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AN ABSTRACT OF THE THESIS OF David Allen Simantel for the Master of Science in Economics presented January 22, 1971.

Title: Federal Reserve Lending to Commercial Banks: Effects on Financial Market Stability and Monetary Control.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

Joseph C. Blumel, Chairman

Richard B. Halley

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Thomas A. McLean

The Federal Reserve has proposed a change in its method of administering the discount window. This paper looks at the effects of this proposal on monetary control and on the money markets, assuming that banks base their behavior on profit maximization over the long run.

First, the reserve supply process is postulated. The conditions under which borrowing from the Federal Reserve will improve or reduce

monetary control are stated. Second, the primary reserve adjustment process is formulated to show how primary reserve adjustment can affect rates in the money market. Finally arguments are set forth to show how borrowed reserves would behave if commercial banks are attempting to maximize long run profits and under the discount window administration proposed by the Federal Reserve Committee. The conclusion is that borrowed reserves will behave to reduce money market instability but at the same time they will behave to reduce the Federal Reserve control over the stock of Reserves available to the banking system. Borrowing from the Federal Reserve Bank can be expected to behave in a way of offset Federal Reserve open market operations.

FEDERAL RESERVE LENDING TO COMMERCIAL BANKS:
EFFECTS ON FINANCIAL MARKET STABILITY AND MONETARY CONTROL

by

DAVID ALLEN SIMANTEL

A thesis submitted in partial fulfillment of the
requirements for the degree of

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in
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1971

TO THE OFFICE OF GRADUATE STUDIES:

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May 22, 1971

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CHAPTER I

INTRODUCTION

In July, 1968 a Federal Reserve System Committee, which had been established to reappraise and where necessary recommend redesign of Federal Reserve lending facilities, made its report.¹ The Committee stated that the objective of its proposals was to reduce instability in financial markets, which is caused by short-run adjustments in bank primary reserve positions, without hampering overall monetary control.² These are really two separate and not necessarily compatible objectives. One is to relieve stress in the financial markets by facilitating primary reserve adjustments. The other is to improve control over the supply of reserves to the banking system.

The purpose of this paper is to consider how well these two objectives might be met if the Committee's proposals are adopted. It is assumed that the basis for decisions at commercial banks is maximization of profits in the long run.

¹"Reappraisal of the Federal Reserve Discount Mechanism: Report of a System Committee," Board of Governors of the Federal Reserve System, July, 1968 (hereafter referred to as Committee Report). Reprinted in the Federal Reserve Bulletin, July, 1968, p. 545.

²Ibid., p. 1.

The Committee proposals can be outlined as follows:

<u>Present System</u>	<u>Proposal</u>
1. Level of the Discount rate. Set by each Reserve bank with the approval of the Board of Governors. The level of the rate is part of the Feds over-all policy.	No change.
2. Administration of the discount window. Each Reserve Bank controls the borrowings of the member banks in its district based on the principles set forth in Regulation A, i.e. "continuous use of Federal Reserve credit is not considered appropriate". The appropriate uses of credit are: a. unexpected temporary need for funds. b. seasonal needs which cannot be met by the banks own resources. c. emergency needs.	Defines more specifically the credit available to individual banks: a. short-term adjustment credit. (1.) basic borrowing privilege. Sets quantity limits on the frequency, duration and amount a bank can borrow from the Reserve Bank with no questions asked. (2.) other adjustment credit. Credit beyond (1.) which is subject to administrative action by the Reserve Bank. b. seasonal borrowing privilege. In addition to a., a bank that can demonstrate a seasonal outflow of funds can qualify to borrow the amount of the seasonal outflow that is greater than 10% of average deposits. c. no change in emergency lending to member banks.

The details of the Committee's proposals are discussed further in Chapter V.

This paper is organized as follows: Chapter II examines in greater detail the two objectives of discount reform. Chapters III and IV propose

a theoretical framework for analyzing the way in which Federal Reserve lending to banks can affect the financial markets and the supply of primary reserves to the banking system. Chapter V develops an aggregate supply function of primary reserves at the discount window based on the recommendations in the Committee Report, and a profit maximizing demand function for borrowed reserves. In Chapter VI, the behavior of borrowed reserves during the primary reserve adjustment process is examined to determine its possible effects on money market rate stability and on the supply of primary reserves to the banking system. Finally, Chapter VII summarizes the results of the inquiry.

CHAPTER II

THE OBJECTIVES OF DISCOUNT REFORM

The two objectives of discount reform are proximate objectives of monetary policy. That is, by promoting them it is believed the ultimate goals of full-employment, price stability, economic growth and external balance can be more readily achieved. Why stability in financial markets and the supply of reserves to the banking system should be used as proximate objectives of Federal Reserve discount policy is another question and one which remains outside the scope of this paper. The purpose here is to determine only the extent to which central bank lending under the new proposals will achieve the stated objectives.

The terms used to describe the objectives need precise definition. The first objective, as stated in the Committee Report, is to "lessen some of the causes (i.e., short-term adjustment in bank reserve positions) of instability in the financial markets". To paraphrase the Committee's language, the objective is to lessen instability in the financial markets which is caused by short-term adjustments in primary reserve positions of banks. Instability in the financial markets is signified by the frequency of changes in direction in rates and by the size of rate movements per unit time. No attempt will be made to quantify a condition of unstable market rates. For the purpose here, instability will increase when the frequency of directional changes increase and when the size of the rate movements in either direction increase per unit of time.

The financial markets affected by bank behavior can be separated into two categories based on the two broad types of earning assets held by banks -- monetary assets and default risk assets. Monetary assets are short-term, readily marketable, fixed in money value and free of default risk. The earning monetary assets which banks hold include short-term Treasury securities, Federal funds sold, commercial paper, acceptances, loans to U. S. Government securities dealers, and negotiable certificates of deposits purchased.³ Non-earning monetary assets are primary reserves.

As the term implies, default risk assets have the characteristics of credit risk and are subject to varying degrees of marketability ranging, at best, from that of earning monetary assets, to those having no marketability at all. Default risk assets include loans and longer term securities.

The market in which monetary assets are traded will be called the money market, and it is here that banks make short-term primary reserve adjustments. More generally, the money market is where large wealth-holders with temporary excess liquidity can employ their cash funds in earning assets for short periods of time at little or no risk of default, and where large wealth-holders with temporary cash deficiencies can obtain funds for short periods of time.⁴ The principle credit instruments in this market were mentioned above when describing the earning monetary assets of banks. The two most important for reserve

³ Roland I. Robinson, Money and Capital Markets (New York: McGraw-Hill, 1964), p. 96.

⁴ Ibid.

adjustment are Treasury Bills and Federal funds.

The markets in which default risk assets are issued and traded will be called the credit market. The principle feature which distinguishes this market from the money market is the existence of default risk and use of the assets in this market mainly for income and capital gains objectives rather than liquidity objectives.

The financial market to be considered for observing the extent of instability in rate movements caused by primary reserve adjustment will be the money market as described above. The justification for singling out this market and the problems raised by doing so are discussed below in Chapter IV.

Short-term as used here means intra-reserve period, intra-monthly and seasonal time periods. The reserve position of a bank is the relation of its actual holdings of primary reserves to its desired holdings. Primary reserves are deposits at the Federal Reserve banks and vault currency and coin. The distinguishing feature is that no rate of return is earned on these assets, and they can be used to fulfill legal reserve requirements. Adjustment is the process by which banks change their actual primary reserves to their desired holdings.

As stated above, the second objective of discount reform is to improve the central banks control over the amount of reserves supplied to the banking system. The Committee Report is not explicit in stating this goal. It wants to lessen money market instability "without hampering overall monetary control" (p. 1). Monetary control is control of the

⁵ The reserve period is now one week for all banks. Seasonal time periods vary in length from one to six months.

stock of money and is employed by the central bank in its attempt to achieve the objectives of general economic policy.⁶ There are three factors which jointly determine the stock of money:

1. The stock of primary reserve assets in the monetary system.
2. The public's preference toward holding money in the form of deposits or currency.
3. The ratio between primary reserves and deposits maintained by the banking system.⁷

At best the central bank has direct control over number one. Given the relationships in two and three, the central bank will improve its control over the money stock by improving its control over the stock of primary reserve assets in the monetary system. This paper will use control over the stock of banking system primary reserves as a proxy of monetary control and as the second major objective of discount reform. The details of the reserve supply process are given below.

⁶ Harry G. Johnson, "Monetary Theory & Policy", *American Economic Review* (June, 1962), p. 335.

⁷ Milton Friedman & Anna J. Schwartz, A Monetary History of the United States 1867-1960 (Princeton University Press), 1963, p. 50.

CHAPTER III

THE SUPPLY OF PRIMARY RESERVES TO THE BANKING SYSTEM

The following is proposed as a framework for analyzing the effect of central bank lending on monetary control. It will be used to examine the conditions under which member-bank borrowing can improve or diminish the central bank's control over the amount of primary reserves supplied to the banking system.

Currency and coin, and deposits at the Federal Reserve Banks are the only two assets that qualify as primary reserves. The factors which determine their supply are:

1. U. S. Government Securities and Acceptances held by the Federal Reserve Banks (S).
2. Federal Reserve Float (F). This is the total amount of credit given to one member bank (payee) without a corresponding charge to another bank (payor) during the check clearing process.
3. Federal Reserve Bank discounts and advances to member banks (B).⁸
4. Gold stock (GS).
5. Treasury Currency outstanding (T_C).

