Volume Title: The Channels of Monetary Effects on Interest Rates

Volume Author/Editor: Philip Cagan

Volume Publisher: NBER

Volume ISBN: 0-87014-235-6

Volume URL: http://www.nber.org/books/caga72-1

Publication Date: 1972

Chapter Title: A Test of the Credit and Portfolio Effects

Chapter Author: Philip Cagan

Chapter URL: http://www.nber.org/chapters/c3478

Chapter pages in book: (p. 61 - 80)

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A Test of the Credit and Portfolio Effects

DEFINITION OF CREDIT AND MONEY

According to the credit theory of money, the growth of bank credit, for which growth of the total money stock is simply a good proxy, is the source of monetary effects on interest rates. The test presented in this chapter is based upon distinguishing the contribution of an expansion of credit from that of other components of monetary growth. Regression analysis is then used to estimate their separate effects on interest rates.

On the consolidated balance sheet of the monetary system, credit is represented by net earning assets—funds lent to the public. Currency issues and deposits are monetary liabilities. For individual banks, changes in total credit and deposits are closely related, though not identical because other items enter the two sides of the balance sheet. In the aggregate, changes in the money stock and in the net earning assets of banks and the government are generally not closely related.

Table 4-1 shows how the credit items are related to the money stock in a condensed balance sheet. Nonfinancial assets and liabilities are omitted. The money stock in the hands of the public comprises deposits with commercial banks (16) plus currency outside banks (lines $6 + 9 - 13$).[1] Credit supplied to the public by the monetary system is represented by net earning assets (lines $2 + 14 + 15 - 10$). In a com-

[1] The minor amount of Treasury currency in vaults of Federal Reserve banks can be treated as a deduction from Federal Reserve notes outstanding.

plete consolidation of the Federal Reserve and the Treasury with commercial banks, certain items cancel: loans to banks (3 and 19), member bank reserves (4 and 11), interbank deposits (12 and 17), and Treasury deposits (7 and 8 against 5 and 18). The remaining item

TABLE 4-1

Condensed Balance Sheet of Monetary and Credit Items of Federal Reserve Banks, U.S. Treasury, and Commercial Banks

Assets	Liabilities
A. Federal Reserve Banks	
1. Gold reserve	Deposits of:
Earning assets:	4. Commercial banks
2. Securities	5. U.S. Treasury
3. Loans to banks	6. Net Federal Reserve notes outstanding
B. U.S. Treasury	
Deposits with:	
7. Federal Reserve Banks	9. Net currency outstanding[a]
8. Commercial banks	10. Securities outside government agencies
C. Commercial Banks	
Deposits with:	Deposits (less bank float) of:
11. Federal Reserve Banks	16. Public
12. Other commercial banks	17. Other commercial banks
13. Vault cash	18. U.S. Treasury
Earning assets:	19. Due to Federal Reserve banks
14. Loans	
15. Investments	

Monetary liabilities = 6 + 9 − 13 + 16
Net earning assets
Consolidated monetary system = 2 + 14 + 15 − 10
Banking system excluding Treasury = 2 + 14 + 15
Federal Reserve banks = 2 + 3
Commercial banks = 14 + 15 − 19

[a] Including note liabilities of national banks before the notes were retired in 1935.

shown, the gold reserve (1), represents the reserves of the monetary system under the international gold standard.

The money stock and net earning assets are not identical. The difference is due not only to the noncanceling gold reserve but also to the numerous nonfinancial items not shown. Thus, gold flows stem from the international payments mechanism, only part of which entails debt issue; Treasury deposits help absorb short-run discrepancies between federal budget receipts and expenditures and trust funds, whose operations only in part involve credit transactions with the public; and other liabilities of the banking system represent a miscellany of operations which can affect the money stock and earning assets differently.

