The Effects of Proximate Determinants of the Money Supply in the Interwar Period*

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I. Introduction

Recent studies of the role of monetary policy in the interwar period and the Great Depression of 1929–33 typically focus on the money supply or the monetary base.[1] For several reasons, however, it is instructive to study the separate impact of money's three proximate determinants.

In this paper we focus on the interwar period and present empirical evidence on the importance of the three proximate determinants of the money supply in explaining fluctuations in output and prices. We define the interwar period as July 1922–June 1938 for reasons explained in Beard and McMillin [2].

As developed by Friedman and Schwartz [15] and extended by Cagan [10], changes in the M2 stock of money can be attributed arithmetically to changes in three proximate determinants—the monetary base, the ratio of currency to deposits (the currency ratio) and the ratio of reserves to deposits (the reserve ratio).[2] The three proximate determinants are affected by different economic forces or react differently to the same variables. Each is under the immediate control of different economic agents.

Changes in any one of the three proximate determinants can have, and have had, important effects on the stock of money. Cagan [10] analyzed in detail the contribution of changes in each of the three proximate determinants to cyclical fluctuations in the rate of change in the money stock over the long period 1877 to 1954. The base and the reserve ratio were each responsible for about one-fourth of these variations; the currency ratio was the most important single contributor, being responsible for roughly one-half of the variations. While the contribution of the currency ratio varied from cycle to cycle, major deviations occurred at times of financial panics when it often played a dominant role. Cagan found that the establishment of the Federal Reserve reduced the relative importance of changes in the reserve ratio and increased the relative importance of changes in the base. While the amplitude of cyclical movements in the reserve ratio fell after 1914 and the ratio itself trended downward, there was a sharp increase in the reserve ratio in the 1930s.

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1. See, for example, Sims [28], Gordon and Wilcox [16], Burbidge and Harrison [9], and Hamilton [17].

2. Friedman and Schwartz [15] actually used the monetary base (called high-powered money), the ratio of deposits to currency, and the ratio of deposits to reserves. Cagan [10] used the monetary base, the ratio of currency to the money supply, and the ratio of reserves to deposits.

A series of bank crises that raised both the currency and reserve ratios and resulted in a drastic decline in the money supply is the key ingredient in Friedman and Schwartz's [15] well-known explanation of the Great Depression. The roles of the currency and deposit ratios have been widely discussed, for example by Temin [30], Mayer [21], Boughton and Wicker [8], Wicker [32;33], and Trescott [31]. A considerable literature suggests a variety of other explanations for the Great Depression.[3] In an influential paper, Bernanke [3] argued that financial shocks had important nonmonetary effects on economic activity in addition to their shocks via the money supply. These shocks increased the cost of credit intermediation and led to a subsequent fall in output. In testing his hypothesis, Bernanke used the deposits of failed banks and the liabilities of failed businesses as joint proxies for the cost of financial intermediation. He also used the yield differential between Baa corporate and long-term Treasury bonds as a single proxy.[4] A recent study by Raynold, Beard and McMillin [23] that uses Bernanke's proxies also points to an important role for the nonmonetary effects of financial factors in explaining economic activity. Thus, it seems useful to include these proxies for the nonmonetary effects of financial shocks in systems that also include the three proximate determinants of the money supply. An interesting question is whether the currency and reserve ratios proxy the same economic forces proxied by Bernanke's variables. Following Barro [1], Rush [25;26], for example, considers the base multiplier as a suitable proxy for the level of financial intermediation in his studies of the gold standard era and the period 1920 to 1983.

In section II, we outline the empirical model used, and in section III we discuss our empirical procedures and results. The conclusions are summarized in section IV.

II. Model Specifications

We use monthly data for the interwar period in estimating and analyzing four vector autoregression (VAR) models from which we calculate variance decompositions (VDCs). These models share four variables: government expenditures, output, the price level and the interest rate. A five-variable model includes the money supply and a seven-variable model drops the money supply and includes the monetary base, the reserve to deposit ratio, and the currency to deposit ratio. An eight-variable model adds an interest rate differential as a proxy for the cost of financial intermediation, and a nine-variable model replaces the interest rate differential with the deposits of failed banks and the liabilities of failed businesses. Cumulative impulse response functions (CIRFs) are also calculated for the eight- and nine-variable systems.