Not all reserve funds supplied by the above factors are available to the banking system as primary reserves. Non-banking-system

⁸ The first three items are called Federal Reserve Bank Credit outstanding. The accounts supplying and using reserve funds are shown in the Federal Reserve Bulletin table: "Member Bank Reserves, Federal Reserve Bank Credit and Related Items."

uses of reserve funds are:

1. Currency and coin held by the public (C_p).
2. Currency and coin held by the Treasury (C_t).
3. Treasury deposits at the Federal Reserve Banks (D_t).
4. Foreign deposits at the Federal Reserve Banks (D_f).
5. Other deposits at the Federal Reserve Banks (D_o).
6. Other Federal Reserve Bank accounts net (OA). This consists of capital accounts and the net value of minor accounts.

The differency between total reserve funds supplied, and non-banking-system uses is the stock of primary reserves available to the banking system (R_s):

$$R_s = (S + F + B + GS + T_c) - (C_p + C_t + D_t + D_f + D_o + OA). \quad (1)$$

Some of the terms in (1) usually have small week-to-week changes and, consequently, are of minor importance in determining week-to-week changes in R_s . These are C_t , D_f , D_o and OA in the non-banking-system uses of reserve funds, and T_c and GS in the factors supplying reserve funds.⁹

Of all the variables determining R_s , only S is completely controlled by the central bank. B is jointly determined by central bank supply conditions and the member bank demand function for borrowing, both of which are discussed later. The remaining variables are determined by a variety of market forces and institutional practices, and

⁹ Of the non-banking-system uses of reserve funds, C_p is by far the most important in its total amount. During July, 1968, C_p averages 95% of total non-banking-system uses of reserve funds. In the same period, U. S. Government securities accounted for 73% of the total factors supplying reserve funds. This proportion has been increasing since the beginning of the Federal Reserve system.

are outside of the central bank's direct control.¹⁰ For example, GS is determined by the relative commodity prices and rates of return in the United States and other countries. C_p is determined by the public's preference to hold currency rather than bank deposits. F is determined by the size of deposit flows among banks that make clearing settlements through the Federal Reserve Banks. The determinants of R_s which are not under the central bank's direct control will be referred to as market determined variables. In order to emphasize the distinction between market determined variables and controlled variables, equation (1) is abbreviated by combining the variable whose week-to-week change are relatively minor (C_t , D_f , D_o , OA, GS and T_c) into O, and by grouping it in brackets with the other variables that are not directly controlled by the central bank:

$$R_s = S + B + (F + O - C_p - D_t) \quad (2)$$

$$O = GS + T_c - C_t - D_f - D_o - OA \quad (3)$$

The volume of primary reserves available to the banking system is determined by Federal Reserve holdings of Securities, S, which is directly controlled by the central bank; by the size of member bank borrowing; and by four market determined variables which are not directly controlled by the central bank. Equation (2) can be further abbreviated to combine the four market determined variables into one term, X, for the purpose of showing how B improves or diminishes the

¹⁰ The central bank can indirectly influence such variables as G, C_p , and D_f via its influence on market rates of return. Float (F) is directly determined by Fed to the extent that Fed sets the time lag for crediting checks cleared through it. But once these terms are set, the amount of F is out of the central bank's direct control.

central bank's control over R_s :

$$R_s = f(S, B, X) \quad (4)$$

The conditions under which B will improve central bank control over R_s can be stated from (4). It will increase the central bank's control over R_s if it behaves in a pattern to offset changes in the uncontrolled and market determined variables summarized in X. B diminishes central bank control over R_s if its behavior offsets changes in the controlled variable, S. B has a neutral effect on monetary control if it does neither. In other words, for B to improve central bank control over R_s , it must behave in a manner that would counter unwanted changes in R_s caused by the market determined variables in X. Since the central bank's influence over R_s is derived from its control over S, changes in S are a proxy for central bank policy with respect to R_s . If B behaves in a manner to offset the policy changes in S, it is reducing central bank control over R_s . As Meigs has stated, "The central bank may not have effective control over of total reserves, in the American system, because the banks may offset open-market operations with changes in the volume of their borrowings."¹¹

The manner in which B is likely to behave can be established by examining the banking system demand function for B and the supply conditions for B as proposed in the Committee Report. This is done after the primary reserve adjustment process is formulated.

¹¹ A. James Meigs, Free Reserves and the Money Supply (Chicago: The University of Chicago Press, 1962), p. 30.

CHAPTER IV

THE PRIMARY RESERVE ADJUSTMENT PROCESS

The problem of this section is to develop a theory of the banking system primary reserve adjustment process which can be used to analyze its effect on the money markets. Specifically, it will be used later to show how this adjustment process can be destabilizing with respect to the rates of return on reserve adjustment instruments. In order to focus on primary reserve management, many of the interesting details of the monetary system have been left out. After the adjustment process is presented, some of these simplifications will be discussed.

Primary reserve adjustment is a process central to money supply theory. The traditional textbook monetary multiplier is based on a demand for primary reserves which is exactly equal to the legally required amount.¹² That is the demand for excess reserves is always zero. In equilibrium (i.e., no change in deposits and earning assets of the banking system) actual reserves equal required reserves—required reserves being the same as desired reserves:

$$rD = R$$

r = legal reserve ratio

D = total deposits

R = actual stock of primary reserves available to the banking system.

Since excess reserves are assumed to be zero, an exogeneously determined

¹² Lester V. Chandler, The Economics of Money and Banking, 4th ed. Harper and Row, 1964), Chapter 5.

R yields a given D, and earning assets are known by the balance sheet constraint $L = D - R$ (L = earning assets).

The central bank directs changes in the money stock (D) by setting the reserve adjustment process in motion. That is, it increases or it reduces R so that $rD \neq R$. If actual reserves are made greater than required (desired) reserves, the individual banks will try to reduce this holding of R by buying earning assets (L). But, such action passes the unwanted reserves onto another bank and for the banking system as a whole, actual reserves cannot be reduced. So, the reserve adjustment process continues until required reserves have risen to equal the actual reserves. Here the banking system is in equilibrium again. Adjustment continues until:

$$r\Delta D = \Delta R$$

The change in desired reserves ($r\Delta D$) equals the change in actual reserves (ΔR). The relation between the ΔR and ΔD is the multiplier $1/r$:

$$\Delta D = 1/r \Delta R.$$

More recent work in money supply theory has attempted to explain variations of desired reserve from required reserves and, in so doing, has applied the modern theories of the demand for money and other financial assets to commercial bank behavior.¹³ This work and the above basic

¹³ cf., Karl Brunner and Allan Meltzer, "Some Further Investigation of the Demand and Supply Function for Money," Journal of Finance (May, 1964), p. 240; Frank deLeeuw, "A Model of Financial Behavior," The Brookings Quarterly Economic Model of the U.S., edited by James Duesenberry (Chicago: Rand McNally and Company, 1965), p. 512; W.G. Dewald, "Free Reserves, Total Reserves and Monetary Control," Journal of Political Economy (April, 1963), p. 141.

outline of the monetary process provide the point of departure for the following formulation of the primary reserve adjustment process.

I. THE DEMAND FOR EXCESS RESERVES

The theory of primary reserve adjustment proceeds from assumptions regarding the behavior of individual banks. A simplified balance sheet of a single bank is:

$$RR + ER + E_1 + E_2 = TD$$

$$ER + RR = TR$$

RR = required reserves.

ER = excess reserves (in the legal sense).

E_1 = earning assets of the type traded in the money markets.

E_2 = earning assets of the type traded in the credit markets.

TD = total deposits subject to reserve requirements.

TR = deposits at FRB and vault cash (primary reserves).

Some asset and liability accounts (e.g., bank premises and capital accounts) are left out on the grounds that they do not influence the reserve adjustment decisions facing the bank. Required reserves (RR) are set by the legal reserve ratio and the volume of deposits subject to that ratio.¹⁴ Earning assets, E_1 and E_2 , are both alternatives to

¹⁴ Since September, 1968, there has been significant changes in the computation of required reserves. They are: (1) Placing all banks on a one-week reserve period. (2) Using average deposits two weeks earlier as the base for weekly average required reserves for the current week. (3) Counting vault cash held two weeks earlier and balances at Fed. in the current week as the current week's legal reserves held, and (4) Permitting banks to carry forward to the next reserve period excess reserves or deficiencies up to 2% of required reserve changer. Nos. 2 and 3 are the most important for primary reserve management. Banks now know what their required reserves are at the beginning of the reserve period, and they know the portion of RR met by vault cash.

holding ER. The asset E_2 is what has previously been called a default risk asset, and the market in which E_2 is issued and traded is called the credit market. The asset, E_1 plays the role of secondary reserves and is a monetary asset which, by previous definition, has no risk of default and is traded in the money market.

In considering the effects of short-run primary reserve adjustment on rates in financial markets, the most frequently used alternative to ER is assumed to be E_1 , an asset which differs from ER only in having a variable market yield, and an asset which is traded in the money market. In other words, the problem is confined to that of choosing between ER on the one hand, and E_1 on the other, both of which are monetary assets. The choice that determines the relative amount of wealth allocated to monetary assets, $E_1 + TR$, and to default risk assets, E_2 , is abstracted in this discussion.¹⁵ Shifts in the relative amount of monetary assets and credit market assets held by banks would certainly affect rates in the two markets. . But, it is assumed that such shifts take place over longer periods of time than the period considered here. Short-term adjustment in primary reserves is the employing of "surplus" primary reserve funds for short periods of time by purchasing assets closely substitutable for primary reserves, namely,

¹⁵ George Morrison suggests that the bank's demand for non-earning assets should be approached from the general context of the demand and supply for each of the principle asset categories in a bank's portfolio. George Morrison, The Liquidity Preference of Commercial Banks (Chicago: University of Chicago Press, 1966), p. 13. For an optimization model of individual bank portfolio selection, see William Russell, "Commercial Bank Portfolio Adjustment," American Economic Review (May, 1964), p. 544.

earning monetary assets. Thus, short-term adjustment to temporary "surplus" reserves affect the money market. The reasoning is the same for a temporary deficient primary reserve position. Therefore, the market in which short-term primary reserve adjustment has its main effect is assumed to be the money market. This affords a well defined market for observing the effects of primary reserve adjustment.

