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*The Impact of Budget Deficits in the Interwar Period**

Five- and six-variable vector autoregressions are estimated, and the effects of deficits on interest rates, money, production, and prices are analyzed through the computation of likelihood ratio tests, variance decompositions and impulse response functions. A Monte Carlo simulation technique is used to estimate standard errors. Systems are analyzed for two alternative time periods that have been used to represent the interwar period. The study concludes that July 1922–June 1938 is the more appropriate period for analyzing deficits. Our results indicate that deficits have no major effects on the non-fiscal variables in this period.

1. Introduction

A large and growing literature on the impact of federal budget deficits and government debt focuses heavily on the post–World War II period. Despite the attention devoted to this important issue in recent years, there appears to be no theoretical or empirical concensus on the impact of deficits on key macro variables.

As Bernheim (1989) suggests, there are three competing schools of thought concerning the impact of budget deficits. In the standard neoclassical model, budget deficits raise total lifetime consumption by shifting taxes to future generations. If economic resources are fully employed, increased consumption implies decreased saving; thus, interest rates must rise and crowd out private capital accumulation. Under the Keynesian view, if resources are initially unemployed, appropriately timed deficits have beneficial effects. Saving and capital accumulation need not be adversely affected since deficits stimulate both consumption and income. Under the Ricardian equivalence view, on the other hand, deficit policy is a matter of indifference.

As developed by Barro (1974), the Ricardian equivalence hypothesis views an increase in government debt as equivalent to a future increase in taxes and thus not an addition to private sector wealth. A switch from lump sum tax to debt finance of a given level of government purchases has no effect on consumption, interest rates,

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or aggregate demand. However, even in the Ricardian framework, changes in government purchases and in distortionary, or nonlump sum, taxes have real effects.

The primary motivation for much of the recent research has been the Ricardian equivalence hypothesis. Controversy over this hypothesis has taken place at both the theoretical and empirical levels. Tobin and Buiter (1980), for example, argue against the underlying assumptions of Ricardian equivalence and conclude that tax and debt finance are not equivalent. In reviews of more recent literature, Brunner (1986) and Bernheim (1989) summarize many of the key theoretical objections to Ricardian equivalence. While Barro (1989) acknowledges that the strong assumptions necessary to support strict Ricardian equivalence are unlikely to hold precisely, and that budget deficits may have second-order effects, he nevertheless concludes that the Ricardian view provides the most useful framework for assessing the first-order effects of deficits on the economy.

The empirical evidence has also been mixed. For example, Feldstein (1982), Makin (1983), Eisner and Pieper (1984), deLeeuw and Holloway (1985), and Hoelscher (1986) find evidence that deficits/debt affect output, consumption, or interest rates. The opposite evidence is found, for example, by Plosser (1982), Dwyer (1982), Kormendi (1983), Hoelscher (1983), McMillin (1985), Evans (1985, 1987), Aschauer (1985), and Fackler and McMillin (1989).

Other studies have focused on the deficit–money supply relationship. Numerous studies find evidence that the Federal Reserve monetizes budget deficits—for example, Hamburger and Zwick (1981) and Allen and Smith (1983)—while other studies suggest no monetization—for example, Barro (1978) and Niskanen (1978). For surveys or reviews of the deficit literature, see Dwyer (1985), Beard and McMillin (1986), and Seater (1985).

While there are notable exceptions, most studies analyze the effects of deficits on selected macro variables in the context of single equation models.[1] An objective of this study is to evaluate empirically the effects of federal deficits on several key macro variables within the context of a small macro model by estimating both 5-variable and 6-variable vector autoregressions (VARs). The 5-variable VARs comprise deficits, interest rates, money supply, industrial production, and prices. The 6-variable VARs add government expenditures as an additional variable. This variable is added since

[1]Exceptions include Plosser (1982), Dwyer (1982), McMillin (1985), and Fackler and McMillin (1989), each of whom evaluate the effects of debt within vector autoregressive models.

Ricardian equivalence is consistent with government purchases having first-order effects. Since government expenditures and deficits are highly correlated, effects attributable to expenditures might incorrectly be attributed to deficits when government expenditures are omitted.[2] In both the 5-variable and 6-variable systems, we employ two alternative definitions of the money supply—M1 and M2.

The effects of deficits and government expenditures are analyzed by computing likelihood ratio tests and through the computation of variance decompositions (VDCs) and impulse response functions (IRFs). A relatively unique feature of this paper is the use of a Monte Carlo simulation technique to estimate standard errors for the VDCs and IRFs.

Our purpose in this paper is to investigate the largely neglected time period between the two world wars. Unlike the period since World War II, the interwar period is of particular interest in that the government ran both budget surpluses as well as deficits in particular years. Since the reaction functions of the pre- and post-World War II Federal Reserve are possibly quite different and the most common explanation for debt monetization assigns the Federal Reserve a crucial role, it is also interesting to see whether the government's fiscal activities in this earlier period affected interest rates (and other variables) and alleviated or created pressures for debt monetization.

While neither looks specifically at the interwar period, both Joines (1985) and Evans (1987) study the impact of budget deficits over a long time span that includes the interwar years. Joines finds no evidence of debt monetization and Evans finds no evidence that deficits affect interest rates.[3] Both Sims (1980) and Burbidge and

[2]One objection to the conclusions of Ricardian equivalence is that taxes are not lump sum, but vary with income and other variables. Ideally, while one might like to include an average marginal tax rate variable in our model, experimentation has not produced a reliable monthly measure of tax rates for the period we investigate. In Barro's (1989) view, at least, the distortionary effects of taxes are likely to have only second-order effects on the economy.

[3]Using a traditional reaction function technique and yearly data, Joines (1985) examines the relationship between deficits and the growth of the monetary base over a very long time period, 1872–1983, and over several subperiods, including 1915–1953. An initial equation shows a positive relation over this subperiod; this relationship disappears, however, when lagged unemployment is added to the model. Using regression techniques and monthly data, Evans (1987) examines the relationship between deficits and interest rates over the period June 1908–March 1984, and over eleven subperiods, including January 1920–December 1929 and January 1930–December 1939. He finds no statistically significant effect between deficits and interest rates in these subperiods.

Harrison (1985) focus on the interwar period, although neither consider a fiscal policy variable in their model. Both use monthly data in estimating 4-variable VARs comprising money, prices, industrial production, and interest rate variables. McMillin and Beard (1988) study the impact of budget deficits in the interwar period by using monthly data and estimating 5-variable VARs that add a deficit variable to the above 4 variables. No evidence of substantial debt monetization or of important effects on the other variables is found. However, unlike the present paper, only one definition of the money supply is used (M2), government expenditures are not included, and standard errors are not calculated.

2. Choice of Time Period

A potentially important consideration in studying the impact of budget deficits in the interwar years is the choice of time period. In both Sims (1980) and Burbidge and Harrison (1985) the interwar period refers to January 1920–December 1941, with data from 1919 used for initial conditions. In McMillin and Beard (1988) the interwar period is defined as July 1922–June 1938. With a maximum lag length of 12 months considered, no data prior to July 1921 are used for initial conditions. In this paper, we estimate VARs for the two alternative periods.