The empirical counterparts to the model variables are as follows. The interest rate (*CPRATE*) is the 4–6 month yield on prime commercial paper which comes from *Banking and Monetary Statistics 1914–1941* (Board of Governors of the Federal Reserve System, 1943). The price level measure (*WPI*) is the wholesale price index and comes from the 1933, 1938, and 1943 editions of the *Statistical Abstract of the United States*. Output is measured by the industrial production index (*IP*) with 1977 as the base year. Data for *IP* are taken from the 1985 revision of *Industrial Production* (Board of Governors of the Federal Reserve, 1985). Money (*M2*) is Friedman and Schwartz's [15] measure of M2 and is taken from their Table A-1, as is the monetary base (*BASE*). Government expenditures (*EXP*) include purchases of goods and services and the small amount of transfer payments in our sample. Separate series on purchases and transfer payments were un-

3. For a review of this literature, see Bordo [7].
4. This variable has also been emphasized by Mishkin [22].

available. *EXP* is measured in billions of dollars and is taken from Firestone's [14] Table A-3, and are deflated by *WPI*. The currency ratio (*CURRT*) and reserve ratio (*RESRT*) are, respectively, the ratios of currency held by the public and bank reserves to adjusted deposits, all commercial banks. These ratios are the inverse of the ratios of adjusted deposits to currency held by the public and bank reserves from Table B-3 of Friedman and Schwartz [15]. The real value of the deposits of failed banks (*DEPFAIL*) is measured in millions of dollars and its nominal counterpart comes from various issues of the *Federal Reserve Bulletin*. The real value of the liabilities of failed commercial businesses (*LIABFAIL*) is measured in millions of dollars and its nominal version comes from various issues of the *Survey of Current Business*. In both cases, real values were obtained by deflating the nominal series with *WPI*. Following Bernanke [3], the yield differential (*FDIF*) is calculated as the fitted value of a regression of the difference (in percentage points) between the yields on Baa corporate and long-term U.S. government bonds on *LIABFAIL* and *DEPFAIL*. Bernanke argues that this purges the yield differential of financial market expectations of future declines in output because movements in *LIABFAIL* and *DEPFAIL* cannot reasonably be considered to be primarily due to anticipations of changes in future economic activity. The Baa and government bond yields are from *Banking and Monetary Statistics 1914–1941*.

Prior to specification and estimation of the VAR, augmented Dickey-Fuller tests were employed to check for first order unit roots. These tests suggested that first differences of the logs of *IP*, *WPI*, *EXP*, and *BASE* and the first differences of the levels of *CPRATE*, *CURRT*, *RESRT*, *FDIF*, *LIABFAIL*, and *DEPFAIL* should be used in specifying and estimating the model. Based upon the arguments of Engle and Granger [12], cointegration tests were also performed for the seven-, eight-, and nine-variable systems.[5] Since the evidence strongly weighed against cointegration, the system was estimated with differences of the variables.

The lag length employed in each model was 12 months. This length was chosen based upon application of Akaike's AIC criterion to the nine-variable model. Q statistics indicated the absence of any serial correlation in the residuals for any of the models for this lag length.[6]

III. Empirical Results

As indicated earlier, the effects of shocks to *BASE*, *RESRT*, *CURRT*, *FDIF*, *LIABFAIL*, and *DEPFAIL* are analyzed through computation of VDCs and CIRFs which, in turn, are based on the moving average representation of the VAR model and reflect both direct and indirect effects.

5. The lag length for the unit root and cointegration tests was determined using the criterion suggested by Schwert [27]. Cointegration tests of the sort suggested by Engle and Yoo [13] were performed. However, since Hansen [18] pointed out that the power of this test, as well as the test proposed by Johansen [19], falls substantially as the size of the system increases, Hansen's two-stage test was also employed. The power of Hansen's test is unaffected by the size of the system. The results from both the Engle and Yoo and Hansen tests strongly indicated the absence of cointegration. Only when the test equations were normalized on *EXP* was there any evidence of cointegration. In all other normalizations for both tests, no evidence of cointegration was found. Details of the tests are available on request.

6. The sensitivity of the results for lag lengths of 11 and 13 months was also checked, and the results from the five- and seven-variable models were always within one standard deviation of those in Table I. For the eight-variable model for a lag of 11 and the nine-variable model with a lag of 13, this was also true. For the eight-variable model for a lag of 13, most results were within one standard deviation of those in Table I; the only exceptions were the effects of *FDIF* on *WPI* which were slightly greater than one standard deviation but well within two standard deviations of those in Table I. For the 11 lag nine-variable model, most results were within one standard deviation of those in Table II; the only exceptions were the effects of *DEPFAIL* on *IP* which were slightly more than one standard deviation but well within two standard deviations of those in Table II.

