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The relationship of money and income: The breakdowns in the 70s and 80s

Diane F. Siegel

The usefulness of the monetary aggregates as intermediate monetary policy targets depends crucially on the relationship between money growth and nominal income growth. The aggregates can function as reliable targets only if the effects of money growth on income are stable enough over time to be forecasted. Serious concern over the stability of this money/income relationship was raised several times in the 1970s and 1980s when velocity, the ratio of nominal GNP to M1, appeared to deviate from its trend rate of growth. The first such episode occurred from late 1974 through early 1976 when economic analysts were surprised by a sudden surge in velocity growth. In the latter 1970s, velocity resumed a growth rate more in line with historical experience. Concern over possible money/income instability subsided until 1982 and 1985 when there were two sharp drops in velocity. The explanations offered during each of these incidents tended to attribute the unusual velocity behavior to one-time shifts in money holdings precipitated by regulatory changes, financial innovation, or interest rate movements.

Such frequent occurrence of unexpected velocity shifts may indicate that the money/income relationship is subject to periodic instability. However, the velocity measure alone cannot provide conclusive evidence that serious breakdowns in the relationship have occurred. As a contemporaneous ratio, velocity cannot capture the full money/income relationship because it ignores the lagged influence of money growth on income growth. Velocity also cannot be used to test apparent changes in the money/income relationship for statistical significance.

This paper attempts a more formal documentation of the behavior of the money/income relationship during the three episodes brought to light by the velocity shifts. The seriousness of each incident is inferred from the performance of two reduced form models which explain nominal income growth as a function of current and lagged money growth and several other exogenous variables. One is the well-known equation developed by the staff at the St. Louis Federal Reserve Bank in the late 1960s.[1] The other is a similar model developed by Thomas Gittings of the Federal Reserve Bank of Chicago.[2]

These models can analyze the performance of the money/income relationship more rigorously than the velocity ratio can. First, they are more sophisticated measures of the relationship because they incorporate both the contemporaneous and lagged influence of money growth on nominal income. Second, they can be used to test statistically for shifts in the parameters of the relationship. Finally, since they are often used for forecasting, their predictive accuracy over time is an important indicator of the usefulness of the monetary aggregates as policy targets.

The stability of the money/income models cannot be statistically tested during the mid-1970s episode of unusual velocity behavior because the period is too short. However, the performance of the two models over that period does reinforce the velocity evidence that some sort of breakdown in the money/income relationship did occur. The in-sample errors of the two models are much greater from mid-1974 through early 1976 than in earlier years. Furthermore, the models substantially underpredict nominal income growth in 1975 and early 1976.

Statistical tests of both models do verify that the money/income relationship has undergone a major change in the 1980s. The two declines in velocity are accompanied by evidence of a significant shift in both money/income models. In addition, the models consistently overforecast nominal income growth from 1981 through 1985. Separate predictions of inflation and real income growth provided by the Gittings model indicate that the breakdown of the relationship occurs in both components of nominal income. How-

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ever, the shapes and timing of the inflation and real growth prediction errors are very different, suggesting that the two components might be breaking down for different reasons.

Past debate over the money/income relationship

The 1970s. Concern arose over possible instability in the money/income relationship in the mid-1970s. From mid-1974 through early 1976, the money demand equations in use at the time severely overpredicted money growth, and velocity grew much more rapidly than expected, particularly after the cyclical trough in early 1975. The most common explanations for the unexpected shortfall in money, called the "missing money," were that financial innovations and regulatory changes had reduced the cost of transferring assets between money and interest-bearing accounts, thus shifting money demand down (Enzler, Johnson, and Paulus (1976), Garcia and Pak (1979), Goldfeld (1976), Judd and Scadding (1982), Paulus and Axilrod (1976), Veazey (1977)).

The innovations most frequently cited were the growing use by businesses of repurchase agreements and cash concentration accounts to improve the efficiency of cash management. The regulatory changes thought to reduce money demand included the authorization of NOW accounts in New England, share draft accounts at credit unions, savings accounts for businesses and state and local governments at commercial banks, and telephone transfer and third-party payments services for savings accounts. Since these changes were considered permanent, the proponents of this explanation for the low growth in M1 thought that the increase observed in velocity was a one-time permanent shift.

Others argued that the prediction errors resulted from misspecification of the money demand equations, as well as money demand shifts due to financial and regulatory changes. Furthermore, these authors contended that the failings of the money demand equations were not indicative of a major change in the influence exerted by money growth on income growth. Tests for structural shifts in a St. Louis type equation and in the M1/GNP equation of the MPS (MIT-University of Pennsylvania-Social Science Research Council) econometric model concluded that the money/income relationship had remained stable in the early and mid-1970s (Hamburger (1977), McElhattan (1976)). Hamburger acknowledged that the St. Louis equation did not predict the steepness of the 1974-76 decline and recovery, but he claimed that forecasting procedures of all types quite often miss cyclical turning points in this manner.

The 1980s. After 1975, velocity growth appeared to return to normal until 1982 when it dropped sharply, leading many to assert that the money/income relationship had gone off track again. As before, much of the discussion of velocity's behavior focused on the demand for money. The explanations offered at the time, as summarized by Tatom (1983a), were that velocity shifted because of changed responsiveness of money demand to interest rates or inflation, growth of interest-bearing checkable accounts, increased foreign demand for U.S. money, and increased monetary volatility.

Judd (1983) argued that the money demand equation was stable over the period and that money holdings had increased due to the sharp decline in nominal interest rates in 1982. Judd and McElhattan (1983) then claimed that economic conditions in 1982 did cause a shift in the money/income relation, as measured by velocity, even though the money demand function remained stable. They argued that real interest rates stayed fairly high in 1982 because the decline in nominal interest rates was accompanied by a similar decline in inflation. As a result, nominal income grew at a sluggish pace, which when combined with the rapid growth of money holdings, caused velocity to fall.

Some attributed the 1982 velocity decline to the same type of regulatory change that was used to explain the velocity increase in the mid-1970s. Hamburger (1983) argued that the money demand function shifted upward in 1982 because of the nationwide introduction of NOW accounts in January 1981. This increased the rate of return on M1 since the NOW accounts were included in the M1 aggregate at the end of 1981. Hamburger claimed that his money demand equation predicted fairly well in 1982 once it included the NOW account rate of return on money.

Finally, Tatom (1983a, 1983b) contended that the 1982 velocity decline was normal for an economy on the verge of a cyclical recovery.

According to his argument, the 1982 increase in money growth led to a lagged increase in income growth in 1983, causing velocity to fall temporarily in 1982. This theory was tested using a velocity equation which included lagged money growth, interest rates, high employment government expenditure, inflation expectations, and slack productive capacity as explanatory variables. Structural tests of this equation yielded no significant evidence of a shift in velocity behavior in 1982. This was interpreted as implying that the money/income relationship had not changed significantly.

Velocity appeared to recover its trend rate of growth in the fourth quarter of 1983, but it began another dramatic decline in the fourth quarter of 1984, falling roughly six percent by the fourth quarter of 1985. The rapid growth in M1 reflected in the velocity decline was not matched by the growth in M2 or M3, the broader aggregates, over this period. Several analysts suggested that the velocity decline was due to a shift of funds to more liquid assets as long-term rates fell relative to short-term rates (Trehan and Walsh (1985), Wenninger and Radecki (1985, 1986)).

Wenninger and Radecki (1985) suggested that measurement problems also contributed to the 1985 drop in velocity. They claimed that GNP seriously understated the volume of transactions for which money was held in 1985 because net imports and sales out of inventory were unusually high that year. They showed that the in-sample errors of a reduced form money/income model were lower in both 1982 and 1985 when the GNP measure included such transactions.

As mentioned earlier, several researchers found that the erratic behavior of velocity in the mid-1970s was not accompanied by evidence of a significant change in the money/income models. So far the discussion of the 1980s velocity declines has not determined whether there has been a significant shift in the money/income relationship. The following sections seek to answer this question by testing the St. Louis and Gittings money/income models for stability in the 1980s. The models are also tested for a shift in the mid-1970s to confirm the findings of the earlier tests.

The St. Louis and Gittings money income models

The St. Louis and Gittings reduced form models express nominal income growth as a function of money growth in current and past quarters, and they both use polynomial distributed lags to estimate their coefficients. The two money income models differ in terms of the number of lagged values of money growth, polynomial degree, additional independent variables, and restrictions.

The St. Louis equation explains nominal income growth as a function of current and lagged growth in M1 and in high employment government expenditures. In this paper we follow a version of the St. Louis equation chosen by Batten and Thornton (1984) from among the specifications offered by six different model selection techniques. The version which dominates the others in a likelihood ratio test has 10 lags of money growth and nine lags of growth in high employment expenditures[3]

$$\dot{y}_t = \sum_{i=0}^{10} \alpha_i \dot{m}_{t-i} + \sum_{i=0}^{9} \beta_i \dot{g}_{t-i}$$

$\dot{y}$ = annualized rate of growth of nominal GNP
$\dot{m}$ = annualized rate of growth of M1
$\dot{g}$ = annualized rate of growth of high employment government expenditures

The polynomial restrictions found to be significant had six degrees for the money growth coefficients and seven or eight degrees for the government expenditure coefficients. In our estimations, we employ the seventh degree polynomial. We also use the cyclically adjusted budget expenditure series which replaced the high employment government expenditure series in 1983.

The Gittings model differs from the St. Louis equation primarily in that its lag structure is selected on economic rather than statistical grounds. The model assumes that money has a neutral impact on nominal income; that is, in the long run an increase in money is fully incorporated into the price level and has no lasting effect on real income. The model includes the number of lagged values of M1 growth necessary to satisfy this neutrality condition. (See box for an explanation of the

neutrality restrictions.) We will follow the performance of a recent version of the Gittings model which uses 20 lags of money growth and a third degree polynomial distributed lag. This model also includes three lagged values of nominal income growth and the real price of energy in the two preceding quarters:

$$\dot{y}_t = \sum_{i=0}^{20} \alpha_i \dot{m}_{t-i} + \sum_{i=1}^{3} \beta_i \dot{y}_{t-i} + \sum_{i=1}^{2} \gamma_i \dot{e}_{t-i}$$

$\dot{e}$ = annualized rate of growth of real energy prices

The lagged endogenous variables partially incorporate the effects of non-monetary shocks. The energy price variables are included to improve the model's performance during the periods of rising oil prices in the 1970s.

Structural change in the money/income relationship

The St. Louis and Gittings models can be used to test the money/income relationship for instability during the episodes of unusual velocity behavior. Evidence from the two models generally confirms Hamburger's (1977) finding of no significant change in the relationship in the first half of the 1970s, although questions still remain concerning the models' performance from mid-1974 through early 1976. Both models indicate that the money/income relationship shifts significantly after 1981.

The 1970s. Hamburger's study of the relationship in the 1970s applies an F test to a version of the St. Louis equation to see if the coefficients change significantly after 1968.[4] He finds no significant shift in the coefficients between the period from 1953 through 1968 and the period from 1969 through the second quarter of 1976. However, he notes that this result does not necessarily imply that the relationship is stable. The tendency of the St. Louis equation to overestimate GNP growth before the second quarter of 1974 and to underestimate it afterwards suggests that there may be two opposing shifts in the relationship, one before 1974 and one after. When these quarters are combined in the second subsample of his F test, they might have offsetting effects on the model's parameters and thus lead to the finding of no significant change in the coefficients. To correct for this possible problem, Hamburger performs another F test using a second subsample which ends in the second quarter of 1974. Again, there is no significant evidence of a shift in the relationship.

