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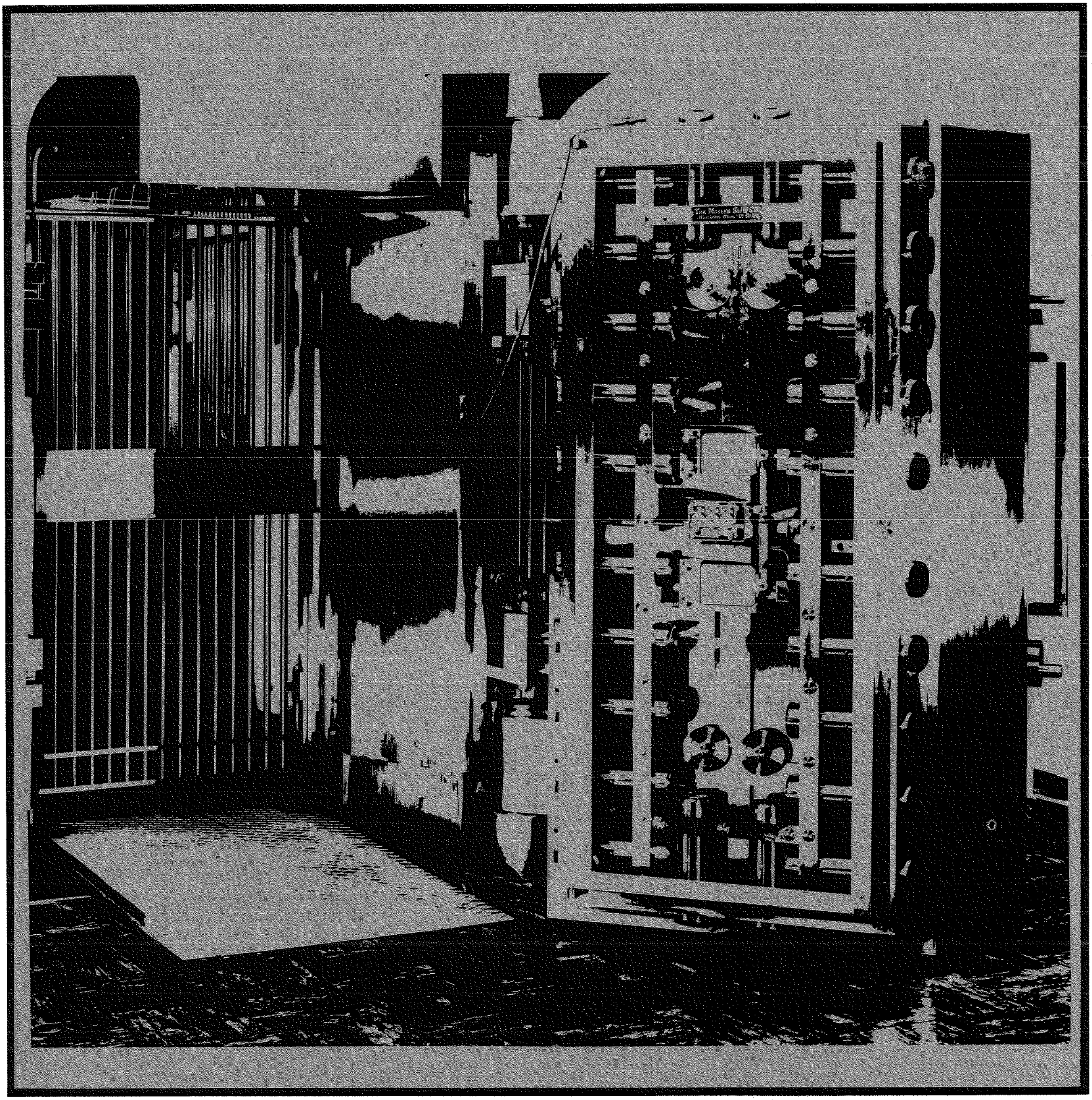

MONEY AND THE MONETARY CONTROL ACT

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Monetary-Control Implications of the Monetary Control Act

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The Depository Institutions Deregulation and Monetary Control Act of 1980 was signed into law by President Carter on March 31, 1980. Referred to by Senator Proxmire as "the most significant banking legislation before the Congress since the passage of the Federal Reserve Act of 1913," the bill (Public Law 96-221) deals with a large and diverse set of monetary-control and financial-regulatory issues. Because of the importance of the monetary-control issue, we concentrate here on that particular aspect of the legislation.

It should be understood that the monetary-control implications of the legislation are not coextensive with its monetary-control *provisions*. Only Title I — designated the Monetary Control Act of 1980 — specifically addresses the question of control, by providing for a system of uniform required reserves (URR) on depository-institution transaction accounts and nonpersonal time deposits. In addition, Title I provides those institutions with access to various Federal Reserve services, and instructs the Fed to develop and implement a schedule of explicit prices for those services.

Title I thus directly addresses the monetary-control issue, but the following two titles also have important implications for that question. Title II provides for the phaseout and ultimate elimination of regulatory ceilings on deposit interest rates, while Title III gives depository institutions permanent authorization to offer certain interest-paying accounts (automatic-transfer accounts, share drafts, and NOW accounts).

These are sweeping changes indeed. The new legislation extends the reach of Federal Reserve requirements from member banks to a number of other institutions, including both nonmember banks and nonbank depository institutions (a term that includes mutual savings banks, credit unions, and savings-and-loan associations). The definition of transaction accounts is similarly broad, encompassing conventional demand deposits, negotiable order of withdrawal (NOW) accounts, savings deposits subject to automatic transfers, and share-draft accounts. More generally, a transaction account is defined as any account on which the account holder may make withdrawals by a transferable instrument for the purpose of making payments to third parties. Moreover, should the process of financial innovation introduce close substitutes for existing transaction accounts, the Federal Reserve Board of Governors has the power under the legislation to classify such accounts as transaction accounts for reserve-requirement purposes.