TD includes demand deposits, savings deposits, and other time deposits net of cash items in process of collection.

The basic assumption with regard to bank behavior is that the individual bank will at all times want to maintain some given amount of excess reserves. The desired volume of excess reserves is denoted ER^* , and the bank's objective in deciding on ER^* is to minimize its loss from holding excess reserves. Based on this objective, there are two main arguments in the function which describes ER^* .

The first is the opportunity cost, OC, of holding ER. This is expected return that could be gotten by holding E_1 rather than ER. OC is, in turn, determined by two factors. One is the rate of return on E_1 , r , which is known with certainty. As mentioned above, the asset, E_1 , which is the alternative of holding ER, is assumed to be payable in a fixed amount at maturity and have no risk of default. Thus, r could be represented by the current yield to maturity on short-term secondary reserve assets.

The other determinant of OC is the expected capital gain or loss, g , due to a change in r . The variable, g , can be described more precisely with a probability distribution whose mean is M_g and whose standard deviation is S_g . Assuming banks on the average expect no change in r ,

$M_g = 0$, and S_g remains as a measure of risk of capital gain or loss. The larger S_g , the larger the risk associated with any given r . If most banks are risk averters¹⁶, for a given r , a rise in S_g will lower the expected return to be obtained from investment in E_1 . Thus, an inverse relationship between OC and S_g can be postulated. As will be shown later in the paper, S_g can become an important destabilizing force on OC and, thus, on ER^* if money market rates fluctuate to a large extent. This is because rate movements in the money market influence S_g .

In contrast to S_g , which is a variable describing expected risk of capital gain or loss, M_g is a measure of either expected gain or expected capital loss. The more positive M_g is, the higher is the expected gain and the higher is OC . The more negative M_g is, the higher is the expected capital loss and the lower is OC . There is a direct relationship between M_g and OC .

To summarize the determinants of OC , the following relationship can be used:

$$OC_1 = F(r, M_g, S_g) \quad (5)$$

$$OC_1 = r + M_g - S_g \quad (6)$$

¹⁶ Professor Tobin defines a risk averter as one who "...will not be satisfied to accept more risk unless they can also expect greater expected return." They are in contrast to the risk lovers who "...are willing to accept lower expected return in order to have the chance of unusually high capital gains..." James Tobin, "Liquidity Preference as Behavior Towards Risk," Review of Economic Studies (February, 1958), p. 73. As a group, banks are more likely to be risk-averters, partly because of the liquidity of their liabilities compared to their assets, and partly because of the complex of laws and governmental authority restraining their activities and shaping their attitudes.

In (6), the signs are used to show the direction of the relationship. The subscript i denotes that this is a function for an individual bank.

The other major argument in the function explaining ER^* is the expected cost of a reserve drain that results in a reserve deficiency (ER less than 0). This will be denoted ECD . It also has two determinants. The first is the penalty cost¹⁷ n , per dollar of reserve deficiency. This is usually known in advance with certainty.¹⁸ The actual size of n depends on how the deficiency is covered. Here it is useful to distinguish two methods of adjustment--borrowing from the Federal Reserve Banks and the use of an adjustment instrument whose rate is determined in the money market. The latter method would include the sale of short-term U. S. Government securities and the purchase of Federal funds. If n is a market determined rate, its value at the beginning of a reserve period would not be known with as much certainty as if the appropriate n were the discount rate. If the deficiency is to be met by selling (reducing) E_1 , n would be the yield on E_1 plus the capital gain or loss from selling E_1 . The yield on E_1 would be known with certainty, but the capital gain or loss would not be known for sure until the asset is sold. If the deficiency is met by purchasing Federal funds, the penalty rate would be the rate paid on Federal funds and would not be known with certainty. In other words, the value of n is more uncertain if the method of adjustment has a market determined rate rather than an administered rate. In a later section all

¹⁷ The term penalty cost is used in this context by Morrison, op. cit., p. 9.

¹⁸ As long as the bank knows it can cover the deficiency by borrowing from the Federal Reserve and is willing to do so, it would be certain that at most n would equal the discount rate.

methods of adjustment with a market determined rate are grouped into a single alternative to borrowing from the Federal Reserve Bank.¹⁹

The other determinant of ECD is expectations regarding a reserve drain greater than ER. This will be denoted by f . The variable f can be specified using a probability distribution of expected reserve flows with a mean of M_f and a standard deviation of S_f . If $M_f = 0$ reserve flows on average are not expected to change ER, but that this will in fact happen is more risky the greater S_f . Thus, S_f becomes a measurement of uncertainty about future reserve flows. The greater the uncertainty about reserve flow, the greater the unexpected cost of reserve deficiency. The relationship between S_f and ECD is direct.

When M_f is positive, the bank on average expects a reserve inflow. When M_f is negative, a reserve loss is expected. The relationship between M_f and ECD is an inverse one. The higher the arithmetic value of M_f , the lower ECD and vice versa.

To summarize the determinants of ECD, the following relationship can be written:

$$ECD = G(n, M_f, S_f) \quad (7)$$

$$ECD = n + S_f - M_f \quad (8)$$

In (8), the signs indicate the direction of the relationship.

¹⁹ This discussion has not included the administrative or transaction costs of meeting a reserve deficiency. It is assumed here that they are constant over time and, therefore, are not responsible for any change in n . For an example of including administrative costs in a reserve adjustment model, see D. Orr and W. Mellon, "Stochastic Reserve Losses and Expansion of Bank Credit," American Economic Review (September, 1961), p. 614.

The above two arguments make up the demand function for excess reserves as follows:

$$ER_1^* = H_1 (ECD_1, OC_1) \quad (9)$$

$$ER_1^* = ECD_1 - OC_1 \quad (10)$$

$$ER_1^* = (n_1 - S_{f1} - M_{f1}) - (r_1 - M_{g1} - S_{g1}) \quad (11)$$

The signs in (10) and (11) show the direction of the relationship. The demand for excess reserves by the entire banking system is the sum of the excess reserves demand for each individual bank and will be shown as:

$$ER^* = H (ECD, OC) \quad (12)$$

$$ER^* = ECD - OC \quad (13)$$

$$ER^* = (n - S_f - M_f) - (r - M_g - S_g) \quad (14)$$

ER^* = Desired holdings of excess reserves.

ECD = Expected cost of a reserve deficiency.

n = Penalty cost per dollar of reserve deficiency.

M_f = Mean of expectations about volume of reserve flows.

S_f = Standard deviation of expectations about volume of reserve flow.

OC = Opportunity cost of holding excess reserves.

r = Rate of return on earning assets.

M_g = Average of expectations about changes in r .

S_g = Standard deviation of expectations regarding changes in r .

The sign in the ER^* formulation indicates the direction of the relationships, but the magnitude of the various relationships are not known. A rise in OC (ceteris paribus) would lower ER^* , and a lowering in OC would rise ER^* . A rise in ECD (ceteris paribus) would raise ER^* ,

and a lowering of ECD would lower ER^* . However, the elasticity of ER^* with respect to OC and ECD is not known. Also (12) does not say anything about the form (i.e., linear or non-linear) of the ER^* function. Both the form of the functions and the elasticity coefficients of the variables are matters to be solved by empirical investigation.

This demand for excess reserve formulation is at the base of banking system reserve management behavior, and it rests squarely on the assumption that reserves are managed with the intention of minimizing losses from holding excess reserves. A factor common to both arguments explaining ER^* is the existence of uncertainty.²⁰ Uncertainty complicates the problem of reserve management. It makes banks balance the gain from use of reserves against the unforeseeable possibility that they may incur a reserve deficiency cost.

The two arguments in the ER^* formulation can be used to demonstrate the two hypotheses set forth to explain the large volumes of excess reserves during the 1930's. The liquidity trap hypothesis says a low OC was responsible for the high ER^* . The shift-in-liquidity preference hypothesis says a high ECD (and in particular, a negative M_F and high S_F), is the proper explanation of the large excess reserves.²¹

²⁰ "With complete certainty no excess reserves would be held," Ibid. p. 616. This reasoning assumes zero rate of return of ER . Kareken presents a model in which ER^* is determined by the rate of return on reserves and loans, and the rate paid on deposits. John H. Kareken, "Commercial Banks and the Supply of Money," Federal Reserve Bulletin, October, 1967, p. 1699. Tobin suggests the payment of interest on excess reserves to make the opportunity cost holding excess reserves controllable according to Central Bank discretion. James Tobin, "Toward Improving the Efficiency of the Monetary Mechanism," Review of Economics and Statistics, August, 1960, p. 276.

²¹ Morrison, op. cit., explores this alternative empirically and gives reasons for the plausibility of a shift in liquidity preference.

What determinants of ER^* have not been explicitly included? The following factors could certainly influence the demand for excess reserves, but they do not show up explicitly in the above ER^* function.