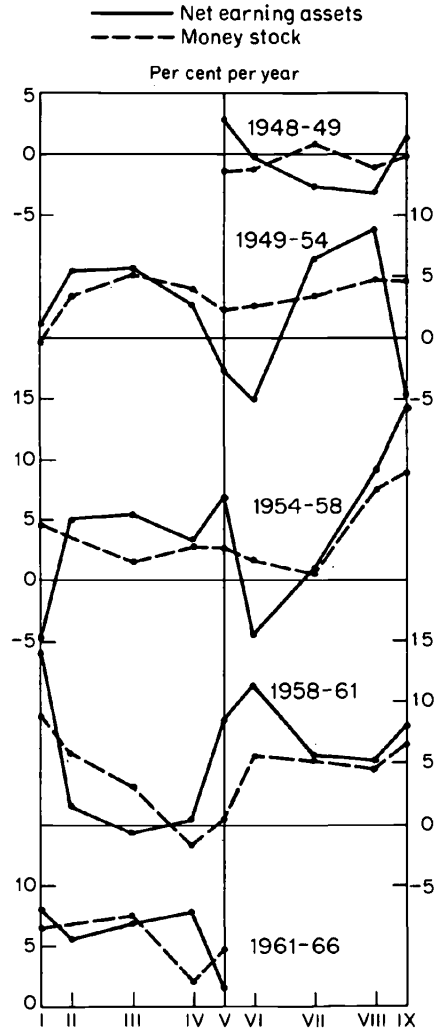
Loans made by the Treasury under various federal programs are not included in the credit total. Such loans are treated as though they were ordinary expenditures, as many of them are. In recent years Treasury lending has increased sharply through such agencies as the Federal National Mortgage Association (which was made a private corporation outside the federal budget in 1968). Fortunately, they are not important for the period covered here, and their exclusion can be passed over.

The Treasury could be excluded altogether (except for adding Treasury currency—line 9—to Federal Reserve notes—line 6); the effect of that alternative treatment will be discussed later. But deducting Treasury securities outstanding—line 10—from the earning assets of the banking system seems desirable in order to allow for transactions between the Treasury and the banking system which have no effect on the public. For example, if the Treasury sells a bond to commercial banks and deposits the proceeds in one of its commercial bank accounts, the money stock and the borrowing of the public are unaffected by the bookkeeping of this transaction; yet investments and the total credit of banks have increased. If we deduct Treasury securities outstanding, however, total credit available to the public is unchanged, as is proper. A similar example could be given involving bond transactions between the Treasury and the Federal Reserve.

In this treatment of Treasury debt operations, it is also true that a budget deficit financed by selling bonds to the public reduces total credit available to the public without affecting the money stock. Such

CHART 4-1

Reference Cycle Patterns of Growth in the Money Stock and in Net Earning Assets of the Consolidated Monetary System, 1948–66



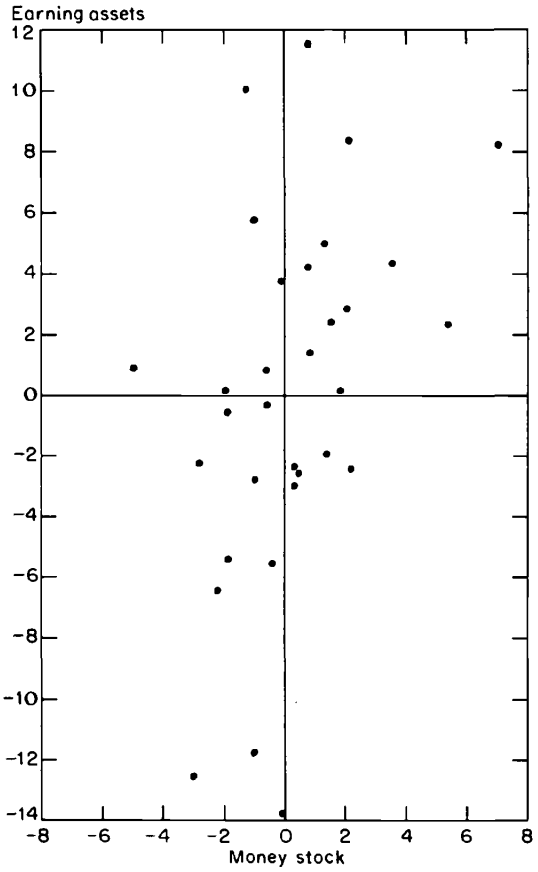
Source: Data appendix. For definition of variables, see Table 4-1.

debt operations contribute to differences between changes in money and in credit.

Chart 4-1 shows reference cycle patterns of monthly changes in net earning assets and the money stock as defined above, both expressed as percentages of the money stock. The chart covers the period since

CHART 4-2

Comparison of Growth in the Money Stock and in Net Earning Assets of the Consolidated Monetary System, Changes Between Reference Cycle Stages, 1948–66
(change in per cent per year)



Source: Data appendix. For definition of variables, see Table 4-1.

1948 for which monthly data for all commercial banks are available. The patterns are certainly highly similar, as we might expect, but the movements are not identical. The degree of covariation is shown by Chart 4-2, a scatter diagram of the stage-to-stage changes in each series. The correlation coefficient for the scatter is .42, indicative of considerable divergence. This shows that it is possible to distinguish the two variables statistically.