In Section I, we discuss the role of reserve requirements in facilitating money-stock control when the Federal Reserve uses an aggregate-reserves measure as its control instrument — as it has done since October 6, 1979. At that time, the Fed changed its open-market operating procedures to place more emphasis on the direct control of reserves [Board of Governors, 2]. In this section, we present criteria for evaluating reserve-requirement systems, and develop the fundamental rationale for uniform required reserves (URR), within the context of a simple deposit-multiplier model that includes both member and nonmember banks.

We show that a URR regime serves to

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reduce the number of disturbances that impinge on the money stock and, as a direct result, facilitates monetary control. Put differently, within the framework of a deposit-multiplier model, the imposition of URR reduces the extent of multiplier uncertainty. The analysis also indicates, however, that two provisions of Title I — a sharply higher reserve requirement on transaction accounts exceeding $25 million than on smaller amounts, and the imposition of required reserves on nonpersonal time deposits — are inconsistent with the logic of a URR regime.

In Section II, we examine the effects of the new law on the monetary-control problems caused by the process of financial innovation. Innovations have been directly induced by two forms of bank regulation: reserve-requirement differentials and deposit interest-rate ceilings. Our analysis supports earlier criticisms of the reserve-requirement differential on transaction accounts. That same analysis, however, shows that deregulation will significantly improve monetary control.

First, deregulation will further reduce the degree of multiplier uncertainty by lessening the extent of funds shifts across different deposit liabilities. Second, and more importantly, deregulation will significantly retard regulation-induced financial innovation by allowing depository institutions to compete for funds by paying market-determined interest rates. The new types of transaction accounts dealt with in the Act's Title III clearly exemplify the innovations generated by regulations — primarily limitations on deposit interest rates. Such innovations have considerably complicated the task of monetary control by altering the relation between the (old) targeted aggregates and nominal GNP and inflation. Thus in an environment of deregulation, the definitions of the monetary aggregates should be more meaningful economically and, therefore, should be more useful for the conduct of monetary policy.[1]

I. Title I and Monetary Control: Rationale for Uniform Required Reserves

To gain some perspective regarding the extent of the changes mandated by Title I, we can compare the preexisting reserve-requirement schedule with the provisions of P.L. 96-221 (Table 1). After complete implementation of those provisions,[2] the reserve requirement will be fixed by statute at 3 percent on each institution's transaction accounts of $25 million or less. However, at the end of each year (beginning December 31, 1981), the Federal Reserve will increase or decrease that $25-million figure by 80 percent of the preceding year's (June 30-June 30) percentage change in total transaction accounts of all depository institutions. Although the Act initially sets the reserve requirement at 12 percent for accounts in excess of the base level, the Board of Governors may vary the requirement within the range of 8 to 14 percent. Similarly, the initial requirement of 3 percent on nonpersonal time deposits can be varied, at the Board's discretion, within a range of zero to 9 percent.

Clearly, the new legislation reduces the level of reserve requirements for virtually all member banks, while simplifying the overall structure of reserve requirements (Table 1). At the same time, the new reserve requirements on nonmember banks and other depository institutions partly offset the reduction in required base-money holdings of member banks — as is seen from a Federal Reserve staff study which compares projected base-money reserve holdings under P.L. 96-221 with those that would have been held in the absence of the legislation (Table 2). The estimates cover the 1981-85 period, to reflect the phase-in of reserve requirements stipulated by the law.[3]

The URR concept is, of course, not a new one. For more than three decades, beginning in 1948, the Board of Governors had requested legislation to subject all insured banks to System reserve requirements. The Commission on Money and Credit in the early 1960's, and the President's Commission on Financial Structure and Regulation in 1971, both supported that same principle. But the acceleration of membership attrition during the 1970's intensified interest in the development of alternative approaches to structural banking reform, and eventually provided the required catalyst for the emergence of the present legislation.[4]

To understand the fundamental rationale for the implementation of a URR regime, we must first develop some general criteria for evaluating reserve-requirement systems. Such a system can have important implications for monetary control when the Federal Reserve attempts to control the money stock with a reserves aggregate instrument. With that instrument set, the joint behavior of the public and the banking system then determines the level of the targeted money stock.

The relationship between the level of reserves and the size of some particular monetary aggregate — the multiplier — is not, however, a constant one. Rather, it is subject to the influence of a wide range of disturbances — disturbances that can originate in any one sector or in all sectors simultaneously. For example, the multiplier may change when the banking system changes its reserve holdings in excess of those required, because this alters the *actual* ratio of reserves to deposit liabilities. Similarly, unpredictable changes may occur in the allocation of the public's asset portfolio between currency and demand deposits, between deposit liabilities of depository institutions with different reserve requirements, and between deposit liabilities and open-market investments. Changes in any of these will alter the ratios on which the multiplier depends. In addition, the setting of the reserves instrument itself will generally require the Federal Reserve to undertake defensive open-market operations, in response to unanticipated changes in such factors as float and Treasury or foreign deposits at the Federal Reserve.

These considerations may be expressed in the following equation:

$$M_i = M_i(\bar{B}, e_1, e_2, \ldots, e_n) \qquad (1)$$

Since the Federal Reserve may target more than one monetary aggregate, M_i simply represents one specific money-stock measure. We assume that the Federal Reserve targets M_i by setting the level of the monetary base[5] — the sum of bank reserves and currency — at $\bar{B}$.

Table 1
Comparison of Reserve Requirement Ratios

A. Applicable Reserve Requirements Under P.L. 96-221

Category	Reserve Requirement	Permissible Range
Net Transaction Accounts		
$0 — 25 million	3%	3% fixed by statute
Over $25 million	12%	8% — 14%
Nonpersonal Time Deposits	3%	0% — 9%

B. Reserve Requirement Ratios in Effect Prior to September 1, 1980

Category	Reserve Requirement
Net Demand Deposits	
$ 0 — 2 million	7%
$ 2 — 10 million	9½%
$ 10 — 100 million	11¾%
$100 — 400 million	12¾%
Over $400 million	16¼%
Savings Deposits	3%
Time Deposits	Varies by maturity and denomination

The remaining terms (the e_j) represent potential disturbances to the system — disturbances that can change the money stock independently of a change in the monetary base.