1. The deposit mix.
2. The earning asset mix.
3. The economic and geographical diversification of depositors.
4. The size of the bank.
5. The bank's desire to accommodate customer loan demand.

The above ER^* function does account for these factors implicitly. That is, their influence is reflected in the explicit arguments of the function. For example, the deposit mix would reflect itself in S_f and M_g . Diversification of depositors would also show up through expected reserve flows. These factors have their impact on ER^* via the explicit variables in (12). Since OC and ECD are hard to quantify for empirical work, directly observable factors such as deposit mix and bank size might be used to approximate the main arguments in the ER^* function.

II. THE SUPPLY OF ER TO THE BANKING SYSTEM

The previous section developed the arguments in the demand for excess reserves. The actual stock of excess reserves is:

$$ER = TR - RR$$

TR (total reserves supplied to the banking system) is formulated elsewhere in this paper. Given the total deposits subject to reserve requirements and the legal reserve ratio, RR at any time is

known.²² The actual amount of excess reserves available to the banking system is jointly determined by banking system required reserves and central bank supply of reserves to the banking system.

III. NEED FOR RESERVE ADJUSTMENT AND METHODS OF ADJUSTMENT

Disequilibrium between the actual stock of excess reserves and the desired stock of excess reserves is the condition needed for primary reserve adjustment. It sets the reserve adjustment process in motion. The need for reserve adjustment can be shown as:

$$ER^* \neq ER$$

If ER is greater than ER^* , the banking system will be attempting to lower ER by increasing their holdings of E_1 . To the extent the banking system increases its holdings of E_1 , deposits are expanded and a rise in RR reduces ER toward ER^* . If ER is less than ER^* , the banking system will be trying to increase ER by selling E_1 . To the extent they sell E_1 to the non-bank sector deposits are lowered and so are RR . This raises ER toward ER^* .

In addition to this stock disequilibrium, there is a second dimension to the primary reserve adjustment process. This is the relationship of the distance between desired excess reserves and actual excess reserves, $(ER^* - ER)$, to the bank's effort to restore equality between ER^* and ER .²³ The assumption is that the desired

²² Because of the changes in reserve computation (referred to in footnote 15), RR and the currency portion of TR are known at the beginning of the reserve period. This makes ER easier to estimate and their actual value known sooner than before.

²³ This aspect of bank behavior is skillfully shown by Meigs, op. cit., especially pp. 49-53.

rates at which banks approach a new equilibrium is an increasing function of the spread between ER^* and ER :

$$\frac{dER_b}{dt} = J (ER^* - ER)$$

The subscript b denotes that this is a change in ER at the initiative of the banking system. The further banks are out of equilibrium with respect to their excess reserve positions, the greater will be their efforts to equate ER^* and ER . Thus, for any given excess reserve disequilibrium, say $(ER^* - ER_0)$, there will be a rate at which banks are trying to change their actual holdings of ER , $(\frac{dER_b}{dt})$; and this increases the greater $(ER^* - ER)$. It can be seen that the greater $ER^* - ER$, the greater the use of available methods of adjustment by the banking system. That is, the greater will the banking system participate as a net supplier or net demander of E_1 assets.

Two methods of adjustment will be used for analyzing the effects of primary reserve disequilibrium on the money market and on the stock of primary reserves available to the banking system. The first is the sale or purchase of E_1 in the money market. These include purchase and sale of Federal funds, purchase and sale of short-term Treasury securities, etc. The second is a change in the level of borrowing from the Federal Reserve Banks. The first method would have an impact on rates in the money market, whereas the second would change the stock of primary reserves available to the banking system.

A final aspect of the reserve adjustment process is the influence of Federal Reserve open market sales and purchases on the banks' attempt to achieve equilibrium in ER^* and ER . For any given $\frac{dER_b}{dt}$, open market operations can be changing the actual ER by a like amount in

the opposite direction, and Federal Reserve policy would be just offsetting the banking system attempts to reconcile ER^* and ER .²⁴ Federal Reserve Policy actions will be denoted $\frac{dER_F}{dt}$. If $\frac{dER_b}{dt}$, actual ER will not change and bank influence on the money market will be negated by Federal Reserve Policy. Therefore, to observe the influence of banks on the money market, the influence of the Federal Reserve must be held constant.

This chapter has described the primary reserve adjustment process. Before determining how this adjustment process affects rates in the money market and how central bank lending can influence these effects on the money market, the determinants of the actual volume of borrowing from the central bank must be examined.

²⁴ Meigs, op. cit., refers to this as a secondary equilibrium. He uses this concept to show that if a constant free reserve position is a secondary equilibrium, the Federal Reserve is not holding its influence constant.

CHAPTER V

THE DETERMINANTS OF BORROWED RESERVES

Most theoretical work on the role of central bank lending in the monetary process assumes that the amount of reserves available to member banks at the discount window is perfectly elastic at the prevailing discount rate. This has been directly stated by Dewald: "Though each Reserve Bank administers discounting as it interprets the governing regulation, the fact is that borrowers are almost always accommodated with no question asked."²⁵ Also, Monhallon and Parthemos, both officers at the Federal Reserve Bank of Richmond, state: "...Reserve Bank administration of the discount window seldom if ever involves any outright refusals of accommodations to particular applicants ... Hence it is reasonable to consider that the supply of discount accommodation at any time is perfectly elastic at the going discount rate ..."²⁶ This idea of perfectly elastic supply of reserves at the discount window is also implied by studies which approach the determinates of member banks borrowing from the Federal Reserve solely by analyzing the demand function for such borrowing.²⁷

²⁵ William G. Dewald, op. cit., p. 142.

²⁶ Jimmie R. Monhallon and James Parthemos, "Administering of the Discount Function: A Comment," National Banking Review (September, 1966), p. 92.

²⁷ Murray E. Polakoff, "Reluctance Elasticity, Least Cost and Member-Bank Borrowing," The Journal of Finance (March, 1960), p. 1; Stephan M. Goldfeld and Edward J. Kane, "The Determinants of Member Bank Borrowing: An Economic Study", Journal of Finance (September, 1966) p. 499.

Federal Reserve Regulation and Statute interpretation regarding the proper use of borrowing, including the forward to Regulation A made effective in 1955,²⁸ and the present Committee Report, should point up the possibility of supply conditions which are not perfectly elastic at the discount rate. Such supply conditions could play a formidable role in determining the amount of borrowing at any time. It is the purpose of this section to show that the amount of borrowing from the Federal Reserve is simultaneously set by both the demand function for borrowing (a behavioral pattern on the part of banks) and the supply conditions at the discount window (set by the Federal Reserve Banks as monopoly suppliers). This will be done by separating the influences on borrowing which come from the demand function from those which are derived from supply conditions. Too often the supply conditions which have nothing to do with member banks' demand function are used as arguments in the demand function for borrowing.²⁹ It is very important that the influences from the supply side be kept separate from those on the demand side if the effect of a change in supply conditions is to be properly assessed. For example, the discount mechanism changes proposed in the Committee Report are changes in supply conditions. There is no reason to believe that they will in any way change the demand function for borrowing on the part of banks. However, the new supply conditions may very well change the quantity of borrowed reserves

²⁸ "Regulation A: Advances and Discounts by Federal Reserve Banks," Federal Reserve Bulletin (January, 1955), pp. 8-14.

²⁹ One example is the following by Monhollon and Parthemos, op. cit., p. 92: "...discount administration affects the quantity of borrowing through its effects on the demand for such accommodation."

demand at any given time. The supply conditions for reserves at the discount window will be developed first.

I. THE SUPPLY OF BORROWED RESERVES

Can an aggregate supply function for reserves at the discount window be postulated from the proposals in the Committee Report? Before attempting to formulate supply conditions, the present guidelines for administering the discount window need to be examined briefly.

There are two ways by which the Federal Reserve can influence the volume of borrowing at the discount window. One is by manipulation of the discount rate. The other is the way in which the Federal Reserve Banks define conditions of eligibility. This definition of eligibility for member bank borrowing is usually referred to as the administration of the discount function.³⁰ Thus, for any given discount rate, supply conditions at the discount window are determined by the administration of the discount function. Regulation A, which gives broad guidelines for discount administration, provides that "the continuous use of Federal Reserve Credit by a member bank over a considerable period of time is not regarded as appropriate."³¹ This can presumably be turned

³⁰ David L. Lapkin and Ralph W. Pfouts, "The Administration of the Discount Window," National Banking Review (December, 1965), p. 179.

³¹ Board of Governors of the Federal Reserve System, Advances and Discounts by Federal Reserve Banks, Regulation A., p. 1, Federal Reserve Bulletin (January, 1955), p. 15.

around and couched in supply terms by saying that continuous lending to a single member bank by a Federal Reserve Bank is not considered appropriate. The 1955 forward to Regulation A gives some specific cases of appropriate and inappropriate lending by the central bank.

The appropriate reasons for lending are to assist a bank in: (1) unexpected temporary need of funds, (2) seasonal needs of funds which cannot reasonably be met from the banks own resources, and (3) unusual or emergency situations. Inappropriate lending includes: (1) lending to a single bank on a continuous basis, (2) lending to a bank so that it can earn a rate differential, (3) lending to a bank so that it can obtain a tax advantage,³² and (4) lending to facilitate speculation.³³

The criterion of continuous borrowing has emerged as the most practical guideline for administering the discount window. Guidelines in the form of collateral eligibility requirements which were supposed to restrict central bank lending to productive uses fell into disuse after the fallacies of the real-bills doctrine were exposed.³⁴ Other criteria

³² This apparently refers to a situation which lasted from 1951 to 1954 under which banks could reduce their liability on the excess profits tax by borrowing from the Federal Reserve. Such borrowing was included in the capital base against which actual profits were compared to get the profit percentage. The smaller the percentage, the lower the excess profits tax.