Hamburger's test cannot be replicated exactly with the Gittings model and the Batten and Thornton version of the St. Louis equation because data limitations and the number of lags in the two models require that the samples begin after 1953. For the St. Louis equation, our F tests compare the model's coefficients estimated from the fourth quarter of 1961 through 1968 with those from Hamburger's second two subsamples, 1969 through the second quarters of 1974 and 1976. The two tests yield F values of 1.28 and 1.59, neither of which is significant at the five percent level. (See Table 1.) These results confirm Hamburger's finding that the St. Louis equation does not experience a shift in the first half of the 1970s.

The first subsample tested by the Gittings model begins in the second quarter of 1964, but otherwise the Gittings test samples match those used by Hamburger. When the second subsample ends in 1976, the coefficients of the two subsamples do not differ significantly from those of the full sample. But when it ends in 1974, the test is significant at the one percent level with an F statistic of 4.78. Thus, the results from the Gittings model could support Hamburger's hypothesis that offsetting shifts in the money/income relationship before and after 1974 prevent observation of any shift in the 1969 through 1976 period.

However, Hamburger's results are not conclusive evidence that the money/income relationship remains stable in the mid-1970s despite the sharp increase in velocity. His tests show only that the relationship is stable over the entire first half of the 1970s. They do not indicate whether the relationship is stable in the narrower period from mid-1974 through early 1976 when fears that the relationship had gone off track were actually raised.

Unfortunately, this period is too short to allow an F test of the stability of the money/income models. Some intuitive evidence about the performance of the relationship over that period can be obtained from the in-sample errors. When the St. Louis equation is estimated from 1961 through the second quarter of 1976, its mean squared error is 44

Table 1
Tests for structural shifts in the money/income relationship

	Sample periods	F value
Tests for shift in the early 1970s		
St. Louis equation	61 Q4-68 Q4, 69 Q1-74 Q2	1.28 - insignificant at 5% level
	61 Q4-68 Q4, 69 Q1-76 Q2	1.59 - insignificant at 5% level
Gittings model	64 Q2-68 Q4, 69 Q1-74 Q2	4.78 - significant at 1% level
	64 Q2-68 Q4, 69 Q1-76 Q2	.58 - insignificant at 5% level
Tests for shift in the 1980s		
St. Louis equation	61 Q4-80 Q4, 81 Q1-85 Q3	6.61 - significant at 1% level
Gittings model	64 Q2-80 Q4, 81 Q1-85 Q4	3.97 - significant at 1% level

percent higher from the third quarter of 1974 through the second quarter of 1976 than in the preceding quarters. The mean squared error of the Gittings model is 71 percent higher in the 1974-76 period than in the 1964-74 period. Although instability in the money/income relationship from mid-1974 through 1976 cannot be rigorously established, the erratic behavior of the money/income models over that period suggests that the relationship did experience some type of breakdown.

The 1980s. In the 1980s, the period of unusual velocity behavior is long enough for the stability of the money/income relationship to be statistically tested. Both the St. Louis and the Gittings models show very strong evidence that a shift in the relationship begins in 1981 and extends at least through 1985. A clear breaking point in the relationship is suggested by the in-sample errors when the two models are estimated through 1985. After assuming positive and negative values with fairly equal frequency throughout most of the sample, the errors become predominantly negative beginning in the second quarter of 1981. So, we test for a structural shift which starts in 1981.

For the St. Louis equation, our test looks for a shift in the parameters between the periods from the fourth quarter of 1961 through 1980 and from 1981 through the third quarter of 1985. This yields an F statistic of 6.61 which is significant at the one percent level. (See Table 1.) Thus, the coefficients of the St. Louis equation from 1981 through 1985 differ significantly from those in the years prior to 1981.

The structural test of the Gittings model compares the parameters estimated from the second quarter of 1964 through 1980 with those estimated from 1981 through the fourth quarter of 1985. Again, the test indicates a strong shift in the money/income relationship with an F statistic of 3.97 which is significant at the one percent level. Unlike the experience of the mid-1970s when a velocity increase is accompanied by inconclusive statistical evidence of a shift in the money/income relationship, the two velocity declines of the 1980s are indicative of a highly significant structural change.

The predictive performance of the money/income models

The erratic performance of the money/income relationship in the mid-1970s and the significant structural shift in the 1980s raise doubts over the usefulness of the reduced form models as tools to predict nominal income growth. This section attempts to replicate the short-term forecasting record that the St. Louis and Gittings models would have achieved in the 1970s and 1980s. The predictive ability of the two models is found to deteriorate in both the mid-1970s and the 1980s.

The short-term predictive performance of the two models is indicated by the errors of nominal growth forecasts one quarter in the future. The analysis assumes that forecasters use models estimated from the most current data. We examine the forecasts generated by estimations of the models from data that extend

through the quarter just before the forecast. The St. Louis equation is estimated repeatedly with samples that begin in the fourth quarter of 1961 and end in every quarter from the fourth quarter of 1973 through the second quarter of 1985. These estimations produce one-quarter-ahead forecasts from 1974 through the third quarter of 1985. The Gittings model is estimated over samples beginning in the second quarter of 1964 and ending in every quarter from the fourth quarter of 1973 through the third quarter of 1985. This yields one-quarter-ahead forecasts for every quarter from 1974 through 1985.

The one-quarter-ahead forecast errors of the two models are plotted in Figures 1 and 2. The general drift of these errors is illustrated by the graphs of their cumulative values in Figures 3 and 4. Both models have a run of positive forecast errors in late 1975 and early 1976 which indicates that they consistently underpredict economic growth during the recovery from the 1974-75 recession.

Following that episode, the forecast errors of the Gittings model appear to move more or less randomly around zero throughout the rest of the decade. The model's cumulative forecast errors remain fairly level after the upward shift in 1975 and 1976. This suggests that the model does not consistently overpredict or underpredict economic growth over that period. The errors from the St. Louis equation also fluctuate around zero in the second half of the 1970s, but the positive errors tend to exceed the negative errors in absolute value. The cumulative errors slope upward during this period, reflecting the dominance of the positive errors.

In the 1980s, the predictive performance of both models deteriorates dramatically. Beginning in mid-1981, the forecast errors are predominantly negative with the exception of the fourth quarter of 1983 and the first quarter of 1984. The cumulative errors fall steadily, illustrating the persistence of the models' tendency to overpredict. The St. Louis equation overpredicts nominal growth by an average of three percentage points from 1981 through 1985, whereas it underforecasts nominal growth by an average of only 0.8 percentage points in the period before 1981. Similarly, the Gittings model overpredicts nominal growth by an average of 3.2 percentage points in the years after 1980, though its average error from 1974 to 1980 is an underprediction of only 0.5 percentage points.

The components of the 1980s shift

The one-quarter-ahead forecast errors offer further descriptive evidence about the nature of the 1980s shift in the money/income relationship. The models which produce the forecasts tend to reflect the money/income relationship prior to the 1980s because they are estimated from samples dominated by the 1960s and 1970s. Therefore, the forecast errors in the 1980s pick up the change in the relationship. This section examines the course taken by these errors over time, particularly as illustrated by the cumulative error graphs, in order to document the timing and configuration of the 1980s shift. Further information about the structure of the 1980s breakdown is provided by the forecast errors of separate inflation and real income growth equations estimated under the Gittings approach.

The cumulative nominal growth forecast errors of both models suggest that the 1980s change in the money/income relationship is composed of two separate shifts. The first occurs from 1981 until mid-1983 when the cumulative errors fall very rapidly from the rough plateau maintained in the latter 1970s. They level off again from mid-1983 through 1984, but in 1985 they begin another sharp decline which is very steep by the end of the year. The timing of these declines corresponds with the two abrupt drops in velocity in 1982 and 1985. This evidence of two shifts in the money/income relationship cannot be rigorously examined at present because not enough data is available for two structural tests over this period.

The breakdown in the money/income relationship can be evaluated further by examining the underlying patterns of inflation and real income growth. A fuller version of the Gittings model estimates separate equations for inflation and real growth which have the same number of lagged money growth, energy price, and endogenous variables as the Gittings nominal income equation. The two equations also impose the monetary neutrality condition that in the long run, money growth is completely incorporated into inflation and does not affect real income.

Figure 1
One-quarter-ahead nominal growth forecast errors—St. Louis equation

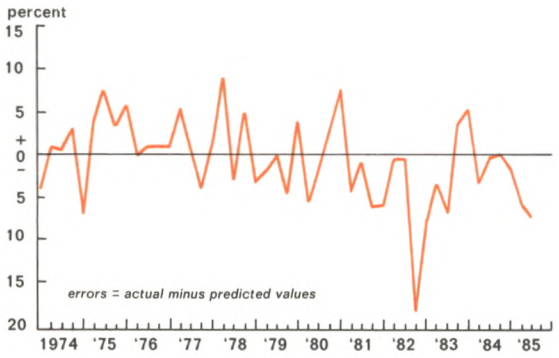


Figure 2
One-quarter-ahead nominal growth forecast errors—Gittings model

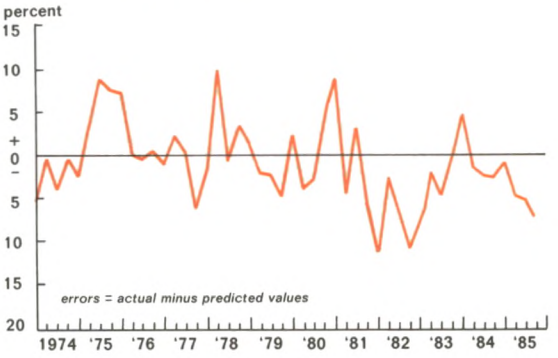


Figure 3
Cumulative one-quarter-ahead nominal growth forecast errors—St. Louis equation

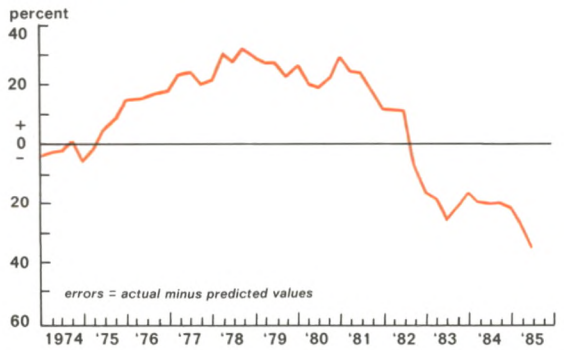
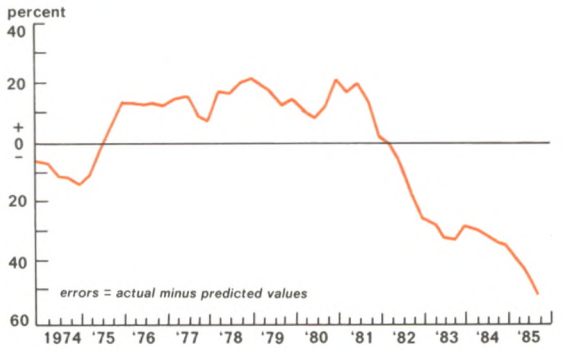


Figure 4
Cumulative one-quarter-ahead nominal growth forecast errors—Gittings model



The nominal growth forecast errors of both models appear to be much more closely tied to errors in forecasting real growth than errors in forecasting inflation. (See Figure 5.) The real growth forecast errors follow the nominal growth errors very closely throughout the sample, while the inflation forecast errors tend to fluctuate around zero until late 1982 when they become predominantly negative. Table 2 shows that the nominal growth forecast errors of both models are highly correlated with the real growth forecast errors over the entire sample and during the two periods when the money/income relationship goes off track. The correlation between the nominal growth forecast errors and the inflation forecast errors is much lower.