The VDCs show the percent of the forecast error variance for each variable that may be attributed to its own innovations and to fluctuations in the other variables in the system. Consider the seven-variable system. The VDC for *IP* indicates the percent of the forecast error variance in *IP* accounted for by *BASE*, *RESRT*, and *CURRT* and the other variables in the system. This suggests that if *BASE*, *RESRT*, and *CURRT* are important determinants of movements in *IP*, they should explain a significant portion of the forecast error variance in *IP*. Moreover, Sims [29] has suggested that VDCs give an indication of the strength of Granger-causal relations that may exist between variables. Therefore, if *BASE*, *RESRT*, and *CURRT* explain a large and significant portion of the forecast error variance of *IP*, this could be interpreted as a strong Granger-causal relation.

The CIRFs indicate the size and direction of effect of a one-standard deviation shock to one of the system's variables on the other variables in the system. By computing CIRFs, we can examine the direction of effect of a shock to the variables in the system on the levels of *IP* and *WPI*. The value of the CIRF in any period is the sum of the effect of the shocks to a variable on another variable in the current and prior periods.

Since Runkle [24] has argued that reporting VDCs and IRFs without standard errors is similar to reporting regression coefficients without t-statistics, a Monte Carlo integration procedure like that described in Doan [11] is employed to estimate standard errors for the VDCs and CIRFs. One thousand draws are employed in the Monte Carlo procedure. For the VDCs, the estimates of the proportion of forecast error variance explained by each variable are judged to be significant if the estimate is at least twice the estimated standard error. For the CIRFs, a two-standard deviation band is constructed around the point estimates. If this band includes zero, the effect is considered insignificant.

Because the equations of the VAR contain only lagged values of the system's variables, it is assumed that the residuals of the VAR model are purged of the effects of past economic activity. Any contemporaneous relations among the variables are reflected in the correlation of residuals across equations. In this paper, the Choleski decomposition is used to orthogonalize the variance-covariance matrix. In this approach, the variables are ordered in a particular fashion, and, in this way, some structure is imposed in the computation of the VDCs and CIRFs. When a variable higher in the order changes, variables lower in the order are assumed to change. The extent of the change depends upon the covariance of the variables higher in the order with those lower in the order. Institutional and theoretical considerations guide our choice of ordering.[7]

The orderings initially examined are: *EXP*, *M2*, *IP*, *WPI*, *CPRATE*, for the five-variable system; *EXP*, *BASE*, *RESRT*, *CURRT*, *IP*, *WPI*, *CPRATE*, for the seven-variable system; *EXP*, *BASE*, *RESRT*, *CURRT*, *FDIF*, *IP*, *WPI*, *CPRATE*, for the eight-variable system; and *EXP*,

7. One alternative to the Choleski decomposition is the structural VAR approach of Bernanke [4]. In this approach the researcher commits himself to a particular structural model and employs the residuals from the VAR model in the estimation of the structural model. This allows the contemporaneous correlation of the VAR model residuals to be purged, and the residuals of the structural model are interpreted as fundamental shocks. However, as noted by Bernanke and Blinder [5], the results of this approach are generally sensitive to the specification of the model and to the restrictions imposed to identify the model. This is a particular problem since there is no general agreement on the most appropriate structural macro model. For this reason, we use an ordering for the Choleski decomposition which is consistent with the class of structural models in which there is no contemporaneous feedback from economic activity to the monetary base, the reserve and currency ratios, and the nonmonetary financial variables that proxy for the cost of credit intermediation.

Another alternative to the Choleski decomposition is recommended by Blanchard and Quah [6]. In this procedure, long-run constraints that are, in principal, consistent with alternative structural models are imposed in order to obtain estimates of fundamental shocks. Implementation of this procedure in models of the size estimated here is a formidable task and is beyond the scope of this paper.

BASE, *RESRT*, *CURRT*, *LIABFAIL*, *DEPFAIL*, *IP*, *WPI*, *CPRATE*, for the nine-variable system. *EXP* is placed first in the orderings based on the assumption that, while government spending decisions may respond to prior movements in other model variables, these spending decisions are independent of current shocks to the other variables in the system. The monetary variables are placed next in order, followed by the nonmonetary financial variables. In the five-variable model, and in the other models, the placement of *M2* and *BASE*, respectively, reflects the common assumption in the macro literature that monetary policymakers respond to movement in the other model variables only with a lag. In the models with *BASE*, the other determinants of the money supply follow *BASE*. The nonmonetary financial variables (*LIABFAIL*, *DEPFAIL*, and *FDIF*) are ordered prior to output and the price level based upon the following argument of Bernanke [3]. He notes that most bankruptcies result from prior movements in economic activity rather than from contemporaneous (or even anticipated future) movements in economic activity. He also argues that failures of banks are not generated in any simple way by current (or perhaps even past) movements in output. Instead, he argues that these failures are clustered around events often considered to be exogenous like the failure of the Bank of United States or Britain's leaving the gold standard. Accordingly, we place *LIABFAIL*, *DEPFAIL*, and *FDIF* prior to output and price.[8] These considerations lead us to focus initially on an ordering in which shocks to *BASE*, *RESRT*, *CURRT*, *FDIF*, *LIABFAIL*, and *DEPFAIL* have a contemporaneous effect on output, the price level, and the interest rate. *CPRATE* is placed last based on efficient market considerations. However, we later consider a more conservative ordering in which output, the price level, and the interest rate have contemporaneous effects on the determinants of the money supply and the nonmonetary financial variables.