Within this framework, the reserve-requirement system affects monetary control in two ways. First, that system influences the *number* of potential disturbances that affect the money stock. Second, the setting of reserve requirements affects the *response* of the monetary aggregate to any given disturbance. The system that minimizes the number of disturbances and/or the sensitivity of the money stock to those disturbances is, ceteris paribus, to be preferred from a monetary-control perspective. The rationale for imposing uniform required reserves on all depository institutions is this system's ability to reduce significantly the number of disturbances that can affect the money stock independently of the monetary base.

Theoretical Framework

We can examine the implications of a URR regime by developing a slightly extended version of the standard deposit-multiplier model.[6] The formal model (Exhibit I) describes the behavior of four sectors: the nonbank public (p), the Federal Reserve (f), member banks (m), and nonmember banks (nm). "Nonmember banks" here include all depository institutions whose liabilities are included in the targeted money stock but are not subject to Federal Reserve reserve requirements. The public holds three assets: currency (C), demand deposits and other transaction accounts (D), and time deposits and all other nontransaction-account liabilities (T). A superscript denotes the sector for which a particular financial instrument is an asset; a subscript the sector for which the instrument is a liability. The Federal Reserve is assumed to control the money stock by the use of a base-money instrument($\bar{B}$).

The model assumes that the public holds demand and time deposits with both member and nonmember banks (equations E1 and E3), its holdings with members being a constant fraction of total demand deposits (given by equations E2 and E4). Thus, the variable (k) designates the proportion of publicly held demand deposits at member banks. The public's demands for time deposits and currency, respectively, are constant fractions of their total demand deposits (t and c in E5 and E6).

The required reserves of member banks are determined by the reserve-requirement ratios imposed on demand and time deposits (q_d and q_t) respectively (E7). The demand-deposit liabilities of member banks (equation E8) are held by the public (D_m^p) and by nonmember banks (D_m^{nm}). Member banks are assumed to provide correspondent services to nonmembers which, in turn, hold demand balances with

Table 2
Comparison of Base Money Reserve Holdings
(in millions of dollars)

	1981	1982	1983	1984	1985
Reserves at Fed: Old Structure	27,196	27,078	27,165	27,369	27,742
Member Bank Reserves at Fed: New Structure	21,492	17,964	14,483	12,664	12,724
Other Institutions' Reserves at Fed: New Structure	1,031	1,702	2,315	2,888	3,523
Total Reserves at Fed: New Structure	22,524	19,672	16,749	15,552	16,252
Reserves Released	4,672	7,407	10,366	11,817	11,490

Source: Federal Reserve Memorandum on "Five-Year Cost Projections for Monetary Improvement Legislation."

member banks. The crucial point to note is that member banks' required reserves must be held in the form of Federal Reserve base money only (E7).

In contrast, nonmember banks must satisfy demand-and time-deposit reserve requirements as specified in equation (E9), with these reserves held either as balances with correspondents (D_m^{nm}) or as vault cash (V_f^{nm}). Nonmember reserve holdings are distributed between correspondent balances and Federal Reserve base money (V_f^{nm}) in the proportions (1 - α) and (α) respectively. Thus, base money is divided among currency held by the public, vault cash of nonmembers, and the reserves of members — with its level fixed by the central bank ($\bar{B}$).

The narrow money stock (M-1) is defined as the sum of publicly held currency and demand deposits:[7]

$$M1 \equiv C^p + D_m^p + D_{nm}^p$$

With a given level of the monetary base, we can derive a behavioral specification for M-1 by substituting equations E1-E11 into equation E12, and then setting the total uses of the base so derived equal to $\bar{B}$. The resulting expression for M-1 is

Exhibit I

Deposit Multiplier Model with Nonmember Bank Sector

I. Model Equations

(E1)	$D^p = D_m^p + D_{nm}^p$	Total Public Demand Deposits
(E2)	$D_m^p = kD^p$	Member-Nonmember Demand-Deposit Mix
(E3)	$T^p = T_m^p + T_{nm}^p$	Total Public Time Deposits
(E4)	$T_m^p = kT^p$	Member-Nonmember Time Deposit Mix
(E5)	$T^p = tD^p$	Time-Deposit Demand Function
(E6)	$C_f^p = cD^p$	Public Demand for Currency
(E7)	$RR_f^m = q_d D_m + q_t T_m$	Member-Bank Required Reserves[1]
(E8)	$D_m = D_m^p + D_m^{nm}$	Demand Deposits at Member Banks
(E9)	$RR^{nm} = \lambda_d D_{nm}^p + \lambda_t T_{nm}^p$	Nonmember-Bank Required Reserves
(E10)	$RR^{nm} = D_m^{nm} + V_f^{nm}$	Reserve Eligible Assets for Nonmembers
(E11)	$V_f^{nm} = \alpha RR^{nm}$	Nonmember Demand for Base Money
(E12)	$B = RR_f^m + V_f^{nm} + C_f^p$	Uses of Base Money
(E13)	$B = \bar{B}$	Exogenous Supply of Base Money

II. Coefficient Definitions

k = proportion of deposits held by member banks.
t = ratio of time to demand deposits.
c = ratio of currency to demand deposits.
q_d, q_t = member-bank required-reserve ratios on demand and time deposits.
λ_d, λ_t = nonmember-bank required-reserve ratios on demand and time deposits.
α = proportion of nonmember-bank reserves held as Federal Reserve base money.

1. Member-bank required reserves, RR_f^m, include their vault cash.

$$M1 = \left[\frac{1 + c}{r^* + c}\right] \bar{B} \equiv m_1^* \bar{B} \qquad (2)$$

where

$$r^* \equiv \frac{RR_f^m + V^{nm}}{D_m^p + D_{nm}^p} =$$

$$q_d[k + (1 - \alpha)(1 - k)(\lambda_d + \lambda_t t)] + q_t tk + \alpha(1 - k)(\lambda_d + \lambda_t t) \qquad (3)$$

The parameters are defined in Exhibit I.