Despite the closer historical association between the nominal growth forecast errors and the real growth forecast errors, it is clear that the large nominal growth forecast errors in the 1980s result from poor prediction of both real growth and inflation. The cumulative inflation and real growth forecast errors illustrate the seriousness of the breakdown in the forecasts of both nominal income components. (See Figure 6.) However, the timing and shape of the two breakdowns are very different. The cumulative inflation errors slope steadily downward beginning in 1983, indicating that the Gittings inflation equation consistently

The current FRB Chicago—Gittings model

Since 1979 the Federal Reserve Bank of Chicago has been using a series of money income models developed by Thomas Gittings. These models have all been intended to capture the fundamentals of money growth's effect on the economy. The current model is a vector model. Changes in real income growth and inflation are modeled in two separate equations:

$$\dot{q} = \alpha_0^q + \sum_{i=1}^{L} \alpha_i^q \dot{q}_{t-i} + \sum_{j=0}^{M} \beta_j^q \dot{m}_{t-j} + \sum_{k=0}^{N} \gamma_k^q \dot{e}_{t-k}$$

$$\dot{p} = \alpha_0^p + \sum_{i=1}^{L} \alpha_i^p \dot{p}_{t-i} + \sum_{j=0}^{M} \beta_j^p \dot{m}_{t-j} + \sum_{k=0}^{N} \gamma_k^p \dot{e}_{t-k}$$

where $\dot{q}$ is the growth in real income, $\dot{p}$ is the inflation rate, $\dot{m}$ is the growth in M1, and $\dot{e}$ is the rate of change in real energy prices.

This model differs in a number of ways from money-income models used elsewhere. First, by separately estimating equations for real growth and inflation rather than estimating a single nominal income equation the tradeoff between real income and inflation can be directly forecasted. Benefits are also derived when the equations are not forecasting well (as all models of this type are prone to do periodically). The breakdown may occur in either the price or real income equation. By having an estimate of where the breakdown is occurring, it is easier to determine what may be causing the trouble and when it may end. Further, the FOMC may want to react to a fall in velocity differently if it is due to less than expected real growth rather than to less than expected inflation.

Second, lagged values of real growth and inflation are included. This gives the model a somewhat richer structure of time series behavior than models where no lagged endogenous variables are included, such as the various St. Louis equations. Our research indicates that the effects of money growth on the economy, especially inflation, are much more protracted than has previously been believed. The use of lagged endogenous variables allows us to model this without using an exorbitant number of lags of money growth.

Third, the rate of change in real energy prices is included as an additional tool to minimize the effect of supply shocks. Oil price shocks and their aftereffects on the entire spectrum of energy prices have been the dominant form of supply shock since 1973. By modeling this particular type of shock directly, the model provides better estimates of the money-income relationship. Without energy prices in the model the estimates of money's effect on both real income and inflation are both smaller and slower. This reduction in size and speed is typical of econometric estimation when a large source of error has been left unmodeled. Unfortunately, oil shocks are largely unpredictable and any direct gains in terms of forecasting are limited.

Fourth, because our research has led us to the belief that a large number of lags of money growth are necessary to correctly model the money-income relationship the danger of over fitting is large. To overcome this problem we use polynomial distributed lags to force the money coefficients to follow a smooth adjustment path. This effectively reduces the number of free parameters which can create artificially good regression results.

The last and most important difference is the application of the principles of neutrality and super neutrality directly to the specification and estimation procedures. Neutrality is a fairly old concept. It states that an increase in the rate of money growth will eventually cause an equal increase in the rate of inflation and that the rate of real growth will in the long

run be unaffected. Without lagged endogenous variables this is equivalent to the statement that in the inflation equation the sum of the coefficients on money must equal one and that in the real growth equation they must sum to zero. For the case with lagged endogenous variables the constraints are slightly more complicated and can be written:

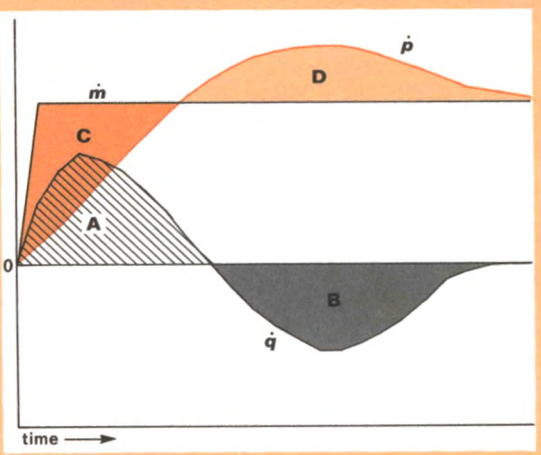
$$\sum_{j=0}^{M} \beta_j^q = 0, \qquad \sum_{i=1}^{L} \alpha_i^p + \sum_{j=0}^{M} \beta_j^p = 1$$

Super neutrality is a generalization of neutrality from rates of growth to levels. Simply put, it says that if the money supply is doubled it will lead to a doubling of the price level but will not affect the level of real income in the long run. Super neutrality comes from the rather straightforward belief that the Federal Reserve cannot create real wealth in the long haul simply by printing more and more money. Since the equations we use are in terms of rates of growth these concepts must be translated to restrictions on growth rates. The diagram shows the impact of a one percent increase in the rate of money growth on real income growth and inflation. In the real income case, the effect on cumulative real growth must be zero so area A must equal area B. In the inflation case it is only slightly more complicated. Inflation must on average equal the rate of money growth, implying that area C must equal area D. It follows after extensive manipulation that the restrictions on the parameters must be:

$$\sum_{j=0}^{M} j\beta_j^q = 0, \qquad \sum_{i=1}^{L} i\alpha_i^p + \sum_{j=0}^{M} j\beta_j^p = 0$$

By imposing the neutrality and super neutrality restrictions, we guarantee that the model will not imply that the Federal Reserve can create unlimited wealth by supplying greater and greater quantities of

Responses to changes in the rate of monetary growth



Coefficients of Gittings model equations

	Real GNP	GNP deflator	Nominal GNP
Intercept			
α_0	4.012	−0.243	4.402
Dependent variable			
α_1	−0.122	0.180	−0.145
α_2	0.014	0.218	−0.110
α_3	−0.102	0.074	−0.172
Money			
β_0	0.395	0.110	0.590
β_1	0.242	0.103	0.439
β_2	0.116	0.095	0.312
β_3	0.014	0.087	0.206
β_4	−0.064	0.077	0.119
β_5	−0.121	0.068	0.051
β_6	−0.159	0.058	−0.001
β_7	−0.180	0.047	−0.038
β_8	−0.186	0.037	−0.062
β_9	−0.179	0.027	−0.075
β_{10}	−0.162	0.017	−0.078
β_{11}	−0.135	0.008	−0.073
β_{12}	−0.102	−0.001	−0.062
β_{13}	−0.064	−0.009	−0.046
β_{14}	−0.023	−0.016	−0.028
β_{15}	0.018	−0.022	−0.008
β_{16}	0.058	−0.027	0.011
β_{17}	0.094	−0.031	0.028
β_{18}	0.125	−0.033	0.042
β_{19}	0.149	−0.033	0.049
β_{20}	0.163	−0.032	0.050
Energy			
γ_1	0.029	−0.010	0.010
γ_2	−0.090	0.075	0.016
R^2	0.386	0.688	0.305
F ratio	5.66	19.82	3.94
Neutrality Lagrange multiplier t−ratio	0.573	−0.065	0.642
Super neutrality Lagrange multiplier t−ratio	1.536	−1.563	−1.187

money, an implication of many money-income models that do not use such restrictions.

The restrictions can also be used to help determine how many lags should be included in the model. As can be seen from the diagram, if the lags are cut off too soon an unrestricted estimation of the equations would violate neutrality and super neutrality. Thus, we need to include enough lags so that the data is consistent with the restrictions. Use of this principle has led to longer lags than are typically used elsewhere. We believe many studies that have rejected super neutrality did so because they included too few lags. For instance, the current St. Louis equation uses 10 lags while our equations use 20 lags.

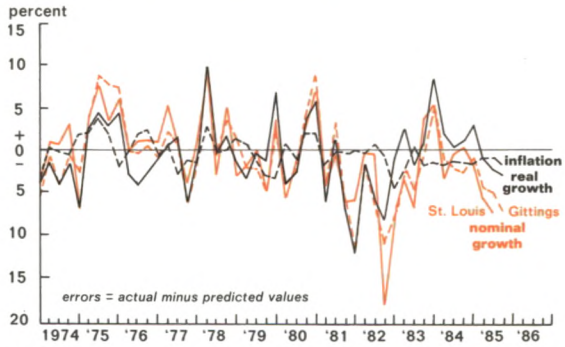
In order to to make easy comparisons with other reduced form models of nominal income, we also maintain a pure nominal income model, which is estimated with the same constraints as the inflation equation. A set of estimated equations for both the vector and single equation models are shown in the table. The sample was restricted to 64:Q2-81:Q4 in order to avoid the questions about the definition of money which have undermined the usefulness of the money-income relationship in the 80s, as the accompanying article documents. Current research is emphasizing techniques to forecast the breakdowns in the money income relationship so that we will have a better idea of when these relationships are useful for policy and when they are not.

—Thomas Gittings and Steven Strongin

overpredicts inflation from 1983 through 1985. The cumulative real growth errors fall rapidly in 1981 and 1982, remain fairly level throughout most of 1983, increase steadily from late 1983 through 1984, and then fall again in 1985.

The breakdown observed in the money/income relationship from 1981 through 1985 thus reflects the breakdowns of the real growth and inflation components at different points. The steep fall in the cumulative nominal growth errors is set off in 1981 by the

Figure 5
One-quarter-ahead forecast errors—Gittings and St. Louis models



overprediction of real growth. Overprediction of inflation starts to contribute to the nominal breakdown in 1983 just as the real growth equation begins to forecast fairly accurately for several quarters. The apparent stability of the nominal money/income relationship in 1984 actually results from offsetting errors in the inflation and real growth equations. Real growth is consistently underpredicted while inflation is consistently overpredicted during that year. But in 1985, negative inflation and real growth forecast errors reinforce each other, resulting in persistent overprediction of nominal growth.

The different patterns and timing of the cumulative inflation and real growth forecast errors suggest that the two nominal income components could be deviating from their past

Figure 6
Cumulative one-quarter-ahead forecast errors—Gittings model

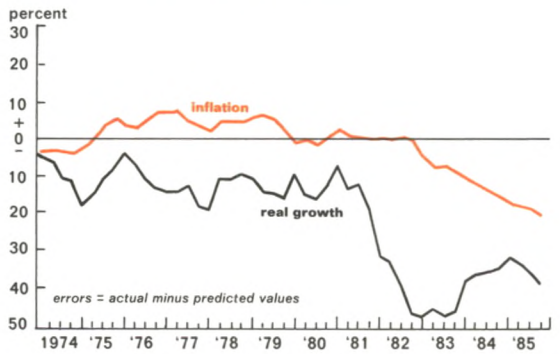


Table 2
Correlation between nominal growth forecast errors and real growth and inflation forecast errors

	Gittings Real growth errors	Gittings Inflation errors
1974-1985		
St. Louis nominal growth errors	.71	.33
Gittings nominal growth errors	.83	.45
1974 Q3-1976 Q2		
St. Louis nominal growth errors	.90	.03
Gittings nominal growth errors	.94	.30
1981-1985		
St. Louis nominal growth errors	.67	.23
Gittings nominal growth errors	.87	.22

behavior for different reasons. The constant decline of the cumulative inflation forecast errors suggests that the breakdown in the inflation equation might be caused by one factor or several persistent factors. The meandering course of the cumulative real growth forecast errors suggests that the breakdown of this process could be caused by several factors or the intermittent occurrence of a single factor.

