Bank response to tight money: a case study

Duane Gail Harris
Iowa State University

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BANK RESPONSE TO TIGHT MONEY: A CASE STUDY

by

Duane Gail Harris

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
MASTER OF SCIENCE

Major Subject: Economics

Signatures have been redacted for privacy

Iowa State University
Of Science and Technology
Ames, Iowa
1968
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CHAPTER I. INTRODUCTION

The response of commercial banks to changes in monetary policy represents a critical component of economic adjustment and control. In a simple Keynesian analysis, this response is manifested in changes in "the" rate of interest. Specifically, when the Federal Reserve restricts bank reserves through open-market sales, increases in the discount rate, or increases in reserve requirements, banks transfer this restriction on lending resources by increasing the loan rate to borrowers. Subsequently, this higher interest rate affects spending decisions, especially those related to capital acquisition, and thus affects economic activity.

More recently, the theory of bank response to tight money has been extended by the credit availability doctrine to include non-price characteristics of loans. In 1955 and 1957, the American Bankers Association (1), (2) conducted surveys which probed the actions of commercial bankers in all parts of the country. Participating banks totaled more than 1,400 and accounted for approximately two-thirds of the total assets of all commercial banks. These banks were questioned about increased selectivity in lending during tight money, the reasons for tightening of bank credit, and their methods of achieving such restriction.

The survey indicated that nearly 80% of all commercial banks had become more selective in their lending policies during the monetary restraint beginning in late 1955. The severity of selectivity increased with deposit size of the banks. Less than 80% of the small banks (deposits under $10 million) indicated they had increased selectivity while over 90% of the large banks (deposits over $500 million) denoted
that they had become more discriminating in their lending policy (2, p. 69).

Of the bankers who indicated they had adopted more conservative lending criteria, 44% stressed the decline in bank liquidity (increase in loan to deposit ratios) as one of the chief reasons; 44% mentioned concern over economic trends as a motivating force; 23% expressed their desire to cooperate with Federal Reserve policy as a determinant of increased selectivity; and 15% added that a decline in bond prices had caused them to become more cautious in making loans (2, p. 69).

Finally, the banks reported a variety of methods used to accomplish increased stringency. About two-thirds modified their practices through stricter credit review; 57% through more consideration of past relations with loan applicants; 42% by considering the willingness of applicants to maintain good balances; 38% by imposing faster repayment schedules; and 25% by scaling down of loan requests (2, p. 70).

These two surveys indicate that bank response and subsequent economic adjustment to tight money are much more complex than a Keynesian analysis would suggest. If, in general, banks do respond to tight money by rationing credit, decisions about debt-financed private spending will be further complicated. Borrowers who are willing to pay the higher interest rate brought about by restricted bank reserves may now be frustrated by these non-price restraints. Stated in another way, the depressive effect on private spending of loan rate increases will be reinforced by non-price credit rationing.

Prior to the ABA studies, however, Paul A. Samuelson (20) had argued that non-price credit rationing will be used only as a temporary measure.
while the interest rate adjusts upward. He contended that no prudent banker would sacrifice additional profits from higher interest rates to "arbitrarily make trouble for himself" by rationing credit through non-price criteria (20, p. 696).

These two views capture the flavor of the controversy between interest rate and credit availability proponents in explicating bank response to tight money. Since the Samuelson testimony and ABA studies, various theoretical models (22), (9), (8), (11), (14) describing bank behavior have been advanced to support or reject the credit availability doctrine. However, empirical evidence is meager. Reasons for the lack of empirical evidence include banks' unwillingness to disclose customer data; loan provisions, such as the value of collateral, which are difficult to quantify; customer relationships which are difficult to evaluate; and qualitative differences among loans.

The purpose of this study is to provide an empirical evaluation of the credit availability doctrine through a case study involving the actions of a single bank during the tight money period of the summer of 1966. Credit rationing explanations plus theoretical models, representative of both the interest rate and credit rationing views, will be presented in Chapter II; economic conditions and the position of the bank will be reviewed in Chapter III; Chapter IV will include the formulation and testing of credit rationing hypotheses; and Chapter V will present and discuss the conclusions of the study.
CHAPTER II. REVIEW OF LITERATURE

Explanations for Credit Rationing

As the credit availability doctrine gained popularity in the 1950's, various explanations were advanced to justify the commercial bank's non-price rationing of credit. These explanations essentially describe influences that central bank policy restraint has upon the forces motivating bank decision making. Following are some of the most commonly mentioned effects of Federal Reserve action and subsequent commercial bank reaction.

Loss of liquidity

The conventional asset management approach to banking theory (18) regards protection of customer deposits as the primary responsibility of the commercial bank. The bank must stand ready to honor the "demand" of a customer to draw from his account. These withdrawals from customer accounts may be expected or unexpected. The ability of the bank to meet expected cash drains is most properly an indicator of its "liquidity" position. Its capacity to meet unforeseen drops in deposits constitutes a measure of the bank's "soundness" (14, p. 2).

The bank provides for adequate liquidity and soundness by maintaining a certain dollar amount of assets in the form of primary and secondary reserves. Primary reserves, made up of legal reserves (vault cash plus reserves at the Federal Reserve Bank) and working reserves (correspondent balances and other non-earning assets), satisfy the bank's legal reserve requirement and provide the necessary liquidity to meet immediate deposit
drains. However, the bank will try to keep the level of primary reserves at a minimum since they earn no return and, thus, contribute nothing to profits.

Secondary reserves -- short-term, highly liquid earning assets such as Treasury bills -- are held to provide liquidity for expected needs such as seasonal demands and to maintain the bank's soundness to meet unforeseen deposit drains due to business reversals or other adverse economic situations. These secondary reserves, though held primarily for liquidity and soundness purposes, do contribute to the bank's profits.

As the central bank sells securities to tighten up the money supply, prices on these securities will be driven down. Consequently, the realizable value of a bank's secondary reserves will drop. In an attempt to regain its desired dollar level of liquidity, the bank will be forced to purchase more secondary reserve assets (13, p. 15). As this is done, the asset structure of the bank is shifted away from loans and other investments to the more liquid government securities. If loan demand remains the same, this decrease in loanable funds will necessitate rationing credit, by some method, among prospective borrowers.

However, a more recent approach to maintaining adequate liquidity includes liability management to complement asset adjustment (17). By offering higher rates on time deposits, borrowing Federal Funds, borrowing at the discount window, or increasing its liabilities in other ways, a bank can create a source of funds to meet liquidity needs without shifting the structure of its assets. To the extent that the bank can create liquidity in this manner, it will not have to sacrifice loans for more
liquid assets and, thus, will not be faced with the problem of credit rationing.

**Lock-in effect**

The decline in security prices caused by central bank action will also affect the bank's propensity to hold government securities. If the bank tries to sell securities to meet loan demands as security prices decline, it may be forced to take capital losses on these assets. Since capital losses lower profits and subsequently may influence stockholder opinion about bank management, proponents of the "lock-in" effect contend that bank officers will be reluctant to liquidate their holdings of government securities (13, p. 22). Thus, another force operates to restrict the size of the loan portfolio and to further necessitate credit rationing.

However, the lock-in effect has fallen into disrepute in recent years as it has been recognized that capital losses on securities may be justified if the proceeds can be used to make a greater rate of return elsewhere.

Yet, there is another aspect of the influence of profits on bank behavior. As security prices decline, yields rise, both in an absolute sense and in relation to rates on loans. Consequently, the contribution made to profits by government securities will increase and cause bank managers to look more favorably on acquiring securities (13, p. 21). Since securities introduce less risk into the portfolio than loans, as yields rise, holdings of government securities may increase. Thus, acquisition of additional securities for profit reasons will reinforce
any need to do so for liquidity purposes.