The shorter time period focuses exclusively on a peacetime economy. Firestone (1960), analyzing monthly data, identified war cycles (measured trough to trough) as December 1914–March 1919 and June 1938–October 1945. He also identified a postwar cycle as March 1919–July 1921. The first of his 4 interwar peacetime cycles thus began in July 1921 and the fourth ended in June 1938.

Kendrick (1955) classified the fiscal years (ending June 30) surrounding and including each war through World War II into wartime, transition and peacetime periods. The World War I period encompassed 1917–1919, and both fiscal years 1920 and 1921 were included in the transition period that followed. Also, fiscal year 1941 was classified as a year of transition prior to World War II. By that time, the U.S. had begun to increase its military spending in anticipation of entry into the war and to make substantial transfers under Lend-Lease.

In his study of the relationship between deficits and growth of the monetary base, Joines (1985) used Kendrick's classifications in computing war spending for both world wars and their transition periods. He thus estimated some positive amounts of war spending in fiscal years 1920, 1921, and 1941, as opposed to zero war spending in the intervening peacetime years. That this is potentially an important consideration is suggested by Joines's finding that his war spending variable had a statistically significant effect on growth in the monetary base over the 1915–53 period while the nonwar deficit had no explanatory power (in the equation which included lagged unemployment rates).

By defining the interwar period as July 1922–June 1938, potential problems connected with war-related government expenditures can be avoided. With a maximum lag length of 12 months considered, this shorter interwar period corresponds to the 4 peacetime cycles in Firestone.

3. Methodology

The VAR technique is chosen to examine the effects of budget deficits on key macro variables for three major reasons. First, it seems appropriate to analyze empirically the impact of deficits within the context of a small macro model. Second, the VAR technique, as opposed to a structural model, avoids the imposition of potentially spurious a priori constraints. Third, as noted by Fischer (1981) and Genberg, Salemi, and Swoboda (1987), VARs are well suited to an examination of the channels through which variables operate since there are few restrictions imposed on the way the variables interact. However, it is difficult to distinguish sharply among structural hypotheses since the VAR is a reduced-form technique. Cooley and LeRoy (1985), for example, have discussed other limitations of VARs. However, since our purpose is to gain insight into the channels through which deficits operate, the VAR technique seems appropriate for this study.

As noted earlier, the 5-variable VAR includes deficits, interest rates, money supply, industrial production, and prices, and the 6-variable VAR adds government expenditures. While, ideally, a measure of government purchases is preferred to government expenditures, a monthly series on government purchases is unavailable. This should not be a serious problem, however, since transfer payments were relatively small. In both systems, money is defined, alternately, as M1 and M2. The deficit measure (DEFFX), taken from Firestone (1960, Table A-3), is in billions of dollars and is calculated on a cash basis as federal *receipts minus expenditures* (EXP). When DEFFX is positive, the actual government budget is in surplus. The money variables are also in billions of dollars and are Friedman and Schwartz's (1963) M1 and M2 measures from their Table A-1. The price variable is the wholesale price index (WPI) (base year 1926) and is taken from the 1933, 1938, and 1943 editions of the *Statistical Abstract of the United States*. Industrial production (IP) data (base year 1977) are taken from the 1985 revision of *Industrial Production* (Board of Governors of the Federal Reserve System, 1985). The interest rate series (RCP) is the 4–6 month prime commercial paper rate taken from *Banking and Monetary Statistics 1914–1941* (Board of Governors of the Federal Reserve System, 1943, Table 120). All data with the exception of RCP are seasonally adjusted.[4]

The VAR models estimated are Sims-type models in which each variable enters each equation with the same lag length. Prior to specification and estimation of the VAR models, it is necessary to render the data stationary. Dickey-Fuller tests for first-order unit roots were performed to determine the appropriate transformation of the variables. These tests, which employed 12 lags, were performed over 1920:*i*–1941:*xii* and 1922:*vii*–1938:*vi*. The estimated test statistics are reported in Table 1. The tests indicate first-order unit roots for the logs of M1, M2, WPI, IP, and EXP, and for the levels of RCP and DEFFX.[5]

[4]The use of seasonally adjusted data was necessitated by the lack of a reliable seasonally unadjusted series for money. Burbidge and Harrison (1985) constructed a seasonally unadjusted series for M1 (currency plus demand deposits), but their series contains deposit data only for member banks of the Federal Reserve in 101 leading cities. The series in Table A-1 (Friedman and Schwartz 1963) are all seasonally adjusted, and, since the coverage of these series is more comprehensive than that of Burbridge and Harrison, it was decided to use the M1 and M2 series seasonally adjusted. A seasonally adjusted deficit series was constructed by seasonally adjusting federal expenditures and receipts from Table A-3 of Firestone (1960) and subtracting expenditures from receipts. The X-11 procedure was used to seasonally adjust expenditures and receipts and was also used to seasonally adjust WPI.

[5]Cointegration tests of the type suggested by Engle and Yoo (1987) were performed next. These tests also employed 12 lags and were estimated over both periods for both the 5- and 6-variable models. For the 1922:*vii*–1938:*vi* period there is no evidence of cointegration. For the 1920:*i*–1941:*xii* period, there is weak evidence of cointegration at the 5% level in the 5-variable M2 system and in both 6-variable systems only when IP is the dependent variable in the cointegrating regressions. Furthermore, based upon the suggestion of a referee, bivariate tests of cointegration between government expenditures and tax receipts were performed but revealed no evidence of cointegration of these variables over either sample period. This result suggests no tendency for long-run budget balance and is consistent with our finding of a unit root in the deficit. Details of the tests are available on request.

TABLE 1. *Unit Root Tests*

	Sample	
Variable	1920:*i*–1941:*xii*	1922:*vii*–1938:*vi*
LM1	−1.32	−2.78
LM2	−1.64	−2.37
RCP	−3.36	−2.42
LWPI	−2.88	−1.07
LIP	−1.88	−2.48
DEFFX	0.59	−1.80
LEXP	−1.10	−2.01

NOTES: The critical value of the test statistic is ≅ −3.44 and is taken from Table 8.5.2 of Fuller (1976). Twelve lags are employed in the tests, and a constant and a linear time trend are included in each regression.

The unit root tests indicate estimation of the models with first differenced data. However, because of concerns about the power of these tests (McCallum 1986), we also estimate the models in levels.[6] When the data are in levels, a linear time trend is included in each equation to induce stationarity. The levels models employ the log levels of M1, M2, IP, WPI, and EXP, and the levels of DEFFX and RCP. In all further discussion, the log levels of M1, M2, IP, WPI, and EXP are designated as LM1, LM2, LIP, LWPI, and LEXP. The first difference models employ the first differences of LM1, LM2, LIP, LWPI, LEXP, DEFFX, and RCP. Hereafter, the first difference variables are referred to as DLM1, DLM2, DLIP, DLWPI, DLEXP, DDEFFX, and DRCP.[7]

The appropriate lag length for each model was determined from a sequence of likelihood ratio tests. A maximum lag of 12 was considered and the likelihood ratio tests were computed in a manner consistent with Anderson (1971) with the correction suggested by Sims. The testing began with a comparison of a 12-lag model with an 11-lag model. If the null hypothesis that the twelfth lag were zero could not be rejected, the 11-lag model was tested against a 10-lag model. This procedure continued until the null hypothesis was rejected. For the first difference models, the optimal lag was 6 for all the 5-variable systems and 8 for all the 6-variable systems.