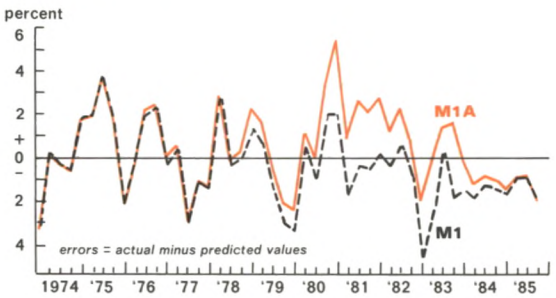
The inflation equation overpredicts by a steady average of 1.6 percentage points from 1983 through 1985, meaning that 1.6 percentage points of the M1 growth rate are not being incorporated into inflation. This suggests that the deterioration of the inflation equation's performance might result from mismeasurement of the monetary aggregate. Perhaps after 1982 M1 consistently overstates the transactions balances whose growth most monetarists believe determines the inflation rate. This could be because, as Kaufman and Strongin (1984) have argued, savings balances did not move in large numbers into the interest-paying components of M1 until interest rates fell in 1982.

Partial support for this view is provided when the Gittings inflation model is estimated with M1A, the aggregate which excludes all interest-bearing accounts and thus should not contain any savings balances. The M1A version does overpredict inflation after 1983 but not as seriously as the M1 version. (See Figure 7.) Thus, removal of all potential savings balances improves the forecasts but does not completely solve the mystery of the breakdown in the inflation equation after 1982.

This change in money definition improves the inflation predictions from 1983 through 1985 at the expense of poorer predictions in the early 1980s. From 1980 through 1982, the M1A model consistently underpredicts inflation while the M1 model performs very well. This is consistent with the Kaufman and Strongin argument that the interest-bearing accounts excluded from M1A primarily contained transactions balances before 1982.

The real income equation is clearly subject to episodic breakdowns in both directions. It is very difficult to speculate about the causes of such alternating bad and good performance without further research on the real income equation. However, it generally appears that the model is unable to incorporate the influence

Figure 7
One-quarter-ahead forecast errors—Gittings inflation equation using M1 and M1A



of real shocks which fundamentally alter the productivity of the economy.

The clear divergence between the shape and timing of the inflation and real growth forecast errors suggests that future research on the money/income relationship should study these two nominal income components separately. The neutrality-of-money proposition lends further support to this recommendation for it contends that money growth influences real income and inflation with different timing and long-term effect. Nominal income growth is determined merely as the product of the inflation and real growth processes. Separate study of money growth's influence on inflation and real growth in the 1980s would focus more directly on the root causes of the breakdown in the money/income relationship documented in this paper.

Conclusion

The behavior of velocity in the mid-1970s and the 1980s raised concern over the stability of the relationship between M1 growth and nominal income growth. This article has examined the behavior of two money/income models during each incident of unusual velocity shifts. The instability of the relationship in the mid-1970s cannot be statistically verified using these models because of insufficient data. However, both models predict very poorly during this period, which does indicate that the money/income relationship did not perform well in the mid-1970s. In the 1980s, there is overwhelming evidence of instability in the money/income relationship. From 1981 through 1985, the two money/income models experience a significant parameter shift, and they consistently overpredict nominal income growth.

The 1980s breakdown appears to be caused by unrelated changes in the inflation and real growth components of the money/income relationship. The fact that inflation is overpredicted at a fairly constant rate since 1982 suggests that the money/inflation relationship may be plagued by some persistent failing, perhaps the mismeasurement of the monetary aggregate. The real growth component of the money/income relationship, on the other hand, alternates between bad and good performance. This raises the possibility that the breakdown in the money/real growth relationship could be caused by a complex set of factors, some of which might be recurrent in nature. We are currently continuing our research in the hope of identifying the full range of factors which affect the performance of the inflation and real growth components of the money/income relationship and in particular to determine whether there are factors which cause periodic breakdowns. A better understanding of the economic conditions under which the money/income relationship does and does not perform well is required if the monetary aggregates are to be reliable policy targets.

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[1] See Leonall C. Andersen and Jerry L. Jordan, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," Federal Reserve Bank of St. Louis *Review* (November 1968), pp. 11-24. The version of the St. Louis model followed in this paper is published in Dallas S. Batten and Daniel L. Thornton, "Polynomial Distributed Lags and the Estimation of the St. Louis Equation," Federal Reserve Bank of St. Louis *Review*, vol. 65, (April 1983), pp.13-25, and in Dallas S. Batten and Daniel L. Thornton, "How Robust Are the Policy Conclusions of the St. Louis Equation?: Some Further Evidence," Federal Reserve Bank of St. Louis *Review*, vol. 66, (June/July 1984), pp. 26-32.

[2] The accompanying box describes the Gittings model.

[3] Some versions of the St. Louis equation have included relative energy prices and a variable representing strike activity.

[4] Hamburger's version of the St. Louis equation is somewhat different from the Batten and Thornton version. It regresses nominal income growth on current and three lagged values of growth in M1 or alternatively, M2. The fiscal policy variables are measures of the "initial stimulus" of federal expenditures and receipts which correct for tax increases induced by inflation. These variables are scaled by nominal income four quarters earlier. The equation includes the current and two lagged values of the expenditures variable and the current and seven lagged values of the tax receipts variable. The model also includes the number of industrial man-hours lost due to strikes.

The F test used determines if a model's coefficients are significantly different when estimated over two separate samples than when the two samples are pooled as one sample. The regression is run over the two subsamples and the full sample. The regression's coefficients are found to shift significantly between the two subsamples if the sum

of squared errors over the two subsamples is significantly less than the sum of squared errors over the full sample. The formula for the F statistic is:

$$F = \frac{(ESS_0 - ESS_1)/(k+1)}{ESS_1/(n_1 + n_2 - 2k)}$$

where ESS_0 = sum of squared errors over full sample
ESS_1 = sum of squared errors over the two subsamples
k = the number of parameters
n_1 = the number of data points in the first subsample
n_2 = the number of data points in the second subsample.

For further explanation of this test see G. S. Maddala, *Econometrics*, (McGraw-Hill, Inc., 1977), pp. 197-201.

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Securitization

Christine Pavel

A primary function of financial intermediaries is to facilitate the flow of capital from savers to borrowers. Financial institutions exist because they can do this at a lower cost than would be possible through direct financing arrangements. Banks and other depository institutions perform this intermediary function by making loans and accepting deposits. Sometimes, however, a financial intermediary's demand for loans at a given rate is greater than its supply of deposits, in which case it may purchase fed funds or other uninsured deposits, sell securities under repurchase agreements, sell short-term securities such as commercial paper or bankers acceptances, or sell assets such as government securities or loans. When an institution sells loans, it can sell whole loans or loan participations, or it can "securitize" a portfolio of similar loans.

Securitization is a recent innovation in asset sales. It involves the pooling and repackaging of loans into securities, which are then sold to investors. Like whole loan sales and participations, securitization provides an additional funding source and eliminates assets from a bank's balance sheet. Unlike whole loan sales and participations, securitization is often used to market small loans that would be difficult to sell on a stand-alone basis. Most importantly, securitization can increase the liquidity and diversification of a loan portfolio. The ability to package and sell these otherwise illiquid assets in an established secondary market increases their liquidity. Greater diversification can be achieved because an institution can hold the same dollar amount of a particular type of loan in the form of a security backed by the loans of numerous borrowers, as opposed to holding whole loans of relatively few borrowers. Securitization can also be used as a tool for gap management because it facilitates the sale of long-term assets of depository institutions. It may also enable institutions to attract long-term funds more profitably than would be possible with conventional tools. Because of these benefits, banks, savings and loan associations, and various nondeposit-based firms engage in securitization.

This paper describes the major types of loan-backed securities and discusses their implications for the financial services industry. The first section describes the various kinds of securitized loan products. The second discusses the costs and benefits from securitization. The third section looks at the factors that determine whether a loan can be securitized and examines the possibilities for further securitization, including the securitization of commercial and industrial loans and other loans on the books of commercial banks. The final section discusses the implications of securitization for the financial services industry, and depository institutions in particular.

Types of loan-backed securities

Loan-backed securities are collateralized by residential, multifamily, and commercial mortgage loans, automobile loans, credit card receivables, Small Business Administration loans, computer and truck leases, loans for mobile homes, and various finance receivables, but the majority of all loan-backed securities are collateralized by single-family, residential mortgages. Securitization began in 1970 when the Government National Mortgage Association (GNMA) developed the "Ginnie Mae" pass-through, a mortgage-backed security collateralized by single-family Federal Housing Administration (FHA) and Veterans Administration (VA) mortgage loans. There are three basic types of loan-backed securities, each of which developed out of the secondary mortgage market.

Pass-throughs

The first type of loan-backed security was the pass-through. A pass-through represents direct ownership in a portfolio of mortgage loans that are similar in term to maturity, interest rate, and quality. The portfolio is placed in trust, and certificates of ownership are sold

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to investors. The loan originator services the mortgage portfolio and collects interest and principal, passing them on, less a servicing fee, to the investors. Often there is a second middleman involved between borrowers and investors. If one of the federal mortgage agencies, such as the GNMA, is involved, it receives the principal and interest from the originator and passes it along to the investors. Ownership of the mortgages in the portfolio lies with the investors; thus, pass-throughs are not debt obligations of the mortgage originator and do not appear on the originator's financial statement.

The most common type of pass-through is the Ginnie Mae. A Ginnie Mae is a mortgage-backed security collateralized by FHA-VA mortgages. The GNMA, a direct agency of the federal government, guarantees the timely payment of principal and interest. Because Ginnie Maes are backed by government-guaranteed mortgages and federal agency guarantees, investors face virtually no default risk. An active and well-developed secondary market provides a high degree of marketability for these securities.

The Federal Home Loan Mortgage Corporation (Freddie Mac), an indirect agency of the federal government, developed a similar pass-through security in 1971, the "participation certificate" (PC), and the Federal National Mortgage Association (FNMA, or Fannie Mae) developed the mortgage-backed security (MBS) in 1981. Both the PC and the MBS are backed by portfolios of uninsured and privately insured mortgage loans. Monthly interest and full repayment of principal on PCs are guaranteed by Freddie Mac. The timing of the principal payments, however, is not guaranteed. Because conventional and privately-insured mortgages tend to be repaid more quickly than FHA-VA mortgage loans, the average life of a PC or an MBS is about seven to nine years.

As shown in Table 1 and Figure 1, the growth in the securitization of mortgage loans has been rapid. The total dollar volume of mortgage pass-throughs issued by federal agencies was over three times the amount outstanding at the end of 1980 and represents nearly 25 percent of all residential mortgages outstanding in 1985. Figure 1 indicates that mortgage pass-through securities have also been growing faster than the overall market for taxable, fixed-income securities. In 1972, such mortgage pass-throughs represented only 1 percent of all taxable, fixed-income securities; in September 1984, they accounted for 14 percent of such securities.

Ginnie Maes account for the largest proportion of mortgage pass-throughs, but their proportion has declined over time. In 1985 Ginnie Maes constituted 58 percent of mortgage pass-throughs, down from 67 percent in 1982, the first full year that all three federal agencies issued pass-throughs. Fannie Mae MBSs account for most of Ginnie Maes' lost "market share." One reason for FNMA's success is its swap program. This program allows a mortgage lender to swap whole mortgage loans for MBSs.

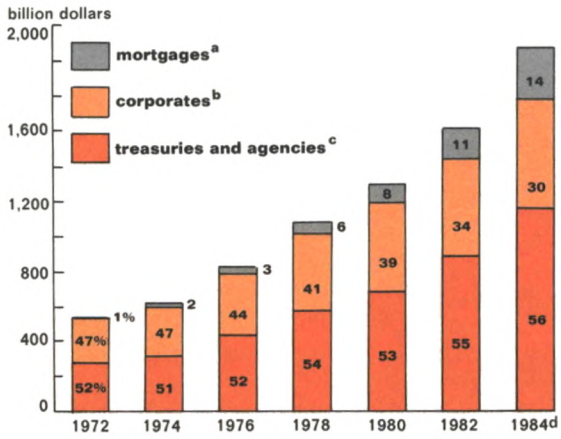
Private sector pass-throughs are not as prevalent as the federal agency pass-throughs.

