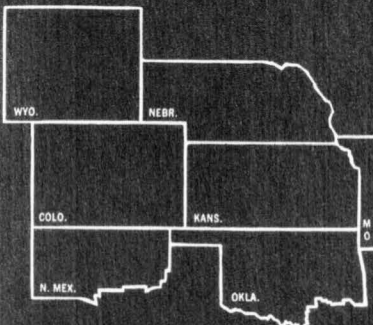




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MARCH 1968

Alternative Approaches to the Analysis Of the Financial Structure	page 3
Interest Rate Variability— Feeder Livestock Loans	page 10



FEDERAL RESERVE BANK OF KANSAS CITY

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Alternative Approaches to the Analysis Of the Financial Structure

By *J. A. Cacy*

THERE APPEAR to be two alternative approaches to an analysis of the role played by commercial banks and nonbank financial institutions in the financial structure and in the transmission of monetary policy actions. The approaches have been referred to as the traditional and the new.

The traditional approach places commercial banks in a strategic position in the financial structure for several interrelated reasons. It is argued that the banking system is strategic because the deposit liabilities of banks constitute a major portion of the public's money supply. In the view of those who adopt the traditional approach, money is a uniquely important asset, the supply of money being a significant determinant of the demand for the economy's output of goods and services. In addition, it is held that the banking industry differs from other financial institutions in that it is not subject to the discipline of public decisions with regard to the size of its assets and liabilities. Only the central bank, it is argued, can exercise control over the banking system. Furthermore, it is by exercising this control, and thereby determining the money supply, that the central bank influences aggregate demand.

According to those who adopt the new approach to the analysis of commercial banks and nonbank financial institutions, banks occupy a significant, but not strategic, position in the financial structure. That bank deposits constitute a major portion of the money supply is not an overriding consideration to these analysts. They stress that money is only one of a number of liquid financial assets. Money is important—but not uniquely so. Furthermore, the new view holds that the public exercises

considerable discipline over the banking system, so that the volume of deposit liabilities outstanding must conform at all times to the volume which the public desires to hold. The view that the central bank affects aggregate demand only through the impact of central bank actions on commercial banks and the money supply is rejected. In analyzing the impact of monetary policy actions, the adherents of the new approach focus on the effect such actions exert on the terms under which funds will be made available for spending. They hold that the behavior of nonbank financial institutions will importantly affect the ultimate impact of central banking actions and, therefore, nonbank financial institutions should be incorporated as an integral element in an analysis of the response of the financial structure to monetary policy.

In this article, the two views are discussed and compared in some detail. The discussion deals primarily with the questions surrounding the nature and economic role of commercial banks and nonbank financial institutions and with the question of the impact of central bank actions on the size of the banking system and on the money supply.

THE TRADITIONAL APPROACH: SIMPLIFIED VERSION

In order to highlight essential features of the traditional approach, a simplified version is described initially. A more sophisticated version will be presented later. In the simplified version, the existence of currency is ignored and it is supposed that commercial banks do not issue time deposits. These simplifications have the effect of rendering money and com-

mercial bank deposits equivalent magnitudes.

One of the elements of the traditional view is the independence of the size of the banking system from public preferences with regard to holding bank deposits. This independence is said to arise from the banks' administration of the payments mechanism. Because banks administer the payments mechanism and bank deposits are used as the medium of exchange, a change in the reserves and deposits of any bank or group of banks resulting from a public desire to alter its holdings of deposits will automatically and immediately result in an equal change (in the opposite direction) in the reserves and deposits of some other banks. For the banking system as a whole, an alteration in the volume of deposits can occur only if banks alter the volume of earning assets they hold. For example, when banks increase their earning assets, additional bank deposits are created equal to the volume of assets acquired. Furthermore, for the banking system, the volume of earning assets held depends directly on the volume of bank reserves. Thus, the volume of bank deposits depends entirely on the volume of earning assets, which, in turn, depends entirely on the volume of bank reserves. Decisions made by the public with regard to holding deposits have no effect on the aggregate volume of deposits because such decisions do not affect aggregate reserves.

Another element of the traditional approach is the contrast drawn between commercial banks and nonbank financial institutions. According to this view, public preferences are the dominant factor determining the size of nonbank financial institutions. The loss of reserves by one of these firms does not—as in the case of commercial banks—automatically and immediately result in a gain for others. Thus, decisions made by the public with regard to the holding of claims on nonbank financial institutions do affect the aggregate reserves, assets, and liabilities of these firms.