Equation (2), which expresses the monetary aggregate as the product of the monetary base ($\bar{B}$) and a money multiplier (m_1^*), represents a specific example of the general equation $M_i = M_i(\bar{B}, e_1, e_2, \ldots, e_n)$. The value of the money multiplier can change as a result of shifts in any of the reserve ratios or fractions dividing the public's wealth among alternative assets — and such shifts will affect the money stock if not offset by appropriate changes in the base. Although the Federal Reserve sets member-bank required-reserve ratios (q_d and q_t), it exercises no direct control over the remaining coefficients of the multiplier. We should note in particular the multiplier's dependence on the ratios applying to the nonbank sector. This raises the question of how the presence of nonmember banks might increase uncertainty with respect to the size of the multiplier.

This point can be illustrated by following a random flow of $100 of demand-deposit funds from member to nonmember banks — a shift in (k). Assume that member and nonmember reserve ratios are 20 percent ($q_d = \lambda_d = .2$); assume also that nonmember banks hold all their reserves as correspondent balances (equivalent to $\alpha = 0$). The funds transfer produces no initial change in M-1, since both member and nonmember deposits are included in the definition of M-1. However, base-money reserves are released by this transfer. Member banks release $20 (their loss in deposits multiplied by q_d). Although nonmembers must now hold $20 of additional reserves, these reserves do *not* take the form of base money, but are instead deposited with a correspondent bank (assumed to be a member bank). In turn, the correspondent's base-money reserve requirement increases by $4 (20 percent of $20). Altogether, $16 of base money is released, and if not offset by the Federal Reserve, this leads to an increase in the money stock. Random deposit flows between member and nonmember banks, therefore, can affect the value of the multiplier and exacerbate the problem of monetary control. However, the imposition of a URR regime can significantly reduce multiplier uncertainty, as we shall next see.

Imposition of Uniform Reserve Requirements

Two basic steps are involved in the imposition of a URR regime. First, the assets eligible to satisfy reserve requirements must be identical for all banks. Second, the ratio of bank liabilities held in the form of reserve-eligible assets must be uniform across banks. These changes can be examined with reference to the preceding model.

The most fundamental change is in the definition of the reserve-eligible assets of nonmembers (E10). Under URR, such assets are restricted to the components of Federal Reserve base money (i.e., deposits with the Fed and vault cash).

$$RR^{nm} = D_f^{nm} + V_f^{nm}$$

Correspondingly, the uses of base money (E12) now include nonmember reserve deposits, unlike previously.

$$B = RR_f^m + D_f^{nm} + V_f^{nm} + C_f^p$$

Within the model, this is equivalent to assuming that nonmember reserves held with correspondents are zero ($\alpha = 1$). As can be seen from equation (E11), this means that nonmember-bank reserves must consist of Federal Reserve base money only.[8]

The second step requires that the reserve-requirement ratios imposed on nonmember banks be identical to those on member banks. With the necessary changes, and with the revised uses of the base set equal to $\bar{B}$, the solution for M-1 is

$$M1 = \left[\frac{1+c}{r+c}\right] \bar{B} \equiv m_1\bar{B} \quad (4)$$

where

$$r = q_d + q_t t. \quad (5)$$

and, once again, the symbol (r) designates the ratio of base-money reserves to demand deposits.

This structural change has several advantages. The money stock is no longer affected by shifts of funds between member and nonmember banks, by alterations in the composition of nonmember-bank reserve holdings, or by differentials in interstate nonmember-bank reserve requirements. Monetary control is therefore improved, according to our first criterion for evaluating reserve-requirement systems. This improvement, in turn, follows directly from a fundamental principle: the imposition of identical *base*-money reserve requirements on all deposit liabilities included within a given monetary aggregate insulates that aggregate from shifts of funds between those liabilities.

Nonmember-bank demand deposits are included in all monetary-aggregate definitions, and so should be subject to the same reserve requirements as member-bank deposits. Moreover, the newly defined transaction aggregate, M-1B, includes NOW and ATS accounts at banks and thrift institutions as well as credit-union share drafts and mutual-savings banks' demand deposits. Thus, our basic principle applies equally to these institutions under the new URR regime.

If identical reserve requirements on the liabilities included within the targeted money stock are desirable, zero reserve requirements on liabilities excluded from the target are also desirable. This would insulate the targeted money stock from shifts of funds between included and excluded liabilities, as shown in (4) and (5). With a positive reserve requirement against time deposits ($q_t > 0$), the transaction aggregate M-1 is affected by deposit flows between demand and time liabilities (shifts in t). By setting $q_t = 0$, an additional source of disturbance is thereby eliminated.

Evaluation of URR Provisions

The provisions of Title I, however, do not completely conform to the principles stated above. In the first place, the Act subjects all depository institutions to identical, but *not* uniform, reserve requirements on transaction accounts. Specifically, the first $25 million of a bank's deposits is subject to a statutory 3-percent requirement whereas the amount in excess of that is subject initially to a 12-percent requirement, within a possible range of 8 to 14 percent (see Table 1). This increase in the reserve requirement at the $25-million level is almost as large as the previously existing increase in graduated reserve requirements over the entire range of bank size categories. Since, with indexing, the base level changes by only 80 percent of the change in total transaction balances during a given year, an increasing proportion of transaction accounts thus will be subject to higher reserve requirements in the future.

It can, of course, be argued that this provision costs very little in terms of increased multiplier uncertainty. If the distribution of transaction accounts across size classifications is relatively predictable, or if the Federal Reserve can obtain reasonably complete and timely information on that distribution, it can offset induced movements in the money multiplier by appropriate adjustment of its operating instrument. However, the basic rationale of a URR regime is that it simplifies and thus strengthens monetary control. Differentiation between size classes of deposits thus is inconsistent with this objective, and must be defended on other grounds, such as equity for smaller institutions.