[6]Consideration of both the levels and difference models is also suggested by the weak evidence of cointegration in the IP equation for 1920:*i*–1941:*xii*.

[7]At the suggestion of a referee, the deficit equation in each system was checked for heteroskedasticity. Breusch-Pagan tests were employed, and no evidence of heteroskedasticity was found. Details are available on request.

With the data in levels, the optimal lag was 11 for all systems over the 1920:*i*–1941:*xii* period and 9 for all systems over the 1922:*vii*–1938:*vi* period.

4. Empirical Results

The effects of budget deficits are evaluated by computing likelihood ratio tests and by examining VDCs and IRFs. The likelihood ratio tests examine whether the deficit Granger-causes the other variables in the systems and are computed with the correction suggested by Sims. The null hypothesis in each test is that the coefficients on the deficit in a particular equation are jointly equal to zero. The VDCs show the proportion of forecast error variance for each variable that is attributable to its own innovations and to shocks to the other system variables. Since VDCs are based on the moving average representation of the VAR model, they capture both direct and indirect effects. Sims (1982) argues that VDCs can be used to measure the strength of Granger-causal relations. However, they provide no indication of the direction of those effects. The IRFs show the predictable response of each variable in the system to a one-standard deviation movement in one of the system's variables. The IRFs are analagous to dynamic multipliers. As such, they represent the predicted paths of the system's variables when one particular variable changes.[8]

Runkle (1987) has recently stressed the importance of providing estimates of the precision with which the VDCs and IRFs are computed. He points out that reporting VDCs and IRFs without estimating the associated standard errors is analogous to reporting regression coefficients without *t*-statistics. Thus, to provide some measure of the confidence that can be placed in the VDCs and IRFs, we generate estimates of the standard errors by a Monte Carlo integration technique similar to that described in Doan and Litterman (1986). Five hundred draws were employed in the Monte Carlo procedure.

It should be noted that, in calculating VDCs, the order in which the variables are included could be important. Since no contemporaneous terms enter the equations of the VAR, any contemporaneous relations among the variables are reflected in the correlation of residuals across equations. In the results we present, the variance-covariance matrix is orthogonalized by the Choleski decomposition. This is a numerical technique to get the same results

[8]Details of the derivation of the moving average representation and the computation of VDCs and IRFs are provided in Judge et al. (1988).

that would be obtained by running OLS with the specified ordering. Because of the cross-equation residual correlation, when a variable higher in the order changes, variables lower in the order are assumed to change. The extent of the change depends on the covariance of the variables higher in the order with those lower in the order. Thus, it is useful to examine several orderings.

The orderings considered are based on theoretical considerations,[9] and are the same for both levels and first difference models. Using the first difference notation, we place the financial sector block (DDEFFX, DRCP, and either DLM1 or DLM2) before the goods market block (DLIP, DLWPI). We contend that it is reasonable to order the financial variables before the goods market variables since financial market data are more quickly available and financial markets clear more rapidly. However, among the financial variables, it may be more difficult to justify any particular ordering, so we experiment with several orderings.

We initially chose the ordering DDEFFX, DRCP, DLM1 or DLM2, DLIP, DLWPI. In this ordering, DDEFFX precedes the money supply measures; this permits the monetary authority to respond to contemporaneous shocks in the deficit variable. The money supply measures also follow DRCP in keeping with a well-known debt monetization theory in which budget deficits drive up interest rates and crowd out private expenditures unless at least part of the newly issued debt is monetized by the Federal Reserve. Fed open market purchases designed to mitigate the upward pressure on interest rates will lead to increases in the money supply and thus in production and prices. We also experiment with an ordering of the financial variables as DDEFFX, DLM1 or DLM2, DRCP; in this case, changes in the money supply initially alter interest rates which in turn affect the goods market. Finally, we order the financial variables as DLM1 or DLM2, DDEFFX, DRCP; this ordering allows a contemporaneous response of deficits to monetary policy.

In the 6-variable systems, we use each of the three orderings of financial variables listed above and place the government expenditure variable, DLEXP, immediately before DDEFFX in each case.

[9]Bernanke (1986) suggests an alternative to the Choleski decomposition that also focuses upon theoretical considerations. To check the robustness of our results to Bernanke's criticism of the Choleski decomposition, a Bernanke-type structural VAR was estimated for 1 of the 16 systems. The VDCs and IRFs for this model are all within one standard deviation of those discussed later in the text. The program to estimate the structural VAR was provided by James S. Fackler. Details of the VAR estimation are available on request.

This is done on the assumption that contemporaneous shocks to DDEFFX are likely to result from shocks to DLEXP, while contemporaneous shocks to DLEXP are not likely to result from shocks to DDEFFX. However, since the results are quite similar across orderings, we only report the orderings DDEFFX, DRCP, DLM1 or DLM2, DLIP, DLWPI for the 5-variable systems and DLEXP, DDEFFX, DRCP, DLM1 or DLM2, DLIP, DLWPI for the 6-variable systems.

First Difference Models

The likelihood ratio test results for the first difference models are reported in Table 2A. The marginal significance level is reported in parentheses beside the estimated test statistics, and the degrees of freedom for the test are reported in brackets. No evidence of Granger-causality from the deficit to any variable is found for any model in either sample period.

The VDCs in the first difference systems are presented in Table 3 for the DLM1 definition of money and in Table 4 for the DLM2 definition. Since the paper focuses on the effects of deficits, only the point estimates of the proportions of the variation in the other system variables explained by innovations in DDEFFX (in the 5-variable systems) and in DLEXP and DDEFFX (in the 6-variable systems) are shown. The estimated standard errors are shown in parentheses next to the point estimates. The point estimates are judged to be "significant" if they are at least twice the estimated standard errors. The VDCs at horizons of 6, 12, 24, 36, and 48 months are presented to convey a sense of the dynamics of the systems.

In general, for all systems, the VDCs indicate that deficits have no major effects on the non-fiscal variables. When money is defined as DLM1, DDEFFX has no significant effect on any non-fiscal variable in either time period. However, when money is defined as DML2, DDEFFX does have a significant effect on DLIP, but only for the 5-variable system in the 1922:*vii*–1938:*vi* period. (See Table 4, column 4.) This effect is relatively small, however, with DDEFFX explaining only 9% of the forecast error variance of DLIP at the 12- and 24-month horizons. Even this small effect reflects an omitted variable problem. When DLEXP is included in the system, DDEFFX no longer has a significant effect on DLIP (Table 4, column 6.) For all the systems in which the variables are first differenced, DLEXP has significant effects on DLIP.

The IRFs are calculated for the deficit variable for all systems.