³³ "Forward to Regulation A," Federal Reserve Bulletin (January, 1955), pp. 8-14.

³⁴ George W. McKinney, The Federal Reserve Discount Window (New Brunswick: Rutgers University Press, 1960). See Chapter 6 for an analysis of the rise and fall of the eligibility requirements concept.

for discount administration (i.e., those listed under the appropriate and inappropriate uses of borrowing) are almost impossible to determine. For example, lending to a bank for a use which is not speculative may free other funds of the bank for speculative use. This would be impossible to determine when making the loan. Apart from the practical problems of the other criteria for discount administration, a basic reason for using the continuity criterion is that appropriate situations for central bank lending can be readily defined in terms of the length of time a bank has been in continuous debt to the Federal Reserve. Barring the extreme circumstances of an emergency, the central bank is only to lend to a bank on a short-term and seasonal basis to help meet temporary needs for funds. Whether or not the use of borrowing was for temporary needs could be adjudged on the basis of the continuous nature of the borrowing. Federal Reserve lending for a continuous period of time could be used as evidence that the borrowed reserves are not being used for temporary short-run purposes.

Although the extent of continuity in lending to a single bank has emerged as criterion for administering the discount function, the vagueness of the word "continuous" has remained a problem. Different interpretations can result in differences in discount administration among the twelve Federal Reserve banks³⁵ and over time. The proposals contained in the Committee Report are aimed at specifying (and quantifying) the meaning of the continuous borrowing criterion of discount administration. Three different situations for appropriate central

³⁵ This possibility is the subject of the Lapkin and Pfouts article, op. cit. They conclude: "The factual evidence is not compatible... with uniform administration of the discount function," p. 186.

bank lending are outlined. These are lending to a bank for short-term adjustment need, lending for seasonal accommodation, and lending for emergency assistance. The last two situations will not be included in the following analysis on the grounds that to the extent such lending situations may arise, they will be a nominal amount in relation to total central bank lending. Also, their behavior can be expected to be constrained by the same specific criteria as central bank lending for short-term needs, although the actual outer limits in emergencies and seasonal lending would be larger.

By far the most important feature of the Committee Report for shaping central bank lending conditions is the "basic borrowing privilege," which is meant to fulfill the short-term needs of a bank. This concept sets specific limits on the amount of reserves a bank can borrow from Fed. per unit of time. In effect it gives specific meaning to the "continuous borrowing" criterion of discount administration. In devising a general definition of continuous borrowing, two questions arise: (1) What is the appropriate time unit of concern? (2) What is the critical duration beyond which borrowing becomes continuous?³⁶ The Committee Report takes a reserve period (now one week) as the proper time unit for expressing a state of borrowing. Since required reserves are specified in average of daily balances, borrowing at any time during a single reserve period is essentially part of the same operation.

The critical number of reserve periods beyond which borrowing

³⁶ Jack L. Cooper, "Continuous Borrowing From the Federal Reserve System: Some Empirical Evidence," Journal of Finance (March, 1969), p. 33.

becomes continuous is set at half the reserve periods out of a six month period. Thus, the proposal wants the base period (half of which can be made up of reserve periods that contain borrowing) to be six months in length. In setting these limits, the Committee's objective was to fulfill the short-term adjustment needs of the individual banks. In the words of the Committee Report:

"The recommended operational objective is for temporary credit accommodation to be extended over a long enough period of time to cushion short-term fluctuations and permit orderly adjustment to longer-term movements but not for so long as to invite procrastination in the making of needed adjustments by individual borrowing banks or to delay unduly the response of the banking system to a change in general monetary policy,"³⁷

In addition to the time limit which defines continuous borrowing, the Committee Report sets dollar limits that the Reserve bank will lend to a member as long as the limits of continuous lending have not been violated. The limits for each bank are to be based on the banks capital and surplus--the relative amount of basic borrowing privilege declining as capital and surplus become larger (i.e., the limit would be 20-40% the first \$1 million of capital and surplus; 10-20% of amounts between \$1 million and \$10 million, and 10% of capital and surplus in excess of \$10 million). Again, these figures are picked because they are thought to be large enough to meet the short-term adjustment needs of individual banks.

Whether or not these quantitative limits on the continuity and absolute amount of lending to a single bank are too large or too small

³⁷ ...:Report of a System Committee, op. cit., p. 8.

is not the problem here. The question is, how do these kinds of self-imposed central bank lending restraints affect the aggregate supply conditions for primary reserves at the discount window? Reserves available to the individual bank at the discount window are limited from the supply side mainly by the amount the central bank has already lent to the individual bank under consideration.³⁸ That is, borrowed reserves supplied to a single bank are a decreasing function of the number of reserve periods the bank has already been in debt to the Federal Reserve:

$$R_B^s = f(\% \text{ of last 26 reserve periods in debt})$$

$$\% \dots < 50$$

Under present proposals, borrowed reserves would be supplied until the bank had borrowed in thirteen of the last twenty-six reserve periods. After this, the supply of reserves at the discount window would be cut off.

The need is to convert this into a supply relationship which makes the reserves supplied at the discount window a function of their effective cost. To do this, an important assumption must be made, namely that discount administration as described above causes the effective cost of borrowed reserves to rise as more reserves are supplied to the bank at the discount window. This assumption may be justified by the notion that the more a bank borrows today, the less it will be allowed to borrow in the future; lower borrowing power

³⁸ The withdrawal of a borrowing request is interpreted as a restraint from the supply side when it is occasioned by a flat refusal to lend by the central bank, or when the bank is persuaded not to make the request, by the central bank.

in the future may require the bank to hold larger excess reserves in the future (which involves a direct cost) than would otherwise be the case.³⁹ Such a supply function for a single bank could be shown as follows:

$$R_B^s = F(r_d + c)$$

R_B^s = Reserves supplied to an individual bank at the discount window.

r_d = Discount rate.

c = Cost factor which increases as the percent of the last 26 reserve periods in debt increases toward 50%. This is a cost factor which increases as future borrowing potential decreases.

This function says that if a bank is willing to pay a higher effective cost for borrowed reserves, it can obtain more reserves at the discount window.

The relationship is derived directly from the supply conditions proposed for the discount window. These supply conditions raise the effective cost of borrowed reserves to a bank as the frequency of recent borrowing increases because they lower a bank's future borrowing potential and this, in turn, raises the amount of future excess reserves a bank will need relative to the amount they would need had their future borrowing capabilities remained unchanged. Such a rise in the need for excess reserves in the future increases the effective cost of borrowing from the Federal Reserve.

As an extreme example suppose a bank has borrowed from the Federal

³⁹ William Poole, "Commercial Bank Reserve Management in a Stochastic Model: Implications for Monetary Policy", Journal of Finance (December, 1968), p. 785.

Reserve in 12 of the last 26 reserve periods (weeks). If it borrows in the present reserve period it cannot borrow in the following reserve period. By borrowing in the present reserve period the bank is creating the need for greater excess reserves next week. This is a cost of borrowing during the present reserve period. The assumption is that if a bank has no discounting capabilities it is going to hold greater excess reserves than if it has the capability to borrow from Fed. Why would smaller future discounting capabilities raise future ER*? Lower future discounting potential would raise the expected cost of a reserve deficiency in two ways. First lower future borrowing capabilities would restrict the means of reserve adjustment to market instruments. The penalty cost, n , for market instruments of adjustment is more uncertain. Other things equal, a rise in uncertainty regarding n would raise the expected cost of a reserve deficiency. Second, if the discount rate were below the rates on market instruments of adjustment, lower future borrowing capabilities would raise the cost per dollar of future reserve deficiencies.

There is a problem in generalizing the supply function (R_B^S). In the case of the single bank, it can be seen that an increase in borrowing from the Federal Reserve would mean a higher effective cost to the bank because of lower future borrowing capability and greater need for excess reserves. But, in the future, increased lending by Fed. does not have to mean increased effective cost of borrowed reserves to all banks. For banks who have not as yet used the discount window (say, in the last six months), there is no increase in the

effective cost of borrowed reserves. Thus, an increase in the supply of borrowed reserves to the banking system does not mean an increase in effective cost to all banks--only to banks that are increasing their borrowings. But, a higher volume of borrowing does mean a rise in the average effective cost of obtaining funds at the discount window.

Whether an increase in system borrowing comes from a bank that has not previously borrowed (say, for six months) or from a bank that has a recent borrowing record, their effective cost of borrowing has increased and this raises the average effective cost for all banks as a result of the increase in supply of reserves at the discount window. It is possible that a bank with a low effective cost of borrowing would borrow from the Federal Reserve and lend Federal funds to the bank which has a higher effective cost of borrowing from the central bank. Such tendencies would work to equalize the effective cost of borrowing from the Federal Reserve among all banks. Therefore, the supply of borrowed primary reserves to the banking system is seen as a function under which the Federal Reserve by its discount administration practices can force an increase in effective cost of borrowing as more borrowed reserves are supplied. The Quantity of borrowed reserves supplied to the banking system is an increasing function of the average effective cost of borrowing.

$$R_B^S = F(C_B); \quad C_B = \text{the average effective cost of borrowing for the banking system.}$$

This supply function together with the demand function for borrowed reserves determines the actual behavior of borrowed reserves.