Questions also arise about the Act's treatment of time and savings deposits. First, the reserve requirement against savings deposits has been eliminated, which is consistent with improved control over a narrow aggregate such as M-1B. Simultaneously, however, a 3 percent reserve requirement on nonpersonal time deposits has been imposed, with the Federal Reserve given discretion to vary the ratio anywhere between zero and 9 percent. Since time deposits are excluded from the narrow aggregates, this provision is detrimental to monetary control. By contrast, if the target aggregate is broadened to include all time deposits at depository institutions, then the zero reserve requirement on the savings deposits included in that aggregate would be nonoptimal.

Imposing required reserves on nonpersonal time deposits can significantly increase the degree of multiplier uncertainty because such deposits are highly volatile. When the Federal Reserve sets an objective for money-supply growth, it must determine a set of reserve paths that are, in its judgment, consistent with the achievement of the money-growth objective. An important element of this process is predicting the growth rate of *nontargeted* liabilities that are subject to reserve requirements. If these grow faster than expected, a given reserves path will support a slower than anticipated growth rate in the target aggregate.

The last quarter of 1979 provides an example of this type of problem.[9] At its October 6 meeting, the Federal Open Market Committee agreed to a 4.5-percent annual growth-rate target for M-1 and a 7.5-percent growth-rate target for M-2. Total reserves actually grew during that quarter at a 13.8-percent annual rate, and the resulting growth rates in M-1 and M-2 were 3.1 percent and 6.8 percent, respectively — both substantially below their targeted growth rates.[10] Of the 13.8 percent growth in total reserves, less than half (5.6 percent) was absorbed by growth in the targeted aggregates. The remaining factors causing reserve absorption included large negotiable CD's (3.6 percent), interbank demand deposits (2.7 percent), and excess reserves (2.0 percent). The setting of reserve requirements on nontargeted liabilities thus accounted for roughly half of the growth in reserves during this period, creating unnecessary complications for monetary policy. In other words, the Federal Reserve had to predict and then attempt to compensate for disturbances that affected the monetary aggregate only because reserve requirements had been imposed on nontargeted liabilities.[11]

Perhaps more importantly, the variation in reserve requirements among different types of deposits will inevitably stimulate depository institutions to engage in a process of financial innovation, in order to substitute low-reserve-requirement time liabilities for high-reserve-requirement transaction accounts. (This process is examined further in Section II). Such financial innovations can complicate the monetary-control task by altering the relation between targeted aggregates and the authorities' ultimate objective of non-inflationary growth. Admittedly, the URR provisions have reduced the incentive for such innovations, by lowering average and marginal reserve requirements against transaction balances — but substantial incentives still remain.

This problem illustrates the difficulty of setting reserve requirements to promote monetary control. Because the rationale of URR requires zero reserves against non-targeted liabilities, the reserve ratio required for targeted liabilities must be fairly low to discourage financial innovation. However, a low reserve ratio — which is tantamount to a high multiplier — implies a much larger impact upon the money stock of any remaining disturbances. Thus a trade-off exists between the need to reduce incentives for financial innovation and the concern to reduce the money stock's response to disturbances.

To summarize, from a monetary-control perspective, a strong *a priori* case can be made for imposing a URR regime. Such a system reduces the number of random variables that affect any definition of the money stock. In particular, shifts of funds across depository-institution liabilities included in the target aggregate no longer affect monetary control. However, the benefits of URR may be reduced if reserve requirements are based on bank-size classifications, and/or if base-money reserve requirements are imposed on liabilities that are not part of the targeted money stock.[12] Furthermore, the variation in levels of reserve requirements among different deposit categories continues to encourage financial innovations that may further complicate the monetary authorities' task.

II. Regulation-Induced Financial Innovation

Only Title I of the Monetary Control Act specifically addresses the question of monetary control, but Title II and Title III may have even more far-reaching implications in that regard. Title II — The Depository Institutions Deregulation Act of 1980 — establishes a Deregulation Committee to provide for the orderly phaseout and ultimate elimination of deposit interest-rate ceilings. The ultimate goal is the payment of market — rather than regulatory — rates of interest on deposit accounts. The Committee has wide latitude for determining the speed of deregulation, but it must move to full implementation within six years from the Act's passage. Title III — the Consumer Checking Account Equity Act of 1980 — gives permanent authority to different depository institutions to provide certain financial services — specifically, interest-paying transaction accounts such as automatic-transfer-from-savings (ATS) accounts, credit-union share drafts, and negotiable-order-of-withdrawal (NOW) accounts.

These sections of the Act jointly reflect a radically transformed financial environment — a transformation brought about primarily by the impact of high and rising inflation rates on market rates of interest, and by the increasing divergence of market rates from regulation-controlled deposit rates. Financial innovation has been dramatically exemplified by the development of new transaction accounts, such as share drafts and NOW accounts. In turn, financial innovation has had important implications for monetary control. It affects the central bank's ability to control any given aggregate and, more profoundly, it significantly affects the appropriateness of existing definitions of the monetary aggregates. For example, the old distinction between M-1 and M-2 rested on the notion that passbook and time accounts could not serve as a medium of exchange, but that distinction has been rendered meaningless by the development of NOW and ATS accounts. The recent redefinition of the monetary aggregates represents an attempt by the Federal Reserve [13] to develop new aggregates more nearly consistent with the innovation-caused transformation of the financial environment.

In this section, we examine innovation in response to two forms of bank regulation: reserve requirements and deposit interest-rate ceilings. First we modify the previous model to incorporate innovation in response to reserve-requirement changes. Following this, we examine the impact of deposit-rate regulation — and, by implication, of *deregulation* as well. This consideration of behavioral responses to financial regulation significantly broadens the implications of the preceding analysis.