A third feature of the traditional approach

is closely related to the view that commercial banks and nonbank institutions differ with regard to the way they are affected by public decisions. Because of this difference, it is argued, banks and nonbank financial institutions perform different economic functions. Nonbank financial institutions perform the function of intermediaries—that is, they facilitate the channeling of savings into investments. A public decision to save a portion of income in the form of a claim on a nonbank financial institution will result in an increase in funds available to the capital market above that which would have been available if the funds had been spent. Commercial banks, on the other hand, are not true financial intermediaries. This is because public decisions with regard to holding bank deposits have no effect on the volume of credit extended by banks. A decision to retain a portion of income in the form of bank deposits rather than spend the funds will not make any more funds available to the capital market than if the decision were made to spend. The decision will not increase bank reserves and therefore will not increase the ability of banks to extend credit. The economic function of the banking system is sometimes stated in terms of augmenting or diminishing the volume of current savings available for investing. The banking system does this by altering its earning assets as the central bank alters the volume of bank reserves. For example, an increase in bank reserves and earning assets allows total investment spending to exceed the volume of savings which the community plans to undertake and therefore increases the actual volume of investment and savings above the amounts that would have occurred in the absence of the increase in the banking system.

The economic role given the commercial banking system by the traditional approach is often stated in a different manner than in the above paragraph. The banking system is viewed as the vehicle for transmitting mone-

tary policy actions to the economic variables which policymakers desire to influence, such as interest rates and aggregate demand. The central bank has direct control over bank reserves and therefore can control the volume of bank deposits. Since the decisions of the public cannot affect the volume of bank deposits, other economic variables must accommodate to the volume of deposits established by the central bank. This accommodation is described as taking place in the following manner: When the central bank establishes bank deposits at a level different than that which the public wishes to hold, the public will alter its spending levels and/or its holdings of nonmonetary financial assets, thereby causing spending levels and interest rates to vary. Spending levels and interest rates will vary until they arrive at levels compatible with the volume of deposits established by the central bank.

The traditional view does not deny that nonbank financial institutions may be affected by the adjustments which occur as a result of an inequality between the volume of bank deposits established by the central bank and the volume of deposits which the public wishes to hold. When the public alters its holdings of financial assets, claims of nonbank financial institutions may be altered; however, these changes are simply a part of the process by which interest rates are affected. Also, intermediaries may be affected as savings levels change along with a central bank-induced alteration in spending levels. It is argued, however, that the existence and behavior of intermediaries normally will not alter the ultimate effect on interest rates and aggregate demand that will result from any given difference between the volume of bank deposits which the central bank establishes and the volume of deposits the public wishes to hold.

THE NEW APPROACH

The new approach contends that the administration of the payments mechanism does

not remove the banking system from the discipline of public preferences. It also is argued that there is no essential difference between the manner in which the liabilities of banks and nonbank financial institutions are determined. Both types of institutions are subject in the same way to the portfolio decisions of the public. The volume of bank earning assets and deposits are no more determined by the volume of bank reserves than are the volume of assets and liabilities of nonbank financial institutions determined by the cash reserves of these firms. Commercial banks are viewed as competing with other types of financial institutions in both the market for the community's accumulated savings and in the various markets for the assets held by the two types of lenders. The relative position of the commercial banking industry in the financial structure depends on the ability of banks to induce the public to hold bank deposits rather than other types of financial claims and on their ability to induce the public to borrow from them.

Commercial banks are financial intermediaries similar in economic function to any other financial institution, according to the adherents of the new approach. The function of intermediaries, in this view, is not usually stated in terms of channeling savings into investment. Their function is to create assets for the public to hold which are more attractive than claims on nonfinancial spending units and, in turn, to absorb the claims of the nonfinancial units. It is argued that commercial banks perform this function the same as nonbank financial institutions.

From this point of view, the banking system does not provide a unique vehicle for transmitting policy actions. Since the decisions of the public help determine the volume of bank deposits, other economic variables do not accommodate to the supply of money; rather the supply of money and other variables interact with one another. An inequality between desired bank deposits and existing deposits may

result in an alteration in the level of deposits as well as an alteration in interest rates and spending levels. Furthermore, interest rates and spending levels may be affected by an inequality between desired and actual holdings of claims on nonbank financial institutions, and the behavior of these institutions may affect the impact of any monetary policy action. Thus, it is argued, commercial banks are inherently no more important as transmitters of policy actions than are nonbank financial institutions.

TRADITIONAL APPROACH: SOPHISTICATED VERSION

The propositions that the banking system controls the volume of bank deposits and that decisions by the public have no effect on this volume are oversimplifications, and are recognized as such by those who adopt the traditional approach. More sophisticated versions of the traditional view are incorporated in examinations of the determinants of the money supply or in what is referred to as the theory of the supply of money. A theory of the way the supply of money is determined is implicit in the version of the traditional approach which was described above, but it is a very simple theory. In effect, the money supply is equal to some constant multiple of aggregate bank reserves; the central bank can determine the supply of money by determining bank reserves, over which the central bank has direct control.