II. THE DEMAND FUNCTION FOR BORROWED RESERVES

The demand for borrowed reserves has received more attention as a determinant of borrowing behavior than have supply conditions. This is probably because of the key role assigned to it by early theories of central banking. In Riefler's reserve position theory of monetary control, the borrowed reserves demand function is the avenue by which open market operations influence commercial bank behavior.⁴⁰ He argued that the demand for borrowed reserves was a stable function of the banking systems total reserves, regardless of profit opportunities for borrowing. Bank behavior could be influenced by changing the actual reserve position of banks, $\frac{BR}{TR}$, from their desired reserve position $\frac{BR^*}{TR}$. BR is borrowed reserves of the banking system, and TR is total reserves. The Federal Reserve could raise $\frac{BR}{TR}$ by selling securities in the open market, since banks would be forced at first to borrow to restore reserves lost through open market operations. With $\frac{BR}{TR}$ greater than $\frac{BR^*}{TR}$, banks would restrict lending so they could reduce their borrowed reserves to the desired level. In other words, open market operations had the affect of changing the actual level of borrowings, and the lending behavior of member banks is closely linked to the amount of their indebtedness to the central bank. The proof of this link was said to be the close relation shown by the volume of borrowing and market interest rates. This reserve position doctrine

⁴⁰ Winfield W. Riefler, *Money Rates and Money Markets in the United States* (New York: Harper and Bros., 1930).

of monetary control was given additional support by W. R. Burgess⁴¹ and later formed the foundation of the free reserve conception of the monetary process.⁴²

What is of interest here is the particular demand function for borrowed reserves which is of critical importance to the reserve position theory. A vital link in reserve position theory was the so-called tradition against borrowing on the part of commercial banks. This was founded on experience with financial conditions which existed prior to the Federal Reserve System. In early financial panics, a bank that depended heavily on borrowing would see its funds dry up and be the first to fail. Also, the existence of borrowing became generally regarded as a confession of weakened financial condition and poor management.⁴³ The tradition against borrowing was felt to be so strong that banks were also reluctant to borrow from the Federal Reserve. This reluctance to borrow was believed to be the dominant factor in the borrowed-reserve demand function. It is a basic tenet in reserve position theory that the amount of borrowed reserves demanded is a stable function of total reserves because of this reluctance motive in the decision to borrow. That is, banks will borrow only when they are forced into it by a "need" and will try to reduce

⁴¹ W. R. Burgess, The Reserve Banks and the Money Market, rev. ed. (New York: Harper and Bros., 1936).

⁴² Karl Brunner and Allan H. Meltzer, The Federal Reserve's Attachment to the Free Reserve Concept: A Staff Analysis. U.S. House of Representatives Banking and Currency Committee (Washington, D. C.: U. S. Government Printing Office, 1964).

⁴³ Murray F. Polakoff, "Federal Reserve Discount Policy and Its Critics," Banking and Monetary Studies, ed. Deane Carson (Homewood, Illinois, 1963), p. 193.

their level of borrowing as soon as possible. Thus, a demand function based on reluctance was a necessary link in the reserve position theory of monetary control.

Today, when bank panics are much less a factor, the reluctance motive is still regarded by many as the dominant force behind the demand function for borrowed reserves. The reason for this is a body of empirical work which shows a poor relationship between the spread of the market rates and the discount rate, and the actual quantity of borrowed reserves. Since an increase in the spread between market rates over the discount rate would mean greater profit incentive to borrow, a lack of actual increase in borrowing under these circumstances is interpreted to mean the reluctance motive in the borrowed reserve function is the dominant one. Professor Polakoff has formalized a reluctance theory of the demand function for borrowed reserves.⁴⁴ The marginal rate of disutility from being in debt to the Federal Reserve rises at an increasing rate as the amount of debt increases. But, at the same time, the marginal utility from profit is only raising at a constant rate as borrowing increases. For any profit spread between market rates and the discount rate there would be an amount of borrowing which, if increased, would increase disutility greater than it would increase profit. The greater the profit spread, the greater this critical amount of borrowing. But Professor Polakoff believes that at relatively low amounts of borrowing disutility from borrowing is increasing at such a rapid rate that an increase in the

⁴⁴ Murray E. Polakoff, "Reluctance Elasticity, Least Cost, and Member Bank Borrowing," Journal of Finance, (March, 1960), p. 1.

profit spread would raise borrowing only an insignificant amount or none at all. His evidence supporting this reluctance theorem is presented in the form of a group of scatter diagrams wherein the volume of system borrowed reserves is plotted against the profit spread between the Treasury Bill rate and the discount rate. The observations show a flattening out of total borrowing as profit spreads increase and even in some cases, a decline in borrowing.

Notwithstanding the evidence that the quantity of borrowed reserves demanded is not closely related to the profit spread between the market and discount rate,⁴⁵ it is the intention of this section to show a demand function for borrowed reserves which is based solely on the profit motive. It should be remembered that the demand function is only one determinant of the actual level of borrowing, and that the profit motive is accepted as the driving force in all other commercial bank behavior. Why should the theoretical demand function for borrowed reserves be any different? The particular phenomenon in the behavior of historical levels of borrowing which has been attributed to reluctance on the part of banks, is also consistent with a model based on the assumption of a profit motive demand function and a supply function of the type previously described. If it were not for the peculiar supply conditions facing banks, their actual borrowing behavior would be free to reflect the profit motive of their demand function.

⁴⁵ It should be noted that evidence has been presented both for and against a profit theory of borrowing from the Federal Reserve. See the work of R. C. Turner, Member Bank Borrowing (Columbus, Ohio: Ohio State University Press, 1938).

To the extent reluctance influences the demand function for borrowed reserves, it does so through the profit motive. A bank's reluctance to depend on borrowing as a source of funds--because such sources may not always be available and may cause future operating difficulties--can be attributed to the bank's desire to maximize long-run profits. Also, reluctance to be indebted to Fed. because such is felt to be admission of poor management is based on the desire to maximize long-run profits. This form of reluctance should not be confused with reluctance in borrowing behavior which is fostered by central bank supply conditions. Demand behavior based on the first form of reluctance is actually demand behavior based on the profit motive. An additional reason for basing the borrowed reserve demand function on profit maximization behavior is the fact that banks today are not reluctant to borrow in general--witness the growth of the Federal Funds market during recent years. Also, short-term note issues became popular sources of short-term funds in 1964 and lasted until 1966 when the Federal Reserve redefined deposits to include most short-term note issues for the purpose of Regulation D ("Reserves of Member Banks") and Regulation Q ("Payment of Interest on Deposits").⁴⁶ Long-term debt in the form of capital notes or debentures have been readily used by commercial banks in recent years.⁴⁷ Thus, when reluctance, which comes from the demand side, is attributed to the profit motive,

⁴⁶ Federal Register, March 29, 1966.

⁴⁷ Stanley Silverberg, "Bank Borrowing: An Analysis of Recent Experience," The National Banking Review (December, 1964), p. 213. During late 1963 and 1964, banks had sold nearly \$800 million in capital notes or debentures (See Appendix p. 232).

the demand function becomes a downward sloping relationship with respect to the effective cost of borrowing from the Federal Reserve at any given set of market rates of interest. At constant market rates of interest, the lower the effective cost of borrowing the greater the profit incentive to borrow and the greater the quantity of borrowed reserves demanded. This effective cost figure would include the discount rate, and the assumed implicit costs of having to hold more ER than would otherwise be the case, due to lower future borrowing potential, and other administrative transaction costs involved. The banking system borrowed reserve demand function for any given market rate of interest is:

$$R_B^d = f(C_B) \quad : \quad C_B = \text{effective cost of borrowed reserves.}$$

The demand function for borrowed reserves, as shown in this section, is based on profit maximization objectives. This is in line with other theoretical formulation of bank behavior (e.g., reserve management theory). Reluctance to borrow, which comes solely from the demand side, has been treated as the result of the basic desire to maximize profit. While the actual behavior of borrowed reserves may show "reluctance behavior," this is the result of both the demand function and supply conditions. This should in no way be taken as a description of the theoretical demand function for the banking system. The actual shape of this borrowing demand function is not known. Only a directional relationship and the factors affecting this relationship is postulated.

III. THE BEHAVIOR OF BORROWED RESERVES

The two previous sections have developed the theoretical supply and demand functions for borrowed reserves. The supply of borrowed reserves was shown as an increasing function of their effective cost to the banking system at a given point in time with all other factors that influence R_B^S held constant. The demand for borrowed reserves was shown as a decreasing function of the effective cost at a given point in time with all other factors held constant. In this static analysis, the actual volume of borrowed reserves and their effective cost are simultaneously determined. It is now necessary to relax this static analysis and examine the sources of changes in borrowed reserves over time. A change in the actual quantity of borrowed reserves demanded would be caused either by a shift in the demand function or in the supply function, or both. Such shifts occur because the factors held constant in static analysis are allowed to vary.

Shifts in the supply function for borrowed reserves would come about by a change in the discount rate or by a change in the method of administering the discount window. To the extent the discount window is administered with uniformity over time, it would help to stabilize the supply function for borrowed reserves. If the discount window is administered more freely and banks are allowed to borrow for longer periods of time and greater amounts, then at any given volume of borrowing the effective cost would be lower than at the previous method of discount administration. An easing of discount administration would shift the supply function out,

and tightening would shift the supply function back. Administration of the discount window is to be independent of monetary policy.⁴⁸ It therefore should not be an important source of instability of the supply function. In fact, the quantitative standards proposed in the Committee Report should reduce it as a source of shifts in the supply function for borrowed reserves.