Reserve-Requirement-Induced Innovation

The analysis of reserve-requirement-induced financial innovation begins with an examination of the behavior of the individual banking firm. Assume that the bank issues two types of deposits — demand and time deposits — through the payment of explicit rates of interest, r_d and r_t, with no regulations governing those interest rates. Let

$$D = D(r_d, r_t, r_g) \quad (6)$$

$$T = T(r_d, r_t, r_g) \quad (7)$$

represent the functions determining the amount of demand and time deposits the public will hold. In (6) and (7), the symbol (r_g) is used to represent the open-market rate of interest. It provides a measure of the opportunity cost of holding the liabilities of depository institutions. It is assumed that

$$D_1 \equiv \delta D/\delta r_d > 0,$$
$$D_2 \equiv \delta D/\delta r_t < 0,$$
$$D_3 \equiv \delta D/\delta r_g < 0$$

$$T_1 \equiv \delta T/\delta r_d < 0,$$
$$T_2 \equiv \delta T/\delta r_t > 0,$$
$$T_3 \equiv \delta T/\delta r_g < 0$$

These conditions simply assert that an increase in the demand-deposit interest rate raises the desired level of demand deposits held by the public, whereas increases in the rates of interest on time deposits and/or open-market assets reduce desired demand-deposit holdings. We may make corresponding assumptions with respect to the time-deposit function.

The initial reserve requirements on demand and time deposits are q_d and zero, respectively. This means that, of each additional dollar of demand deposits, the bank can invest the fraction $(1 - q_d)$. For simplicity, assume that, after satisfying reserve requirements, the bank acquires a single earning asset — one that pays a constant marginal and average rate of return, r_g. The profit function for the individual bank then is:

$$\Pi = r_g(1 - q_d)D + r_gT - r_tT - r_dD \qquad (8)$$

The bank must choose the deposit interest rates, r_d and r_t, which will maximize its profits. The profit-maximization conditions are:

$$\frac{\delta\Pi}{\delta r_d} = r_g(1 - q_d)D_1 + r_gT_1 - r_tT_1 - r_dD_1 - D = 0 \qquad (9)$$

$$\frac{\delta\Pi}{\delta r_t} = r_g(1 - q_d)D_2 + r_gT_2 - r_tT_2 - r_dD_2 - T = 0 \qquad (10)$$

Equations (9) and (10) implicitly determine the bank's offering rates, r_d and r_t, on its deposit liabilities. These rates are chosen so that the marginal revenue the bank receives from lending the funds acquired from each deposit category just equals the marginal costs of such deposits. Reserve requirements affect the marginal revenue from deposits — shown by the presence of q_d in (9) and (10) — and thus influence the bank's offering rates on deposits, as seen in the following example.

We can measure the direct impact of a rise in demand-deposit reserve requirements by differentiating (9) and (10) totally with respect to q_d. Such a rise in reserve requirements produces a fall in the demand-deposit interest rate and, therefore, causes a shift in the public's desired deposit mix in favor of time deposits.[13] In terms of our deposit-multiplier model, a rise in q_d leads to an increase in the value of the coefficient (t), in the following fashion. The increase in reserve requirements reduces the marginal revenue from demand deposits. Profit maximization requires the bank to respond by lowering its offering rate on those deposits. At its new profit-maximizing position, the bank suffers a loss of both total deposit funds and profits.

If this were the end of the story, such considerations could easily be integrated into the preceding deposit-multiplier model. Through a process of financial innovation, however, the bank may succeed in offsetting at least part of its profits loss. For example, the bank could permit its time-deposit account holders to use their balances to cover overdrafts in their checking accounts. Although this may induce switching of funds from lower-rate demand accounts to higher-rate time accounts, the innovation should be beneficial to both the bank and its depositors. The bank could recoup some or all of its lost funds and, simultaneously, switch those funds from higher-reserve-requirement liabilities to lower-reserve-requirement liabilities. The bank's depositors meanwhile could obtain higher yields on their deposits, reflecting the lower reserve requirement on time deposits.

Would monetary control be improved by an increase in reserve requirements on demand deposits? The answer is yes, according to the conventional analysis [Cacy, 3; Kaminow, 6], which ignores the existence of financial innovation. Given a narrow target aggregate, a rise in q_d reduces the size of the money multiplier and, therefore, moderates the impact of exogenous shocks on the money supply. But that conclusion, although technically correct, is also very misleading. Given the financial innovation described here, some transaction balances would now be labeled time deposits, with zero reserve requirements. If transaction balances are the economically relevant object of policy, monetary control could actually be eroded, because of the reduction in the average and marginal reserve requirement on the transaction aggregate. The effective average reserve requirement on transaction balances would equal a weighted average of the q_d requirement on demand deposits and the zero requirement on the transaction component of time deposits. If reserve-requirement-induced substitution is sufficiently large, this weighted aggregate could be reduced — resulting in a higher money multiplier and *increased* sensitivity of the money stock to exogenous shocks. Professors Stuart Greenbaum and George Kanatas [4] have advanced an argument of this type, despite a substantial difference in approach from ours.

We do not contend that reserve-requirement increases invariably affect monetary control in ways opposite to those normally expected. Rather, we argue only that financial innovation is a predictable response to such increases — and that any analysis of the impact of reserve-requirement changes would be suspect if it failed to consider such induced innovation.

This discussion further illustrates the difficulties created by the variation between the 12-percent reserve requirement on transaction balances and the zero reserve requirement against time-and-savings deposits mandated by URR principles. As argued above, this sharp difference provides a strong incentive for financial innovation, stimulating institutions to develop new accounts which serve the same economic function as traditional transaction accounts, but which can be classified either as time deposits or other liabilities subject to lower (or zero) reserve requirements. Such innovations can substantially complicate the task of the monetary authorities in reducing and controlling inflation, as recent experience indicates.

Incentives for financial innovation could be significantly reduced by narrowing the spread between reserve requirements on different deposit categories. As suggested above, a reduction in the requirement against deposits *officially* classified as transaction accounts might not lower the effective reserve requirement nearly as much against *all* deposits serving the function of such balances, because the incentive to disguise lower reserve-requirement balances would also be reduced. Admittedly, the Federal Reserve can determine what is, and what is not, a transaction account for reserve purposes — and hence, in principle, can compensate *eventually* for the impact of reserve-requirement-induced financial innovations by altering its regulations. Clearly, however, such innovations can present substantial problems in the near- and medium-term future. Hence a regulatory environment that minimizes artificial incentives for innovation is inherently superior, all other factors the same, to one that relies on ex-post regulatory proceedings.