Due to the large number of systems involved, only a "representative sample" of these IRFs is shown in Figure 1, where the mean response from the Monte Carlo simulations is plotted as a dotted line and the solid lines represent a two standard deviation band around the mean. If the two standard deviation band includes zero, the effects are considered insignificant. The panels in Figure 1 show the effects on industrial production in the 5-variable systems where money is defined as M1. Figure 1A applies to first differences, 1920:*i*–1941:*xii*, and 1B applies to first differences, 1922:*vii*–1938:*vi*. In most cases, a shock to DDEFFX has no significant effects on the nonfiscal variables. In the cases where there are some significant effects on DLM1, DLM2, DLIP, and DLWPI (such as shown in Figures 1A and 1B), they are quite transitory.[10]

In summary, the likelihood ratio tests, VDCs, and IRFs all indicate little impact of the deficit on the macroeconomy in either period. However, it would be inappropriate to conclude from this evidence that the parameters of the models are the same over both sample periods. This proposition is tested using a likelihood ratio test similar to that described by Christiano (1986).[11] The results of

[10]In the 1920:*i*–1941:*xii* period, the only significant effects of a shock to DDEFFX are a negative effect on both DLM1 and DLM2 in month 9 (the 6-variable systems) and (in the 5-variable systems) a negative effect on DLIP in month 4 with both money definitions. Recall the DDEFFX is defined as receipts minus expenditures, so an increase in the actual budget deficit (decrease in DDEFFX) leads to transitory increases in the money supply and DLIP. The only significant effects in the 1922:*vii*–1938:*vi* period are negative effects on DLM1 and DLM2 in month 1 (the 6-variable systems), and (in the 5-variable systems) some brief negative effects on DLIP and DLWPI. A one standard deviation shock to DDEFFX has a negative effect on DLWPI in month 2 with both definitions of money, a negative effect on DLIP in months 3–4 when money is defined as DLM1, and a negative effect on DLIP in months 2–4 when money is defined as DLM2. Complete details on these results and all unreported results are available from the authors.

[11]This test involves estimating the system over 1920:*i*–1941:*xii* with and without interaction dummy variables. The interaction dummy variables are constructed by multiplying a 0–1 dummy times all the right hand side variables in each system. The 0–1 dummy takes on the value of 1 from 1920:*i*–1922:*vi* and 1938:*vii*–1941:*xii* and zero in the period 1922:*vii*–1938:*vi*. The test statistic

$$(T - C)(\log |DR| - \log |DUR|)$$

was formed where $|DR|$ = the determinant of the variance-covariance matrix of the restricted system, $|DUR|$ = the determinant of the variance-covariance matrix for the unrestricted system (system with dummy variables), C = the number of parameters in each unrestricted equation, and T = the number of observations in the sample period 1920:*i*–1941:*xii*. This statistic is distributed as X^2 with degrees of freedom equal to the number of restrictions. C is Sims's small sample correction.

TABLE 2. *Likelihood Ratio Tests*

A. First Difference Models

Model: DLM1

Equation	5-Variable 1920:*i*–1941:*xii*	5-Variable 1922:*vii*–1938:*vi*	6-Variable 1920:*i*–1941:*xii*	6-Variable 1922:*vii*–1938:*vi*
DRCP	4.52(0.60)[6]	2.42(0.88)[6]	5.45(0.71)[8]	8.93(0.35)[8]
DLIP	7.10(0.31)[6]	4.56(0.60)[6]	6.80(0.56)[8]	5.81(0.67)[8]
DLWPI	3.93(0.68)[6]	7.27(0.30)[6]	5.92(0.66)[8]	6.90(0.55)[8]
DLM1	1.54(0.96)[6]	2.31(0.89)[6]	7.85(0.45)[8]	9.73(0.28)[8]
DLEXP			3.62(0.89)[8]	4.31(0.83)[8]

Model: DLM2

Equation	5-Variable 1920:*i*–1941:*xii*	5-Variable 1922:*vii*–1938:*vi*	6-Variable 1920:*i*–1941:*xii*	6-Variable 1922:*vii*–1938:*vi*
DRCP	4.06(0.67)[6]	2.25(0.90)[6]	5.82(0.67)[8]	9.49(0.30)[8]
DLIP	8.70(0.14)[6]	6.50(0.37)[6]	6.65(0.57)[8]	3.47(0.90)[8]
DLWPI	4.33(0.63)[6]	9.01(0.17)[6]	5.69(0.68)[8]	6.15(0.63)[8]
DLM2	2.14(0.91)[6]	2.96(0.81)[6]	4.90(0.77)[8]	7.36(0.50)[8]
DLEXP			3.43(0.90)[8]	4.23(0.84)[8]

B. Levels Models

Model: LM1

	5-Variable		6-Variable	
Equation	1920:*i*–1941:*xii*	1922:*vii*–1938:*vi*	1920:*i*–1941:*xii*	1922:*vii*–1938:*vi*
RCP	7.24(0.78) [11]	7.31(0.60)[9]	9.11(0.61) [11]	10.78(0.29)[9]
LIP	23.00(0.02)*[11]	12.88(0.17)[9]	5.17(0.92) [11]	10.91(0.28)[9]
LWPI	15.58(0.16) [11]	10.88(0.25)[9]	8.16(0.70) [11]	10.94(0.28)[9]
LM1	9.52(0.57) [11]	2.20(0.99)[9]	23.77(0.01)*[11]	13.18(0.15)[9]
LEXP			7.10(0.79) [11]	9.55(0.39)[9]

Model: LM2

	5-Variable		6-Variable	
Equation	1920:*i*–1941:*xii*	1922:*vii*–1938:*vi*	1920:*i*–1941:*xii*	1922:*vii*–1938:*vi*
RCP	6.99(0.80) [11]	6.22(0.71)[9]	7.53(0.75) [11]	16.58(0.06)[9]
LIP	23.04(0.02)*[11]	14.22(0.11)[9]	6.45(0.84) [11]	10.18(0.34)[9]
LWPI	13.86(0.24) [11]	10.72(0.30)[9]	7.98(0.72) [11]	7.59(0.58)[9]
LM2	15.72(0.15) [11]	4.18(0.90)[9]	21.25(0.03)*[11]	11.58(0.24)[9]
LEXP			8.22(0.69) [11]	6.43(0.70)[9]

NOTE: *Indicates significance at the 5% level.