Uncertainty

Finally, monetary restraint may also affect the risk factor of a bank's assets by injecting added uncertainty into the government security and loan markets. As interest rates on securities change, Scott (22, p. 42) notes that uncertainty with respect to the prices at which the securities can be sold before maturity increases. To relieve this added risk in the portfolio, he concludes that banks must move into governments (22, p. 45). This follows from the fact that even though securities are more risky than before, they remain less risky than loans. To bring the asset portfolio back to the desired level of risk, it is therefore necessary to substitute governments for loans.

Rosa (19, p. 287) extends the argument to the loan market by asserting that a tightening of credit conditions, accompanied by higher interest rates, may make lenders expect even tighter conditions in the future. This will induce them to postpone part of their supply of credit to take advantage of higher rates at a future date.

Combined effects

The liquidity, lock-in, and uncertainty effects of tight money combine to restrict the ability of the commercial bank to meet loan demands. Therefore, some mechanism for rationing credit, whether it be the interest rate or non-price criteria, is necessary.

Credit Availability Models

Although the above explanations offer some insight into the motivating forces causing credit restraint, a more precise formulation of bank
behavior is necessary to explain the exact nature of restricted availability during tight money. Following are three proposed theoretical models which either lend support to or question the validity of non-price credit rationing.

Hodgman model

Donald Hodgman (9) offered one of the pioneering attempts to formally quantify the credit availability tenets. His emphasis is centered about the prime rate convention and the profitability of the customer relationship. He formulates the net revenue that the bank can receive from a customer as

\[ P_i = r d_i (1 - R) + c_{ij} L_{ij}, \]

where \( P_i \) is the net earnings on the \( i \)th customer relationship; \( r \), the market rate of interest (adjusted for risk and net of costs) on loans and investments which do not involve a deposit relationship; \( d_i \), the deposit of the \( i \)th customer, net of loan proceeds; \( R \), the ratio of the bank's cash and legal reserves to its demand deposits; \((1 - R)\), the proportion of deposits which can be used to acquire earning assets; \( L_{ij} \), a \( j \)th size loan to the \( i \)th customer; and \( c_{ij} \), the preferential contract rate of interest charged on the \( j \)th size loan to the \( i \)th customer.

The net proceeds, \( P_i \), consist of the net revenue from earning assets supported by the customer's deposit, \( r[ d_i (1 - R)] \), plus the revenue directly associated with the loan to the customer, \( c_{ij} L_{ij} \).

\(^1\) Hodgman also includes terms to provide for interest paid on demand deposits and for net service charges. Since exclusion of these does not alter the important relationships, they have been omitted.
These proceeds can be expressed as a percent of loan size and compared to the market rate of interest. If \( P_i/L_{ij} = r \), the return on the customer relationship is equal to that on loans to non-customers and investments made at the market rate, \( r \). When \( P_i/L_{ij} \) is greater than \( r \), the bank enjoys a rate of return on its loan to the \( i \)th customer which exceeds the market rate available on loans to non-depositors or on open market securities.

The rate of return on the customer relationship can be restated as

\[
(2-2) \quad \frac{P_i}{L_{ij}} = \frac{rd_i(1 - R)}{L_{ij}} + c_{ij}.
\]

If this return is to be equal to that on an open market opportunity, then

\[
(2-3) \quad r = \frac{rd_i(1 - R)}{L_{ij}} + c_{ij}.
\]

By rearranging terms, Hodgman arrives at the minimum rate which must be charged a customer with deposits of \( d_i \) on a loan of size \( L_{ij} \):

\[
(2-4) \quad (\min c_{ij}) = r \left[ 1 - \frac{d_i(1 - R)}{L_{ij}} \right].
\]

As loan size, \( L_{ij} \), increases toward infinity, the minimum preferential rate increases and approaches the market rate, \( r \). Also, as deposit size, \( d_i \), approaches zero, the preferential rate approaches the market rate.

The relationship between the preferential rate and the loan to deposit ratio of the customer is shown in Figure 1 by the cc' line. The cc' line approaches the rr' line at large loan sizes as indicated above.
Figure 1. Minimum preferential rate on a bank loan to a depositor

A negative preferential rate is possible if the earning assets supported by the customer's deposit are greater than the size of the loan made:

$$d_i (1 - R) > \frac{L_{ij}}{d_i}$$

As the prime interest rate convention is introduced, certain restrictions are imposed upon the bank. The prime rate is a tacitly agreed minimum interest rate, made among competing banks, on loans to deposit customers. It in effect represents that fixed rate charged on a loan to a bank's very best deposit customer. The prime rate establishes a floor on all preferential rates and also dictates the largest individual loan/deposit ratio that will be tolerated by the bank at that rate. In
Figure 1, a prime rate of M will be charged on a loan to the very best customer up to a loan/deposit ratio of \( L_{11}/d_1 \). On any loan/deposit ratio below \( L_{11}/d_1 \), the bank will make a rate of return greater than the market rate (the difference represented by the vertical distance between the MM' line and the cc' line). A loan request at the prime rate which makes \( L_{ij}/d_i \) greater than \( L_{11}/d_1 \) will offer a net rate of return less than that available in the market and will be refused, even at the expense of losing the entire customer relationship (9, p. 118).^2

The effect of tight money on the system is to increase the market rate \( r \), or the opportunity cost associated with making a loan to a depositor. As \( r \) is increased, \( \min c_{ij} \) in Equation 2-4 will be increased for every loan size. The result in Figure 1 will be a shift in the cc' line to \( c_1c_1' \). If the prime rate does not change, the largest loan/deposit ratio at the prime rate will decrease to \( L_{12}/d_i \) from \( L_{11}/d_1 \). Thus, credit rationing results in the form of decreasing loan size. But, if the prime rate adjusts upward over time, as in usually the case, rationing will become less severe and will take on temporary characteristics as claimed by Samuelson.

In summary, the Hodgman model emphasizes the profitability of the customer relationship. By considering both the deposit size and loan request size of a customer, the bank can calculate a preferential rate to the customer which is commensurate with the rate available on market

---

^2 The loan could be granted if the borrower were willing to provide a compensating deposit balance large enough to keep the loan/deposit ratio below the allowable maximum. See Hodgman (9, pp. 106-110).
investments or loans to non-depositors.

If the prime rate is introduced, this imposes a fixed rate on the system which will set a limit on the size of the loan made at that rate. Any loan request made which is larger than the dictated maximum will be refused because the net return from the total customer relationship (deposits and loans) will be less than that available in the market. This results in credit rationing by loan size.

However, the Hodgman model fails to deal adequately with the risk aspect of bank portfolio management. Therefore, the Kane and Malkiel model will be introduced to bring this dimension into the theoretical discussion.

Kane and Malkiel model

Kane and Malkiel (11) use a modified Tobin-Markowitz portfolio model which considers a commercial bank to be a utility maximizer. The utility of the bank is dependent upon expected profits and risk. It is assumed that bank managers choose between but two types of assets -- loans (L) and government securities (G).

The following equations describe the model:

\[ \max U = U[E(\pi), \sigma^2(\pi)] \]

\[ L + G = D + N \text{ where } L \geq 0 \text{ and } G \geq 0; \]

Expected profits and risk are represented by \( E(\pi) \) and \( \sigma^2(\pi) \) respectively;
\( \bar{D} \) and \( \bar{N} \) stand for deposits and net worth which are assumed known and constant.\(^3\)

\[
(2-8) \quad \mathbb{E}(\pi) = L \cdot \mathbb{E}(r) + G \cdot \mathbb{E}(g)
\]

where \( \mathbb{E}(r) \) represents the expected holding-period rates of return on loans, and \( \mathbb{E}(g) \) the expected rates on governments.

\[
(2-9) \quad \sigma^2(\pi) = L \sigma^2_r + 2LG \sigma_r \sigma_g + G \sigma^2_g.
\]

The bank's utility surface is restricted by

\[
(2-10) \quad \frac{\Delta U}{\Delta \mathbb{E}(\pi)} > 0, \quad \frac{\Delta U}{\Delta \sigma^2(\pi)} < 0
\]

such that utility is increased by higher expected profits and decreased by additional risk. The marginal rate of substitution along a utility indifference curve is positive since additional risk must be compensated by larger expected profits to keep utility constant.