Rate-Regulation-Induced Innovation

Traditionally, the monetary authorities have imposed the highest reserve requirements on demand deposits. Simultaneously, however, Congress has prohibited the payment of interest on such accounts. Consequently, the normal interest-rate differentials that would have been produced by the demand-deposit reserve requirement have been exacerbated by the imposition of interest-rate controls. Against this background, we should examine the deregulation provisions of Title II.

Interest-rate controls on the liabilities of depository institutions are a conspicuous feature of the U.S. financial system. The Banking Act of 1933 prohibited the payment of interest on demand deposits and empowered the Federal Reserve Board of Governors to impose ceiling rates on member-bank time-and-savings deposits. Two years later, the Banking Act of 1935 provided the Federal Deposit Insurance Corporation (FDIC) with similar powers with respect to state nonmember banks. Congress later (1966) extended this network of interest-rate regulations with the passage of the Interest Rate Adjustment Act. Under its provisions, mutual savings banks became subject to FDIC rate regulation, while savings-and-loan associations became subject to rate ceilings administered by the Federal Home Loan Bank Board.

Economists have vigorously criticized these regulations on the grounds that they have led to repeated and disruptive periods of financial disintermediation [Treasury Dept., 15]; to a substitution of implicit for explicit interest payments [Klein, 8]; and to consistent discrimination against the small saver [Kane, 7]. We confine our analysis to an examination of the monetary control implications of such regulations — and of the benefits flowing from deregulation.

During periods of rising inflation rates, nominal interest rates increase to reflect the anticipated depreciation in the purchasing power of money over the period during which the money is loaned out. This increase in the nominal yield of earning assets acquired by depository institutions would, in the absence of rate regulation, lead them to offer higher yields to their depositors. This can be seen by differentiating (9) and (10) again, this time with respect to r_g. As would be expected,[14] a rise in the rate of return available on bank earning assets leads to an increase in the rates of interest offered on time and demand deposits.

This sympathetic movement of deposit rates in response to changing market rates assures a degree of stability in the public's demand for depository-institution liabilities. Because deposit rates are flexible, there is less need for quantity adjustment. In this case, the effect of the rise in open-market rates on the demand for deposit liabilities is cushioned by the sympathetic movement in deposit interest rates. In contrast, if deposit rates are fixed so that $dr_d = dr_t = 0$, the flow of funds to depository institutions varies substantially. This is, of course, the well-known phenomenon of disintermediation.

We are concerned here with the implications of this phenomenon for control of a given money aggregate. We can see this most easily by assuming that r_d is completely inflexible, whereas r_t is at least partly free to respond to open-market rates of interest. Despite the legal constraints on time-deposit interest rates, regulators frequently have modified such constraints in response to changed open-market rates. Under these conditions, an increase in the open-market rate will induce a substitution between bank liabilities and open-market investments — and in addition, the changed structure of bank deposit rates will cause depositors to shift funds between various liability categories. In the preceding section, we treated shifts in the coefficient (t) as purely random, whereas such shifts in fact have a strong systematic component. Changes in relative interest rates on deposits — and changes between deposit rates and open-market rates — induce changes in the behavioral coefficients of the deposit-multiplier model. Rate regulation inevitably magnifies the size of those changes and is, therefore, inconsistent with effective monetary control.

The problems that rate regulation poses for monetary control are significantly compounded by financial innovation in response to those regulations. Innovation here takes two forms. First, in a manner analogous to the case of an increased reserve requirement on demand deposits, banks and their depositors both have a strong incentive to evade the regulations — at least in part, through a form of innovation that enables what are, essentially, transaction balances to be transferred to liability classifications that are less constrained by the rate restrictions. Since those liability types generally have different reserve requirements than demand deposits, monetary control is inevitably weakened.

Perhaps more importantly, institutions that are not subject to deposit rate ceilings could respond by offering liabilities similar to those of the constrained institutions — offering an interest rate on their liabilities which is, at least, closer to the market rate than the offering rates of the constrained institutions. In the mid-70's, for example, thrift institutions developed NOW accounts and share drafts, and in more recent years, the mutual-funds industry developed the fast-growing money-market funds. Given the sharp difference in reserve requirements between rate-constrained institutions and those unconstrained institutions, monetary control once again is significantly weakened.

The process of financial innovation is, of course, an ongoing one. It is neither necessary nor desirable for innovation to be suppressed, or deplored for its effects on monetary-control procedures. It is, however, desirable — and it may be necessary — that policymakers formulate control procedures so that the procedures themselves do not induce further financial innovation.

In this respect, Titles II and III together should unambiguously improve monetary control. First, the legislation provides for gradual relaxation of interest-rate constraints on time deposits, and thereby reduces the variability of the differential between open-market and time-deposit rates of interest. Second, the legislation provides permanent authorization for demand-deposit substitutes (such as NOW accounts) and for rate deregulation on such accounts — even though it does not expressly repeal the 1933 prohibition of interest on demand deposits. The legislation thus reduces the variability of the rate differential between at least some components of the transaction aggregate, M-1B, and time deposits. Congress thus has reduced the likelihood of "nontraditional" institutions developing successful transaction-account substitutes, through its decision to permit banks and other depository institutions to compete for funds by offering explicit, competitively determined interest rates. As a consequence, the monetary aggregates should retain a more consistent economic interpretation, and therefore, should be more meaningful for the conduct of monetary policy.

III. Summary and Conclusions

The Depository Institutions Deregulation and Monetary Control Act of 1980 should have profound implications for the nation's financial structure, for competition among banking institutions — and above all, for monetary control. The reserve-requirement and deregulation provisions examined in this paper are only two of the elements affecting the Federal Reserve's ability to control the monetary aggregates and, through this control, to reduce inflation and promote stable economic growth. Indeed, monetary control is a complex process about which significant disagreements still exist. But on the whole, the Act is likely to aid the Federal Reserve in its task of monetary control, despite the impediments created by several provisions of the Act.

