*
Quarterly Data

Comment [A22]: Data are form: CAB_QT_LSQ_LGDEF&AUX_Experiments_01-17-11.xls. THE CBO DEF & EXP coefficients have been multiplied by 6!

Variable	FEDDEF_AC		FEDDEF_DT	
	DRCAD	DRLCAD	DRCAD	DRLCAD
***FEDDEF*(-1)**	0.123 *[.121]*	0.207** *[.006]*	-0.010 *[.466]*	-0.019 *[.153]*
***FEDDEF*(-2)**	0.161* *[.079]*	0.145 *[.108]*	-0.003 *[.859]*	-0.012 *[.446]*
***FEDDEF*(-3)**	0.127 *[.153]*	0.078 *[.360]*	-0.026* *[.065]*	-0.029** *[.030]*
CBO5DEF	-0.0007 *[.323]*	-0.0006 *[.460]*	-0.0001 *[.893]*	0.0003 *[.673]*
***CBO5DEF*(-1)**	-0.0003 *[.735]*	0.0001 *[.870]*	0.0004 *[.558]*	0.0012 *[.152]*
***CBO5DEF*(-2)**	0.0000 *[1.00]*	0.0006 *[.484]*	0.0003 *[.648]*	0.0011 *[.168]*
***CBO5DEF*(-3)**	0.0003 *[.674]*	0.0007 *[.440]*	0.0007 *[.387]*	0.0011 *[.185]*
FEDEXP	0.234* *[.064]*	0.218 *[.104]*	0.211* *[.091]*	0.235* *[.083]*
***FEDEXP*(-1)**	-0.121 *[.409]*	-0.259 *[.101]*	-0.079 *[.549]*	-0.046 *[.746]*
***FEDEXP*(-2)**	-0.295** *[.041]*	-0.489** *[.002]*	-0.279** *[.039]*	-0.435** *[.003]*
***FEDEXP*(-3)**	-0.147 *[.298]*	-0.206 *[.190]*	0.011 *[.937]*	-0.031 *[.835]*
CBO5EXP	0.0004 *[.640]*	0.0004 *[.700]*	-0.0004 *[.658]*	-0.0007 *[.515]*
***CBO5EXP*(-1)**	-0.0001 *[.940]*	-0.0007 *[.534]*	-0.0007 *[.430]*	-0.0012 *[.243]*
***CBO5EXP*(-2)**	0.0007 *[.488]*	-0.0003 *[.790]*	0.0003 *[.777]*	-0.0008 *[.424]*
***CBO5EXP*(-3)**	0.0010 *[.279]*	0.0005 *[.651]*	0.0006 *[.521]*	0.0001 *[.944]*
***EC*(-1)**	0.025 *[.792]*	-0.130 *[.237]*	0.001 *[.993]*	-0.162 *[.158]*
***EC*(-2)**	0.108 *[.298]*	0.245** *[.034]*	0.084 *[.457]*	0.232* *[.052]*
***EC*(-3)**	-0.097** *[.035]*	-0.083* *[.059]*	-0.070 *[.124]*	-0.045 *[.305]*
***UNEM*(-2)**	-0.003* *[.052]*	-0.149** *[.041]*	-0.002 *[.231]*	-0.106 *[.132]*
***UNEM*(-3)**	0.003* *[.063]*	0.123** *[.050]*	0.004** *[.006]*	0.141** *[.023]*
***NYSE*(-1)**	0.020 *[.381]*	0.005 *[.809]*	0.026 *[.255]*	0.014 *[.522]*
***HsWealth*(-1)**	0.001 *[.930]*	0.018 *[.148]*	-0.001 *[.937]*	0.015 *[.233]*

TABLE A-6 (continued)