Kane and Malkiel graphically illustrate the model as shown in Figure 2. The arguments of the utility function, \( \mathbb{E}(\pi) \) and \( \sigma^2(\pi) \), are used as axes, and the loan portfolio is allowed to consist of all combinations of loans and government securities from 100% governments and 0% loans to 100% loans and 0% governments. It is assumed that risk associated with governments is less than that on loans \( (\sigma^2_g < \sigma^2_r) \) and that the rate of return on loans exceeds that on governments, \( \mathbb{E}(r) > \mathbb{E}(g) \).

\(^3\)Variable deposits are introduced into the model in a later section of the article.
Figure 2. Portfolio allocation

The \( O_1 \) line in Figure 2 represents the particular risk-profit combination of any specific loan-government portfolio mix. The overall risk of the portfolio will decline as loans are first included because of the effect of diversity. As more loans are incorporated in relation to governments, however, the force of \( (\sigma_r^2 > \sigma_g^2) \) will take over and cause the overall risk to rise. The risk related to holding 100% loans is greater than that of holding 100% governments since \( \sigma_r^2 > \sigma_g^2 \). Expected profits increase as more loans are included in the portfolio since \( E(r) > E(g) \).

The \( U_1 \) line in Figure 2, representing the bank's indifference curve, is concave downward due to the positive marginal rate of substitution between risk and profit. The specific loan-government combination which
maximizes the bank's utility will be at A which corresponds to that point where the indifference curve $U_1$ is tangent to the opportunity-locus $O_1$.

The imposition of central bank action on the system will introduce increased uncertainty in the government securities market and cause the $O_1$ line to shift upward to $O_2$. If the bank readjusts its assets to once again attain optimality, it will move out of loans into governments (A to B). If loan demand remains constant, then it seems that rationing must take place. However, Kane and Malkiel argue that nothing in the model would lead one to expect credit rationing (11, p. 118). Rather, they contend that bankers will rely on the interest rate mechanism to do the job. However, it should be noted that rationing on the basis of loan quality is implicitly impossible in the model since Kane and Malkiel initially assume a homogeneous class of loan applicants.

They further support their non-rationing argument by introducing $L^*$ borrowers, who, because of their continuing contribution to bank utility, will be satisfied at any cost. Holdings of government securities will be sacrificed, even at a utility loss, to accommodate these favored customers.

The only support they lend the credit rationing argument is via three intuitive suggestions: (1) that raising credit standards may in effect be an implicit increase in interest rates; (2) that legal ceilings or other institutional restraints may make interest rates sticky; or (3) that as a customer borrows more and more money, his financial position becomes weaker and weaker until a point is reached where the bank may refuse him another loan.

---

4 Hodgman (10) and Freimer and Gordon (5) develop this suggestion of credit rationing in much more detail.
In their concluding remarks, Kane and Malkiel do modify their insistence on no credit rationing by recognizing differing degrees of \( L^* \)-ness among borrowers. They expect that to the extent credit rationing does exist, it will be done on the basis of existing customer relationships; the size, stability, and prospects for future growth of deposits; and the existence of profitable future lending opportunities (11, p. 129).

In summary, the Kane and Malkiel model describes bank behavior as the adjustment of assets (loans and governments) to maximize utility. Since profits and risk constitute the arguments of the bank's utility function, the introduction of additional risk into the portfolio via tight money causes the bank to readjust its assets in favor of governments. However, the loan market disequilibrium caused by this decrease in loanable funds will be adjusted by the interest rate mechanism, not by credit rationing, according to Kane and Malkiel. Credit rationing is further disputed by the existence of \( L^* \) (favored) borrowers who will be accommodated at any cost since their continued relationship with the bank is important to bank utility.

However, the model is hampered by the lack of emphasis on differing degrees of deposit contribution and creditworthiness among borrowers. To bring these areas into focus, a model including an explicit deposit relationship will be presented and Luckett's model incorporating the discrepancies in loan quality will be reviewed.

*Kane and Malkiel model - a modification*

Deposit customers will affect bank utility, not only through their loan demands, but also through the size and stability of their deposit
accounts. For this reason, I propose a simple modification of the Kane and Malkiel framework to explicitly include the deposit relationship in profit and risk determination.

The deposit relationship can be introduced into the utility framework by altering the set of equations as follows:

\[
\begin{align*}
\text{max } U &= U[E(\pi), \sigma^2(\pi)]; \\
E(\pi) &= f[E(r), E(g), D]; \text{ and} \\
\sigma^2(\pi) &= h(\sigma^2_r, \sigma^2_g, \sigma^2_D).
\end{align*}
\]

Utility still remains a function of profits and risk, but now profits depend on expected loan rates, expected government rates, and on the level of deposits. Risk becomes a function of loan rate variability, government rate variability, and deposit variability. If a bank is faced with excess loan demand, decisions as to the method of allocation will be affected by the strength of the customer relationship which is determined by the size and stability of a customer's deposit account.

It can be assumed that a bank will have four general types of deposit customers -- those who maintain (1) large, stable deposits; (2) small, stable deposits; (3) large, unstable deposits; or (4) small, unstable deposits. Customers with large, stable deposits will be preferred over all others; those with small, unstable deposits will lend the least to bank utility. It will be further assumed that loans are normally distributed among these classes of depositors as shown in Figure 3.

Given a certain amount of funds available for lending, if customer demands exceed this, the bank has two alternatives -- (1) weaken its
liquidity position to satisfy all customers, or (2) refuse some loan requests. Kane and Malkiel seem to imply that L* customers will be satisfied at the expense of liquidity. But it now becomes clear that favored customers can be accommodated at the expense of poorer customers. If the bank is determined to maintain its liquidity position at the desired level, then it can cut some borrowers out of the market. The question remains -- how?

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<tr>
<td>High D</td>
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<tr>
<td>Low σ^2_D</td>
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<tr>
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<td></td>
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<tr>
<td>High D</td>
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<tr>
<td>High σ^2_D</td>
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Figure 3. Distribution of loan customers as to size and stability of deposit account

If the bank leaves the job of allocation to the interest rate mechanism, then it is, in effect, granting credit to anyone who will pay the price, regardless of the strength of his customer relationship. If retention of a customer's deposit account is dependent upon loan accommodation, since the bank has no control over the number of borrowers in each of the deposit classes who are eliminated by the interest rate charged, the bank may lose some of its best deposit customers. On the
other hand, if the bank does its own rationing, it can accommodate those customers who offer the bank the most utility.

To state this in terms of the model, the changes in utility brought about by bank controlled variables will be

(2-14) \[ \frac{\partial U}{\partial E(r)} = \frac{\partial U}{\partial E(\pi)} \cdot \frac{\partial E(\pi)}{\partial E(r)} \]

(2-15) \[ \frac{\partial U}{\partial D} = \frac{\partial U}{\partial E(\pi)} \cdot \frac{\partial E(\pi)}{\partial D} \]

(2-16) \[ \frac{\partial U}{\partial \sigma^2_D} = \frac{\partial U}{\partial \sigma^2(\pi)} \cdot \frac{\partial \sigma^2(\pi)}{\partial \sigma^2_D} \]

The inclusion of the customer relationship in the utility framework gives the bank additional control over its own utility. Now, by selecting its customers, it can alter \( D \) and \( \sigma^2_D \) to directly affect its optimum position.