TABLE 3. *Variance Decompositions with DLM1*

		Explained by Innovations in					
Relative Variation in	*Months Later*	(1) DDEFFX 20:*i*–41:*xii*	(2) DLEXP 20:*i*–41:*xii*	(3) DDEFFX 20:*i*–41:*xii*	(4) DDEFFX 22:*vii*–38:*vi*	(5) DLEXP 22:*vii*–38:*vi*	(6) DDEFFX 22:*vii*–38:*vi*
DLEXP	6		94.5 (3.8)*	2.0 (2.4)		95.3 (4.2)*	1.4 (2.6)
	12		90.9 (4.7)*	2.4 (2.7)		91.9 (4.9)*	1.8 (2.7)
	24		90.0 (5.1)*	2.5 (2.8)		90.8 (5.5)*	1.8 (2.7)
	36		90.0 (5.3)*	2.5 (2.8)		90.6 (5.7)*	1.8 (2.7)
	48		90.0 (5.3)*	2.5 (2.8)		90.6 (5.8)*	1.8 (2.7)
DDEFFX	6	94.3 (3.5)*	57.5 (4.6)*	37.7 (4.5)*	93.5 (4.0)*	70.0 (5.3)*	24.1 (4.4)*
	12	92.1 (4.0)*	56.2 (4.7)*	36.7 (4.3)*	88.6 (4.8)*	67.5 (5.4)*	24.1 (4.2)*
	24	91.9 (4.0)*	55.5 (4.8)*	36.5 (4.2)*	88.2 (5.0)*	66.3 (5.6)*	23.6 (4.0)*
	36	91.9 (4.1)*	55.5 (4.9)*	36.5 (4.3)*	88.2 (5.0)*	66.2 (5.6)*	23.6 (4.0)*
	48	91.9 (4.1)*	55.5 (4.9)*	36.5 (4.3)*	88.2 (5.1)*	66.1 (5.7)*	23.6 (4.0)*
DRCP	6	1.3 (1.9)	2.0 (2.0)	2.1 (2.2)	0.5 (1.7)	1.7 (2.2)	2.3 (2.3)
	12	2.0 (2.1)	3.8 (2.2)	3.3 (2.8)	0.9 (1.9)	3.2 (2.6)	3.4 (2.5)
	24	2.2 (2.1)	4.0 (2.3)	4.0 (3.0)	1.0 (1.9)	3.7 (2.7)	3.7 (2.6)

	36	2.2 (2.2)	4.0 (2.3)	4.0 (3.1)	1.0 (1.9)	3.7 (2.8)	3.7 (2.6)
	48	2.2 (2.2)	4.0 (2.3)	4.0 (3.1)	1.0 (1.9)	3.7 (2.8)	3.7 (2.6)
DLM1	6	1.7 (1.8)	2.9 (2.0)	2.1 (1.9)	1.8 (2.4)	2.9 (2.5)	4.2 (2.5)
	12	2.6 (2.4)	5.9 (3.0)	5.3 (3.0)	2.7 (2.7)	5.8 (3.4)	5.1 (2.7)
	24	2.9 (2.6)	6.2 (3.6)	6.2 (3.6)	2.7 (2.7)	5.9 (3.3)	5.2 (2.8)
	36	2.9 (2.7)	6.2 (3.3)	6.2 (3.8)	2.7 (2.8)	5.9 (3.3)	5.2 (2.8)
	48	2.9 (2.7)	6.2 (3.3)	6.2 (3.9)	2.7 (2.8)	5.9 (3.4)	5.2 (2.9)
DLIP	6	4.5 (3.3)	7.0 (3.9)	2.5 (2.4)	6.4 (4.3)	6.3 (4.2)	2.1 (2.9)
	12	5.0 (3.4)	8.1 (3.5)*	4.3 (3.6)	6.9 (4.2)	11.0 (4.2)*	2.4 (2.6)
	24	5.1 (3.5)	8.9 (3.8)*	5.7 (3.9)	7.1 (4.3)	13.0 (4.8)*	2.7 (2.7)
	36	5.1 (3.5)	9.0 (3.8)*	5.7 (4.0)	7.1 (4.3)	13.4 (5.2)*	2.7 (2.7)
	48	5.1 (3.5)	9.0 (3.8)*	5.7 (4.0)	7.1 (4.3)	13.5 (5.4)*	2.7 (2.7)
DLWPI	6	1.5 (2.3)	3.4 (3.3)	1.0 (1.9)	4.0 (3.3)	5.4 (3.7)	2.4 (2.8)
	12	3.6 (3.8)	5.3 (4.2)	2.6 (3.3)	3.9 (3.3)	5.1 (3.4)	3.1 (2.7)
	24	3.9 (4.1)	5.6 (4.4)	4.0 (3.9)	3.8 (3.3)	5.4 (3.4)	3.3 (2.6)
	36	3.9 (4.1)	5.6 (4.4)	4.0 (4.0)	3.8 (3.3)	5.5 (3.5)	3.3 (2.7)
	48	3.9 (4.2)	5.6 (4.4)	4.0 (4.0)	3.8 (3.3)	5.5 (3.6)	3.3 (2.7)

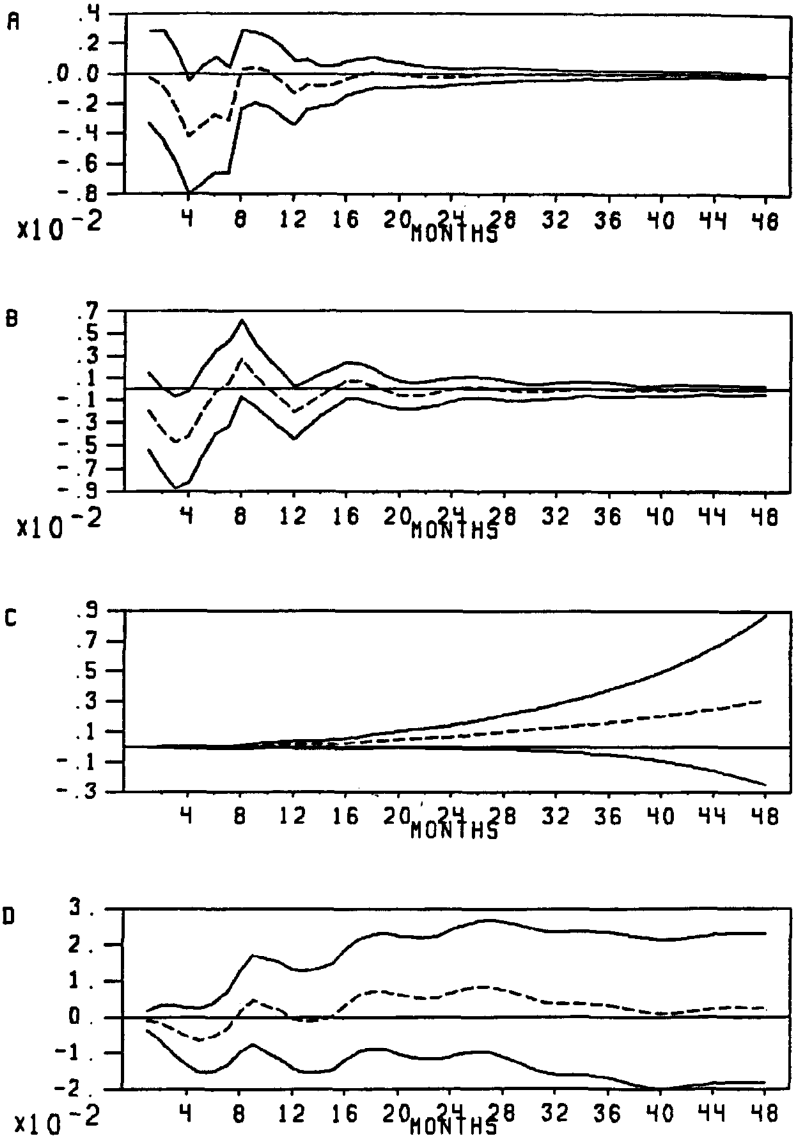
NOTE: *Indicates the point estimate is at least twice the estimated standard error.