The VDCs for *IP* and *WPI* are presented in Table I for the five-, seven-, and eight-variable models, and in Table II for the nine-variable model. The estimated standard errors are shown in parentheses below the point estimates. A * indicates the point estimate is at least twice the standard error. VDCs at horizons of 6, 12, 24, 36, and 48 months are shown in order to convey a sense of the dynamics of the system.

We observe in the five-variable model that *M2* significantly explains 25–26% of the variation in *IP* at horizons on 12 months or longer, but has no significant effects on *WPI*. In the seven-variable model, the three proximate determinants of the money supply replace *M2* (see columns 2–4). In this model the combined effects of *BASE*, *RESRT*, and *CURRT* on *IP* and *WPI* are larger than are the effects of *M2* in the smaller model (see column 5). This is especially true for *WPI* at the longer horizons. Both *BASE* and *CURRT* have significant effects on *IP* and *WPI* with the effects of *CURRT* on *IP* being more than twice the size of the effects of *BASE* at horizons of 12 months or longer.

8. We note a strong, negative contemporaneous correlation between the nonmonetary financial variables and *IP* and *WPI*. For example, in the nine-variable model, the contemporaneous correlations between *LIABFAIL* and *IP* and *WPI* are, respectively, −.25 and −.35, while for *DEPFAIL*, both correlations are −.35. For *FDIF*, the correlations are −.32 and −.29, respectively. These correlations are in the directions suggested by the arguments of Bernanke. However, as Raynold, Beard and McMillin [23] point out, the possibility that a negative shock to output might increase both bank and business failures in the current period cannot be ruled out. Consequently, consideration of an ordering in which there is contemporaneous feedback from output and the price level to *LIABFAIL*, *DEPFAIL*, and *FDIF* is suggested. We further note that the contemporaneous correlation between *CURRT* and *IP* ranges from −.23 to −.3 across the seven-, eight-, and nine-variable models while for *WPI* it ranges from −.29 to −.3. For *RESRT*, the contemporaneous correlation with *IP* is approximately −.25 in all models but ranges from .002 to .07 for *WPI*. Again, these correlations are in the directions suggested for negative real shocks. However, the possibility of contemporaneous effects from output and the price level to *CURRT* and *RESRT* cannot be totally ruled out. This is another reason for examining an alternative ordering in which there is contemporaneous feedback from output and the price level to *CURRT* and *RESRT*.

Table I. Variance Decompositions: Five-, Seven-, and Eight-Variable Models[a]

Variable	Horizon	Explained By Shocks To									
		M2 (1)	*BASE* (2)	*RESRT* (3)	*CURRT* (4)	*SUM1* (5)	*BASE* (6)	*RESRT* (7)	*CURRT* (8)	*SUM2* (9)	*FDIF* (10)
IP	6	14.4*	10.8*	3.1	12.1*	26.0	11.0*	3.2	13.5*	27.7	11.6*
		(4.4)	(4.4)	(2.2)	(3.7)		(4.1)	(2.2)	(3.9)		(4.4)
	12	25.4*	9.6*	4.2	20.5*	34.3	10.9*	4.7	18.2*	33.8	16.4*
		(6.2)	(3.8)	(2.5)	(5.1)		(3.6)	(2.9)	(4.8)		(5.0)
	24	26.0*	8.2*	5.9	19.5*	33.6	8.8*	5.9	15.8*	30.5	16.5*
		(6.5)	(3.5)	(3.2)	(5.0)		(3.3)	(3.4)	(4.6)		(4.5)
	36	26.3*	8.1*	6.6	18.9*	33.6	8.7*	6.3	15.1*	30.1	16.7*
		(6.8)	(3.5)	(3.5)	(5.1)		(3.4)	(3.7)	(4.6)		(4.5)
	48	26.3*	8.1*	7.0	18.8*	33.9	8.6*	6.9	15.2*	30.7	16.6*
		(7.0)	(3.5)	(3.7)	(5.3)		(3.5)	(4.1)	(4.7)		(4.5)
WPI	6	2.0	4.9	4.2	4.9	14.0	3.4	4.9	6.3*	14.6	10.2*
		(2.3)	(2.9)	(2.7)	(2.7)		(2.6)	(3.0)	(2.8)		(4.7)
	12	7.5	8.3*	5.4	12.1*	25.8	13.2*	4.5	11.0*	28.7	14.5*
		(3.9)	(3.9)	(3.4)	(4.5)		(5.0)	(2.9)	(3.8)		(5.1)
	24	7.8	9.9*	7.2	12.0*	29.1	13.4*	7.3	11.2*	31.9	13.2*
		(4.1)	(4.4)	(4.0)	(4.3)		(5.0)	(3.8)	(3.7)		(4.5)
	36	7.9	10.4*	7.2	11.7*	29.3	13.5*	7.8	11.2*	32.5	12.8*
		(4.4)	(4.6)	(3.9)	(4.5)		(5.1)	(4.2)	(3.9)		(4.3)
	48	8.0	10.3*	7.4	11.6*	29.3	13.2*	8.3	11.0*	32.5	13.1*
		(4.6)	(4.7)	(4.1)	(4.8)		(5.1)	(4.5)	(4.0)		(4.4)