A change in the discount rate would also cause a shift in the supply function. A rise in the discount rate would raise the effective cost of borrowed reserves at every level of borrowing, and, by itself, would lower the actual quantity of borrowed reserves demanded. A lowering of the discount rate would shift the supply function out and the amount of borrowed reserves demanded would increase. Thus, a lowering of the discount rate would, by itself, be expected to raise the level of borrowing and vice versa.

A change in the actual quantity of borrowed reserves outstanding could also come about as a result of a shift in the demand function for borrowed reserves. The most important shift would be that resulting from changes in market rates of interest. For each demand curve, the market rate of interest is taken as given. At a constant market rate of return, a lowering of the effective cost of borrowed reserves will increase the quantity demanded because of the greater profit opportunities in borrowing. This gives the borrowed reserve demand function a downward sloping shape. If the market rate of return on bank earning assets increases, a greater quantity of borrowed reserves

⁴⁸ Professor Whittlesey made this point in his discussion of conceptions regarding discount administration. C.R. Whittlesey, "Credit Policy of the Discount Window," Quarterly Journal of Economics (May, 1959) p. 207.

would be demanded at each level of their effective cost. Alternatively, at each original level of borrowing, the profit incentive to borrow would be widened causing banks to increase their borrowing until the effective cost rose high enough to eliminate the profit incentive to borrow. Thus, an increase in market rates would shift the demand function upward and, by itself, increase the volume of borrowed reserves outstanding. Other things equal, a decrease in market rates of return would lower the amount of borrowed reserves outstanding.

Using the theoretical demand and supply function previously developed in static analysis, the effect of a change in the discount rate and in market rates of return on the volume of borrowed reserves outstanding have been shown. A rise in the discount would, by itself, reduce borrowing and vice versa. A rise in the market interest rates would raise borrowing, and lower market rates would lower borrowing. Thus, movements in the same direction by these two variables have opposite effects on actual borrowing behavior. The effect of these two rates on borrowed reserves can be put another way: A rise in market rates relative to the discount rate would increase borrowed reserves. A decline in market rates relative to the discount rate would be expected to reduce borrowing. How much actual borrowing responds to such rate movements depends on the elasticities of the supply and demand functions. The actual shapes of the supply and demand functions are not known. Only directional relationships and the factors affecting these relationships are postulated. This, however, is enough to suggest how actual borrowed reserves will behave during the primary reserve adjustment process. The effects of borrowing

from the central bank on money market rates and on the supply of reserves to the banking system will now be discussed.

CHAPTER VI

THE EFFECT OF CENTRAL BANK LENDING ON THE TWO OBJECTIVES OF DISCOUNT REFORM

Up to now, this paper has developed theoretical tools for use in understanding how member bank borrowing from the Federal Reserve will affect rates in the money market and the supply of reserves to the banking system. First, a model of the primary reserve supply process was developed and the conditions stated by which borrowed reserves will improve monetary control. Second, the primary reserve adjustment process was formulated. In part three, the determinants of borrowed reserves were shown with special emphasis on how market rates of interest and the discount rate affect the quantity of borrowed reserves demanded. In this part, these tools will be used to identify the probable effects of central bank lending on the two objectives of discount reform. To do this, the relation of the reserve adjustment process to the money market must be developed. From this, the effect of central bank lending on money market rates can be seen. Also, implications for monetary control will be studied.

I. RELATIONSHIP OF THE RESERVE ADJUSTMENT PROCESS TO THE MONEY MARKET

Two concepts were developed in describing the reserve adjustment process. One is the need for banking system reserve adjustment signified by disequilibrium between ER and ER^* . The other is the rate at which the banking system is trying to correct differences in ER and

ER*. The assumption is that the greater the difference between ER and ER*, the faster banks are attempting to achieve equilibrium. How do these two factors in the reserve adjustment process affect the money market?

In attempting to determine the effect of the banking system reserve adjustment on the money market, we must assume in this analysis that all other participants in the money market are holding their effects constant. This includes the Federal Reserve. In such a controlled experiment, any rate change in the market is a rate change caused by bank adjustment.

In Chapter IV, the methods of banking primary reserve adjustments were grouped into two categories: (1) changes in the amount of borrowing from the Federal Reserve, and (2) buying and selling earning monetary assets (E_1). The former changes excess reserves (ER) by changing total reserves (TR), while the latter changes ER by changing required reserves (RR). Assuming no borrowing from the Federal Reserve (this assumption will be dropped later when the effect of central bank lending on money market instability is considered), all methods of adjustment can be combined into the demand for and supply of one single reserve adjustment instrument, and the market for this instrument is called the money market. Banks in the system having ER greater than ER* have "surplus" excess reserves, and banks that have ER less than ER* have "deficient" excess reserves.⁴⁹ Any "surplus" is expressed

⁴⁹ This concept of "surplus" and "deficient" excess reserves is used by Brunner and Meltzer to describe a condition of monetary expansion or contraction. See Karl Brunner and Allan H. Meltzer, An Alternative Approach to the Monetary Mechanism, U.S. House of Representatives Banking and Currency Committee (Washington D. C.: U. S. Government Printing Office, 1964.)

as a demand for the reserve adjustment instrument. A "deficient" excess reserve position is expressed as a supply of the reserve adjustment instrument.

Can the money market rate (single adjustment instrument rate) change because of individual bank adjustments when the aggregate $ER^* = ER$ (i.e., when the banking system is in equilibrium with respect to the holding of excess reserves)? The answer is no. Some individual banks will have "surplus" excess reserves and some will have "deficient" excess reserves based on their individual ER^* and ER relationships. But, for all banks, "surplus" excess reserves will be zero. When aggregate $ER^* = ER$, individual bank reserve deficiencies add to the supply of this market in the same amount that individual reserve surpluses add to the demand. Bank reserve adjustments as a whole are contributing to the supply in the money market in the same amount as they are contributing to the demand, and, therefore, primary reserve adjustments have no effects on the rates in this market.

Instability in the money market can come from the bank reserve adjustment process only if aggregate $ER^* \neq ER$. When this is the case, the bank reserve adjustment process is having a net effect one way or the other on rates in this market. When aggregate ER^* is greater than ER , there is a net supply increase of assets to this market. This would raise rates. Banks are net sellers of their reserve adjustment assets to this market in the attempt to build ER up to ER^* . When aggregate ER^* is less than ER , banks will be net buyers in the market in their attempt to lower ER to ER^* . They will be contributing more to demand in the market than they are contributing to supply, and the

reserve adjustment factor will have a downward effect on rates in this market. Thus, instability in the money market rate which is caused by banking system reserve adjustment must therefore be explained by differences in ER^* and ER , and these differences must move in opposite directions.

Before adding borrowing from the Federal Reserve as the second method of adjustment, the implications of combining all market instruments of adjustment (i.e., Fed. Funds, Treasury Bills, etc.) into one reserve adjustment instrument should be discussed. Are there any complications when the assumption of a single market reserve adjustment instrument is dropped? Suppose Federal Funds are used as a single proxy for all market reserve adjustment instruments. Then individual bank "surplus" excess reserve positions would be shown as a supply of Federal Funds, and a "deficient" excess reserve position would show up as a demand for Federal Funds. Now suppose Treasury Bills are added as a reserve adjustment instrument. A surplus could be reduced by purchasing Bills or by selling Federal Funds. Some banks would use one while others choose the other. This could result in a greater addition to supply than demand, or vice versa, for either one of these instruments even though aggregate $ER^* = ER$. While aggregate $ER^* = ER$, a net demand for one instrument could develop while a net supply developed for the other. The reserve adjustment process would, therefore, be causing rates on the two instruments of adjustment to move in opposite directions. But, rates would not diverge far because banks with "deficiencies" would use the least costly instrument, and banks with "surpluses" would choose the higher rate instrument. The result would

be to drive rates on different market adjustment instruments together, and when $ER^* = ER$, they are not as a group changing over time. Thus, there seems to be no problem in treating all market instruments of adjustment as one instrument (referred to as E_1), and as a single alternative to borrowing from the Federal Reserve, during the reserve adjustment process.