TABLE 4. *Variance Decompositions with DLM2*

		Explained by Innovations in					
Relative Variation in	*Months Later*	(1) DDEFFX 20:*i*–41:*xii*	(2) DLEXP 20:*i*–41:*xii*	(3) DDEFFX 20:*i*–41:*xii*	(4) DDEFFX 22:*vii*–38:*vi*	(5) DLEXP 22:*vii*–38:*vi*	(6) DDEFFX 22:*vii*–38:*vi*
DLEXP	6		95.2 (3.5)*	1.8 (2.2)		95.9 (4.3)*	1.2 (2.3)
	12		91.6 (4.3)*	2.1 (2.4)		92.2 (5.6)*	1.6 (2.6)
	24		90.7 (4.8)*	2.2 (2.5)		91.2 (6.1)*	1.6 (2.6)
	36		90.7 (4.9)*	2.2 (2.5)		91.0 (6.3)*	1.6 (2.6)
	48		90.7 (5.0)*	2.2 (2.5)		91.0 (6.4)*	1.6 (2.6)
DDEFFX	6	94.5 (3.4)*	58.0 (4.5)*	37.2 (4.3)*	93.5 (4.2)*	70.4 (5.3)*	23.2 (4.2)*
	12	92.4 (3.8)*	56.7 (4.6)*	36.4 (4.3)*	88.8 (5.0)*	67.8 (5.6)*	23.2 (4.3)*
	24	92.2 (3.9)*	56.1 (4.8)*	36.2 (4.3)*	88.3 (5.2)*	66.7 (5.9)*	22.8 (4.2)*
	36	92.2 (3.9)*	56.1 (4.8)*	36.2 (4.3)*	88.3 (5.3)*	66.6 (6.0)*	22.8 (4.2)*
	48	92.2 (3.9)*	56.1 (4.8)*	36.1 (4.3)*	88.3 (5.3)*	66.6 (6.0)*	22.7 (4.2)*
DRCP	6	1.1 (1.8)	1.9 (1.9)	2.4 (2.4)	0.6 (1.6)	2.4 (2.3)	2.8 (2.4)
	12	1.8 (2.1)	3.8 (2.2)	3.7 (3.2)	1.1 (1.8)	3.9 (2.6)	3.9 (2.6)
	24	2.0 (2.1)	3.9 (2.2)	4.4 (3.3)	1.2 (1.9)	4.3 (2.7)	4.2 (2.6)

	36	2.0 (2.1)	3.9 (2.3)	4.4 (3.4)	1.3 (1.9)	4.4 (2.8)	4.1 (2.6)
	48	2.0 (2.1)	3.9 (2.3)	4.4 (3.4)	1.3 (1.9)	4.4 (2.8)	4.1 (2.6)
DLM2	6	1.4 (1.9)	1.6 (1.6)	1.7 (1.9)	1.5 (2.0)	1.5 (2.2)	4.8 (3.1)
	12	2.6 (2.5)	4.3 (2.4)	4.3 (3.3)	2.6 (2.5)	4.0 (2.6)	4.9 (2.8)
	24	3.1 (3.1)	5.1 (3.0)	5.0 (4.0)	2.9 (2.7)	4.7 (2.7)	4.6 (2.7)
	36	3.1 (3.1)	5.1 (3.2)	5.1 (4.2)	2.9 (2.8)	4.7 (2.8)	4.6 (2.8)
	48	3.1 (3.1)	5.1 (3.2)	5.1 (4.3)	2.9 (2.8)	4.7 (2.9)	4.6 (2.9)
DLIP	6	5.3 (3.7)	8.3 (3.8)*	2.6 (2.5)	8.7 (4.6)	7.8 (4.4)	0.8 (2.0)
	12	5.8 (3.6)	9.0 (3.4)*	4.3 (3.6)	9.0 (4.5)*	12.0 (4.6)*	1.1 (2.1)
	24	5.9 (3.7)	9.9 (3.6)*	5.7 (4.0)	9.3 (4.6)*	14.5 (5.2)*	1.4 (2.3)
	36	5.9 (3.7)	10.0 (3.7)*	5.7 (4.0)	9.3 (4.7)	15.1 (5.6)*	1.4 (2.4)
	48	5.9 (3.7)	10.0 (3.7)*	5.7 (4.1)	9.3 (4.7)	15.2 (5.7)*	1.3 (2.4)
DLWPI	6	1.6 (2.5)	3.8 (3.0)	0.9 (2.0)	5.2 (3.6)	5.8 (3.8)	2.3 (2.4)
	12	3.8 (3.8)	5.8 (4.3)	2.3 (3.0)	5.3 (3.6)	5.5 (3.5)	2.8 (2.3)
	24	4.0 (4.0)	6.1 (4.5)	3.3 (3.5)	5.3 (3.6)	6.0 (3.5)	2.9 (2.4)
	36	4.0 (4.0)	6.2 (4.6)	3.4 (3.6)	5.3 (3.7)	6.0 (3.5)	2.9 (2.4)
	48	4.0 (4.0)	6.2 (4.6)	3.4 (3.6)	5.3 (3.7)	6.0 (3.5)	2.9 (2.4)

NOTE: *Indicates the point estimate is at least twice the estimated standard error.


A
.4
.2
.0.0
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x10^-2
4 8 12 16 20 24 28 32 36 40 44 48
MONTHS
B
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x10^-2
4 8 12 16 20 24 28 32 36 40 44 48
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C
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4 8 12 16 20 24 28 32 36 40 44 48
MONTHS
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3.
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-1.
-2.
x10^-2
4 8 12 16 20 24 28 32 36 40 44 48
MONTHS

Figure 1.

this exercise are reported in Table 7A. We observe that the null hypothesis that the coefficients are the same for 1920:*i*–1941:*xii* and 1922:*vii*–1938:*vi* is rejected in each case.

Levels Models

Unlike the difference models, the choice of time period is of considerable importance in the levels models. The likelihood ratio tests for Granger-causality in the levels models are reported in Table 2B. In the 5-variable LM1 and LM2 models estimated over 1920:*i*–1941:*xii*, the deficit Granger-causes LIP. However, this Granger-causality disappears when government expenditures are added to the system. There does appear to be some Granger-causality from the deficit to money in the 6-variable systems estimated over 1920:*i*–1941:*xii*. In the 5- and 6-variable systems estimated over 1922:*vii*–1938:*vi*, there is no evidence of Granger-causality from the deficit to the other variables.

The VDCs in the levels models are presented in Table 5 for the LM1 definition of money and in Table 6 for the LM2 definition. When LEXP is not included in the systems, DEFFX appears to be the dominant variable at the 36- and especially 48-month horizons in the 1920:*i*–1941:*xii* period. While the estimated standard errors are also quite large, DEFFX significantly explains a surprisingly high 58% to 95% of the forecast error variances in RCP, LM1 or LM2, LIP, and LWPI at the 48-month horizon. (See column 1 in Tables 5 and 6.) When LEXP is added to the systems, the percentage of the forecast error variance attributable to DEFFX typically falls, although the figures still remain generally large and significant at the longer time horizons (column 3 in Tables 5 and 6). The combined effects of LEXP and DEFFX in explaining the four non-fiscal variables are extremely large. In sharp contrast to the longer time period, DEFFX has no significant effects on the non-fiscal variables in the 1922:*vii*–1938:*vi* period in either the 5- or 6-variable systems. Nor does LEXP have any significant effects on these variables.