Table 1
Mortgage pass-through securities and home mortgages outstanding ($ billions)

	1980	1981	1982	1983	1984	1985
Mortgage pass-throughs						
GNMA	$ 94	$106	$119	160	$180	$212
Freddie Mac PC	17	20	43	58	71	99
FNMA MBS	n.a.	1	15	25	36	55
Total	114	127	177	243	287	366
1-4 family mortgages	891	1,065	1,075	1,190	1,319	1,467
Mortgage pass-throughs as a % of 1-4 family mortgages	12.8%	11.9%	16.5%	20.4%	21.8%	24.9%

SOURCE: Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin,* various issues.

Figure 1
Taxable fixed income securities: Amount outstanding at year-end



[a]GNMA, FHLMC and FNMA mortgage-backed securities, and publicly sold conventional pass-throughs.
[b]Private placements, convertible bonds, foreign issues sold in the U.S., and straight domestic public issues.
[c]Treasury notes and bonds and nonmortgage agency issues.
[d]As of September 30, 1984.
SOURCE: Salomon Brothers, *Mortgage Securities: 1972-84*, by Michael Waldman and Steve Gutterman, (New York, March 1985).

In 1977, Bank of America issued the first private sector pass-through. The securities were backed by conventional mortgages, and private mortgage insurance covered the entire pool of loans rather than each individual loan. Only $10 billion in private sector pass-throughs were outstanding at year-end 1984.[1] This amounted to only 3.5 percent of all federal agency pass-throughs outstanding at that time.

Popularity of mortgage pass-throughs has been greatest among savings institutions. This popularity probably results from S&Ls' ability to substitute pass-throughs for whole mortgage loans, thus increasing the diversification and liquidity of their portfolios. Pass-throughs accounted for about 15 percent of all savings institution assets, 8 percent of insurance company assets, 7 percent of commercial bank assets, and 5 percent of pension fund assets.[2]

Mortgage-backed bonds

The second type of mortgage-backed security is the mortgage-backed bond (MBB). Like the pass-through, the MBB is collateralized by a portfolio of mortgages. Sometimes an MBB is backed by a portfolio of mortgage pass-through securities such as Ginnie Maes. Unlike the pass-through, the MBB is a debt obligation of the issuer, so the portfolio of mortgages used as collateral remain on the issuer's books as assets and the MBBs are reported as liabilities. Also, the cash flows from the collateral are not dedicated to the payment of principal and interest on MBBs. MBBs have a stated maturity (usually between five and 12 years), and interest is generally paid on a semiannual basis.

One important characteristic of MBBs is that they are usually overcollateralized. The collateral is evaluated quarterly, and if its value falls below the level stated in the bond indenture, more mortgage loans or securities must be added to the collateral.

There are three reasons for the overcollateralization of MBBs.[3] First, because the cash flows accrue to the issuer rather than to the mortgage pool or to the bondholders, the outstanding balance of any mortgage pool may decline faster over time than the principal on the MBBs. Second, the excess collateral provides additional protection to the bondholder against default on individual mortgages in the portfolio. Third, the excess collateral protects bondholders from declines in the market value of the collateral between valuation dates. Premiums for default risk and risk of collateral depreciation could be captured in the yield on MBBs; however, because payment of principal and interest accrues to the issuer and can be used for reinvestment the issuer may prefer to use overcollaterization.

Both the private sector and federal agencies issue MBBs, although they are more prevalent among private issues. In the private sector, they are issued by savings and loan associations and mutual savings banks. The number of issues, however, has been somewhat limited. At the end of 1984, savings and loans had issued only $5 billion in MBBs.[4] One reason for this limited activity is that MBBs may be more costly to issue than pass-throughs. Because the mortgages that serve as collateral from MBBs remain on the issuer's books, a depository institution that issues MBBs must cover these loans with a certain proportion of capital.

Pay-throughs

The third type of mortgage-backed security is the pay-through bond. This bond combines some of the features of the pass-through with some from the MBB. The bond is collateralized by mortgage loans and appears on the issuer's financial statements as debt. The cash flows from the mortgages, however, are dedicated to servicing the bonds in a way similar to that of pass-throughs.

In June 1983, Freddie Mac issued a pay-through bond known as the CMO (collateralized mortgage obligation). Each CMO issue was divided into three maturity classes, and each class received semiannual interest payments. Class 1 bondholders, however, received the first installments of principal payments and any prepayments until Class 1 bonds were paid off. Class 2 bondholders, in turn, received principal payments and prepayments before Class 3 bondholders received any principal payments. The original Freddie Mac CMO was structured so that Class 1 bonds were repaid within five years of the offering date; Class 2 bonds, within 12 years; and Class 3, within 20 years.

The structure of CMOs makes the term of the securities more certain. Therefore, bondholders are given a kind of "call protection." This call protection is one of the primary reasons for the success of CMOs. Because CMOs mitigate the prepayment risk, and provide shorter maturity classes of mortgage securities, investors who might not have otherwise invested in mortgages have been attracted to the mortgage securities market.

Since Freddie Mac developed the first CMO, many variations have been developed. Issues of CMOs now have from three to more than six maturity classes. Most CMO issues, however, have four maturity classes.

In addition to Freddie Mac, private sector firms also issue pay-throughs. As shown in Table 2, at least six different types of private firms issue CMOs. Home builders have accounted for the most issues of CMOs (33) as of June 1985. Investment banks, however, have issued the greatest dollar volume of CMOs—$7.4 billion, or 34 percent.

The level of activity in pay-throughs has been limited compared to mortgage pass-throughs. Total dollar volume of CMOs was only $22 billion as of June 1985, less than one-tenth of the volume of mortgage pass-throughs issued by GNMA, FNMA, and Freddie Mac over that same time period. Furthermore, the federal agency pass-throughs serve as collateral for 45 percent of CMOs issued since June 1983. Conventional mortgages are collateral for 28 percent of CMOs issued, and a mixture of conventional mortgages and federal agency pass-throughs account for the remaining 27 percent.

One reason that nongovernment intermediaries have been more successful as issuers of CMOs than of other mortgage-related securities is that nearly half of all CMOs are backed by GNMAs and other federal agency mortgage securities. Thus, by issuing CMOs investment bankers and other intermediaries primarily provide investors with call protection and shorter-term mortgage securities. The value of call protection and the value to breaking mortgage securities into various maturity classes is reflected in the spread between the underlying assets and the yields on CMOs.

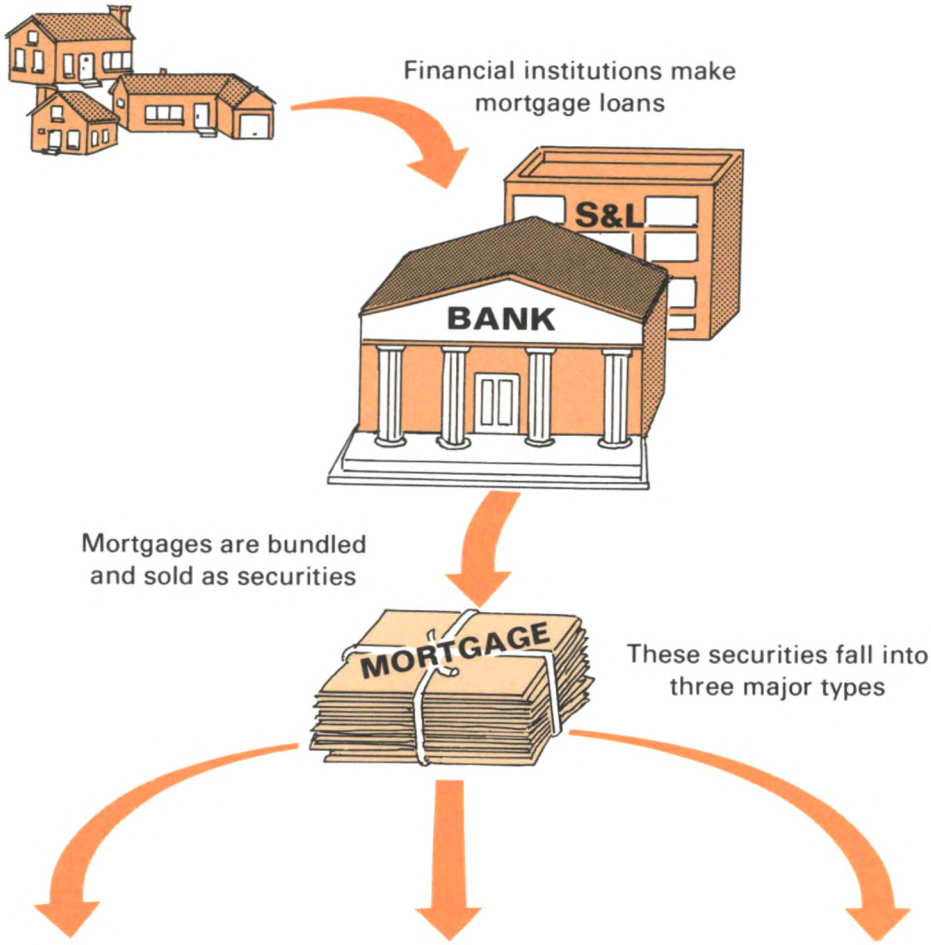
The primary investors in CMOs are insurance companies, pension funds, thrift institutions and commercial banks. As shown in Table 3, insurance companies and pension funds account for the largest share of CMOs in the long-term maturity classes. As expected, the CMOs held by thrifts and banks are from the short-term maturity class.

CARS and other loan-backed securities

Although most loans packaged and sold in the secondary market are mortgages, other types of loans have been securitized. As of September 1985, GNMA had issued $3.2 billion in pass-throughs collateralized by mobile home loans.[5] In addition, auto loans, computer leases, credit card loans, and other receivables have recently been securitized.

In 1985 automobile loans were first packaged and sold as securities. These loan-backed securities, known as certificates of automobile receivables (CARs), are pass-through securities, in which the interest and principal of the underlying auto loans are passed on to the security holders. CARs generally require a higher servicing fee than do mortgage-backed securities because an auto loan requires more monitoring. The collateral, a car, is not sta-

Figure 2
Turning mortgages into securities



tionary, and the collateral does not maintain its value as well as a home.

CARs were developed and first issued by Salomon Brothers in January 1985. Salomon privately placed $10 million of CARs for a firm that specializes in financial services for auto dealers. The CARs were backed by a pool of auto loans, each of which carried its own credit insurance. In addition, the pool of auto loans was insured by a private insurer.

The first public offering of CARs occurred in March 1985 when Salomon Brothers offered

Table 2
CMOs by issuer and by type of collateral:
June 1983 - June 1985
($ billions)

	$ millions	% of total	Number of issues
Issuer			
Investment bankers	$7,377	34	22
FHLMC	4,869	22	7
Home builders	4,459	20	33
Mortgage bankers	1,678	8	9
S&Ls	1,547	7	7
Insurance companies	1,522	7	2
Commercial banks	500	2	1
Collateral			
GNMAs	$8,808	40	38
Conventional mortgages	6,231	28	11
Mixed collateral	5,833	27	26
FHLMC PCs	728	3	4
FNMAs	350	2	2

SOURCE: Joseph Hu, "Proliferation of Mortgage-Backed Securities," *Mortgage Banking* 45 (September 1985): 38.