REGRESSION TEST OF THE TWO SOURCES OF MONETARY GROWTH

Conceivably we observe monetary growth to be associated with interest rates simply because it approximates, however imperfectly, the growth in credit. Interest rates depend upon the growth of credit insofar as the first-round effects of extending credit are important, and on growth of the total money stock insofar as money creation itself is important. A regression equation to test these effects is

$$i = \beta(dE) + \mu(dM - dE), \tag{1}$$

where i is the interest rate, E is net earning assets of the monetary system, M is the money stock as defined above, and d denotes changes in the variables. β and μ are coefficients: their value is a measure of the effect of monetary growth due to credit expansion (β) and all other sources (μ). Theoretically, β and μ may be zero or negative. If μ is zero, the residual sources have no effect on interest rates, and the entire effect of monetary growth can be attributed to credit effects. If both coefficients are negative and equal, the two sources of monetary growth have the same effect on interest rates. Credit expansion then plays no separate role, and the entire effect can be attributed to the portfolio effect as described in Chapter 1. For credit to have a separate additional effect, $\beta - \mu$ must be significantly negative.[2]

In the remainder of this chapter, estimates of these coefficients are presented.

[2] If $\beta - \mu$ were significantly *positive*, it would mean that monetary growth had less effect on interest rates when produced through credit expansion. This would not be consistent with either the credit or the portfolio theory.

PROBLEMS OF THE DATA

To estimate equation 1, the series on monetary growth used in the previous chapter were supplemented by data on the earning assets of the monetary system. Monthly Federal Reserve earning assets exclusive of loans to banks have been reported since 1914, and a monthly series for Treasury securities outstanding was also available. Asset data for all commercial banks, unfortunately, were not available on a monthly basis before World War II. There were data for all commercial banks annually since 1896 and monthly since 1948. The only earlier monthly data pertained to weekly reporting member banks since 1919. Reporting member banks have accounted for about half of total earning assets of all commercial banks.

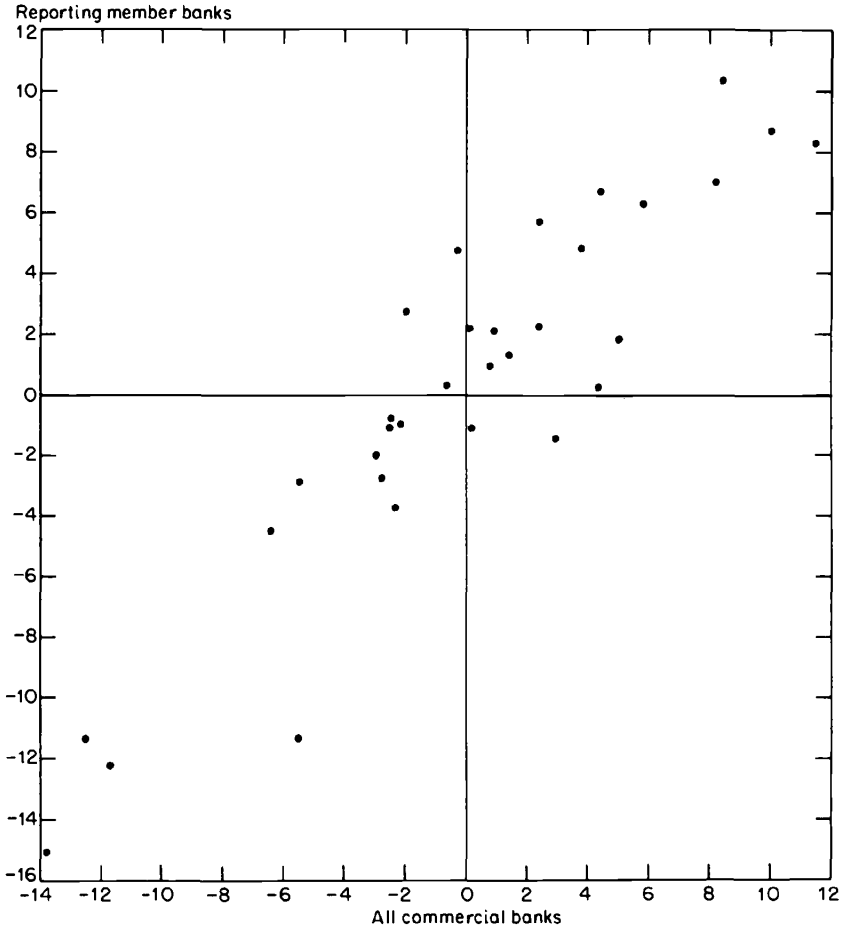
Using reporting member banks to represent all commercial banks tends to reduce the size and significance of the coefficient of the credit variable. We may assess the size of the misrepresentation from Chart 4-3. The chart presents a scatter diagram of the stage-to-stage changes in credit growth, as used in the subsequent regressions, of all commercial banks and of reporting member banks for 1948–66, which the former data cover. The correlation coefficient is .92. It is high, both because reporting member banks are a good proxy for all commercial banks and because commercial banks contribute only one part of total credit along with the Federal Reserve and the Treasury. Since it exceeds the .42 correlation between credit and monetary growth for the same period (Chart 4-2), it suggests that the series for reporting member banks can be run with the money series to distinguish satisfactorily the effects on interest rates of credit and monetary growth. The statistical analysis therefore uses the reporting member bank data for the period since 1919. The errors due to misrepresentation are probably not negligible, however, so the series for all commercial banks, though available monthly only since 1948 and prior to that only annually, is also used in separate regressions as a check on the proxy series. Actually, the different data give similar results.