A bank will rely on the interest rate to ration credit only if

(2-17) \[ [\frac{\partial U}{\partial E(r)}]_r + [\frac{\partial U}{\partial D}]_r + [\frac{\partial U}{\partial \sigma^2_D}]_r > [\frac{\partial U}{\partial D}]_R + [\frac{\partial U}{\partial \sigma^2_D}]_R \]

where the subscript \( r \) indicates rationing by interest rate and \( R \), rationing by deposit criteria. As indicated above, if the interest rate is used, \( (\frac{\partial U}{\partial D})_r + (\frac{\partial U}{\partial \sigma^2_D})_r \) may be negative due to the loss of customers with large, stable accounts. This in turn will reduce the contribution to utility made by the higher interest rate. At the extreme, it might be possible that as loan rates move high enough to clear the market, only poor depositor-borrowers will be willing to pay the price. This will skew the distribution of loans to the right in Figure 3 and will leave the bank with overall deposits which are considerably smaller and less stable.
It becomes possible then that more utility can be gained (or less utility lost) by directly rationing credit than by allowing the interest rate mechanism to allocate loans. Hence, the deposit-relationship influence of loan customers may contribute motivation, consistent with bank utility maximization, for non-price credit rationing.

**Luckett model**

Another characteristic of the customer relationship -- the credit-worthiness of the borrower -- is demonstrated to effectuate non-price credit rationing in a model developed by Luckett (14). He argues that raising credit standards on loans during tight money will allow the bank to expand loans to meet demand without increasing the aggregate risk exposure of the asset portfolio. Specifically, the additional risk introduced into the portfolio by selling governments to expand loans can be offset by upgrading the quality of loans made. Thus, profits can be increased by moving from governments to loans while risk can be maintained at the previously accepted level.

The commercial bank is considered to be a utility maximizer, as in the Kane and Malkiel model, but profit and soundness constitute the arguments of the utility function. The model is specified by the

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5 Liquidity is also considered, in an earlier draft of the paper, to be a variable affecting utility, but since it does not alter the conclusions of the model and does complicate the algebra, it is omitted.
following equations and functional properties:

\[(2-18) \quad R + G + L = D, \text{ and} \]

\[(2-19) \quad U = U(\pi, \tau); \quad \frac{\partial U}{\partial \pi}, \frac{\partial U}{\partial \tau} > 0 \]

where \(R\) is required reserves, \(G\) is government securities, \(L\) is loans and \(D\) is demand deposits. Deposits are assumed given and required reserves bear the usual fixed relation to deposits. Profits and soundness are represented by \(\pi\) and \(\tau\) respectively. A ceteris paribus increase in profits or soundness will add to bank utility.

Luckett alleviates the problem of the homogeneous loan portfolio in the Kane and Malkiel model by dividing bank loans into two classes, strong (\(L_s\)) and weak (\(L_w\)). These are combined with the other assets and liabilities of the bank to determine a measure of the bank's soundness. It is assumed that the banker attaches subjective weights to each of his assets according to his best estimate of their realizable value in case of forced liquidation under distress conditions. The degree of the bank's soundness is measured by the excess of its weighted assets over its weighted liabilities (14, p. 4). Therefore,

\[(2-20) \quad \tau = cR + aG + b_sL_s + b_wL_w - cD \]

where \(c, a, b_s,\) and \(b_w\) are the assigned weights and \(a > b_s > b_w.\)

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\(^6\) "While the quality of the loans of an actual bank no doubt comprise a continuous spectrum from poor to excellent, it will be adequate to separate loans into two classes." (14, p. 5)
The profit function is written as

\[ \pi = rG + \gamma_s L_s + \gamma_w L_w \]

where \( r \) is the rate of return on governments, \( \gamma_w \) the net (of lending costs) rate charged on weak loans, and \( \gamma_s \) the net rate on strong loans. It is assumed that \( \gamma_w, \gamma_s > r \).

The bank is considered to be a constrained maximizer, maximizing profits subject to the soundness constraint. Using the technique of Lagrangian multipliers, Luckett derives the values for the bank controlled variables \((L_w, L_s, \gamma_w, \gamma_s)\) which will provide the constrained maximum. Next he allows \( b_w \) to become a decision variable which can also be altered in response to changing economic conditions.

When the model is subjected to tight money, the optimal values for \( L_w, L_s, \gamma_w, \) and \( \gamma_s \) increase. This yields the familiar results of increasing loan to deposit ratios and rising loan rates during periods of monetary restraint. More importantly, tight money also causes the value for \( b_w \) to rise. Since \( b_w \) is the weight attached to weak loans in the soundness calculation and indicates the realizable value of the \( L_w \) loans, an increase in \( b_w \) can be interpreted as evidence of a rise in the bank's standards of creditworthiness. Thus, bank response to tight money will include non-price rationing of credit.

**Summary**

The literature offers theoretical models of bank behavior which both justify and dispute non-price credit rationing. The validity of the credit availability doctrine must therefore rest on empirical evidence.
Unfortunately, such evidence is scarce. The only major study, other than the ABA surveys, dealing with credit availability is one conducted by Donald Hester in conjunction with his development and testing of a bank loan offer function (8).

Hester Study

Hester develops a theory to explain the terms at which a bank with particular characteristics will lend to a loan applicant. The theory relates, through a bank loan offer function, the terms at which a specific bank will be willing to lend to a borrower with known profits, balance sheet characteristics, and credit history. Four principal terms of lending are considered: (1) the loan rate, (2) the loan maturity, (3) the size of the loan, and (4) the likelihood of security. It is hypothesized that banks are willing to substitute among these terms of lending such that, for example, longer maturity loans might be obtained by paying higher rates of interest and/or accepting a smaller sized loan and/or by offering more security.

Data, concerning the years 1955 and 1957, from three large commercial banks and from surveys conducted by the Federal Reserve are used to test various hypotheses related to the loan offer function. Hester reports that it appears that banks do trade off terms of lending (8, p. 52).

The relevance of the loan offer function to the availability doctrine lies in the bank's use of these lending terms for rationing criteria. Hester finds that there is some evidence that banks are less willing to grant long maturity term loans as interest rates rise. However, analysis of commercial and industrial loans reveals that borrowers of any particular
size could obtain loans of at least the same maturity, the same amount, and with the same likelihood of security regardless of the level of competing interest rates. He concludes that in the situation represented by his data, "there was no credit rationing" (8, p. 54).

Thus, the Hester study disagrees with the results of the ABA surveys and creates an even greater need for more evidence to resolve the credit rationing controversy. The remainder of the thesis is devoted to providing an empirical analysis of bank response to tight money.

Description of the Study

The procedure used to test the credit availability doctrine was a two-period comparative analysis contrasting the characteristics of borrowers and loans at a single bank during a tight money period and an easier money period. The test bank is a medium-sized Iowa bank with assets and deposits between $10-25 million. The tight money period, selected on the basis of general monetary conditions and interviews with the bank's officers, was August, 1966. The easier money period, chosen for contrast, was August of 1964. The same month was selected in both periods to avoid seasonal differences in variables affecting loan supply and demand.

Information on national monetary conditions and on the bank's position was compiled for the months preceding the two periods and is presented in Chapter III. Data were collected on all cash loans,7 $500 and above, made

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7 Commercial and personal loans other than real estate and consumer installment loans.
during the two test months. Averages reflecting characteristics of the loans and the borrowers were calculated and contrasted to test various hypotheses about the credit availability tenets. The results of this analysis are presented in Chapter IV. Finally, conclusions about the effect of tight money on this specific bank are drawn in Chapter V.
CHAPTER III. MONETARY CONDITIONS: 1964 AND 1966

General Trends

General monetary conditions in the United States during 1964 and 1966 set the stage for the two-period comparative analysis. During 1964, Federal Reserve authorities sought to "contribute to orderly and sustainable expansion in the domestic economy" (24, p. 9). The Federal Reserve Bank of New York (3, p. 23) described monetary policy as one which "facilitated a high rate of growth in bank credit and the money supply."

In contrast, 1966 was described as a year of monetary restraint. The major task of monetary policy was to "restrain demand pressures in an economy that was clearly overheated" (4, p. 21). The Federal Reserve "endeavored to slow the rate of monetary expansion, first by raising the discount rate in December, 1965, and then beginning in February, by reducing the rate at which it supplied reserves to commercial banks through operations of the System Open Market Account" (25, p. 3).