a. Numbers in parentheses are standard errors. A * indicates that the point estimate is at least twice its standard error. *SUM1* = columns (2) + (3) + (4). *SUM2* = columns (6) + (7) + (8).

The eight-variable model adds *FDIF* to the variables in the seven-variable model (see columns 6–10). In general, the results support the view that nonmonetary financial factors have an important role in explaining aggregate economic activity. At the same time the sum of the impact of the three proximate determinants of the money supply on *IP* and *WPI* (see column 9) are quite similar to those in the seven-variable model. There is no indication that *FDIF* proxies the same economic forces as do *CURRT* and *RESRT*. Both *BASE* and *CURRT* continue to have significant effects on *IP* and *WPI* and the effects of *CURRT* on *IP* are almost twice the size of the effects of *BASE* at horizons of 12 months or longer.

The nine-variable model replaces *FDIF* with *LIABFAIL* and *DEPFAIL* (see Table II). Both joint proxies for the nonmonetary effects of financial factors have significant effects on *IP* and *WPI*, and their combined effects (column 7) are considerably larger than those of *FDIF* in the eight-variable model. Again, the results for the three proximate determinants of the money supply are quite similar to those reported earlier. *CURRT* continues to play an equally important, or more important, role than *BASE*.

The sensitivity of the results for *IP* and *WPI* to various modifications of our preferred ordering was also examined. One modification to the seven-, eight-, and nine-variable models was to reverse the positions of *RESRT* and *CURRT* since there is no strong rationale for placing one

Table II. Variance Decompositions: Nine-Variable Model[a]

Variable Horizon		Explained By Shocks To						
		BASE (1)	*RESRT* (2)	*CURRT* (3)	*SUM1* (4)	*LIABFAIL* (5)	*DEPFAIL* (6)	*SUM2* (7)
IP	6	11.0* (3.9)	2.6 (2.3)	11.0* (3.4)	24.6	8.6* (4.0)	12.2* (4.7)	20.8
	12	10.8* (3.6)	5.1 (3.1)	17.7* (4.0)	33.6	10.3* (4.4)	13.9* (4.2)	24.2
	24	8.7* (3.3)	6.5* (3.2)	17.0* (4.4)	32.2	12.8* (4.1)	15.2* (3.8)	28.0
	36	8.6* (3.4)	6.8* (3.4)	16.9* (4.3)	32.2	12.3* (4.2)	16.2* (4.0)	28.5
	48	8.4* (3.5)	8.2* (3.8)	16.9* (4.4)	33.5	12.1* (4.4)	16.2* (4.0)	28.3
WPI	6	4.4 (2.9)	2.0 (2.5)	6.6* (2.5)	13.0	14.9* (5.4)	8.9* (3.5)	23.8
	12	13.4* (5.0)	2.3 (2.6)	11.0* (3.7)	26.7	19.4* (6.0)	6.7* (2.7)	26.1
	24	13.5* (4.8)	5.1 (3.8)	11.9* (3.5)	30.5	17.4* (5.3)	8.6* (2.9)	26.0
	36	13.2* (4.6)	5.2 (4.0)	11.8* (3.6)	30.2	16.9* (5.3)	9.0* (2.9)	25.9
	48	12.8* (4.4)	6.0 (4.3)	11.5* (3.8)	30.3	17.4* (5.4)	8.9* (2.9)	26.3

a. Numbers in parentheses are standard errors. A * indicates that the point estimate is at least twice its standard error. *SUM1* = columns (1) + (2) + (3). *SUM2* = columns (5) + (6).