One step toward a more sophisticated version of the traditional approach is to recognize that the central bank does not have direct control over the volume of bank reserves. Rather, the central bank, through open market operations, can control directly the sum of bank reserves plus currency.¹ This sum is referred to as the monetary base or as high-powered money. Given the monetary base, the volume of bank reserves depends on the public's de-

isions with regard to the holding of currency and bank deposits. An increase in currency holdings by the public will reduce bank reserves, and vice versa. A second step is to recognize that bank deposits are not homogeneous. Banks issue both time and demand deposits and the public has preferences between holding the two types. Regardless of whether or not time deposits are viewed as a part of money balances, public shifts between demand and time deposits will affect the volume of each type outstanding and, therefore, affect money balances. Finally, it is recognized that there is no direct constant relation between bank reserves and the volume of earning assets. The volume of earning assets which banks wish to hold will depend on factors in addition to the volume of bank reserves; that is, the ratio of reserves to deposits that banks wish to maintain may vary. Analysis along these lines takes the form of an examination of the factors which determine the volume of reserves which banks wish to hold. In this analysis, total reserves often are divided into required and excess. Required reserves depend on the required reserve ratios, the composition of bank deposits between time and demand, and the distribution of deposits among banks. The desired volume of excess reserves is recognized to depend, among other things, on the rates banks can earn on loans and investments.

Using this approach, it may be stated that the money supply depends on (1) the monetary base, (2) the public's decisions with regard to the form in which it wishes to hold any given money supply, and (3) the ratio of reserves to deposits which banks maintain. From this, various formulas for the money supply can be derived. For example, suppose that time deposits at commercial banks are included as a part of money balances, and that

M = money balances (currency plus demand deposits plus time deposits)

H = monetary base (currency plus bank reserves)

¹This is also a simplification. For example, banks affect aggregate reserves by borrowing from the Federal Reserve Banks.

d = the percentage of total money balances which the public holds in the form of demand deposits

t = the percentage of total money balances which the public holds in the form of time deposits

c = the percentage of total money balances which the public holds in the form of currency

a = the percentage of demand deposits which banks hold as cash reserves

b = the percentage of time deposits which banks hold as cash reserves.

The formula for the money supply is:

$$M = H \frac{1}{a d + b t + c}$$

This formula implies that the public cannot directly alter the supply of money which they hold. For example, total money balances will not increase if the public attempts to augment them while maintaining relative holdings of currency, demand, and time deposits. The public can indirectly affect its money supply by altering the form of its money balances. Also, the public may indirectly influence the supply of money if its actions alter the willingness of banks to hold reserves, that is, if the reserve-deposit ratios are affected.

VIEWS ON USEFULNESS OF MONEY SUPPLY FORMULAS

The issues separating the traditional approach from the new approach revolve around the usefulness of the above formula or similar formulas as a guide in conducting monetary policy. (The formula is known as an identity; it is always true by definition.) The adherents of the traditional view maintain that the formula is useful. They contend that the modifications incorporated into the sophisticated version do not alter the essential validity of the approach. It is conceded that determination of the money supply is somewhat more complicated than implied by the simplified version

because certain public and commercial bank decisions must be taken into account. The view is maintained, however, that the central bank influences aggregate demand by determining the money supply, and that monetary policy should be directed toward controlling money balances. In this effort, the sophisticated version allows the central bank to take public decisions with regard to money into account. This can be done by using the above formula or some variant of it.

Those who adopt the new approach hold that money supply formulas are not useful as guides in conducting monetary policy. This position rests in part on the contention that money supply formulas obscure the important role played by the public and overstate the role played by the central bank in the determination of the volume of money balances. It is pointed out that, of the variables in the above formula, the central bank has control of only one—the monetary base (H). In addition, the central bank establishes lower limits to the values of the reserve-deposit ratios (a and b) by setting required reserve ratios. Thus, given the relative amounts of total money balances the public allocates to currency, demand deposits, and time deposits, the central bank, through its control over the monetary base and the required reserve ratios, establishes an upper limit on the volume of money balances, but does not exercise direct control over them. Since the reserve-deposit ratios theoretically may vary from one to the lower limits established by the central bank, many values of the money supply are theoretically consistent with any given set of values for the monetary base and the required ratios.

The adherents of the new approach argue that an operative mechanism exists whereby the public exercises an effective discipline over the banking system which induces banks to maintain reserve-deposit ratios (values of a and b) compatible with the volume of money the public wishes to hold. The mechanism is

said to be the profit and risk-aversion motives of individual commercial banks operating in a competitive financial environment. The argument focuses on the behavior of the individual bank, which is viewed as attracting funds by offering competitive rates to the public and allocating these funds to reserves and earning assets. The volume of funds the individual bank desires to attract and the proportion of these funds placed in earning assets are viewed as depending on the competitively established cost of attracting funds and the rate of return on those earning assets available for the bank to hold.

For example, if the difference between the rate of return on earning assets and the cost of obtaining funds is such that the prospective gains from increasing earning assets by obtaining additional funds and/or reducing reserves outweigh the costs and risks associated with this action, individual banks will increase their offering rates on deposits and increase their holdings of earning assets. The latter will tend to reduce the rate of return on earning assets. This reduction, together with the increase in the rate on deposits, will reduce the difference between the income on earning assets and the cost of obtaining funds. This process will continue until each bank is satisfied with the volume of its deposits and the division of its assets between reserves and earning assets. The extent to which deposits increase will depend on the response of the public to both the increase in the interest rate on deposits and the reduction in the interest rates on the earning assets held by commercial banks. Important considerations in this connection are the responses of nonbank financial institutions to the alterations in the interest rates, and the preferences of the public with regard to holding claims on these institutions compared with holding bank deposits and with regard to borrowing from various types of lenders. The point at which the public, nonbank financial institutions, and banks are satisfied with the

volume of their assets and liabilities may or may not be compatible with the lower limits on the reserve-deposit ratios established by the central bank. In other words, the actual volume of money balances determined by competitive market forces may or may not be equal to the upper limit established by the central bank.