A representative sample of IRFs for the levels models is shown in Figures 1C and 1D. These figures show the effects of DEFFX on LIP in the 5-variable systems with money defined as LM1 for 1920:*i*–1941:*xii* and 1922:*vii*–1938:*vi*, respectively. A one-standard deviation shock to DEFFX has no significant short- or long-run effect on LM1, LM2, RCP, LIP, or LWPI in the 1920:*i*–1941:*xii* time period. However, all results suggest a dynamic instability of the system (for example, see Figure 1C). These results cast further doubts

TABLE 5. *Variance Decompositions with LM1*

		Explained by Innovations in					
Relative Variation in	*Months Later*	(1) DEFFX 20:*i*–41:*xii*	(2) LEXP 20:*i*–41:*xii*	(3) DEFFX 20:*i*–41:*xii*	(4) DEFFX 22:*vii*–38:*vi*	(5) LEXP 22:*vii*–38:*vi*	(6) DEFFX 22:*vii*–38:*vi*
LEXP	6		95.7 (3.1)*	2.1 (2.2)		89.4 (4.2)*	1.9 (1.9)
	12		91.2 (5.7)*	1.9 (4.3)		76.4 (5.1)*	3.6 (2.5)
	24		90.6 (11.7)*	2.4 (11.1)		68.4 (6.6)*	3.7 (2.9)
	36		86.0 (15.0)*	3.4 (14.7)		64.2 (7.4)*	3.6 (3.5)
	48		65.2 (19.8)*	21.2 (15.1)		58.5 (8.2)*	3.4 (3.8)
DEFFX	6	96.3 (2.6)*	58.7 (6.3)*	37.6 (6.2)*	82.5 (5.3)*	61.7 (4.7)*	25.5 (3.5)*
	12	95.8 (3.9)*	63.6 (8.5)*	31.7 (8.4)*	78.6 (5.6)*	57.6 (4.7)*	26.4 (3.9)*
	24	95.9 (7.3)*	68.2 (11.8)*	25.3 (11.1)*	69.8 (6.9)*	50.2 (5.3)*	24.1 (4.1)*
	36	93.5 (11.5)*	68.3 (13.8)*	19.4 (12.5)	62.2 (8.3)*	44.5 (6.0)*	21.6 (4.5)*
	48	88.2 (16.9)*	53.7 (15.0)*	23.2 (12.9)	57.6 (9.5)*	40.9 (6.7)*	20.1 (5.0)*
RCP	6	0.9 (2.3)	0.7 (1.8)	0.1 (1.6)	2.7 (4.2)	1.3 (2.9)	2.6 (3.6)
	12	3.9 (7.4)	1.3 (4.1)	2.8 (6.1)	4.6 (6.5)	1.9 (4.1)	4.9 (5.6)
	24	10.8 (19.1)	11.6 (11.4)	39.7 (16.0)*	6.3 (7.6)	4.8 (5.6)	4.4 (6.2)

	36	26.3 (25.9)	35.5 (17.0)*	35.3 (13.8)*	6.1 (7.2)	4.8 (5.3)	4.7 (7.1)
	48	58.0 (27.5)*	32.8 (16.9)	27.5 (12.6)*	5.4 (6.8)	4.3 (5.1)	4.5 (7.4)
LM1	6	1.4 (2.5)	0.7 (1.8)	2.1 (3.1)	4.6 (4.5)	1.8 (2.8)	7.8 (4.8)
	12	1.0 (3.6)	0.7 (3.0)	1.9 (4.4)	3.5 (5.0)	1.4 (3.3)	7.8 (6.0)
	24	7.1 (14.0)	17.1 (10.9)	27.4 (13.2)*	1.2 (4.5)	0.5 (3.7)	2.8 (5.2)
	36	44.6 (26.8)	43.1 (13.9)*	42.5 (14.4)*	0.8 (5.3)	0.3 (4.3)	2.6 (7.4)
	48	79.5 (27.3)*	55.5 (14.7)*	37.9 (14.4)*	0.8 (6.0)	0.3 (4.6)	4.1 (9.5)
LIP	6	1.3 (2.3)	2.9 (3.1)	0.6 (1.8)	2.2 (3.5)	7.0 (5.3)	4.6 (4.3)
	12	5.5 (5.7)	2.6 (3.1)	5.5 (8.1)	1.4 (2.9)	3.7 (3.3)	2.5 (3.0)
	24	39.7 (19.0)*	14.4 (11.1)	15.7 (10.3)	2.2 (4.4)	3.8 (3.9)	1.7 (4.5)
	36	81.5 (19.4)*	43.4 (14.4)*	39.9 (12.9)*	2.8 (5.3)	3.4 (4.0)	5.0 (7.1)
	48	90.4 (16.9)*	56.4 (14.9)*	35.8 (13.9)*	2.7 (5.7)	3.3 (4.1)	6.1 (8.6)
LWPI	6	0.1 (1.4)	0.8 (1.9)	0.1 (1.4)	0.3 (1.8)	0.9 (2.3)	3.1 (3.6)
	12	0.2 (4.5)	1.6 (4.0)	6.2 (7.5)	0.5 (3.0)	0.3 (2.3)	3.2 (4.7)
	24	1.2 (14.5)	6.3 (11.9)	7.5 (10.9)	0.4 (4.4)	0.2 (3.4)	2.3 (6.3)
	36	22.9 (23.7)	23.8 (12.9)	39.2 (13.4)*	0.8 (5.5)	0.2 (3.9)	3.8 (9.0)
	48	63.4 (25.9)*	46.7 (14.4)*	43.2 (13.7)*	0.9 (6.1)	0.3 (4.4)	5.2 (10.4)

NOTE: *Indicates the point estimate is at least twice the estimated standard error.

TABLE 6. *Variance Decompositions with LM2*

		Explained by Innovations in					
Relative Variation in	*Months Later*	(1) DEFFX 20:*i*–41:*xii*	(2) LEXP 20:*i*–41:*xii*	(3) DEFFX 20:*i*–41:*xii*	(4) DEFFX 22:*vii*–38:*vi*	(5) LEXP 22:*vii*–38:*vi*	(6) DEFFX 22:*vii*–38:*vi*
LEXP	6		95.4 (3.2)*	2.9 (2.7)		92.6 (4.0)*	1.5 (2.0)
	12		90.4 (5.9)*	3.5 (5.0)		80.7 (5.0)*	2.7 (2.3)
	24		89.3 (10.1)*	6.0 (9.7)		74.6 (6.1)*	3.1 (2.5)
	36		89.7 (12.9)*	5.1 (12.0)		69.1 (6.9)*	3.0 (2.9)
	48		86.2 (14.0)*	4.6 (12.1)		62.0 (7.8)*	2.7 (3.6)
DEFFX	6	97.8 (2.2)*	61.7 (6.2)*	35.8 (6.1)*	83.5 (4.9)*	62.0 (4.6)*	24.7 (3.2)*
	12	96.8 (3.6)*	69.6 (8.1)*	27.5 (7.8)*	79.8 (5.2)*	57.9 (4.8)*	26.1 (3.7)*
	24	97.5 (5.7)*	79.4 (10.9)*	18.4 (9.8)	70.6 (6.3)*	49.7 (5.6)*	23.9 (4.3)*
	36	95.7 (9.0)*	82.7 (13.5)*	12.4 (11.1)	64.1 (7.6)*	44.8 (6.8)*	22.1 (5.4)*
	48	93.6 (12.7)*	75.3 (15.0)*	11.7 (12.3)	61.0 (8.8)*	42.1 (7.9)*	21.1 (6.6)*
RCP	6	1.7 (2.8)	0.6 (1.8)	1.1 (2.6)	2.5 (3.9)	0.2 (1.8)	4.9 (4.0)
	12	5.3 (7.3)	1.9 (4.7)	3.5 (6.7)	3.8 (5.4)	0.2 (2.6)	10.8 (7.1)
	24	6.1 (18.2)	2.5 (12.6)	9.6 (11.2)	5.9 (7.0)	1.5 (4.2)	10.0 (7.8)