$60 million of pass-through securities backed by automobile loans originated and serviced by Marine Midland Bank. Originally, Marine Midland Bank was to issue the CARs with its holding company, Marine Midland Banks, Inc., insuring the transaction. The Federal Reserve Board, however, indicated that it would impose reserve requirements on the issue and the auto loans remain on the bank's books as assets for computing capital requirements.[6] The offering, therefore, was restructured. A private insurer was secured to insure the pool of auto loans, and a trust was established to hold the underlying loans.

CARs have not been nearly as successful as mortgage pass-throughs. Less than one-half of 1 percent of all auto loans outstanding have been securitized. A major reason for the CARs' lack of success can be attributed to the Federal Reserve's decision concerning Marine Midland's public offering. Additionally, the need to secure private insurance or forego insurance makes many of these deals unprofitable. However, recently the market for CARs has shown signs of improving. General Motors Acceptance Corporation (GMAC), the largest auto lender in the country based on auto loans outstanding, issued nearly $525 million of securitized auto loans. A spokesman for GMAC said that subject to interest rates, GMAC could issue $500 million of CARs every quarter.[7]

Credit card receivables have also been securitized. In April 1986, Salomon Brothers privately placed $50 million of pass-throughs backed by a pool of Bank One credit card receivables. The "certificates of amortizing revolving debts" (CARDs) were unrated and have a stated maturity of five years. For the first 18 months, only interest payments are passed through to investors. Principal payments made during this time are used to purchase additional receivables. After the first 18 months, investors receive principal payments.

The CARDs were not guaranteed by a third-party; rather, Bank One established a reserve fund equal to twice the historical default rate on credit card debt, and Bank One retained a 30 percent interest in the credit card pool. When the CARDs mature, if there are no defaults within the pool, the bank recoups the entire value of the reserve fund. The reserve fund concept is not only applicable to CARDs. It could be applied to CARs and other loan-backed securities where recourse or private insurance is thought to be necessary.

Other types of securitized loans include loans guaranteed by the Small Business Administration, computer leases, and various types of trade credit.[8] The first SBA loan-backed securities were sold in August 1985, and

Table 3
Major buyers of CMOs

	Thrift institutions	Banks	Insurance companies	Pension funds	Other
Maturity class (weighted average life)					
Class 1 (less than 4 years)	26.9%	17.7%	18.1%	33.2%	4.1%
Class 2 (4.1 - 7 years)	7.2	2.1	57.4	29.1	4.2
Class 3 (7.1 - 10 years)	5.5	3.4	40.4	48.7	2.0
Class 4 (more than 10 years)	3.3	—	29.3	67.4	—

SOURCE: Salomon Brothers, "Comments on Credit," March 9, 1985, p. 3.

in February 1986, First National Bank of Wisconsin became the first bank to package SBA loans and sell them as securities.

The securities backed by lease receivables and trade credit are similar to mortgage-backed bonds. Commercial paper or corporate bonds are collateralized by lease and trade credit receivables. The receivables remain on the books of the issuer. Some companies, however, sell their receivables to a subsidiary set up for the purpose of issuing debt backed by the parent's receivables. AMAX, a metals and mining company, is responsible for developing the securitization of trade credit. Since 1982, AMAX has been selling a portion of its receivables to a subsidiary. To buy the receivables, the subsidiary issues commercial paper insured by a private insurance company.

The securitization of computer leases was pioneered by Comdisco early in 1985. The firm sold $35 million in four and one-half year bonds backed by computer leases. In March 1985, Sperry Corporation followed Comdisco's lead and issued $192.5 million of six-year notes backed by computer leases, and in September 1985, Sperry issued another $145.8 million in debt collateralized by computer leases.[9]

Why securitize?

A pool of loans will, of course, only be securitized if the benefits from doing so exceed the costs, and if the net benefits are greater than those from other funding sources. The primary costs of securitization are the administrative costs, such as investment banking fees, the cost of providing information to investors and the rating agencies, and, in some instances, the cost of private insurance.[10] The benefits from securitization include protection from interest rate risk (and sometimes prepayment risk), increased liquidity for original lenders and for investors, a more efficient flow of capital from investors to borrowers, and new and less expensive funding sources for original lenders.

The first two benefits are particularly applicable to the mortgage market. Savings and loans associations (S&Ls), the primary suppliers of mortgage credit, hold residential mortgages with average stated maturities of 27.5 years and fixed interest rates. Although originations of adjustable-rate mortgages have been increasing, 62 percent of all mortgages held by S&Ls are still fixed-rate loans.[11] Sixty-five percent of the typical S&L's liabilities, primarily time and savings deposits, mature in one year or less. This gross mismatching of maturities leaves S&Ls open to the risk that interest rates will rise. Savings institutions have several techniques available to hedge interest rate risk. For example, they can utilize the options and futures markets. These techniques, however, can be costlier than securitization, and thrift managers may be more familiar with securitization than with other gap management tools.

Pass-through mortgage securities as well as mortgage-backed bonds and pay-through bonds allow S&Ls to reduce the maturity gap between their assets and liabilities. With pass-throughs, an S&L sells a pool of mortgages; thus, the long-term assets are taken off its books, shortening the average maturity of its assets and decreasing its required level of capital. The thrift, however, continues to service the loans and collects the servicing fees. Pass-throughs, therefore, have the added advantage of allowing the issuer to earn income on fewer assets and less capital, thereby greatly improving its return on assets and equity.

Figure 3
Cost vs. benefits from securitization

In addition to issuing pass-throughs, S&Ls can hold mortgage pass-throughs and CMOS in their portfolios in place of whole mortgage loans. By holding pass-throughs and CMOs, thrifts can further diversify their assets, and with CMOs they can protect themselves against prepayment risk. Pass-throughs and CMOs can also increase the liquidity of their portfolios because pass-throughs trade in an active secondary market.[12] Trading in mortgage-backed securities increased from $243 billion in 1981 to $1.2 trillion in 1985.[13] Also, the ability to liquify such assets as mortgage loans, consumer loans, credit card receivables, and leases increases an institution's ability to manage its liquidity position.

With MBBs and pay-through bonds, the portfolio of loans remains on the issuer's books, serving as collateral for the bonds. The issuer, therefore, increases its leverage by issuing more debt; however, by issuing the bonds, the thrift lengthens the average maturity of its liabilities. An MBB has an average maturity of about five to 12 years, while most deposits have maturities of less than one year.

Table 4 shows how S&Ls are using mortgage-backed securities to restructure their balance sheets. In 1980, pass-throughs held at and MBBs issued by S&Ls represented only 7.3 percent of their 1-4 family mortgages. By 1984, however, pass-throughs and MBBs were over 28 percent of 1-4 family mortgages at S&Ls.

Securitization also provides for a more efficient flow of funds from investors to borrowers. Large institutional investors, such as insurance companies and pension funds, have long-term liabilities; however, they generally do not have decentralized investment operations or distribution systems that allow them to make residential mortgages directly. Thrifts, as already discussed, have very short-term liabilities and an expertise in making residential mortgage loans. Securitization links the long-term funds of insurance companies and pension funds with the long-term assets of S&Ls, thus allowing more capital to flow into the market for mortgage credit.

Securitization may also provide a firm with a relatively inexpensive source of funds. For example, a thrift may have to increase the rate it pays on savings deposits from 8 percent to 9 percent to raise additional funds. Alternatively, it could issue MBBs at 10 percent. The marginal cost of issuing the MBBs may be less than that of raising deposit funds because the higher rate paid on savings deposits will have to be paid on all deposits, old and new.

Securitization can provide an inexpensive funding source when a firm's overall credit rating is lower than the credit rating on its receivables. For instance, Gelco Corp., a firm that leases trucks, was rated BB- by Standard and Poor's. Its commercial paper backed by high-quality leases was rated A-1. The firm saved about 80 basis points in borrowing costs by securitizing its lease receivables.[14] Similarly, securitization can enable small and new companies to offer customer financing.

Finally, securitization can also provide a depository institution with an inexpensive source of funds because, in some cases, it can enable a depository institution to avoid "intermediation taxes," i.e., reserve and capital requirements and deposit insurance premiums. If a depository institution sells mortgage pass-throughs, it eliminates the underlying mortgage loans from its balance sheet and, therefore, no longer has to hold capital against these loans. Since the proceeds from the sale of pass-

Table 4
One-to-four family mortgages, pass-throughs and mortgage-backed bonds at S&Ls

	1980	1981	1982	1983	1984
Pass-throughs	27	33	61	93	118
Pass-throughs/1-4 family	6.4%	7.6%	15.5%	23.7%	27.3%
Mortgage-backed bonds	4	3	3	4	5
MBBs/1-4 family	0.9%	0.7%	0.9%	0.9%	1.1%

SOURCE: Federal Home Loan Bank Board, *Quarterly Financial Report, State of Condition* (as of December 1980 to 1984), and Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin,* various issues.

throughs are not deposits, the issuer does not have to hold reserves or pay for deposit insurance against the proceeds. As "intermediation taxes" increase, this benefit from securitization, and therefore securitization itself, would be expected to increase as well.

To the extent that intermediation taxes are too high on some types of bank assets, securitization may be a reaction to these taxes. For example, deposit insurance and capital requirements are flat taxes; thus, high-risk loans are taxed at the same rate as low-risk loans. The cost of funding low-risk loans "after tax" may be higher than the costs faced by nonregulated competitors or by the borrowers themselves. Therefore, in reaction to intermediation taxes, banks may be selling off these high quality assets and substituting high-risk assets. Indeed, some bankers have suggested that securitization would dry up if capital requirements and deposit insurance were "correctly" priced according to risk.

In some ways, securitization could facilitate the implementation of deposit insurance. The primary problem with implementing a risk-based deposit insurance scheme is in measuring risk. However, if most of a bank's assets were securities and trading in a secondary market, the market value of a bank's assets and their corresponding risk could be measured. Securitization, therefore, would facilitate risk-based deposit insurance by increasing the available information on bank riskiness.

One very serious problem, however, still remains. If each bank that issues loan-backed securities guarantees the principal and interest on the securities, and if the FDIC makes good on all contingent liabilities of failed banks, then, indirectly, the FDIC is guaranteeing the securities. This guarantee will be reflected in the price of the securities; i.e., they will have lower yields and be less risky than if they were not guaranteed. Then the primary problem with administering risk-based deposit insurance would be valuing the indirect guarantee of the FDIC on loan-backed securities.

Can everything be securitized?

Not all loans are easy to securitize. Loan terms and structures vary significantly. Also, the benefits to any individual firm from securitization depend upon each firm's particular situation and upon the type of loan securitized. The costs of securitizing are not uniform across different types of loans.

The riskiness of a loan-backed security is the main determinant of its price. The riskier the security, the lower the price, and therefore the higher the yield. If the yield on the security is greater than the average yield on the underlying pool of loans, the benefits from securitizing may be eliminated. In addition, if securities are rated below BBB or Baa by the rating agencies (Moody's and Standard and Poor's), then regulated financial institutions usually will not invest in them because they have to justify such investments to the regulatory authorities.

However, several options to decrease the riskiness of an issue are available to a securities issuer. For loan-backed bonds, such as mortgage-backed bonds, a high degree of over-collateralization will increase the safety of the bonds and decrease the required return. Another way to increase the safety of an issue is to insure the securities themselves.

When an issuer of loan-backed securities uses a private firm to insure the loans or the portfolio underlying the securities, the issuer passes the default risk on to the insurer. The insurer then has to evaluate the portfolio's de-

fault risk. The premium that the insurer charges is compensation for the default risk and the cost of evaluating the portfolio. The cost of evaluating complicated portfolios may eliminate the benefits of securitization. Therefore, the easier a portfolio is to evaluate, the more likely that it will be securitized.