QUALIFICATIONS OF THE ARGUMENTS OF THE NEW APPROACH

Proponents of the new approach concede that the flexibility of banks in competing for funds and in managing their portfolios is reduced by legal restrictions. These restrictions, it is argued, obscure the operation of the disciplining mechanism, and tend to validate the proposition that the central bank exercises direct control over the volume of money balances. One restriction is the establishing of reserve requirements. The central bank, it is stated, sets lower limits on the reserve-deposit ratios (a and b) above the values some banks wish to maintain. In other words, some banks are forced to hold more reserves than they wish. An additional regulation is the prohibition against paying interest on demand deposits. Due to this, it is argued, some banks will have outstanding a lower volume of deposits than they would prefer. Because of these two restrictions, for some banks the benefits from acquiring assets by increasing their deposits and/or reducing their reserves will exceed the costs and risks involved. This means that these banks will hold the smallest volume of reserves and the largest volume of earning assets allowed by regulations, that is, these banks will attempt to maintain reserve-deposit ratios at the lower limits established by the central bank. This, in turn, means that the actual money supply will be closer to the upper limit established by the central bank than would be the case if there were no reserve requirements or if the requirements were set at lower levels, and

if there were no restrictions on paying interest on deposits.

The disciplining mechanism is not totally obscured by legal regulations according to the adherents of the new approach. In this connection, they stress the role of commercial bank time deposits, and the increasing importance of these deposits in the liability structure of the banking system. It also has been argued that the prohibition against paying interest on demand deposits may not be effective; banks may pay interest in unconventional ways. Finally, the adherents of the new approach stress that some banks maintain reserve-deposit ratios substantially above the legally established lower limits, and that, for the banking system as a whole, the difference between the actual reserve-deposit ratio and the lower limits has varied significantly over time.

AN INTERPRETATION OF THE ISSUES

It was stated earlier that the adherents of the new approach object to the use of money supply formulas partly because these formulas obscure the role played by the public in the determination of money balances. This may appear to imply that the issue separating the two approaches centers on the manner in which the supply of money is determined. It is our interpretation that, while the issue is not unimportant, it is not the basic one.

In this connection, it should be kept in mind that there is a difference between exercising direct control over the money supply and determining the money supply. If the central bank exercises direct control, decisions by the public and commercial banks are entirely irrelevant and need not be considered. On the other hand, the central bank may determine the money supply, even though there is no direct control, by anticipating and offsetting the decisions of others.

The issue involving the manner in which money balances are determined may be stated

as follows: If the central bank exercises direct control over the money supply, the traditional approach is valid. On the other hand, if the central bank does not exercise direct control, but, in determining the money supply, must anticipate and offset the decisions of the public, the traditional approach is not valid. In the interpretation offered here, this issue is more apparent than real for the following reason. Although there is now no direct control, certain institutional changes could be introduced that would produce direct control. Suppose all agreed that the important issue is as stated, and that the central bank could systematically influence aggregate demand by exercising direct control over the money supply if it possessed such control. In this case, should not all agree that the institutional changes should be introduced? But, there is no agreement to this effect.

Agreement is lacking because the adherents of the new approach do not accept the basic premise of the traditional approach: the unique importance of money as a determinant of aggregate demand and as a guide to the conduct of monetary policy. They contend that the behavior of the volume of money balances—as they respond either to policy actions or to other influences—is an unsatisfactory guide to concurrent or subsequent movements in the demand for goods and services, and other variables which policymakers are interested in influencing. Satisfactory guides can be discovered only by broadening the analysis of the financial structure to incorporate additional assets, markets, and economic units, including nonbank financial institutions, as integral parts of the analysis. The purpose of the broadened analysis is not necessarily to increase the precision of the central bank's control over the money supply. The objective is to arrive at a better understanding of the impact of monetary policy actions on the entire financial structure, interest rates, and aggregate demand.

Interest Rate Variability— Feeder Livestock Loans

By *Gene L. Swackhamer*
Raymond J. Doll

INTEREST rates are prices paid for credit. Many forces influence these rates. Under perfectly competitive market conditions, one would expect identical interest rates for loans that are homogeneous in all respects. If interest rates are not identical for given kinds of loans, knowledge of the significant factors explaining rate variability would become important to monetary policy authorities and other decision-makers. Similarly, it would be helpful for authorities to be familiar with those factors having little impact on rate variability.

In the Federal Reserve System's Agricultural Loan Survey of June 30, 1966, data were collected from a random sample of commercial bank borrowers. The data permitted an intensive analysis to be made of various factors that had a probable impact on interest rates charged on specific kinds of loans. The analysis in this article is based upon \$542,708,000 in feeder livestock loans at insured commercial banks in the Tenth Federal Reserve District. These banks were holding 57,021 such notes averaging \$10,204.