STATISTICAL RESULTS

Table 4-2 presents the three sets of regressions. To express the independent variables as growth rates, they have been divided by the

CHART 4-3

Growth in Net Earning Assets of the Consolidated Monetary System, Comparison Using Weekly Reporting Members and All Commercial Banks, Changes Between Reference Cycle Stages, 1948–66
(change in per cent per year)



Source: Data appendix. For definition of variables, see Table 4-1.

money stock. Thus, equation 1 becomes

$$i = \beta(dE/M) + \mu[dM/M - dE/M]. \quad (2)$$

The regressions of reference cycle stages exclude, as before, the war contractions and 1929–33, and the regressions of annual data also exclude all the war years 1940–46. The monetary and credit changes are so large during those years that their inclusion would dominate the annual regressions. The war years are unimportant in the reference stage regressions and need not be excluded, since they affect only part of one reference expansion. The regressions including dummy variables for cycle stages (as described in the appendix to Chapter 3) are discussed later.

All the regressions were made comparable to those in the previous chapter by taking *first differences* of equation 2 and adding a constant term not given in the table (see the note to Table 4-2). The dependent variable, therefore, is the stage-to-stage or annual change in the level of interest rates, and the independent variables are stage-to-stage changes in the average monthly rate of change (as in Chart 4-2) or year-to-year changes in the annual rate of change. The unit of measurement for the interest rates is the change per stage or per year in basis points (one hundredth of a percentage point); for the independent variables, it is the change per stage or per year in the monthly or annual rate of change, all expressed as the change in an annual percentage rate. A regression coefficient of −10, say, indicates that an increase of one percentage point in the annual growth rate would reduce interest rates by ten basis points.

In all the regressions the credit effect on interest rates (as indicated by the negative value of the difference between the coefficients) is generally from about 10 to 40 per cent of the effect of monetary growth given by μ. The only larger credit effects are shown by two of the regressions for corporate and municipal bonds and two for annual changes in government securities. But in general the differences are not statistically significant (their t values are nearly all less then 2.0).

The large credit coefficient for corporate and municipal bond yields in the 1948–66 period is anomalous and may be disregarded since its statistical significance is low. The relatively large credit coefficients for bill and bond yields in the annual changes, however, can be given

TABLE 4-2

Relation Between Interest Rates and Two Sources of Monetary Growth, Consolidated Monetary System Including Treasury, 1919–66 and 1948–66

Interest Rate and Period[a]	Partial Regression Coefficient[b] Credit Expansion[c] (β)	Residual Monetary Growth (μ)	$(\beta - \mu)$[d]	Inclusion of Stage Dummy Variables	R
	Changes Between Reference Cycle Stages				
1919–66					
Commercial paper	−5.2	−4.3(3.4)	−0.9(1.1)	NO	.43
	−5.0	−4.4(3.8)	−0.6(0.9)	YES	.67
Treasury bills	−6.2	−4.4(3.3)	−1.8(2.0)	NO	.49
	−6.3	−5.0(4.4)	−1.2(1.7)	YES	.75
U.S. bonds	−2.2	−2.1(4.0)	−0.1(0.3)	NO	.45
	−2.1	−2.1(3.7)	−0.0(0.1)	YES	.55
Corp. and municipal bonds	−2.9	−2.5(1.3)	−0.4(0.3)	NO	.17
	−1.7	−1.3(0.6)	−0.4(0.3)	YES	.34
1948–66					
Commercial paper	−12.7	−12.4(3.1)	−0.3(0.2)	NO	.55
	−6.7	−5.6(2.1)	−1.2(1.2)	YES	.90
Treasury bills	−13.7	−13.3(3.3)	−0.5(0.3)	NO	.58
	−8.2	−6.9(2.6)	−1.3(1.3)	YES	.91
U.S. bonds	−3.8	−3.7(2.5)	−0.1(0.2)	NO	.47
	−1.6	−1.2(1.3)	−0.4(1.2)	YES	.90
Corp. and municipal bonds	−12.1	−10.3(1.2)	−1.8(0.5)	NO	.28
	−4.8	−1.8(0.2)	−3.0(0.8)	YES	.56
		Annual Changes			
1919–66					
Commercial paper	−9.4	−7.9(3.0)	−1.5(0.6)	NO	.68
Treasury bills[e]	−11.5	−7.0(2.6)	−4.4(1.4)	NO	.60
U.S. bonds	−3.0	−0.6(0.5)	−2.4(2.2)	NO	.56
Corp. and municipal bonds	−2.7	−1.1(1.0)	−1.6(1.4)	NO	.52