II. THE EFFECT OF BORROWING FROM THE FEDERAL RESERVE ON MONEY MARKET RATES

The way in which banking system primary reserve adjustment can affect the money market has been shown above. There must be disequilibrium in ER and ER^* . Attempts to correct this disequilibrium by buying or selling E_1 influence rates in the money market. To the extent borrowing from the Federal Reserve is used instead of market instruments of adjustment, the effects of banking system reserve adjustment on the money market can be mitigated. Will borrowed reserves, in fact, be expected to behave in a manner that would mitigate money market movements that are the result of primary reserve adjustment? It is the preliminary conclusion of this paper that they will. When there are "deficient" excess reserves, the banking system is a net demander of E_1 assets. This would tend to raise money market rates. The greater ER^* is over ER , the faster banks will be trying to sell E_1 and the greater will be their upward influence on market rates per unit time. Now, borrowing from the Federal Reserve can be added as a method of adjustment, and it would be expected to behave in a manner described in Chapter V. If banks were at first in equilibrium with

respect to borrowed reserves, a rise in market rates caused by a "deficient" excess reserve position would increase borrowed reserves, and this method of adjustment would reduce the net amount of E_1 assets supplied to the money market for any given $ER^* > ER$. This would reduce the change in market rates caused by primary reserve adjustment. The assumption that borrowed reserves were in equilibrium in the first place means the effective cost of borrowed reserves is equal to the market rate of return and there is no incentive to increase borrowed reserves. A "surplus" in the excess reserve position of banks would mean the bank reserve adjustment process is having a downward influence in money market rates. To the extent borrowing from the Federal Reserve is reduced in response to the decline in market rates, ER would be lowered toward ER^* without net purchases of E_1 assets by the banking system. Therefore, the existence of borrowing from the Federal Reserve as an alternative adjustment instrument to the purchase and sale of E_1 , is a mitigating factor on market rate movements caused by banking system primary reserve adjustment. This is because the greater the difference between ER^* and ER , the greater the change in borrowed reserves in a direction which reduces the need to use E_1 as an instrument of adjustment. This use of E_1 in reserve adjustment is the proximate cause of money market rate movements.⁵⁰

The above analysis has shown that borrowed reserve behavior would be expected to lessen money market rate movement once disequilibrium

⁵⁰ The analysis so far has assumed the discount rate to be constant. Borrowed reserves would behave in the same direction if market rate changes were taken as changes relative to the discount rate.

in ER and ER^* started their movement in one direction or another. Whether or not central bank lending will lessen the cause of bank reserve adjustment pressure on money market rates is another question. Instability in the money market has been previously defined as rapid and directional changes in rates. Thus, for bank reserve adjustment to cause rate instability, the aggregate reserve position of banks must be in disequilibrium in opposite directions over relatively short periods of time. This means ER must be greater than ER^* , and then less than ER , etc., over time. In this way, banks would shift from net demanders of E_1 to net suppliers of E_1 and influence money market rates in opposite directions. To eliminate this cause of money market instability, the behavior of borrowed reserves would have to reduce the tendency of ER^* and ER to shift around. In other words, it would have to reduce instability in the ER^* and ER .

Federal Reserve lending practice must stabilize ER^* by stabilizing its two main arguments-- OC and ECD . The tendency of borrowed reserves to mitigate rate movements once they are started is a factor that would work to stabilize OC . This is because lower fluctuation in market rates lowers S_g and stabilizes r . But, there is no apparent reason to expect the postulated borrowed reserve behavior to affect the ECD argument. The effect of the borrowed reserve behavior on actual excess reserves (ER) and, therefore, on money market rates will be discussed below.

This section has applied the postulates on borrowed reserve behavior with respect to market rates and the discount rate to the reserve adjustment process. It has shown how the banking system

reserve adjustment process influences money market rates. Borrowed reserve behavior was seen as a mitigating factor on such money market rate movements. In doing this, it does tend to stabilize ER^* through the OC argument. Instability in ER^* and ER were shown to be the cause of reserve-adjustment induced instability on money market rates. Thus, there are reasons to believe the behavior of borrowed reserves would tend to reduce instability in money market rates. The analysis points to tendencies only. The strength and magnitude of the relationships are not known.

III. THE EFFECT OF BORROWING FROM THE FEDERAL RESERVE ON MONETARY CONTROL

The conditions under which borrowed reserve behavior can improve monetary control were given in Chapter III. The supply of reserves to the banking system is:

$$R_g = f(S, B, X)$$

If B behaved in a way to offset unwanted movements in the market determined variables summarized in X , it would improve monetary control. If B behaves in a manner to offset changes in the controlled variable S , it is diminishing monetary control. Is there anything to indicate that B would behave differently toward the controlled variable S than the market determined variables in X ? The answer is yes. B would more likely behave in a manner to offset changes in the controlled variable S than the market determined variables in X . A purchase in securities by the Federal Reserve (increase in S) is an indication that it is Fed's policy to increase R_g . This action would tend to lower market rates. According to the previously postulated

relationship between market rates and borrowed reserves, this lower market rate would decrease B , and this would offset part of the increase in S . Likewise, a sale of securities by Fed would indicate a policy of reducing R_g . This sale would tend to raise market rates, and this, in turn, would increase borrowing. The rise in B would offset at least part of the policy change in S . This offsetting direction that B would be likely to move in response to a change in S would be known, but the magnitude would not. This would depend on the change in market rates for a given change in S , and the change in B for a given change in market rates.

On the other hand, there is no apparent reason to think B would act to offset unwanted changes in the market determined variables. B would not be expected to automatically offset unwanted change in the variables in X . Therefore, in this analysis, the behavior of borrowed reserves is seen as diminishing the central bank control over the supply of reserves to the banking system. It does this by weakening the link between the controlled variable S and the object to be controlled-- R_g . Also, borrowed reserves would not be expected to offset unwanted changes in the market determined variables of the primary reserve supply model.

CHAPTER VII

SUMMARY

This paper has attempted to clarify the issues and relationships to be considered in understanding the effects of borrowed reserves on the supply of reserves to the banking system and on money market rate stability. These include the following:

1. The relationship of the reserve adjustment process to the money market (Chapter VI).
2. The relation of borrowed reserves outstanding to market rates of interest and the discount rate (Chapter V).
3. The relation of borrowed reserves to policy directed open market operations (Chapter VI).

The implications of the analysis for the two objectives of discount reform can be summarized as follows:

1. Borrowed reserves are likely to behave in a manner to mitigate money market rate movements which are caused by primary reserve adjustment. The reasons for reserve-adjustment induced instability in money market rates--instability in the supply and demand for excess reserves--may also be reduced by borrowed reserve behavior, however central bank lending alone cannot be expected to eliminate this cause of money market instability.
2. The analysis also gave reasons to believe that borrowed reserves behavior would diminish the central banks control over the supply of reserves to the banking system.

The nature of the relationships underlying these conclusions has been shown, but a test of their strength is an empirical task which has yet to be undertaken.

REFERENCES

- Board of Governors of the Federal Reserve System. "Regulation A: Advances and Discounts by Federal Reserve Banks." Federal Reserve Bulletin, Vol. 41 (1955) 1.
- Brunner, Karl and Allan Meltzer. "Some Further Investigation of The Demand and Supply Function for Money." Journal of Finance, Vol. 19 (1964) 2.
- _____. The Federal Reserve's Attachment to the Free Reserve Concept: A Staff Analysis. Washington, D. C.: U. S. Government Printing Office, 1964.
- Burgess, W. R. The Reserve Banks and the Money Market, Rev. ed. New York: Harper and Bros., 1936.
- Chandler, Lester V. The Economics of Money and Banking, 4th ed. New York: Harper and Row, 1964.
- Cooper, Jack L. "Continuous Borrowing from the Federal Reserve System: Some Empirical Evidence." Journal of Finance, Vol. 24 (1969) 1.
- deLeeuw, Frank. "A Model of Financial Behavior." The Brookings Quarterly Economic Model of the United States, James Duesenberry, ed. Chicago: Rand McNally, 1965.
- Dewald, W. G. "Free Reserves, Total Reserves and Monetary Control." Journal of Political Economy, Vol. 71 (1963) 2.
- Friedman, Milton and Anna J. Schwartz. A Monetary History of the United States, 1867-1960. Princeton: Princeton University Press, 1963.
- Johnson, Harry G. "Monetary Theory and Policy." American Economic Review, Vol. 52 (1962) 3.
- Kareken, John H. "Commercial Banks and the Supply of Money." Federal Reserve Bulletin, Bol. 53 (1967) 10.
- Lapkin, David L. and Ralph W. Pfouts. "The Administration of the Discount Window." National Banking Review, Vol. 3 (1965) 2.
- McKinney, George W. The Federal Reserve Discount Window. New Brunswick: Rutgers University Press, 1960.

- Meigs, A. James. Free Reserves and the Money Supply. Chicago: The University of Chicago Press, 1962.
- Monhollon, Jimmie R. and James Parthemos. "Administering of the Discount Function: A Comment." National Banking Review, Vol. 4 (1966) 1.
- Morrison, George. The Liquidity Preference of Commercial Banks. Chicago: University of Chicago Press, 1966.
- Orr, D. and W. Mellon. "Stochastic Reserve Losses and Expansion of Bank Credit." American Economic Review, Vol. 51 (1961) 4.
- Polakoff, Murray E. "Federal Reserve Discount Policy and Its Critics." Banking and Monetary Studies, Deane Carson ed. Homewood: Richard D. Irvin, Inc., 1963.
- _____. "Reluctance Elasticity, Least Cost, and Member Bank Borrowing." Journal of Finance. Vol. 15 (1960) 1.
- Poole, William. "Commercial Bank Reserve Management in a Stochastic Model: Implications for Monetary Policy." Journal of Finance, Vol. 23 (1968) 5.
- Reappraisal of the Federal Reserve Discount Mechanism: Report of A System Committee. Washington: Board of Governors of the Federal Reserve System, July, 1968.
- Riefler, Winfield W. Money Rates and Money Markets in the United States. New York: Harper and Bros., 1930.
- Robinson, Roland I. Money and Capital Markets. New York: McGraw-Hill, 1964.
- Russell, William. "Commercial Bank Portfolio Adjustment." American Economic Review, Vol. 54 (1964) 3.
- Silverberg, Stanley. "Bank Borrowing: An Analysis of Recent Experience." The National Banking Review. Vol. 2 (1964) 2.
- Tobin, James. "Toward Improving the Efficiency of the Monetary Mechanism," Review of Economics and Statistics, Vol. 42.
- _____. "Liquidity Preference as Behavior Toward Risk." Review of Economic Studies, Vol. 25 (1958) 67.
- Turner, R. C. Member Bank Borrowing. Columbus: Ohio State University Press, 1938.