	36	14.4 (26.4)	4.6 (18.9)	9.5 (10.0)	6.2 (7.4)	1.6 (4.4)	10.1 (8.8)
	48	58.9 (27.2)*	18.3 (20.2)	20.6 (11.6)	5.6 (7.5)	1.6 (4.8)	9.0 (9.3)
LM2	6	2.1 (2.8)	0.3 (1.6)	2.0 (2.8)	4.3 (4.8)	0.3 (1.6)	9.0 (5.4)
	12	2.2 (4.2)	0.6 (3.0)	2.1 (5.0)	2.9 (4.4)	1.3 (3.0)	11.8 (7.6)
	24	17.2 (16.9)	19.5 (13.7)	15.6 (11.1)	1.4 (4.5)	3.1 (5.1)	4.5 (6.5)
	36	77.6 (24.8)*	56.9 (16.8)*	27.2 (12.2)*	2.2 (6.4)	5.6 (7.0)	3.1 (7.0)
	48	94.6 (17.3)*	73.3 (14.9)*	22.1 (12.1)	3.5 (7.9)	5.8 (7.5)	6.2 (9.6)
LIP	6	4.6 (3.8)	6.2 (4.3)	0.6 (1.7)	5.8 (4.9)	10.0 (6.0)	3.2 (3.8)
	12	3.0 (3.6)	3.9 (3.7)	5.3 (7.7)	3.2 (3.6)	6.4 (4.0)	2.4 (3.5)
	24	29.3 (19.4)	11.6 (11.1)	15.0 (9.6)	5.1 (5.7)	9.1 (5.5)	1.5 (4.0)
	36	86.3 (20.2)*	53.8 (16.4)*	31.2 (11.4)*	7.0 (7.4)	8.9 (6.2)	6.3 (8.0)
	48	94.6 (14.6)*	72.4 (14.7)*	22.1 (11.5)	6.9 (7.9)	8.6 (6.2)	8.9 (10.4)
LWPI	6	0.5 (1.5)	0.9 (2.2)	0.1 (1.5)	1.0 (2.1)	2.2 (3.0)	2.3 (3.0)
	12	1.6 (4.3)	2.4 (4.5)	7.0 (8.1)	0.6 (2.9)	1.0 (2.6)	3.4 (4.6)
	24	6.4 (16.4)	13.9 (14.9)	7.5 (9.8)	1.6 (6.0)	1.8 (4.2)	2.8 (6.3)
	36	30.1 (23.8)	24.3 (15.6)	30.6 (12.0)*	3.6 (8.0)	2.5 (5.4)	6.0 (10.2)
	48	80.0 (21.6)*	58.6 (15.1)*	30.6 (11.6)*	4.3 (8.7)	2.4 (5.7)	9.8 (12.7)

NOTE: *Indicates the point estimate is at least twice the estimated standard error.

on the appropriateness of using 1920:*i*–1941:*xii* to represent the interwar period and point to the desirability of focusing on the shorter time period when studying fiscal variables. While there are a few significant effects on non-fiscal variables of a one-standard deviation shock to DEFFX in the 1922:*vii*–1938:*vi* period, these effects are minor and short-lived.[12]

Stability tests for the levels models are reported in Table 7B. These tests indicate instability at the 10% level for the 5-variable LM1 model and the 6-variable LM1 and LM2 models. Instability is indicated at the 11% level for the 5-variable LM2 models. When these tests are computed without Sims's correction factor (not reported in the table), all indicate instability. On the basis of the likelihood ratio tests, the VDCs, and the IRFs, we conclude that the coefficients of the levels models are not the same over the entire 1920:*i*–1941:*xii* period.

TABLE 7. *Stability Tests*

Model	χ^2 *Statistic*
A. First Difference Models	
1. 5 Variable DLM1	215.79 (0.00) [155]
2. 5 Variable DLM2	224.81 (0.00) [155]
3. 6 Variable DLM1	356.82 (0.00) [294]
4. 6 Variable DLM2	358.97 (0.00) [294]
B. Levels Models	
1. 5 Variable LM1	267.86 (0.06) [235]
2. 5 Variable LM2	262.17 (0.11) [235]
3. 6 Variable LM1	376.14 (0.06) [336]
4. 6 Variable LM2	373.10 (0.08) [336]

NOTES: Marginal significance levels are in parentheses beside the χ^2 statistic. The degrees of freedom are in brackets.

[12]The only significant effects on the money supply are negative effects on LM1 in month 1 (5-variable system) and in months 6 and 7 (6-variable system) and on LM2 in months 5–9 (6-variable system). There is also a significant positive effect of DEFFX on RCP in months 6–9 when money is defined as LM2 in the 6-variable system. With the exception of a significant negative effect on LIP in months 4–5 when money is defined as LM2 in the 5-variable system, there are no other significant effects on LIP (see, for example, Figure 1D) or LWPI.

5. Conclusions

A major conclusion of this study is the importance of representing the interwar period by a time span that excludes war-related government expenditures and focuses exclusively on a peacetime economy. While likelihood ratio tests, VDCs, and IRFs indicate little impact of the deficit in either 1920:*i*–1941:*xii* or 1922:*vii*–1938:*vi* in the difference models, there is evidence that the parameters of the models are not the same over both sample periods. The choice of time period is of considerable importance in the levels models. There is some evidence of Granger-causality from the deficit over the longer period, and when VDCs are computed, innovations in deficits account for extremely high and significant percentages of the variations in the non-fiscal variables at longtime horizons. When IRFs are calculated, however, shocks to deficits indicate no significant short-run or long-run effects on the non-fiscal variables and there is an indication that the systems are dynamically unstable. We therefore conclude that the shorter period is more appropriate for analyzing the impact of fiscal variables.

For both difference and levels models, our evidence indicates that deficits have no major effects on non-fiscal variables in 1922:*vii*–1938:*vi*. In only one case are VDCs significant, and this significance disappears when government expenditures are added to the system. The IRFs indicate, at best, only weak transitory effects of deficits on non-fiscal variables. As a whole, the results for deficits are roughly consistent with the predictions of the Ricardian equivalence hypothesis. Our results are broadly consistent with those studies using post–World War II data that find small or insignificant effects of deficits, with the earlier McMillin-Beard study of the interwar period, and with the results of Joines (for money) and Evans (for interest rates) for somewhat different time periods than ours.

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