before the other. For the seven- and nine-variable models, all results were within one standard deviation of those in Tables I and II. For the eight-variable model, all results were within one standard deviation of those in Table I with the sole exception of the effect of *RESRT* on *IP* at a horizon of 6 months. This effect was slightly greater than one standard deviation, but well within two standard deviations, of the value in Table I. A second modification placed *FDIF* or *LIABFAIL* and *DEPFAIL* before *BASE* in the preferred ordering. For the eight-variable model, all results were within one standard deviation of those in Table I. For the nine-variable model, this was also true with the exception that the effects of *CURRT* on *IP* were all within two standard deviations of those in Table II at horizons of 24, 36, and 48 months. The same pattern emerged when *FDIF* or *LIABFAIL* and *DEPFAIL* were placed after *BASE* but before *RESRT* and *CURRT* in the preferred ordering. Finally, when *DEPFAIL* was placed before *LIABFAIL* in the preferred ordering for the nine-variable model, all results were within one standard deviation of those in Table II.

A more conservative test of the impact of monetary and nonmonetary financial variables would be to place them last in the orderings. Since all contemporaneous correlation between these variables and the other variables is credited to the other variables, the monetary and nonmonetary financial variables are placed in the least favorable position. These orderings are consistent with

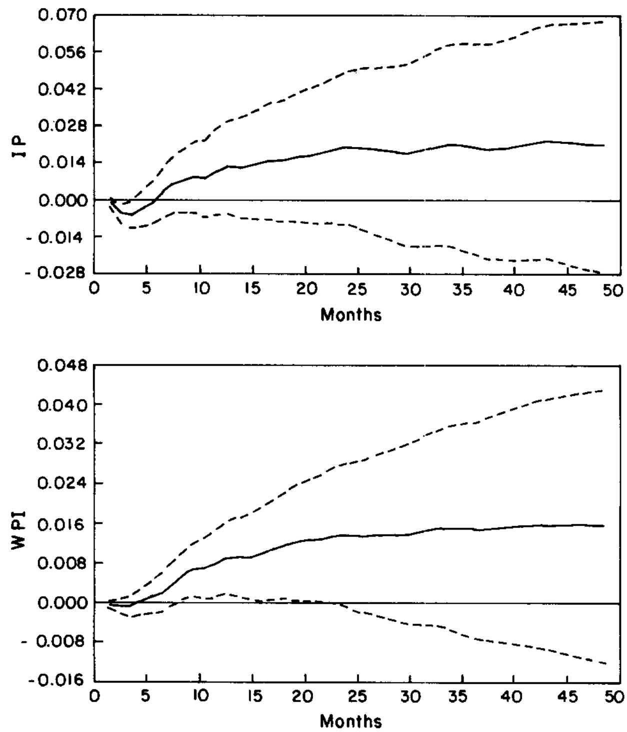

Figure 1. CIRFs for a shock to *BASE*

the set of structural models in which there is contemporaneous feedback from the other model variables to the monetary and nonmonetary financial variables. Our orderings in the four models are: *EXP*, *IP*, *WPI*, *CPRATE*, *M2*; *EXP*, *IP*, *WPI*, *CPRATE*, *BASE*, *RESRT*, *CURRT*; *EXP*, *IP*, *WPI*, *CPRATE*, *BASE*, *RESRT*, *CURRT*, *FDIF*; *EXP*, *IP*, *WPI*, *CPRATE*, *BASE*, *RESRT*, *CURRT*, *LIABFAIL*, *DEPFAIL*. Most results for the proximate determinants of the money supply are within one standard deviation of those reported in Tables I and II; in a few remaining cases, the results are within two standard deviations.[9] Thus, allowing a contemporaneous response of the proximate determinants of the money supply to *IP*, *WPI* and *CPRATE* does little to change the overall importance of the monetary variables or the importance of *CURRT* relative to *BASE*. Placing the nonmonetary financial variables last, however, does reduce their importance appreciably. Still, shocks to *FDIF* significantly explain 9–11% of the variation in *IP* and 6% of the variation in *WPI* at horizons of 12 months or longer. Shocks to both *LIABFAIL* and *DEPFAIL* continue to have significant effects, and their combined effects explain 18–20% of the variation in *IP* and 14–15% of the variation in *WPI* at horizons of 24 months or longer.