Variable	FEDDEF_AC		FEDDEF_DT	
	DRCAD	DRLCAD	DRCAD	DRLCAD
***HousePr*(-1)**	0.518 *[.699]*	1.537 *[.286]*	0.201 *[.879]*	0.998 *[.487]*
***HousePr*(-2)**	1.987 *[.171]*	1.855 *[.263]*	1.403 *[.329]*	1.353 *[.421]*
***HousePr*(-3)**	-2.218* *[.098]*	-2.623* *[.080]*	-1.750 *[.194]*	-2.099 *[.167]*
OilPr	0.025** *[.003]*	1.401** *[.001]*	0.027** *[.001]*	1.514** *[.000]*
***OilPr*(-1)**	-0.031** *[.004]*	-1.164** *[.023]*	-0.031** *[.003]*	-1.186** *[.021]*
***OilPr*(-2)**	0.008 *[.509]*	0.793 *[.175]*	0.015 *[.202]*	1.066* *[.062]*
***OilPr*(-3)**	-0.014 *[.233]*	-0.257 *[.657]*	-0.013 *[.284]*	-0.222 *[.698]*
GulfDum	-0.006** *[.041]*	-0.264* *[.058]*	-0.006** *[.028]*	-0.239* *[.089]*
***CAD*(-1)**	-0.086 *[.578]*	-0.338** *[.046]*	-0.032 *[.846]*	-0.302* *[.087]*
***CAD*(-2)**	0.220** *[.047]*	0.311** *[.007]*	0.162 *[.149]*	0.229** *[.049]*
***CAD*(-3)**	0.133 *[.152]*	0.084 *[.349]*	0.152* *[.093]*	0.092 *[.299]*
Constant	0.0001 *[.361]*	0.073 *[.189]*	0.001 *[.177]*	0.058 *[.318]*
R^2	0.521	0.579	0.534	0.580
Durbin Watson	2.04	2.00	1.97	1.95

NOTES

The table shows the coefficient estimates and their associated *p*-values (immediately below in brackets and in italics), for all the variables of the full model, for the *DR* and *DRL* specifications and the *FEDDEF_AC* and *FEDDEF_DT* definitions.

When included, the current value of *HsWealth* is positive and highly significant in all four specifications but its presence does not change the conclusions.

"**" stands for 5% and "*" for 10% significance level.

TABLE A-7: TRANSITORY IMPACT OF DEFICITS ON THE *CAD*
FULL MODEL
Annual Data, 1979 – 2008

Comment [A23]: Was Table 7 in the earlier version.

PANEL A: *P*-Values of *F*-Tests

Lag Length Tests;	FEDDEF_AC DRCAD	FEDDEF_AC DRLCAD	FEDDEF_DT DRCAD	FEDDEF_DT DRLCAD
All Variables				
1 Lag vs. 2 Lags	31.92%	39.55%	39.94%	49.42%
0 Lag vs. 2 Lags	17.84%	14.74%	9.21%*	23.20%
0 Lags vs. 1 Lag	29.25%	20.27%	12.37%	27.10%
Remove Both DEFs				
2-Lag Model	1.95%**	0.98%**	1.60%**	3.97%**
1-Lag Model	1.61%**	0.61%**	1.03%**	2.25%**
Remove FEDDEF				
2-Lag Model	32.41%	1.15%**	22.19%	6.70%*
1-Lag Model	11.90%	0.22%**	5.86%*	1.06%**
Remove CBO5DEF				
2-Lag Model	48.56%	55.11%	22.31%	44.47%
1-Lag Model	25.62%	36.08%	6.10%*	19.50%

PANEL B: Sums of the Deficit Coefficients; the 2-Lag Model

Comment [A24]: These data are from: All-CAD_ANN_LSQ LGDEFS&AUX_Experiments_02-05-11.xls. All new

Comment [A25]: These data are from: CAB_QT_LSQ_LGDEF&AUX_Experiments_02-05-11.xls; same as above.

Variable	FEDDEF_AC DRCAD	FEDDEF_AC DRLCAD	FEDDEF_DT DRCAD	FEDDEF_DT DRLCAD
SUM ALL	0.239*	0.376**	0.188**	0.195**
	[.056]	[.003]	[.013]	[.025]
SUM FED	0.236*	0.374**	0.185**	0.192**
	[.061]	[.003]	[.015]	[.028]
SUM CBO5DEF	0.003*	0.002	0.003**	0.003**
	[.051]	[.168]	[.000]	[.002]

NOTES

1. "**" stands for 5% and "*" for 10% significance level.
2. The models are for 2, 1, and 0 lags of the same variables. The first column shows the comparison being made.
3. The following three sets of two rows in panel A show *p*-values of *F*-tests of eliminating simultaneously from the model with the specified lags, (a) both deficit measures from the models, (b) only *FEDDEF*, and (c) only *CBO5DEF*.
4. We allow 2, 1, and 0 lags in turn for *CAD*, *EC*, *FEDDEF*, *FEDEXP*, *CBO5DEF*, and *CBO5EXP*; the current value of *FEDDEF* is excluded. We retain *NYSE* (-1), *HsWealth*(-1,-2), *HousePr*(-2), *OilPr* (-1) as conditioning variables in all the regressions.
5. Panel B shows the values and of the sums of deficit coefficients and their *p*-values. *SUM ALL* is the sum of all the deficit coefficients (actual and forecast), *SUM DEF* is the sum of only the *FEDDEF* coefficients, and *SUMCBO5DEF* is the sum of only the *CBO5DEF* coefficients. The sums are computed from the corresponding model with all the deficit variables present.