Feeder livestock loans were used in this study because they tend to be homogeneous as to purpose, maturity, and security used. They are usually written for relatively short maturities, as single-repayment loans, and are secured with highly liquid assets because of

the marketability of the cattle. Thus, one would expect rates on such loans to be highly uniform, but to vary somewhat because of differences in such factors as net worth of borrower, volume of sales, size of note, and date made.

Rates charged on a large proportion of these loans in mid-1966 were highly uniform. For example, about 90 per cent of the dollar volume of such loans was made at rates of 5.5 to 7.0 per cent, with a major proportion of these loans being made at 6.0 and 6.5 per cent. On the other hand, it should be pointed out that rates on feeder livestock loans in the District in mid-1966 varied from less than 4.5 per cent to more than 11 per cent. Thus, despite a high degree of uniformity, there was substantial variability in rates charged on some of the loans.

There are many problems involved in determining the importance of a given factor in explaining variability in interest rates. For example, a cross-classification table showing interest rates by size of loans usually will indicate noticeably higher average rates on small notes, as compared with average rates on large notes. However, not all of the difference can be attributed to varying size of note, since borrowers with larger notes also tend to have higher net worths and larger dollar volumes of sales—both of which also are likely to have some

influence on interest rates. Because of such interrelationships between different factors, evaluations of the impact of individual factors on interest rates can become quite complicated. Another complication is that interaction may exist—for example, the relationship between rates and net worth may be different for younger than for older farmers. In the ensuing model, which will be explained and then used, an intensive effort has been made to check on such difficulties and either minimize them where possible or to acknowledge that they exist and evaluate the results accordingly.

THE MODEL

One method for attempting to determine the relative importance of the impact of a number of different factors on interest rates is to use what statisticians refer to as least-squares multiple regression analysis. Without describing the complexities of such a model, simply stated, it enables the analyst to determine what proportion of the variability in interest rates is accounted for by the factors that are entered into the model and how much is unaccounted for. Furthermore, it is possible, by use of this method, to get some indication as to what factors are most responsible for the variability that is accounted for.

Information obtained through the loan survey mentioned earlier was used to relate the following factors (explanatory variables shown in Table 1) to interest rates on feeder livestock loans: annual gross dollar value of sales of borrower; net worth of borrower; number of competing banks located within the lender's major trade territory; and bank size, as measured by deposits. Additional factors examined included date note was made; note size; and form of business organization—sole proprietorship (age of borrowers), and partnership or corporation. Because of the way much of the information was obtained, along with other benefits, it was advantageous to convert numerical values of the variables listed above into

Table 1
ANALYSIS OF FACTORS INFLUENCING INTEREST RATES ON FEEDER LIVESTOCK LOANS IN THE TENTH DISTRICT

Explanatory Factors and Subclassifications (Independent variables)	No. of Loans	Variation in Rates Explained by Each Factor Independently (In per cent)	Differences from District Average Rate Associated with Membership in Subclass	Net Explanatory Contribution of Factor	
				When Combined with All Other Factors (In per cent)	Differences from District Average Rate Associated with Membership in Subclass
Totals and Averages	57,021		6.723	29.54	6.723
Gross Dollar Sales:					
Less than \$5,000	8,773		1.099		.758
\$5,000 to 9,999	6,944		.178		.060
\$10,000 to 19,999	17,188	19.04	-.118	5.21	-.251
\$20,000 to 39,999	11,127		-.240		-.092
\$40,000 and over	12,989		-.476		-.132
Net Worth:					
Less than \$5,000	3,622		1.401		.750
\$5,000 to 9,999	5,403		.487		.180
\$10,000 to 24,999	11,457	17.68	.274	3.61	.180
\$25,000 to 99,999	24,479		-.174		-.092
\$100,000 and over	12,060		-.546		-.290
Other Financial Institutions in Lender's Trade Area:					
None	3,993		.156		.020
One	14,757		-.132		-.508
Two to Five	18,849	.91	.125	3.00	.125
More than Five	19,422		-.053		.260
Bank Size by Deposits:					
Under \$5 Million	34,430		.216		.263
\$5 to 14.9 Million	16,178		-.298		-.401
\$15 to 24.9 Million	2,410		-.258		-.287
\$25 to 49.9 Million	887	5.59	-.183	2.80	-.388
\$50 to 99.9 Million	710		-.712		-.580
\$100 Million and over	2,406		-.551		-.466
Date Made:					
Dec. 1965 or before	7,520		.332		.140
Jan.-Feb. 1966	11,159		.119		.091
Mar.-Apr. 1966	15,324	1.78	-.110	.61	-.040
May-June 1966	23,018		-.093		-.063
Note Size:					
Less than \$10,000	44,182		.101		-.003
\$10,000 to 24,999	8,092		-.326		-.036
\$25,000 to 49,999	2,911		-.343		.093
\$50,000 to 99,999	1,288	2.64	-.044	.50	.070
\$100,000 to 499,999	507		-.525		.139
\$500,000 and over	41		-.426		.275
Form of Organization:					
Sole Proprietorships by Borrower Ages; Partnerships and Corporations:					
Under 30	5,201		.226		-.057
30 to 34	4,928		.197		-.140
35 to 44	16,830		.070		.020
45 to 54	15,565		-.085		.034
55 to 64	8,800	2.08	.021	.50	.067
65 and over	2,664		-.264		-.065
Partnerships	2,067		-.427		-.114
Corporations	966		-.622		-.060