While VDCs can be used to measure the strength of Granger-causal relations, they provide no indication of the direction of those effects. CIRFs are calculated using our preferred orderings for the eight- and nine-variable systems. Since the results are qualitatively similar in the two systems, only those for the nine-variable system are shown. The CIRFs reported in Figures 1–5

9. In the eight-variable model the results are within two standard deviations for the impact of *CURRT* on *IP* at the 6 and 12 month horizons and the impact of *RESRT* on *IP* at the 6 month horizon. In the nine-variable model the results are within two standard deviations for the impact of *CURRT* on *IP* at horizons of 12 months or longer.

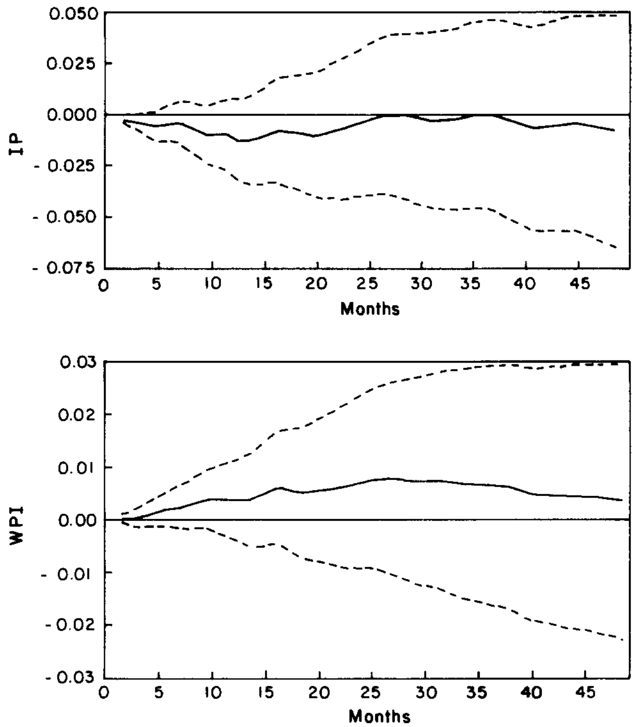

Figure 2. CIRFs for a shock to *RESRT*

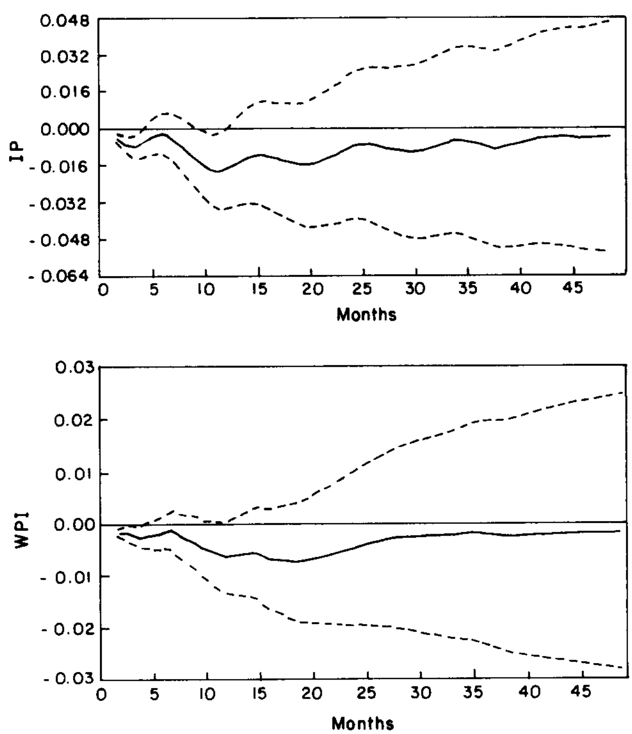

Figure 3. CIRFs for a shock to *CURRT*

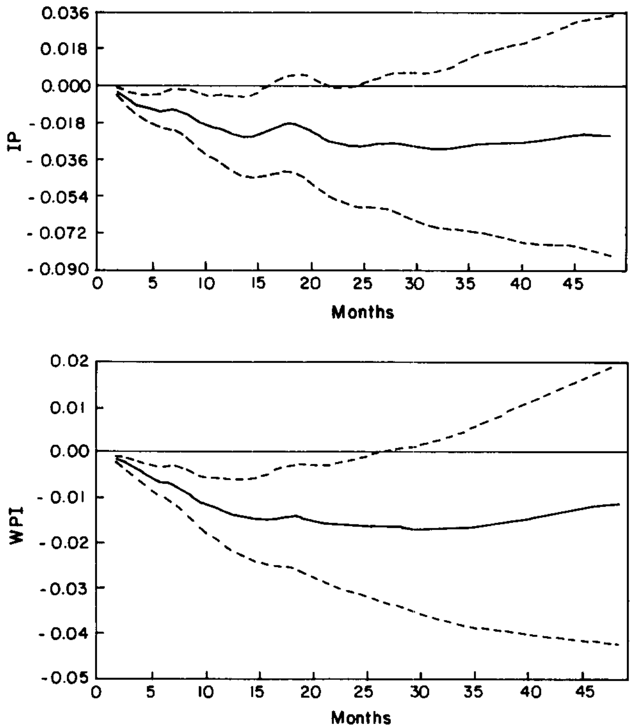

Figure 4. CIRFs for a shock to *LIABFAIL*

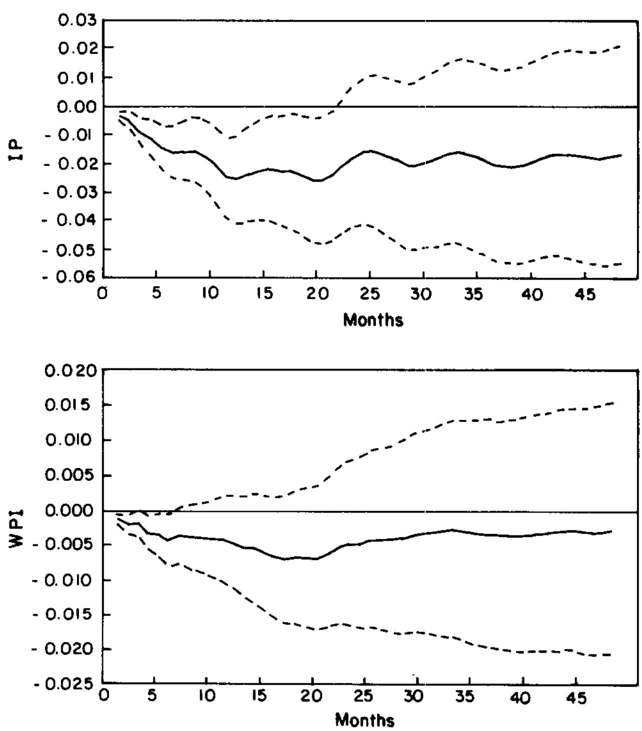

Figure 5. CIRFs for a shock to *DEPFAIL*

indicate the size and direction of effect of a one-standard deviation shock to the growth rate of *BASE* or the change in *RESRT*, *CURRT*, *LIABFAIL*, and *DEPFAIL* on the levels of *IP* and *WPI*.

A shock to *BASE* raises both *IP* and *WPI* following initial declines. This positive effect is significantly different from zero for *WPI* at horizons of 8–21 months. A shock to *RESRT* reduces *IP* and raises *WPI*, but these effects are not statistically significant except for *IP* at the initial two horizons. A shock to *CURRT* reduces both *IP* and *WPI*. These effects are statistically different from zero at horizons of 1–4 and 9–12 months for *IP* and 1–4 months for *WPI*. Shocks to *LIABFAIL* and *DEPFAIL* have significant and long-lived effects in reducing both *IP* and *WPI*. In the case of *LIABFAIL*, these effects are significant for *IP* at horizons of 1–15 and 22–24 months and for *WPI* at horizons of 1–27 months. In the case of *DEPFAIL*, the effects are significant for *IP* at horizons of 1–21 months and for *WPI* at horizons of 1–7 months.