Familiar policy indicators also stress the relative monetary tightness of 1966 compared to 1964. Interest rates on 3-5 year government bonds increased from 3.81% to 3.99% from August, 1963 to August, 1964, while they increased from 4.19% to 5.58% from August, 1965 to August, 1966. Bank rates on short-term loans hovered near 5.00% from August, 1963 to August, 1964 but increased from 5.00% to 5.82% over the same months during 1965-66 (26). Free reserves declined much more rapidly and to much lower levels in 1966 than in 1964. Figure 4 shows the
movement of free reserves at all member banks from January to August of the two test years.

Figure 4. Free reserves: 1964 and 1966 (26)

The effect of the contrasting monetary policies on commercial bank portfolio allocation during the months leading up to the two test periods can be discerned by comparing the values of analytical bank ratios for 1964 and 1966. The loan-to-deposit ratio, for example, is one of the more commonly used indicators of bank liquidity. An increase in a bank's loan/deposit ratio denotes that the bank is allocating more of its resources (deposits) to the less liquid loan portfolio. Increasing loan/deposit ratios are typical during tight money periods when banks move into more loans to try to satisfy higher loan demands.
Figure 5 shows the average loan/deposit ratios for all member banks for the 12 months preceding the test months. The August 1963 ratio was used as a base and all subsequent ratios were indexed as a percent of that figure. The 1965-66 monthly ratios remained about 10% higher than those for the months preceding August, 1964.

![Loan/Deposit Ratios](image)

**Figure 5. Loan/deposit ratios: all member banks (26)**

Capital adequacy is another bank characteristic which plays a dominant role in management of funds. It guarantees the continued ability of the bank to serve the needs of the community and to maintain public confidence in the bank's management. One indicator commonly used to denote the degree of capital adequacy is the capital/risk asset ratio. Since capital provides the base for continuing operations, even in periods of stress conditions, and since risk assets\(^8\) constitute the

---

\(^8\)Risk assets include all assets except cash and government securities.
possible sources of losses during these stress periods, the capital/risk asset ratio represents a measure of possible capital impairment. As the ratio falls in value (risk assets increase faster than the capital base), the ability of the bank to ultimately absorb losses on these risk assets diminishes. One would expect that during tight money periods bank capital/risk asset ratios decline since increased loan demand, ceteris paribus, will cause a shift into loans away from government securities and thus, increase the total volume of risk assets. Figure 6 relates the levels and movements of average capital/risk asset ratios during the months before August, 1964 and August, 1966. Tighter money conditions in 1965-66 are evidenced by the lower ratio values.

![Graph showing C/RA ratios for 1963-64 and 1965-66](image)

Figure 6. Capital/risk asset ratios: all member banks (26)

Thus, 1966 and 1964 seem to offer an appropriate contrast for studying the effects of tight money on bank management. Stated policy, policy indicators, and aggregate analytical ratios all indicate that
borrowers faced more competition for bank loans during 1966 than in 1964.

Position of the Test Bank

In addition to observing the general monetary conditions leading up to the test months, it is important to describe and evaluate the position and condition of the test bank to determine if it also was faced with contrasting monetary situations appropriate for determining bank response to tight money.

Figure 7 shows the loan/deposit ratios of the test bank. Once again, the August 1963 value was used as a base. Although more erratic than the averages of all member banks, the ratios do take on higher values during most of the 1965-66 period. This indicates that general pressures on lending resources experienced by the nation as a whole were also felt.
by this particular bank. Tighter conditions in 1966 are especially evident during the months immediately preceding the test months. From December to August, 1965-66, loan/deposit ratios increased by 17.5% while during the same period in 1963-64 they decreased by 15.4%. Also, during this period, 1966 ratio values were approximately 20% higher than those for 1964. Thus, the bank experienced a greater percentage increase in its loan/deposit ratio from 1964 to 1966 than the national average.

Figure 8 depicts the comparative capital/risk asset ratios. These

Figure 8. Capital/risk asset ratios: test bank

do not indicate as explicit an argument for tight money pressures as the loan/deposit ratio. However, capital/risk asset ratio values are less over most of the period from December to August of 1966 than during the same interval of 1964. Also, the 1965-66 ratio decreased by 10.4% from December to August while the 1963-64 ratio increased by 3.1%.
The two analytical ratios taken together indicate that the test bank did experience tighter conditions during 1965-66 than in 1963-64. It should be noted, however, that the two analytical ratio comparisons demonstrate that monetary restraint pressed down on the test bank later than it did on banks in general. Loan/deposit ratios were higher and capital/risk asset ratios lower for banks in general over the entire 12 month period before August of 1966. On the other hand, January of 1966 seemed to initiate the tight money movement for the test bank.

A final measurement which will aid in establishing the position of the bank is Luckett's soundness coefficient. Appropriate weights for the realizable value of assets and liabilities held by the bank can be obtained from the "Form for Analyzing Bank Capital"\(^9\) used by Federal Reserve examiners. This form designates the percentage capital requirement on each type of asset and liability that the bank holds. If the bank needs to hold a certain amount of capital for each asset and liability, then one minus the percentage capital requirement will give a percentage indication of the expected immediate realizable value. Since the breakdown of assets and liabilities on the form is much more sophisticated than the categories of data available for the bank, specific weights were averaged to obtain approximate weights for the more general classifications.

\(^9\) This form is reproduced by Lyon (15, Appendix 2).
The following formula for soundness resulted:

\[
\tau = 0.33 \text{ (Reserves required for demand deposits)} \\
+ 0.20 \text{ (Reserves required for time deposits)} \\
+ 0.90 \text{ (U.S. government securities)} \\
+ 1.00 \text{ (Federal funds)} \\
+ 0.75 \text{ (State and local securities)} \\
+ 0.75 \text{ (Loans + commercial paper)} \\
- 0.33 \text{ (Demand deposits)} \\
- 0.20 \text{ (Time deposits)}.
\]

It is assumed that excess reserves equal zero.

A change in the soundness coefficient could result from a shifting of types of assets within the asset base or from a change in the asset base itself. Therefore, to provide a measure which could be meaningfully compared from one time period to another, the soundness coefficient was divided by the asset level to obtain the soundness/asset ratio. This ratio gives a comparative measure of the ability of the commercial bank to meet an unexpected and substantial decrease in deposits.

In periods of tight money, it would be expected that, ceteris paribus, the soundness/asset ratio will be lower than in easier money periods. As a bank adjusts its assets in response to increased loan demand, the soundness coefficient will diminish and thus, the ratio will decline.

Figure 9 shows the soundness/asset ratios for the considered time intervals. It is not at all apparent that relative soundness for the
two intervals was substantially different although, once again, some tightness is in evidence during the months immediately before the August test periods. The soundness/asset ratio was lower for most of the December-August period in 1965-66 and decreased by 3.4% as compared to an increase of 0.6% for the same period in 1963-64.

![Graph showing soundness/asset ratios for test bank]

Figure 9. Soundness/asset ratios: test bank

Note that, although the loan/deposit ratio increased sharply from 1964 to 1966, the soundness/asset ratio remained at relatively the same level. This is due in part to the fact that the drop in soundness caused by the shift into loans was offset by an increase in soundness due to an increase in time deposits at the bank.