mutually exclusive classes. For example, annual gross dollar value of sales of borrower was divided into five categories varying from sales of "less than \$5,000" to "\$40,000 and over." All told, the seven explanatory variables listed were divided into 38 subclasses. This technique of variable representation has numerous advantages. Allowance is made automatically for nonlinear relationships, and the effect of loan membership in any given subclass of the seven major variables can be measured directly as differences from the average interest rate for all loans. By solving this model for various combinations of the variables, by checking for reliability with the use of appropriate statistical tests, and by simple plotting and observing, an effort has been made to check the validity of the evaluations made in the subsequent analysis.

THE RESULTS

Solution of the above model indicates that the explanatory factors represented in the model account for 30 per cent of the variability in interest rates charged on feeder livestock loans. This means that 70 per cent of the variability remains unexplained.¹ The model did provide a number of interesting observations about the factors that were statistically significant in measuring variability as well as about those that were less significant. Despite the small per cent of variability explained, the model was helpful in pointing out that some factors, thought of as being important in explaining rate variability, were of little significance. The data in the model indicate that

¹In regression studies of time series data this low per cent of explained variability would be unacceptable, but even the most successful regression studies of cross-sectional data seldom explain more than 40-50 per cent of the variability. Time series studies generally use averages, aggregated data, and fewer observations. Thus, differences at the individual loan level would likely be nullified in averages. Cross-sectional data for a given date, on the other hand, contain all of the dispersion associated with individual loans.

there is considerable stickiness, or inflexibility, in rates charged on feeder livestock loans.

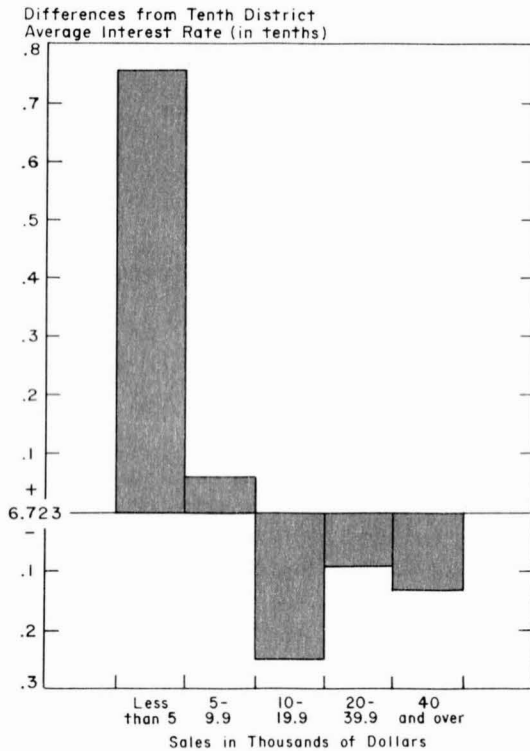
Before discussing the individual variables used in the model, it is appropriate to hypothesize as to why more of the rate variability cannot be explained. First, it is probable that there are important unidentified variables not included in the model. Second, there undoubtedly are some sampling and measurement errors in the data. Third, some bankers probably decide about how many loans they will make and under what terms and then charge uniform rates. Thus, rather than vary rates, bankers refuse loans. To the extent that different bankers use different standards, rate variability from bank to bank would not be detected adequately by the model. Fourth, even though an effort was made to check for such problems as interaction, it is virtually impossible to eliminate such difficulties completely.

Of the factors evaluated, gross dollar value of sales and net worth were the most important explanatory variables, and number of competing banks; date made; borrower age, partnership, and corporation; and note size were of little significance in explaining rate variability. Bank size had a moderate influence. It also should be pointed out that gross dollar value of sales and net worth were highly intercorrelated as shown by the fact that gross value of sales alone explained 19 per cent and net worth alone 17.7 per cent of rate variability, while the two variables combined explained only 22 per cent of the variability. Consequently, either of the factors alone explained almost as much of the variability as did the two combined. All the other factors combined explained an additional 8 per cent of the variability.

Gross Dollar Value of Sales

As expected, interest rates varied inversely with annual gross dollar value of sales. Borrowers with gross sales of less than \$5,000 on an average paid significantly higher rates than

Chart 1
RATE VARIABILITY BY SALES GROUP*



*The effect of loan memberships in a given classification, as shown here, is measured as a deviation from the sample mean interest rate.

did the average borrower for feeder livestock loans. These borrowers with small volume paid about 8 per cent interest for their loans, or about 7.5 per cent when allowance is made for the influence of other explanatory variables, versus the average of about 6.75 per cent for all feeder loans.² Average rates were lowest for borrowers in the \$10,000 to \$20,000 gross sales group, if the influence of other variables

²In a January-February 1967 *Monthly Review* article, "Farm Lending by Commercial Banks in the Tenth Federal Reserve District," based upon the same loan survey, the average effective interest rate on feeder livestock loans was reported as 6.4 per cent. This rate was an aggregate rate weighted by amount of loans outstanding contrasted to the simple average rate of 6.72 for the 57,021 loans in this study.

is isolated, but were below average for all sales categories above \$10,000 annually.