Note: These regressions are first differences of equation 2 in the text:

$$\Delta i = \beta\Delta(dE/M) + \mu\Delta[(dM/M) - (dE/M)] + \text{constant}$$

(continued)

Notes to Table 4-2 (concluded)

where i is the interest rate; M, total money stock; and E, net earning assets of monetary system as defined in Table 4-1. E pertains to all commercial banks for reference stages 1948–61 and for annual changes, and to weekly reporting member banks for reference stages 1919–66. β and μ are regression coefficients. The operator Δ denotes first differences of reference-cycle stage average or of annual data.

For computation, all the regressions were run in the statistically equivalent form:

$$\Delta i = (\beta - \mu)\Delta(dE/M) + \mu\Delta(dM/M) + \text{constant}$$

in order to obtain the t value of the difference between the regression coefficients.

In the regressions so indicated, seven dummy variables were added, one for each stage-to-stage change but the last. For each stage change, the corresponding dummy variable was unity and the rest were zero. The regression coefficients of the dummy variables (not shown) are estimates of the average change in interest rates between each pair of stages relative to the average change for the omitted pair.

Source: See the data appendix.

[a] The 1919–66 regressions begin with the 1919 reference trough and end with an assumed business peak in December 1966, except for the Treasury bill series, which begins with the 1920 peak. Excluded stages are the same as for Table 3-1. The 1948–66 regressions begin with the 1948 reference peak, end with the 1966 peak, and have no intervening exclusions. The annual regressions cover the years indicated, excluding the ten annual changes 1929–33 and 1940–46.

[b] Units of regression coefficients are interest-rate change in basis points for increase in monetary growth rate of one percentage point per year (100 basis points equals 1 percentage point). Figures in parentheses are t values with signs omitted.

[c] t values were not computed for credit variable.

[d] Because of rounding, differences shown may not be the same as differences computed from the figures shown in the first two columns. Figures in parentheses are t values with signs omitted.

[e] Begins 1920.

a special explanation: They result from the inclusion of Treasury debt; when the Treasury debt is excluded, as is done later in Table 4-3, they fall more in line with the other regressions. Treasury debt issues can be expected to influence the government security market, and the effect may carry over to corporate and municipal bonds as well. The greater credit effect shows up mainly in the annual regressions, probably because the security market anticipates Treasury deficits ahead of time, and the annual observations cover a long enough time span to incorporate the anticipations of, as well as the actual, Treasury issues in one observation. The reference stages, on the other hand, are probably too short to incorporate both, if the anticipations tend to lead the actual Treasury issues by several months or more.

Explanations for some of the other differences between the three sets of regressions can also be suggested. First, the effect of both variables is generally weaker on bond yields, as was found in Chapter 3. This simply reflects the longer maturity of bonds and the smaller amplitude of fluctuation of their yields. Bond yields typically respond slowly to short-run influences. These results do not show, therefore, that monetary and credit effects have their first impact in the markets for short-term funds. This question is taken up in Chapter 5. Second, both regression coefficients are smaller (in absolute size) for the top set covering the full 1919–66 period, which suggests that the association between money and interest rates was weaker in the earlier period. Even so, $\beta - \mu$ is on the average about the same for 1948–66 as for 1919–66, implying that the weekly reporting member bank data used for the longer period are not seriously deficient for the purposes of these regressions. Third, both coefficients are larger (in absolute size) for the annual regressions than for the 1919–66 reference regressions, probably because the monetary effect on interest rates is distributed over time and the annual observations encompass more of it. This is supported by the time pattern of the effect, discussed in Chapter 7.

Aside from these minor differences, this evidence taken as a whole shows that new money affects interest rates no matter how it enters the economy, though it has an additional, marginal effect when it is created by an expansion of credit.