In conclusion, it is clear that the test bank experienced an increased demand for loans, relative to its resources, during the six months leading up to August, 1966. However, the bank's levels of capital adequacy and soundness seemed to be maintained during this tight
money episode which indicates that the bank probably did not face the degree of tightness experienced by banks in general. Nevertheless, the conditions of August, 1964 and August, 1966 offer enough of a contrast to provide for a meaningful analysis of the differences of loan policy during easy and tight money. The next chapter presents the analysis of loan and borrower characteristics and the testing of the credit availability hypotheses.
CHAPTER IV. CREDIT AVAILABILITY ANALYSIS

Statement of Hypotheses

On the basis of the theories described in Chapter II, four major credit availability hypotheses describing the action of a bank were formulated. During tight money, the bank will, in addition to raising interest rates, ration credit in the following ways:

1. raise standards of creditworthiness; and/or
2. satisfy established deposit-customer requests before those of new customers or non-customers; and/or
3. grant smaller loans than requested; and/or
4. shorten loan maturities.

These hypotheses were subjected to bank officer evaluation and statistical analysis for verification.

Bank Officer Evaluation

Officers at the test bank indicated that rationing along non-price lines does occur during tight money. In periods of excess loan demand, satisfaction of established customers attains a prime position in loan considerations. Credit positions of borrowers are reviewed carefully and those customers offering the bank the greatest degree of creditworthiness are favored. Loan size, typically, is scaled back on marginal loan requests as the quantity of credit demanded exceeds the available loanable funds. Finally, shorter maturities become a natural by-product of rising interest rates as the bank becomes increasingly aware that even better opportunities may develop in the near future.
Statistical Analysis

To make the strongest test of the hypotheses, data concerning loan refusals and loan term rejections would be necessary. Since such information was not available, each of the hypotheses was tested by contrasting loan characteristics for August, 1964 and August, 1966. A basic assumption of the study is that the borrowers in both test months came from the same population and made similar loan requests for similar purposes. The analysis was first made with data from all loans. Business loans were then singled out for separate investigation. The loans considered in each of the two months constituted the entire population of cash loans $500 and above. Comparisons made were between population averages from population sizes of 103 in 1966 and 70 in 1964. Population sizes for business loans were 54 and 32 for 1966 and 1964 respectively.

Higher interest rates

The test bank conformed to the general trend of higher interest rates in the August, 1966, period as compared to August, 1964. The average interest rate for loans made in each test month was calculated. Average interest rates weighted by loan size and weighted by credit ratings were also computed. 10 The use of credit ratings as a weight assigns a measure of loan quality to the price charged for borrowing and attaches increased significance to loans made to respectively better credit customers.

10 The credit ratings of loan customers were obtained from the local credit bureau and categorized into five groups according to quality. These categories were in turn assigned a value from 0 to 4 with 0 representing the poorest credit group and 4 the best. The customer's credit rating weight was then used to compute the weighted average.
Table 1 contrasts the averages and weighted averages for interest rates charged on all loans and business loans only. The averages for both classifications increased by approximately 7 to 8 percent from 1964 to 1966.

Table 1. Interest rates at the test bank

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>All Loans</th>
<th>Business Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1966</td>
<td>1964</td>
</tr>
<tr>
<td>Ave. Interest Rate</td>
<td>6.65%</td>
<td>6.18%</td>
</tr>
<tr>
<td>Wt. Ave. Int. Rate (by loan size)</td>
<td>6.67</td>
<td>6.14</td>
</tr>
<tr>
<td>Wt. Ave. Int. Rate (by credit rating)</td>
<td>6.47</td>
<td>5.98</td>
</tr>
</tbody>
</table>

Higher credit standards

Many test statistics were available to examine the level of credit standards in the two time periods. Credit ratings, the financial positions of the borrowers, and collateral requirements made by the bank all contributed to the analysis. Table 2 relates the comparative figures for these data.

The average credit rating of loan customers was computed on the basis of the assigned weights described in footnote 10 (p. 37). The hypothesized imposition of higher credit standards during tight money implies a higher average credit rating. The table shows that the average
credit ratings rose for both the all loans and business loans classifications from 1964 to 1966. These statistics, however, are biased by the

Table 2. Credit standards at the test bank

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>All Loans 1966</th>
<th>All Loans 1964</th>
<th>Business Loans 1966</th>
<th>Business Loans 1964</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave. Credit Rating</td>
<td>3.45</td>
<td>3.25</td>
<td>3.28</td>
<td>2.93</td>
</tr>
<tr>
<td>Wt. Ave. Credit Rating (by loan size)</td>
<td>3.57</td>
<td>3.55</td>
<td>3.55</td>
<td>3.44</td>
</tr>
<tr>
<td>Ave. Current Ratio</td>
<td>4.66</td>
<td>3.15</td>
<td>4.87</td>
<td>3.53</td>
</tr>
<tr>
<td>Wt. Ave. Current Ratio (by loan size)</td>
<td>4.49</td>
<td>3.18</td>
<td>4.65</td>
<td>3.56</td>
</tr>
<tr>
<td>Ave. (Loan/Net Worth)</td>
<td>0.06</td>
<td>0.11</td>
<td>0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Ave. (Total Loans/Net Worth)</td>
<td>0.14</td>
<td>0.17</td>
<td>0.17</td>
<td>0.12</td>
</tr>
<tr>
<td>(Secured $)/(Total $ Loaned)</td>
<td>0.50</td>
<td>0.62</td>
<td>0.42</td>
<td>0.44</td>
</tr>
<tr>
<td>(# Secured Loans)/(Total # Loans)</td>
<td>0.49</td>
<td>0.57</td>
<td>0.46</td>
<td>0.44</td>
</tr>
</tbody>
</table>

fact that credit ratings were not available for every borrower. Decisions, nevertheless, were made by the bank, even without this credit information. Consequently, the "no rating" (NR) group became an alternative lending category in loan decisions.

Table 3 breaks down the all loans classification into credit rating groups (including NR loans). The column relating the percent of the total number of loans made to each group indicates that the bank moved
away from poorer credit borrowers and NR borrowers in 1966. This would imply that the bank was taking fewer chances on poor credit loans and on

Table 3. Breakdown of loans by credit rating

<table>
<thead>
<tr>
<th>Credit Rating</th>
<th>% of No. Loaned 1966</th>
<th>% of No. Loaned 1964</th>
<th>% of Dollars Loaned 1966</th>
<th>% of Dollars Loaned 1964</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>49.5</td>
<td>42.9</td>
<td>50.2</td>
<td>61.1</td>
</tr>
<tr>
<td>3</td>
<td>20.4</td>
<td>14.2</td>
<td>22.7</td>
<td>17.2</td>
</tr>
<tr>
<td>2</td>
<td>3.9</td>
<td>12.9</td>
<td>2.2</td>
<td>9.0</td>
</tr>
<tr>
<td>1</td>
<td>1.0</td>
<td>5.7</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td>0</td>
<td>2.9</td>
<td>0.0</td>
<td>1.3</td>
<td>0.0</td>
</tr>
<tr>
<td>NR</td>
<td>22.3</td>
<td>24.3</td>
<td>23.4</td>
<td>11.1</td>
</tr>
</tbody>
</table>

loans characterized by a lack of credit information. The column specifying the percentage of total dollars loaned, however, tells a conflicting story. In this case, a higher percentage of NR dollars and a lower percentage of high quality dollars were in evidence in 1966 than in 1964.

The average financial characteristics of borrowers should improve when standards of creditworthiness are raised. Since the current ratio is an indicator of a borrower's ability to meet his short-term obligations, the bank would, during periods of excess loan demand, accommodate those borrowers with the highest current ratios. Similarly, the bank
imposing higher credit standards would tend to grant loans to those customers offering the most net worth in proportion to loan size and in proportion to the borrower's total amount of loans outstanding at the bank. Thus, according to the hypothesis, higher average current ratios and lower average loan/net worth ratios would be in evidence during tight money.

Table 2 shows that the average current ratios of borrowers were substantially higher (30 to 40%) in August of 1966 than in August of 1964. The average level of net worth supporting a dollar loaned or a dollar of total loans outstanding also increased for the all loans classification, although movements of these same averages for business loans were in conflict.