There are two logical explanations for the substantially higher rates paid by borrowers with less than \$5,000 of sales. First, such borrowers are less likely to have debt repayment capacity and risk on loans to this group will tend to be higher. Second, many of the loans made to this group are small and costs of servicing small loans are high; to get a modest rate of return from funds invested in such loans, higher interest rates are necessary.

It also is of interest to note that rates for the "\$20,000 to \$40,000" and "\$40,000 and over" groups are slightly higher than those charged the "\$10,000 to \$20,000" group, if allowance is made for the influence of other explanatory variables, even though rates charged all three groups are below average. Although the difference is not too significant, it probably can be attributed partly to the desire of banks to avoid lending extensive sums to individual borrowers. Although borrowers in these higher sales categories are usually good credit risks, many banks are concerned more with the risk of loss of a relatively large loan as compared with loss of a small loan.

Net Worth of Borrower

Interest rates charged borrowers on feeder livestock loans varied inversely with net worth of borrower when the influence of related explanatory variables is allowed for. Rates varied from about 7.5 per cent paid by the group with net worths of less than \$5,000 to a little less than 6.5 per cent for the group with net worths of \$100,000 and over. Because of the high relationship between gross dollar value of sales and net worth groupings, it is difficult to distribute the exact contribution of each toward explaining interest rate variability. However, as pointed out earlier, adding net worth to gross value of sales did improve the model's ability to explain rate variability from 19 to 22 per cent of total variability.

Number of Competing Banks

Although the direct relationship between number of competing banks in a given bank's farm lending territory and rate variability on feeder livestock loans was almost nil, careful study of the data reveals evidences of inter-correlation and perhaps also interaction. A bank having no other bank in its major farm lending territory almost certainly would be relatively small. Such a bank would tend to make more small loans to borrowers with small sales and low net worths. Management of such a bank very likely would have less ready access to money markets and not be in a position to keep as well informed on credit developments as would bank management in a money market center. The likely result would be interaction and a higher degree of stickiness in rates for more isolated rural banks. Although the analysis indicates that number of competing banks was a more important variable in explaining interest rate variability than the direct measurement indicated, its contribution to explaining such variability was minor even after efforts were made to adjust for these other factors.

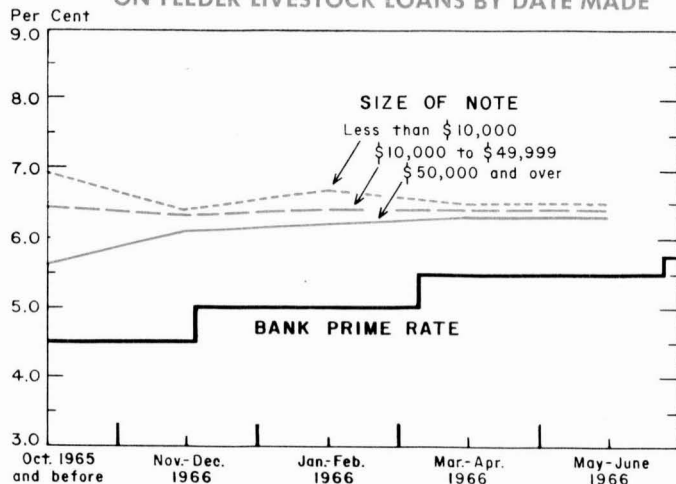
Bank Size

Some relationship between bank size and interest rates is to be expected. Generally, it would be anticipated that larger banks would charge lower rates than smaller banks. Larger banks usually are located in money centers or work closely with banks in these centers. Furthermore, larger banks tend to make loans to farmers with larger volumes of sales and high net worths, and are more likely to have specialists on all facets of money markets. There was a relationship of the anticipated type, but it was quite modest. This factor accounted for less than 3 percentage points of the 30 per cent variability that was explained.

Date Note Was Made

One would expect increases in the prime rate on business loans to be reflected in rates on feeder livestock loans. Since the prime rate increased, by successive stages, from 4½ per cent in late 1965 to 5¾ per cent by mid-1966, it might be expected that rates charged on feeder livestock loans made in 1965 would be lower than rates for loans made just prior to the date of the Agricultural Loan Survey taken as of June 30, 1966. The ½ per cent increases in the prime rate made in December 1965 and again in March 1966 reinforce the expectation that feeder livestock loan rates would also increase. A relationship would be anticipated between date on which note was made and rate charged. Chart 2 shows changes in the prime rate and rates charged by date note was made for the period under study. Data in the chart show that there was little relationship between interest rates and the date on which feeder livestock loans were made, despite the 1¼ per cent increase in the prime rate during this period. This is particularly surprising, since it was expected that rates on feeder livestock loans would follow the prime rate more closely than rates on any other type of agricultural loan. These loans tend to be large, well se-

Chart 2
CHANGES IN PRIME RATE AND RATES
ON FEEDER LIVESTOCK LOANS BY DATE MADE



cured with highly liquid assets, and have relatively short maturities. Either there is a substantial lag in any relationship between rates charged on feeder livestock loans and the prime rate or feeder livestock loans tend to be highly inflexible through time for unexplained reasons.