IV. Conclusions

This paper focuses on the interwar period and employs vector autoregressions to estimate the "average" impact on output and prices of the three proximate determinants of *M2* and proxies for the nonmonetary effects of financial factors. In general, the results indicate the currency ratio is usually more important than the base, especially with regards to output, while the reserve ratio is of less importance. Nonmonetary financial factors also have an important impact on output and prices.

Variance decompositions indicate that the combined effects of the three proximate determinants on output and prices in a seven-variable model are larger than those of *M2* in a five-variable model. These combined effects of the proximate determinants are changed little when proxies for the nonmonetary effects of financial factors are added in eight- and nine-variable systems. The latter results suggest that the significant impact of the currency ratio is due largely to changes in deposits and money rather than to changes in the cost of credit intermediation.

Cumulative impulse response functions indicate the importance of shocks to the base in raising prices, and shocks to the currency ratio in reducing both prices and output. It is important to note that the base appears to be neutral since shocks to the base have only transitory effects on output. The importance of nonmonetary financial shocks in reducing the levels of both output and prices is also evident.

Rather than focusing narrowly on the money supply or the monetary base during the interwar period, our results point to the importance of considering the separate effects of each of the three proximate determinants of money, and to the important role of nonmonetary financial factors, as emphasized by Bernanke. The importance of the currency ratio in this period is not inconsistent with the findings of Manchester [20], who used VARs to study the post-war period.

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