Common Cyclical Patterns

In the final stages of business upswings, when borrowers clamor for credit, banks may often be able, despite Federal Reserve efforts to restrain monetary growth, to expand total credit temporarily by reducing their reserve ratios; and, conversely, in business recessions, when loan demand contracts, banks may allow credit growth to taper off (total credit may even decline temporarily) by increasing their reserve ratios. This behavior over the business cycle might affect credit growth more than monetary growth. Demand deposits would increase commensurately with the credit expansion, but time deposits and currency might not. As a result of such shifts in the demand curve for loans along the supply curve of bank credit (for a given amount of reserves), the regression coefficient of the credit component, intended to

show the negative slope of a given demand curve by means of shifts in supply, could be pulled toward zero and so be understated.

There is a simple test of this possibility. As a first approximation we may assume that shifts in the demand curve for bank loans occur in consonance with the stages of the business cycle, inasmuch as those shifts and business activity are usually highly correlated. We may then add dummy variables for the stage-to-stage changes, as described in the appendix to Chapter 3. Each stage change of the variables is thereby converted into a deviation from its average change in those stages. The partial regression coefficients for the independent variables in such regressions are largely independent of cyclical influences.

The estimates are presented in Table 4-2 along with the regressions already discussed. For the full period 1919–66, the dummy variables tend to reduce the credit effect relative to the portfolio effect and, for the 1948–66 period, to increase it. Although this may be no more than a statistical accident, it may reflect a difference in economic behavior. Monetary policy since World War II has produced greater inverse cyclical conformity in monetary growth than formerly, and interest rates have for a variety of reasons displayed greater conformity. As a result, the dummy variables in the later period may absorb relatively more of the common fluctuation between monetary growth and interest rates than between credit growth and interest rates.

Of course, by affecting the variables differently the dummy variables may produce misleading estimates. There is no easy way to tell which estimates are more reliable. We may best conclude that the true values probably lie somewhere between the two sets of estimates shown in Table 4-2. By either set the portfolio effect is clearly quite strong, while the credit component has an uncertain additional effect.

Exclusion of Treasury Debt Operations

As explained above, Treasury debt operations were consolidated with the banking system in Table 4-2 in order to cancel out transactions not involving the public, such as the sale of Treasury securities to the banking system. It is proper that such a transaction not affect the credit variable, because the transaction by itself does not affect total credit supplied to the public.

If banks reduce loans to the public to make room for the purchase

of Treasury securities, that is equivalent for present purposes to a sale of Treasury securities to the public. In a sale to the public the credit variable is reduced. The logic of this procedure is that such a sale reduces the supply of credit—shifting the supply curve—available to private borrowers. This procedure implicitly assumes that Treasury debt operations reflect a shift in the supply curve rather than a movement along it. It assumes, in other words, that the operation affects interest rates but is not affected by them. The assumption may not be entirely valid since the supply of Treasury securities may partly depend inversely upon interest rates. To avoid the need to rely on this assumption in testing the credit theory, the regressions were rerun with Treasury debt operations excluded by following the alternative definition given in Table 4-1.

The results with the credit variable now covering just the Federal Reserve and commercial banks are about the same (Table 4-3). The residual monetary growth is somewhat less significant in most regressions here than in Table 4-2, and the credit effect is relatively larger, except for corporate and municipal bonds in the later period and, as noted earlier, for the annual regressions, though the differences are still not significant. The credit effect ranges up to one-half of the portfolio effect, and in one case—commercial paper 1948–66—up to three-quarters.

The larger difference between these coefficients than between those in Table 4-2 could mean that it is inappropriate to include Treasury operations and that the true credit effect is indeed larger with the exclusion. On that interpretation Treasury debt operations are not entirely independent of interest rates and act as an extraneous element in the regressions. Yet, as noted, that is not true for the annual regressions. Furthermore, since the effect of excluding Treasury debt is greater for the 1948–66 period, another interpretation is more appealing. It is that Treasury debt, especially the short-term bills issued in such large volume after World War II, is a partial money substitute and should be added (presumably with a weight less than unity) to monetary liabilities rather than wholly deducted from earning assets of the monetary system. In that case, Treasury debt was inappropriately treated in Table 4-2, and its exclusion in Table 4-3 partially removed its biased effect on the credit variable, but also removed its effect from

TABLE 4-3

Relation Between Interest Rates and Two Sources of Monetary Growth, Consolidated Monetary System Excluding Treasury, 1919–66 and 1948–66