Finally, during periods of tight money, according to the hypothesis, the bank would require more loans to be secured and would demand more security per dollar loaned. The collateral requirements on loans during the two months were contrasted by examining the number of secured loans as a percent of the total number of loans and the dollar amount of secured loans as a percent of total dollars loaned. These ratios would be expected to increase as the bank faced tighter credit conditions.

Table 2 indicates that these averages declined from 1964 to 1966 for all loans. The percent of secured dollars decreased, while the percent of total loans made increased for the business loan category.
Established-customer accommodation

The strength of a customer's relationship with a bank can be measured by the length of that relationship and by the characteristics of his deposit account. If a bank rations credit by favoring certain customers, then it would select those customers with the largest, most stable deposit accounts and the longest continued customer relationships. Unfortunately, data regarding deposit variability were not available. Table 4 relates averages used to describe the strength of the customer relationship.

Table 4. Loan-customer characteristics at the test bank

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>All Loans 1966</th>
<th>All Loans 1964</th>
<th>Business Loans 1966</th>
<th>Business Loans 1964</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave. (Loan/Min. Bal.)</td>
<td>65.15</td>
<td>87.18</td>
<td>93.35</td>
<td>128.09</td>
</tr>
<tr>
<td>Ave. Length of Customer Relationship</td>
<td>3.14</td>
<td>3.01</td>
<td>3.29</td>
<td>3.47</td>
</tr>
<tr>
<td>Wt. Ave. Length of Customer Relationship</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(by loan size)</td>
<td>3.15</td>
<td>3.21</td>
<td>3.29</td>
<td>3.62</td>
</tr>
</tbody>
</table>

The size of a customer's deposit account was measured by calculating the average minimum balance for six months prior to the loan. This minimum balance was related to the loan size to compute the average (loan/minimum balance) figure shown in Table 4. In periods of tight money, according to the hypothesis, this average should decrease as the bank makes loans to customers with higher minimum balances. From
August, 1964, to August, 1966, the average decreased for both all loans and business loans by 25.3% and 27.1% respectively. The decrease in this average could be attributed to either a lower loan size or a higher minimum balance. Since average loan size decreased by less than the 25.3% and 27.1% figures (see the next section), evidently the average minimum balance supporting a one dollar loan in 1966 was greater than that for 1964.

Customers were classified into five groups for purposes of establishing the length of the customer relationship. These groups were then assigned values as follows: less than 1 year -- 0; 1-5 years -- 1; 6-10 years -- 2; 11-15 years -- 3; and over 15 years -- 4. Successively greater weights were associated with respectively longer customer relationships. The customers were so grouped because it is hardly expected that a bank would refuse a loan to an 8-year customer while granting an identical loan to an identical customer with a 9-year customer relationship. Rather, it is more probable that bank officers categorize borrowers, in some manner, according to the length of the customer relationship.

If a bank rations credit to those customers with the longest relationships, the value of the average weights should increase during periods of excess loan demand. At this bank, as shown in Table 4, the average length of the customer relationship was greater in only the all loans category during the tight money period examined. The all loans weighted average and the averages in the business loans category all were smaller in August, 1966, than in August, 1964.
Smaller loans

This hypothesis contends that borrowers will be granted smaller loans during tight money than during periods of less restraint. Such action allows the bank to satisfy more loan customers with the same dollar amount of lending resources.

Table 5 gives the average loan size figures for August, 1964, and August, 1966. The average loan size and the average loan size weighted by credit rating decreased for both loan classifications in 1966. The average and weighted average for all loans decreased by 16.2% and 33.3% respectively while the same averages for business loans decreased by only 3.3% and 14.7%.

Table 5. Loan sizes at the test bank

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>All Loans</th>
<th></th>
<th>Business Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1966</td>
<td>1964</td>
<td>1966</td>
</tr>
<tr>
<td>Ave. Loan Size</td>
<td>$2,637</td>
<td>$3,145</td>
<td>$3,563</td>
</tr>
<tr>
<td>Wt. Ave. Loan Size</td>
<td>2,693</td>
<td>4,038</td>
<td>3,947</td>
</tr>
<tr>
<td>(by credit rating)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although the average figures relate that this bank granted smaller loans during August, 1966, they do not point out which borrowers suffered the burden of the loan decreases. Table 6 breaks down the all loans category by loan size to isolate the differential effects of rationing. The greatest percentage decrease in number loaned and in dollars loaned
occurred in the $5,500-and-over loan group indicating that customers requesting large loans bore the brunt of rationing by loan size.

Table 6. Breakdown of loans by size

<table>
<thead>
<tr>
<th>Loan Size</th>
<th>% of No. Loaned 1966</th>
<th>% of No. Loaned 1964</th>
<th>% of Dollars Loaned 1966</th>
<th>% of Dollars Loaned 1964</th>
</tr>
</thead>
<tbody>
<tr>
<td>$500 - $1499</td>
<td>44.7</td>
<td>48.6</td>
<td>13.4</td>
<td>11.6</td>
</tr>
<tr>
<td>$1500 - $2499</td>
<td>21.4</td>
<td>12.9</td>
<td>14.4</td>
<td>8.3</td>
</tr>
<tr>
<td>$2500 - $3499</td>
<td>12.6</td>
<td>8.6</td>
<td>13.3</td>
<td>7.7</td>
</tr>
<tr>
<td>$3500 - $4499</td>
<td>4.9</td>
<td>5.7</td>
<td>6.6</td>
<td>7.1</td>
</tr>
<tr>
<td>$4500 - $5499</td>
<td>8.7</td>
<td>4.3</td>
<td>16.6</td>
<td>6.5</td>
</tr>
<tr>
<td>$5500 and over</td>
<td>7.8</td>
<td>20.0</td>
<td>35.7</td>
<td>58.7</td>
</tr>
</tbody>
</table>

Shorter maturities

Another hypothesized method of non-price rationing is the shortening of maturities on loans. This will cause increased turnover in loans and allow the bank to accommodate more customers. If shorter maturities are granted, the average maturities for loans should decrease. Table 7 shows the average maturity values for the two test periods. Average maturities decreased by 16.6% for all loans and 4.5% for business loans. The weighted average values decreased by 13.9% for all loans but increased by 13.2% for business loans.
As in the case of loan size, the average figures relate only part of the availability story. They do not specify which classes of borrowers were most affected by tight money. Table 8 classifies the change in average maturity of all loans by months. It is apparent that loans of 12 month maturity and longer suffered the sharpest decrease from 1964 to 1966.

Table 8. Breakdown of loans by maturity

<table>
<thead>
<tr>
<th>Maturity</th>
<th>% of No. Loaned 1966</th>
<th>% of No. Loaned 1964</th>
<th>% of Dollars Loaned 1966</th>
<th>% of Dollars Loaned 1964</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2.9 mo.</td>
<td>23.3</td>
<td>21.4</td>
<td>14.8</td>
<td>24.2</td>
</tr>
<tr>
<td>3 - 5.9</td>
<td>26.2</td>
<td>28.6</td>
<td>30.3</td>
<td>31.8</td>
</tr>
<tr>
<td>6 - 8.9</td>
<td>24.3</td>
<td>18.6</td>
<td>36.5</td>
<td>11.1</td>
</tr>
<tr>
<td>9 - 11.9</td>
<td>2.9</td>
<td>0.0</td>
<td>1.6</td>
<td>0.0</td>
</tr>
<tr>
<td>12 and over</td>
<td>23.3</td>
<td>31.4</td>
<td>16.9</td>
<td>32.9</td>
</tr>
</tbody>
</table>
CHAPTER V. SUMMARY AND CONCLUSIONS

It is apparent from interviews with the bank's officers and from the statistical analysis that the test bank did engage in credit rationing along non-price lines during the particular tight money period analyzed. In general, higher credit standards were required, smaller loans were made, and shorter maturities were granted. It is not clear from the statistical analysis that rationing was carried out on the basis of the strength of the customer relationship, although the bank's officers indicated that the accommodation of established customers was a prime goal of the bank.