Note Size

It was surprising to find that size of note was a negligible factor in explaining variability in interest rates on feeder livestock loans. Since the result was not anticipated, various checks were made to determine that no error was made in preparation of the model. Cross-tabulation tables were prepared in which rates were computed by size of note groupings and other factors. A scatter diagram also was prepared, using interest rates as the dependent variable and size of note as the independent variable. Both techniques confirmed that the variations computed by the model were accurate.

Another surprising feature of the analysis is that, when the impact of related variables was held constant, the small relationship that did appear was the opposite of what would be expected. Interest rates on smaller notes tended to be lower than average, while interest rates on larger notes tended to be higher than average. However, rates decreased as expected with increasing note size when both were regressed independently of all other variables. That is, small notes had higher rates than larger notes. Although both the independent and net relationships are quite poor, the fact that they show opposite relationships indicates intercorrelation with other factors, such as net worth, and, perhaps, bank size. The fact that the amount of relationship attributed to note size is virtually negligible means that the importance of this variable as an explanatory variable for rate variation in feeder livestock loans is quite small. Thus, interaction is not as serious as it otherwise might be.

The scatter diagrams indicated that very small loans—less than \$3,000—do tend to have somewhat higher rates than larger loans. However, by using a less than \$10,000 category, the effects of the few very small (for feeder livestock) loans on interest rates were eliminated even within this classification. Since feeder livestock loans tend to be relatively large, are backed by high liquidity security, and have short maturities, rates probably tend to vary even less on this kind of loan than for loans generally, particularly if such rates are as sticky as is indicated by the analysis of other factors.

Form of Business Organization—Sole Proprietors (Age of Borrower), Partnerships, and Corporations

It is assumed frequently that age of borrower or whether the farm is a partnership or corporation is likely to have an impact on interest rates. The model indicates little relationship between age and interest rates, regardless of whether age and rates were compared directly or if age was included with all other variables and an effort made to compute a net relationship. Partnerships and corporations showed a rate noticeably lower than average when a direct comparison was made without involving the other variables. When included with all other variables, however, the more favorable relationship was largely obliterated. This indicates that the more favorable rate shown by the direct comparison was caused by intercorrelation with other variables—partnerships and corporations had larger dollar values of sales and higher net worths than did the average farm that borrowed. These variables, rather than the type of organization, were largely responsible for the more favorable rates.

SUMMARY AND CONCLUSIONS

Careful analysis of a large random sample of feeder livestock loans indicates a high de-

gree of uniformity in rates charged on a large proportion of such loans. However, there is substantial variability in a relatively small proportion of these loans. Although the factors used in the model explained about 30 per cent of this variability, the major proportion was not explained.

The study reveals evidence of a considerable degree of rigidity in interest rates charged on feeder livestock loans. To the extent that such rigidity exists and random differences are evident among banks, it is difficult to isolate the reasons for the rate variability that does prevail—particularly since most of the variability occurred in a relatively small proportion of the loans.

The surprising results of the study were the lack of variability in rates charged by size of note and the apparent lack of response of rates charged on feeder livestock loans to major changes in the prime rate. In fact, results of the study point out that rates charged on feeder livestock loans were not increased with the successive increases from $4\frac{1}{2}$ to $5\frac{3}{4}$ per cent in the prime rate during the period that the feeder livestock notes were being written.

There are several possible explanations for the lack of relationship between rates charged and size of note. One explanation is the homogeneous nature of such notes, with respect to such factors as maturity, method of repayment,

and security. In the case of feeder livestock loans, all of these features tend to minimize the administration cost and tend to make them relatively safe investments compared to many other types of loans. Rates charged by competing lenders on such loans probably are better known by both lenders and borrowers than are rates charged on most other kinds of loans. Thus, banks tend to charge more uniform rates, regardless of loan size. Finally, the apparent rigidity of rates may cause lenders to hesitate in varying rates by size of loan.

It is more difficult to explain the apparent lack of response of rates charged on feeder livestock loans to changes in the prime rate. One could hypothesize that feeder livestock loans are made chiefly by small banks which do not respond as readily to changes in the prime rate as do large city banks. However, many of the feeder livestock overlines are carried by city banks and their rates responded to changes in the prime rate little more than did the total. The best explanation appears to be that lenders believe that feeders object to increasing rates and, since the average rate charged on feeder livestock loans was above the prime rate, they preferred to maintain rates charged on such loans as long as possible. In other words, there may be considerable rigidity in rates charged on farm loans by both country and city banks.