Interest Rate and Period	Partial Regression Coefficient: Credit Expansion (β)	Partial Regression Coefficient: Residual Monetary Growth (μ)	$\beta - \mu$	Inclusion of Stage Dummy Variables	R
	Changes Between Reference Cycle Stages				
1919–66					
Commercial paper	−5.5	−3.8(2.8)	−1.7(1.4)	NO	.44
	−5.2	−4.1(3.2)	−1.2(1.0)	YES	.67
Treasury bills	−6.1	−4.2(2.9)	−1.8(1.4)	NO	.46
	−6.2	−4.8(3.8)	−1.4(1.2)	YES	.74
U.S. bonds	−2.5	−1.8(3.1)	−0.7(1.3)	NO	.47
	−2.4	−1.7(2.9)	−0.6(1.2)	YES	.56
Corp. and municipal bonds	−2.6	−2.8(1.3)	+0.2(0.1)	NO	.16
	−1.4	−1.6(0.7)	+0.1(0.1)	YES	.33
1948–66					
Commercial paper	−13.5	−10.0(2.5)	−3.5(1.4)	NO	.58
	−7.8	−4.6(1.8)	−3.3(1.9)	YES	.91
Treasury bills	−14.4	−11.4(2.8)	−3.1(1.2)	NO	.60
	−9.0	−7.0(2.6)	−2.0(1.1)	YES	.90
U.S. bonds	−3.9	−3.3(2.2)	−0.6(0.6)	NO	.48
	−1.7	−1.5(1.6)	−0.2(0.3)	YES	.89
Corp. and municipal bonds	−12.6	−10.9(1.2)	−1.7(0.3)	NO	.27
	−6.8	−1.8(0.2)	−5.0(0.7)	YES	.56
		Annual Changes			
1919–66					
Commercial paper	−9.2	−7.8(2.6)	−1.4(0.5)	NO	.68
Treasury bills	−9.8	−7.8(2.4)	−2.0(0.7)	NO	.58
U.S. bonds	−2.6	−8.7(0.7)	−1.8(1.4)	NO	.52
Corp. and municipal bonds	−2.4	−1.6(1.2)	−0.8(0.7)	NO	.49

Source and notes: Same as for Table 4-2.

the money variable and thus reduced the measured monetary effect.

In either case, the main conclusion is unchanged: Money created by whatever means affects interest rates and the credit effect is only a fraction of the portfolio effect.

SEPARATION OF GOVERNMENT AND COMMERCIAL BANKS

In Chapter 2 it was argued that the beneficiaries of private money creation may strive to maintain some desired ratio of their imputed net worth to consumption. In doing so, they would largely offset additions to their imputed net worth due to credit expansion by banks and thus largely negate the effect of that expansion on the total supply of credit and thus on interest rates. This argument does not apply to government money creation, however. To whatever extent stockholders and depositors of commercial banks behave in that manner, taxpayers of the government would not necessarily behave similarly in response to government money creation. Government money created in lieu of debt issues has a much less certain effect on the discounted value of future taxes for debt servicing than money created by a commercial bank has on its net worth. It follows that money creation through credit expansion by the government may have a greater effect on interest rates than that of commercial banks. Combining the two sectors therefore dilutes the measured credit effect of the government.

In Table 4-4, this proposition is tested by dividing the credit variable into two components, one for commercial banks and one for the Federal Reserve. Loans to banks by the Federal Reserve now do not cancel, since there is no consolidation of the two sectors; these loans are treated as credit extended by the Federal Reserve and are deducted from the credit of commercial banks. Also, to avoid the possibility of underestimating the credit effect here, the Treasury is excluded. In terms of Table 4-1, commercial bank credit E_C is loans (line 14) plus investments (line 15) minus loans from Federal Reserve Banks (line 19). Federal Reserve credit E_F is earning assets (lines 2 + 3). The regression equation has three independent variables:

$$i = \beta_C(dE_C/M) + \beta_F(dE_F/M) + \mu[(dM - dE_C - dE_F)/M]. \qquad (3)$$

The proposition to be tested is whether $\beta_F - \beta_C$ is negative.

Generally, the proposition is supported by the test. With the inclusion of dummy variables, which, as explained above, tends to remove the response of bank credit to cycles in the private demand for credit, the effect of Federal Reserve credit is greater than the effect of commercial bank credit; and even without the dummy variables, Federal Reserve credit has the greater effect more often than not. (A puzzling exception is U.S. bond yields in the annual regressions. Perhaps this is an accident; I have no ready explanation.)

While consistent with the theory, this evidence is still no more than suggestive for two reasons. First, the differential effect of Federal Reserve credit is significantly greater by the t test in only two regressions, those with dummy variables for commercial paper and Treasury bill rates, 1919–66. And, second, when Treasury debt operations are consolidated with the Federal Reserve to form a variable of total government credit (not shown), these differences largely disappear.

CONCLUSIONS

The theories outlined in Chapter 1 imply that monetary growth affects interest rates inversely through portfolio adjustments and has an additional effect if created through credit expansion. In Chapter 2 it was argued that the credit effect is likely to be strongest for government money creation and to be temporary and uncertain for commercial bank money creation. In some monetary literature, on the other hand, the credit effect is viewed as the only or the main short-run monetary effect on interest rates.