Tables 9 and 10 summarize the movements in test statistic values for all loans and business loans and relate these movements to those hypothesized by the availability doctrine. The doctrine is most convincingly supported by the changes in the test statistic values for all loans. The test value changes moved in the hypothesized direction in 12 out of 15 cases. In the business loans classification, the values moved in the correct direction in 10 of 15 instances.

More specifically, the substantial increase in the average current ratios from 1964 to 1966, coupled with the support of larger amounts of net worth per dollar loaned and loans outstanding, testifies that higher standards of creditworthiness were required in the tight money period. This trend is confirmed by the general increase in credit rating levels in 1966. The bank apparently did not, however, require increased security on loans during the tight money month.
Table 9. Summary of test statistic values for all loans

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Test Statistic</th>
<th>1966</th>
<th>1964</th>
<th>% Change</th>
<th>Conform to Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raise</td>
<td>Ave. Credit Rating</td>
<td>3.45</td>
<td>3.25</td>
<td>+6.2</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Credit Rating (by loan size)</td>
<td>3.57</td>
<td>3.55</td>
<td>+0.6</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Current Ratio</td>
<td>4.66</td>
<td>3.15</td>
<td>+47.9</td>
<td>Yes</td>
</tr>
<tr>
<td>Credit</td>
<td>Ave. (Loan/NW)</td>
<td>0.06</td>
<td>0.11</td>
<td>-45.5</td>
<td>Yes</td>
</tr>
<tr>
<td>Standards</td>
<td>Ave. (Total Loans/NW)</td>
<td>0.14</td>
<td>0.17</td>
<td>-17.6</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Secured $ / Total $ Loaned</td>
<td>0.50</td>
<td>0.62</td>
<td>-19.4</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td># Secured Loans / Total # Loans</td>
<td>0.49</td>
<td>0.57</td>
<td>-14.0</td>
<td>No</td>
</tr>
<tr>
<td>Satisfy</td>
<td>Ave. (Loan/Min. Bal.)</td>
<td>65.15</td>
<td>87.18</td>
<td>-25.3</td>
<td>Yes</td>
</tr>
<tr>
<td>Established</td>
<td>Ave. Length Customer Relationship</td>
<td>3.14</td>
<td>3.01</td>
<td>+4.3</td>
<td>Yes</td>
</tr>
<tr>
<td>Customers</td>
<td>Wt. Ave. Length (by loan size)</td>
<td>3.15</td>
<td>3.21</td>
<td>-1.9</td>
<td>No</td>
</tr>
<tr>
<td>Decrease</td>
<td>Ave. Loan Size ($)</td>
<td>2,637</td>
<td>3,145</td>
<td>-16.2</td>
<td>Yes</td>
</tr>
<tr>
<td>Loan Size</td>
<td>Wt. Ave. Loan Size (by credit rating)</td>
<td>2,693</td>
<td>4,038</td>
<td>-33.3</td>
<td>Yes</td>
</tr>
<tr>
<td>Decrease</td>
<td>Ave. Maturity (mo.)</td>
<td>5.47</td>
<td>6.56</td>
<td>-16.6</td>
<td>Yes</td>
</tr>
<tr>
<td>Maturity</td>
<td>Wt. Ave. Maturity (by loan size)</td>
<td>5.44</td>
<td>6.32</td>
<td>-13.9</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 10. Summary of test statistic values for business loans

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Test Statistic</th>
<th>1966</th>
<th>1964</th>
<th>% Change</th>
<th>Conform to Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raise Credit Standards</td>
<td>Ave. Credit Rating</td>
<td>3.28</td>
<td>2.93</td>
<td>+11.9</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Credit Rating (by loan size)</td>
<td>3.55</td>
<td>3.44</td>
<td>+3.2</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Ave. Current Ratio</td>
<td>4.87</td>
<td>3.53</td>
<td>+38.0</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Current Ratio (by loan size)</td>
<td>4.65</td>
<td>3.56</td>
<td>+30.6</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Ave. (Loan/NW)</td>
<td>0.06</td>
<td>0.08</td>
<td>-25.0</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Ave. (Total Loans/NW)</td>
<td>0.17</td>
<td>0.12</td>
<td>+41.6</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Secured $ / Total $ Loaned</td>
<td>0.42</td>
<td>0.44</td>
<td>-4.5</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td># Secured Loans / Total # Loans</td>
<td>0.46</td>
<td>0.44</td>
<td>+4.5</td>
<td>Yes</td>
</tr>
<tr>
<td>Satisfy</td>
<td>Ave. (Loan/Min. Bal.)</td>
<td>93.35</td>
<td>128.05</td>
<td>-27.1</td>
<td>Yes</td>
</tr>
<tr>
<td>Established Customers</td>
<td>Ave. Length Customer Relationship</td>
<td>3.29</td>
<td>3.47</td>
<td>-5.2</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Length (by loan size)</td>
<td>3.29</td>
<td>3.62</td>
<td>-9.1</td>
<td>No</td>
</tr>
<tr>
<td>Decrease Loan Size</td>
<td>Ave. Loan Size ($)</td>
<td>3,563</td>
<td>3,683</td>
<td>-3.3</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Loan Size (by credit rating)</td>
<td>3,947</td>
<td>4,630</td>
<td>-14.7</td>
<td>Yes</td>
</tr>
<tr>
<td>Decrease Maturity</td>
<td>Ave. Maturity (mo.)</td>
<td>4.50</td>
<td>4.71</td>
<td>-4.5</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Wt. Ave. Maturity (by loan size)</td>
<td>4.80</td>
<td>4.24</td>
<td>+13.2</td>
<td>No</td>
</tr>
</tbody>
</table>
The analysis suggests that borrowers carried a larger minimum balance per dollar loaned during August, 1966, but average length of the customer relationship was not convincingly higher during that time. Thus, it is not statistically clear whether the bank gave preferential treatment to established customers during this tight money episode.

The movement in loan size and maturity for the all loans category offers a much more convincing argument for rationing. Loans were scaled back and maturities shortened during August, 1966. Borrowers requesting large loans and maturities over 12 months were especially frustrated by the credit restraint.

Special significance should be attached to the movement of the averages for business loans as compared to all loans. Tables 9 and 10 offer this contrast.

The average current ratios for both all loans and business loans increased from 1964 to 1966, but the percentage increase for business loans was less than that for all loans. This indicates that businesses faced more lenient creditworthiness standards than did personal loan customers. Similarly loan size for both all loans and business loans decreased, but the percentage decrease in business loan size was much smaller than that for all loans, showing that personal loans had been more severely cut back in size to allow accommodation of the business borrowers. Finally, maturities for all loans decreased by a greater percentage than maturities for business loans -- once again indicating that commercial customers were satisfied at the expense of those individuals making personal loans.
Although this study indicates that credit rationing occurred at this particular bank during one particular tight money period, it is not appropriate to make inferences about the general response of this bank to tight money or about the response of other banks to the August, 1966, tight money period. Nonetheless, this study does offer some insight into the validity of the explanations and theories of credit availability reviewed in Chapter II.

The Hodgman model, which stressed the profitability of the customer relationship and the effect of the prime rate convention, is substantiated in its implication that credit will be rationed on the basis of loan size. The convincing degree of credit rationing along non-price lines at this bank, on the other hand, questions the contention of Kane and Malkiel that rationing will not take place during tight money. It is evident that L* customers at the test bank were satisfied, not by selling government securities to obtain loanable funds, but rather, by cutting marginal borrowers out of the market and by decreasing loan sizes and shortening maturities. Finally, Luckett's theoretical construct calling for increased standards of creditworthiness during periods of monetary restraint is supported by the study.

It should be emphasized again that dangers exist in making general conclusions or evaluations based on a case study. An analysis involving many more banks and additional tight money periods would be necessary to appropriately test the validity of the availability doctrine.

Hopefully, this thesis will encourage further and more extensive work in the availability area.


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