The ability to evaluate the pool of loans that underlies a security issue, and therefore the securities themselves, seems to be the key to securitization. The credit characteristics of the underlying portfolio must be understandable to the rating agencies and to investors. Loans that are very large or have complex credit characteristics are better suited for whole loan sales or loan participations. Other important credit characteristics for securitization include a well-defined payments pattern and a sufficiently long maturity, at least one and one-half to two years.

Mortgage loans are illustrative of characteristics that make a loan a prime candidate for securitization. Mortgages are relatively homogeneous products that are relatively easy to evaluate. There is a secondary market for whole mortgage loans, and a wealth of data is collected on mortgages, delinquencies, and prepayments, broken down by various demographic characteristics.[15] Also, the structures and terms of mortgage loans, at least fixed-rate mortgage loans, are similar. And even though most mortgage loans are prepaid, the actual average maturity is about 12 years.

Historically, mortgage loans have had excellent credit characteristics, although recently mortgage default rates have reached record levels. The delinquency rate on mortgages was 6 percent of the total number of loans outstanding in the fourth quarter of 1985; only 0.81 percent resulted in foreclosures.[16] The collateral backing mortgage loans contributes to their excellent credit characteristics. The value of a single-family house does not depreciate as fast as other forms of collateral. In fact, it often appreciates. During the 1970s, housing prices soared, so the collateral backing many mortgages far exceeded the value of the loan. Also, these mortgages were not prepaid quickly because interest rates rose during this period as well.

Adjustable-rate mortgages (ARMs) do not have characteristics that make them good candidates for securitization. They do not have fixed payments streams and are generally priced below the fixed-rate loans. As these loans are repriced, the rate fluctuates with market rates; however, there are usually limitations placed on how much the rate on the loan can fluctuate or how much monthly payments can increase over the life of the loan.

Thus, negative amortization is possible. Also, the period for interest rate adjustments and the index to which the rate is tied varies across loans. As a result of these complications, securities backed by adjustable-rate mortgages have not been successful, and they trade more like whole loan packages than like securities. Nonetheless, FNMA has issued over $5 billion in adjustable-rate mortgage-backed securities, and Freddie Mac recently issued a "standardized" ARM-backed security with ARMs that are tied to Treasury rates and have 2 percent annual caps and 5 percent lifetime caps.

Besides residential mortgages, consumer loans such as auto loans, credit card receivables, lease receivables, and loans for boats and mobile homes are probably the best candidates for securitization. As discussed earlier, auto loans, credit card receivables, and lease receivables have already been securitized.

Commercial and industrial (C&I) loans are relatively difficult to securitize. One type of commercial loan, however, has been securitized—small business loans guaranteed by the Small Business Administration (SBA), an agency of the federal government. The structure of these loans is fairly standard, and the federal government assumes much of the risk and many of the evaluation problems for a pool of SBA loans by guaranteeing 85 percent of the principal and interest. Still, very few SBA loans have been securitized and the number of participants in this market is very small. As of February 1986, only five of 19 approved pool assemblers have securitized SBA loans.

Nonguaranteed C&I loans would be the most difficult to securitize, and to date, none have been. C&I loans are not homogeneous, and the terms and structures of C&I loans vary across borrowers.[17] For example, the maturity of C&I loans ranges from less than one year to about eight years. The pricing of C&I loans also varies, and the stream of payments from a C&I loan is not fixed. C&I loans are also repriced frequently, and the timing of payments is generally tailored to meet individual borrower needs.

Securitization and the regulatory environment

Securitization has raised two regulatory questions. First, are the proceeds from the sale of securitized assets that are sold with an obligation to repurchase the assets considered deposits, and does a bank have to hold reserves against these proceeds? And second, if a bank sells securitized assets with recourse, does it have to hold capital against the securities, and if so, how much?

Deposits and reservability

The question of reservability was formally addressed in 1983 by the Federal Reserve Board's Legal Division in response to banks' sales of industrial revenue bonds (IRBs). Because of poor earnings, banks were not able to profit from tax-exempt income. Consequently, they were selling IRBs with an *unconditional* obligation to repurchase the bonds in the event of default. The Board's legal staff said:

> For purposes of Regulation D, the sale of the loan subject to an unconditional agreement to repurchase is properly regarded as a borrowing by the bank . . . As such, we continue to be of the view that the bank's obligation to repurchase gives rise to the creation of a deposit . . .[1]

There have been exceptions to this rule. First, Regulation D states that a deposit does not include "an obligation arising from the retention by a depository institution of no more than a 10 percent interest in a pool of conventional one-to-four family mortgages that are sold to third parties." Thus, if a bank issues mortgage pass-through securities and promises to compensate purchasers for losses up to 10 percent of the market value of underlying pool of mortgages at the time of sale, the proceeds from the sale of the pass-throughs are not considered deposits. Therefore, they are not reservable. This 10 percent rule, however, applies only to mortgage pass-through securities and does not extend to securities backed by a pledge of mortgages or other types of assets, nor to other asset sales. The Fed allows the proceeds from pass-throughs to be exempt from reserve requirements in order to encourage the growth of the secondary mortgage market.[2]

A second exception was made by Board staff for asset sales with recourse in 1980. A bank proposed to sell IRBs and retain an insurance company to guarantee the bonds. The bank paid a premium for the guarantee, but the bank also agreed to indemnify the insurer for any losses incurred as a result of the bonds. The purchasers of the bonds only knew that the insurance company guaranteed the bonds; they were not aware of the agreement for reimbursement between the bank and the insurer. The Board's Legal staff reasoned that "the insurance broke the nexus between the sale of the asset by the bank and the purchase of the assets by the third party. Thus, the bank's obligation was not regarded as issued in connection with the raising of funds."[3] Therefore, the proceeds from the sale of the IRBs were not considered deposits and were not reservable in the 1980 case.

With the recent rise in asset sales and securitization of nonmortgage loans, the Federal Reserve Board has increasingly received requests for interpretations of Regulation D, especially with regard to the reservability of asset sales with recourse by depository institutions. Consequently, in May 1986, the Board issued for comment a proposal to amend the definition of "deposit." This proposed amendment would define "deposit" to include "sales of assets where the depository institution issues or undertakes a liability supporting the assets sold or retains a reversionary interest in these assets, regardless of whether the liability or interest is conditional, unconditional or contingent or whether the liability covers all or a portion of the assets sold."[4] The proposal would preserve the Board's earlier exception to the definition of "deposit" for sales with

recourse of one-to-four-family mortgage pools where the seller retains no more than a 10-percent interest in the pool.

While the Board's recent proposal would not extend this exception to other types of assets, it does provide for a few exceptions to the definition of "deposit" for other types of assets sold with some kind of investor protection. First, if a depository institutions sells an asset and agrees to be liable for 75 percent or less of the *losses* from that asset as they are realized, then under the proposal, the proceeds from the asset sale would not be reservable. Second, the proposal would continue the former treatment of sales of assets by a depository institution that are guaranteed by a third party and "the depository institution's only liability in the transaction is to reimburse a third-party guarantor of the assets sold," the proceeds from such a transaction would generally not be considered deposits under the Board's proposal.

Finally, the proposal would also exclude obligations of affiliates from the definition of deposit "if the proceeds from an affiliate's obligation are used to purchase assets from a depository institution without recourse;" the proposal would extend the definition of "affiliate" to include any organization that a depository institution effectively manages or controls. Currently Regulation D regards obligations of affiliates as deposits when the obligations are used to fund the depository institution, if the obligation would have been a deposit if it had been issued by the institution.

Regardless of whether or not an asset sold with recourse meets the above exceptions, the proceeds from the asset sale still might not be reservable under the current proposal if the maturity of the "liability," the recourse provision, is greater than 18 months. The Fed proposes to determine the maturity according to the remaining maturity of the assets sold unless the maturity is effectively shortened by the nature of the assets or the guarantee. The Fed is considering setting the maturity at the "earliest time" the guarantee could be exercised, but the definition of "earliest time" is still an unresolved issue. Even if the effective maturity was determined to be one day, the reserve requirements on an asset could be minimal if payments to the purchaser in the first 18 months primarily consist of interest payments, as reserves would apply only to the principal repaid in the first 18 months.

Capital requirements

The Federal Reserve's policy with regard to the second question—capital requirements on assets sold with recourse—is more stringent than its policy with regard to reserve requirements. The question of capital requirements arises because securitization reduces the assets of the bank but would leave the riskiness of a bank unchanged when the bank agrees to buy back all or a portion of the portfolio of underlying loans in the event of default, or when the bank guarantees the payment of principal and interest on the securities. If the bank guarantees the securities, it still assumes the risk of the underlying loans. Therefore, should a bank have to hold capital against the sale of securitized assets if the securities are somehow guaranteed by the bank, and if so, how much?

In general, the Federal Reserve Board and the other bank regulatory agencies do require banks to hold capital against assets sold with recourse. According to the revisions of the instructions for filing the Reports of Condition and Income, "A transfer of loans, securities, receivables, or other assets is to be reported as a sale of the transferred assets" by the selling institution and a purchase by the purchasing institution only if the selling institution retains no risk of loss from the sale of assets and has no obligation to any party to pay principal or interest on the assets sold.[5] Thus, "if risk of loss or obligation for payment of principal or interest is retained by, or may fall

back upon, the seller, the transaction must be reported by the seller as a borrowing from the purchaser and by the purchaser as a loan to the seller."[6] The selling institution must keep the assets on its books and include them in the calculation of capital requirements. These revisions do not apply to the sale of fed funds, securities subject to repurchase agreements, or pass-through pools of residential mortgages.

Even if the selling institution promises to compensate purchasers for losses up to a certain portion of the assets sold, the entire amount of the assets must be reported and carried on the seller's books. Only if the selling institution guarantees a percentage of the losses, rather than a percentage of the assets, can the seller reduce the capital that it is required to hold. In that case, the seller would have to report that percentage of the total amount of the asset on its balance sheet. Thus, if a bank sold $1 million of auto loans and promises to compensate purchasers for losses up to 10 percent of the portfolio the bank would have to continue to report the entire $1 million as assets on its balance sheet and continue to hold roughly $55,000 of capital against these loans. But if the bank guaranteed 10 percent of the default losses incurred on the portfolio, the bank would have to report only $100,000 as assets on its balance sheet and hold $5,500 of capital against these loans.

The Financial Accounting Standards Board (FASB) differs in the treatment of asset sales with recourse on the balance sheet. According to FASB 77, such a sale should be recognized as a sale if the seller "surrenders control of the future economic benefits embodied in" the assets sold; the seller's "obligation under the recourse provisions can be reasonably estimated;" and the buyer "cannot require the [seller] to repurchase the receivables [assets] except pursuant to the recourse provisions."[7] Therefore, in the example of the sale of auto loans above, the bank would reduce its holdings of auto loans by $1 million and, under GAAP, be expected to show $20,000 in reserve against this portfolio of assets since a well-diversified portfolio has an expected default rate of about 2 percent.[8] If the FASB standard were employed in Federal Reserve calculations of capital requirements, the banks would have to hold significantly less capital. The Federal Reserve Board feels that if the seller of the assets assumes the risk of default, regardless of what the expected default rate might be, the seller retains the total risk inherent in the assets sold and the correct proportion of capital to be held against the assets is equal to the capital requirement.

Some bankers are concerned that the Fed's treatment of asset sales with recourse will eliminate a useful tool for liquidity at a time when many institutions have, or still could encounter, liquidity problems. The Federal Reserve Board's policy, however, is consistent with the idea that the benefits to the safety of the banking system that result from requiring banks to hold capital against the entire amount of assets sold with recourse outweigh the costs associated with losing what many bankers believe to be a valuable tool for liquidity management.

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[1] Letter from Gilbert T. Schwartz to Reserve Bank General Counsels, March 7, 1983.

[2] Federal Financial Institutions Examination Council, October 28, 1985, memo to The Chief Executive Officer of the bank addressed from Robert J. Lawrence.