This chapter presented a test of these propositions. Interest rates were regressed on two parts of monetary growth, one set representing credit expansion of commercial banks and the government, and a residual part representing all other sources of monetary growth. Credit was measured by growth in the earning assets of commercial banks, the Federal Reserve, and the Treasury. In some regressions all three were consolidated, in some just the former two with the Treasury excluded; and in some of these, commercial bank and Federal Reserve credit were treated as separate variables.

The results clearly indicated that monetary growth affects interest rates inversely no matter how it is created. If created through credit

TABLE 4-4

Relation Between Interest Rates and Three Sources of Monetary Growth, Consolidated Monetary System Excluding Treasury, 1919–66 and 1948–66

Interest Rate and Period	Partial Regression Coefficient: Credit Expansion of Commercial Banks (β_C)	Credit Expansion of Federal Reserve (β_F)	Residual Monetary Growth (μ)	$\beta_C - \mu$	$\beta_F - \mu$	Inclusion of Stage Dummy Variables	R
			Changes Between Reference Cycle Stages				
1919–66							
Commercial paper	−5.1	−7.9	−3.5(2.4)	−1.6(1.2)	−4.4(1.2)	NO	.45
	−3.8	−11.9	−3.0(2.3)	−0.9(0.8)	−8.9(2.5)	YES	.70
Treasury bills	−6.4	−5.1	−4.5(2.8)	−1.9(1.4)	−0.6(0.2)	NO	.47
	−5.2	−10.6	−4.0(3.0)	−1.1(1.0)	−6.6(1.9)	YES	.75
U.S. bonds	−2.5	−2.4	−1.8(3.0)	−0.7(1.3)	−0.6(0.4)	NO	.47
	−2.1	−3.8	−1.5(2.3)	−0.6(1.0)	−2.3(1.3)	YES	.57
Corp. and municipal bonds	−2.4	−3.7	−2.6(1.2)	+0.2(0.1)	−1.0(0.2)	NO	.17
	−0.2	−7.2	−0.7(0.3)	+0.4(0.2)	−6.5(1.0)	YES	.36

1948–66							
Commercial paper	−13.7	−12.4	−10.2(2.4)	−3.6(1.4)	−2.2(0.4)	NO	.59
	−7.4	−9.5	−4.3(1.6)	−3.1(1.7)	−5.2(1.2)	YES	.91
Treasury bills	−9.7	−15.4	−12.1(2.9)	+2.4(0.4)	−3.3(1.3)	NO	.62
	−8.5	−10.6	−6.7(2.3)	−1.8(1.0)	−3.9(0.9)	YES	.91
U.S. bonds	−4.4	−1.5	−3.7(2.5)	−0.7(0.8)	+2.2(1.0)	NO	.54
	−1.6	−2.2	−1.5(1.4)	−0.2(0.2)	−0.7(0.4)	YES	.89
Corp. and municipal bonds	−13.0	−10.3	−11.2(1.2)	−1.8(0.3)	+0.9(0.1)	NO	.27
	−4.6	−7.5	−2.2(0.2)	−2.4(0.1)	−5.2(0.7)	YES	.56
			Annual Changes				
1919–66							
Commercial paper	−8.9	−10.8	−7.9(2.6)	−1.0(0.3)	−2.9(0.4)	NO	.68
Treasury bills	−9.5	−12.5	−8.0(2.4)	−1.6(0.5)	−4.5(0.6)	NO	.58
U.S. bonds	−3.0	−0.9	−0.8(0.6)	−2.2(1.6)	−0.0(0.0)	NO	.52
Corp. and municipal bonds	−2.3	−3.0	−1.6(1.2)	−0.7(0.5)	−1.4(0.5)	NO	.49

Source and notes: Same as for Table 4-2, except for division of credit variable into two parts according to definition of Table 4-1.

expansion, however, the effect is greater generally by about 10 to 40 per cent, though several estimates fall beyond that range. But only a few of the credit coefficients are statistically significant. Federal Reserve credit treated separately apparently has a larger effect than commercial bank credit. While the magnitude of the credit effect is somewhat uncertain and marginal, the portfolio effect is strong and uniformly statistically significant.

These results pertain to the relative effects in the time span of the observations, that is from a few to many months for reference stages and to a year for the annual regressions. For shorter periods the credit effect may be relatively larger; for longer periods it is very likely even smaller.

Since bank credit is a sum of bank loans and investments, the effect of one of the components on interest rates may be even greater than the estimated effect of both together. This possibility is examined in Chapter 5.