[3] Letter from Gilbert T. Schwartz of March 7, 1983.

[4] Board of Governors of the Federal Reserve System, 12 CFR Part 204, May 1, 1986.

[5] Federal Financial Institution's Examination Council, October 28, 1985, memo.

[6] Ibid.

[7] Financial Accounting Standards Board, Statement of Financial Accounting Standards No. 77—Reporting by Transferors for Transfers to Receivables with Recourse.

[8] American Bankers Association, "Consumer Credit Delinquency Survey," 4th Q, 1985.

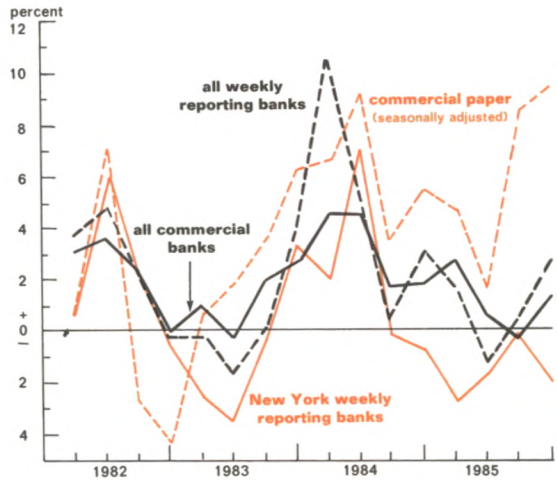
These characteristics make evaluating C&I loans difficult. Many of the difficulties are similar to those encountered when buying or selling a loan participation. A bank sells, or participates, portions of a loan to a relatively small number of banks. Participations are used primarily for loans that are too big for a bank legally or practicably to hold on its books. The buyer of a participation is responsible for the credit evaluation. Usually, to ameliorate the evaluation problem, a "coinsurance" scheme is used whereby the originator keeps 10 percent of the loan and sells 90 percent. In addition, the originator may agree to buy back the 90 percent if there are any difficulties. But even when the sale is made with recourse and the originator keeps a portion of the loan, the buyer still evaluates the quality of the loan.

A similar coinsurance arrangement could be made for securities backed by C&I loans. However, with a C&I participation, a few buyers evaluate only one loan at a time. With securitization, many buyers evaluate a pool of loans. Also, if a bank sells loan-backed securities with recourse, the bank usually must hold reserves against the proceeds from the sale and capital against the loans sold (see box).

Another complication in evaluating C&I loans is that their credit characteristics vary greatly. Some loans are collateralized and others are not. Even if the loans in a pool are collateralized, the collateral differs across loans, and there may not be a ready market for the collateral in the event of default. Furthermore, prepayments rates are not stable and predictable. Consequently, only securities backed by high quality loans could be sold. But the securitization of high-quality, C&I-backed securities would leave banks with portfolios of the riskiest loans, and the depositors, or at least their guarantor, the FDIC, as well as uninsured depositors and shareholders, would be placed at great risk.

In addition to the technical difficulties in securitizing C&I loans, there are less costly alternatives. Whole loan sales, participations, syndications, and commercial paper provide good alternatives to securitization. According to the Federal Reserve System's February 1986 Senior Loan Officer Opinion Survey on Bank Lending Practices, 60 large banks had approximately $26 billion in domestic commercial and industrial loan participations and sales outstanding at year-end 1985.[18] The nine largest

Figure 4
Growth of business loans vs. commercial paper



SOURCE: *Federal Reserve Bulletin*, various issues.

banks accounted for $15 billion in domestic C&I loans sold. Sixty-seven percent of the loans sold by the 60 respondents were loans made to investment grade borrowers, and 87 percent of the loans sold by the nine largest banks were obligations of investment grade borrowers. This is consistent with the argument that intermediation taxes encourage banks to sell loans of high quality borrowers because "after tax" these borrowers face a lower cost of funds than banks do.

Corporate borrower sources for these cheaper funds are found by directly accessing the capital markets, but analysis of the market for corporate debt since 1975 does not indicate that bank asset disintermediation is rampant. Total corporate bonds plus commercial paper as well as bank loans to nonfinancial corporate business increased 3 times over the 1975-85 period.[19] The growth in the commercial paper market, however, has by far outpaced the growth of commercial and industrial loans held at banks. Since 1975, commercial paper outstanding has increased over sevenfold. In addition, studies have found that in the late 1970s, large New York City banks experienced weak loan demand because large corporate customers with high credit ratings (typical customers of money center banks) were turning to the commercial paper market.[20] As shown in Figure 4, C&I loans outstanding at all com-

mercial banks have fallen dramatically since the beginning of 1984. The fall has been most precipitous at the large New York banks, but as smaller nonfinancial firms begin to securitize their own assets by backing their commercial paper with their high-quality receivables, smaller banks throughout the country may begin to feel the impact of commercial paper and other forms of direct corporate borrowing.

Implications for the financial services industry

Since 1970, when the GNMA introduced the first mortgage pass-through security, the growth in the securitization of loans has been phenomenal. As investment banking firms and others involved in securitization move along the learning curve, the development and issuance of new loan-backed securities will become less expensive. More issues will likely be brought to market, and more types of loans, perhaps even commercial and industrial loans, will be securitized. If the securitization of loans other than mortgages becomes as successful as mortgage-backed securities, the financial services industry will be transformed into a system in which banks increasingly have to compete with nonbanks in allocating credit, especially if banks are limited in their ability to securitize loans. Also, if a large part of the loan portfolios of all commercial banks become securitized, then the banking industry will be very different than it is today. Banks will operate like brokers or investment bankers, warehousing loans to be sold to investors.

Securitization will cause banks to compete increasingly with manufacturers and retailers who finance their own customers' purchases. Currently, banks compete for consumer and commercial loans with the captive finance companies of the large retailers and manufacturers such as Sears and General Motors. Securitization could allow many consumers who would have taken out a bank loan to purchase, say, a new household appliance from a small retailer to bypass the bank and finance their purchases directly through the retailer. Also, banks' inability to securitize commercial and industrial loans combined with the Fed's imposition of reserve and capital requirements on asset sales with recourse, may "permit greater relative advantages to nonbank originators of credit in liquifying and diversifying portfolios, matching assets and liabilities, and achieving funding costs (at AAA rates) lower than those of most banks."[21] If, however, commercial banks could securitize the majority of their loan portfolios, securitization could transform the banking industry into one that is more fragmented and specialized than it is today. Consider the following scenarios.

Banks accept deposits and make loans. Individual banks, however, specialize in making certain types of loans. For instance, one bank might emphasize consumer loans while another specializes in making commercial loans. Or the lines of specialization could be narrower: one bank specializes in making auto loans, and another, in loans to the shipping industry. Each bank packages and sells its loans as securities to other banks, other depository institutions, and to the public. The only whole loans on a bank's balance sheet at a given point in time are loans that are in the securitization pipeline. Banks fund new loans with deposits and with the proceeds from the sale of loan-backed securities. Consequently, most of a bank's income is derived from servicing the loans it originates and from underwriting fees.

This scenario does not imply that banks would no longer provide maturity and default risk intermediation. Securitization allows for the diversification of default risk through the pooling of loans, and securitization also enables a financial intermediary to match long-term borrowers with long-term investors.

A second possible scenario is that banks specialize in either deposit taking or lending.[22] One bank might have a comparative advantage in operating a retail distribution network and collecting deposits, while another bank has a comparative advantage in making and servicing loans. The first bank then would collect deposits and invest them in securities purchased from the second bank.

If banks do have comparative advantages along either product or functional lines, then securitization could provide for a more efficient banking system. If there are economies of scale in the functions of deposit taking and lending, or in lending categories, securitization would allow a bank to generate the volume necessary to realize those economies. Securitization would also allow banking services to be provided with less capital and could allow funds to flow more easily to their most productive uses. It would provide for lower interest rates,

more nationally uniform rates, and greater availability of funds for loans.[23] Therefore, securitization would enable banks to compete more effectively in an increasingly competitive financial services environment.

Securitization has already begun to change the financial services industry. It has enhanced the flow of credit, changed the way firms manage their portfolios, and increased the number of firms that compete for commercial and retail customer financing. As securitization becomes more widespread, its impact on the financial services industry and the banking industry, in particular, will likely depend on a clear understanding of the costs and benefits of asset securitization by both the market and regulators.

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[1] Judy Hustick, Salomon Brothers, telephone conversation with author, November 13, 1985.

[2] Board of Governors of the Federal Reserve System, *Federal Reserve Bulletin* 71 (March 1985): A18, A26, and Board of Governors of the Federal Reserve System, *Flow of Funds Accounts, Fourth Quarter 1984*, p. 11.

[3] John R. Brick, "A Primer on Mortgage-Backed Securities," *Bankers Magazine*, 167 (January-February 1984), p. 48.

[4] Federal Home Loan Bank Board, *Quarterly Financial Report, State of Condition as of December 1984.*

[5] Salomon Brothers, "Mortgage Security Prepayment Rate Profile," (September 1985): p. 6.

[6] *Amercian Banker*, May 15, 1985, p. 3.

[7] *Wall Street Journal*, December 13, 1985, p. 33.

[8] Harvey D. Shapiro, "The securitization of practically everything," *Institutional Investor* 19 (May 1985): p. 196.

[9] "Growth of Securitization," *The Vanderwicken Report*, New Hope, Pennsylvania, October 1985, p. 1.

[10] Cunningham and Hendershott have estimated that the insurance premium on a 30-year, level-payment, residential mortgage with a loan-to-value ration of 80 percent is between 5 and 15 basis points. See Donald F. Cunningham and Patric H. Hendershott, "Pricing FHA Mortgage Default Insurance," *Housing Finance Review*, (3 October 1984), p. 373.

[11] Diana Fortier and Dave Phillis, "Bank and Thrift Performance Since DIDMCA," *Economic Perspectives*, Federal Reserve Bank of Chicago, IX (September/October 1985): p. 65.

[12] In 1983, mortgage pass-throughs turned over about 5 times; this compares with 9.6 times for Treasury securities. see Michael Stamper, Patricia Dodson, and Rick Watson "Mortgage-Backed Securities Track Record," *Mortgage Banking* 45 (December 1984) p. 24 and *Secondary Mortgage Markets*, (Spring 1985) p. 39.

[13] Robert Gunther, "Mortgage-Exchange Proposal Is Studied," *Wall Street Journal*, February 26, 1986, p. 6.

[14] Shapiro, p. 201.

[15] The Federal Reserve System, the Federal Home Loan Bank, the federal mortgage agencies, and the Mortgage Bankers Association, among others, collect data on mortgages.

[16] Mortgage Bankers Association of America, "National Delinquency Survey," (February 28, 1986).

[17] For a description of commercial loans, see Richard Brealey and Stewart Myers, *Principles of Corporate Finance*, 2nd ed. (New York: McGraw-Hill, 1984), pp. 688-94.

[18] The respondents included six large banks in the New York Federal Reserve District, six in the San Francisco District; three in the Minneapolis District, and five in each of the other nine Federal Reserve Districts.

[19] Board of Governors of the Federal Reserve System, *Flow of Funds Accounts, Financial Assets and Liabilities Year-end, 1961-84*, p. 10, and *Flow of Funds Accounts, Fourth Quarter 1985*, p. 11.

[20] John P. Judd, "Competition Between the Commercial Paper Market and Commercial Banks," *Economic Review*, Federal Reserve Bank of San Francisco, (Winter 1979), pp. 39-53.

[21] "Growth of Securitization," p. 5.

[22] James McCormick, "Transforming Banks into Capital-Efficient Intermediaries: Part I," *American Banker*, 20 September 1985, p. 8.

[23] "Growth of Securitization," p. 2.

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