Certainly, the benefits of deregulation are unambiguous. Deregulation will improve equity by allowing all savers equal access to investment opportunities, will promote efficiency by removing artificial barriers to competition — and will enhance monetary control by reducing most of the incentives for financial innovations that alter the economic significance of targeted monetary aggregates. All these considerations strongly support the wisdom of Title II of the legislation.

The reserve-requirement provisions are more problematical. Theoretically, monetary control is best promoted when reserve requirements are imposed on targeted liabilities, but *not* on untargeted liabilities. Thus the appropriate setting of reserve requirements depends upon the precise definition of the aggregate to be targeted. Despite the lack of consensus on this point, at least a preliminary case can be made for targeting a broad transaction aggregate, such as M-1B. This aggregate can at least be given a consistent interpretation in terms of a medium-of-exchange concept of money [Berkman, 1].

Generally, but with some important exceptions, the reserve-requirement provisions are consistent with the objective of controlling a broad transaction aggregate. In contrast to the previous situation, most transaction balances (but not untargeted liabilities) will be subject to uniform reserve requirements. The law also gives the Federal Reserve considerable flexibility in adapting to the changing financial environment by providing it with the authority to establish uniform reserve requirements on all accounts which serve the function of transaction balances.

In other respects, however, the Act's provisions do not go far enough in the direction needed for optimal monetary control. First, the differential between the reserve requirement on the first $25 million of transaction balances and the requirement on larger balances clearly violates the basic principle of uniform reserve requirements. Even though the fraction of deposits subject to the lower requirement is likely to decline over time (because of the partial indexing of the cutoff), the basic logic and intent of the Act argue for the abolition of this differential.

More importantly, the Act continues to impose reserve requirements on nonpersonal time deposits, which is inconsistent with the URR principle under any plausible choice of targeted aggregates. Given the objective of controlling M-1B, shifts between transaction and nonpersonal time accounts will continue to lead to unwanted changes in the multiplier. But optimal control of a broader aggregate (including time and savings accounts) requires equal ratios for transaction and nonpersonal time balances. In either case, the present reserve requirements against nonpersonal time deposits should be changed to reflect the URR principle. Given the M-1B control objective, this can be accomplished at the Federal Reserve's discretion simply by reducing reserve requirements on nonpersonal time deposits to zero.

Finally, the process of financial innovation strongly affects the use of reserve requirements for promoting monetary control. In the absence of such innovations, monetary control considerations *alone* might argue for a fairly high reserve ratio (low multiplier), because this approach would provide the best means of insulating the targeted aggregate from any remaining disturbances to the base. In an environment favorable to financial innovations, however, even moderate reserve requirements against transaction balances can create problems. The higher the reserve ratio — assuming URR requirements are met — the greater the incentive of financial institutions to modify non-reservable accounts so that they can be used for transaction purposes. Such a process considerably complicates the authorities' money-control task, since it forces them to adjust their targets for the officially defined aggregates continually to reflect the innovations. Such adjustments are necessarily imprecise and uncertain in the short run. On this basis, the present 12-percent reserve requirement against transaction balances may be too high for purposes of monetary control. Our argument suggests that the ratio should be lowered to the present statutory minimum of 8 percent — and perhaps even this lower limit should be reconsidered as well.

FOOTNOTES

1. Michael Keran has suggested the term "measurement uncertainty" to describe the control problems caused by regulation-induced financial innovation. Thus, Section I of this article deals with the implications of P.L. 96-221 for multiplier uncertainty, whereas Section II examines its implications for measurement uncertainty.

2. The new law stipulates a gradual phase-in of reserve-requirement provisions. On September 4, 1980, reserve requirements of Federal Reserve member banks were reduced by 25 percent of the difference in the required reserves under the new and old systems. Subsequent phasedowns will occur annually until September 1, 1983. Reserve requirements for other institutions are being phased in over an eight-year period, with complete implementation scheduled for September 3, 1987. We have limited our analysis to the case of full implementation.

The Act also provides for the imposition of a supplemental (interest bearing) reserve requirement of up to 4 percent on transaction accounts. This requirement could be imposed only if existing reserves were deemed inadequate for monetary-control purposes. The term "inadequate" is not defined in the legislation.

3. The member-bank estimates provided in this table are adjusted for the estimated attrition of member banks in the absence of legislation designed to halt the exodus.

4. A brief history of URR proposals is provided in Robert Knight [9].

5. Alternative specifications of central-bank behavior are clearly possible. The Federal Reserve could, for example, set the level of bank reserves — either total reserves or nonborrowed reserves — rather than the monetary base. A general treatment of these alternatives is provided by Kaminow [6] and Cacy [3].

6. The model is similar to that of Kenneth J. Kopecky [10]. Kopecky's analysis, however, ignores liabilities other than demand deposits. Note that for the purposes of the present model, "non-member banks" include institutions (such as credit unions) that issue transaction balances but which are not normally denoted as banks.

7. We use the old definitions of the monetary aggregates to illustrate the reserve-requirement principles. During the 1970's, the Board of Governors undertook a major research effort on the process of financial innovation, focusing on the appropriate definitions of the monetary aggregates in a changed financial environment. The original Board proposal is given in Simpson [13]. A critical review of the new aggregates is provided by Berkman [1]. An example of the research methodology is given in Porter, Simpson, and Mauskopf [12]. Subsequent sections of the present article discuss the relevance of P.L. 96-221 to the newly defined transactions aggregate M-1B.

8. Setting $\alpha = 1$ provides an additional simplification of the model. From (E10) and (E11), $\alpha = 1$ implies that $D_m^{nm} = 0$; interbank deposits are eliminated. This specification implies (incorrectly) the demise of the correspondent-banking system — the imposition of URR will affect the correspondent network, but not dramatically. Estimates are provided in Horvitz [5].

9. The following data are taken from the Congressional testimony of Federal Reserve Chairman Volcker [16].

10. The testimony indicates that the actual growth rates, although slower than targeted, were not below what the FOMC found "acceptable". See [16, p. 16].

11. In a 1972 study of money-supply control, Poole and Lieberman [11] examined the sources of variability in the ratio of total member-bank required reserves to member-bank demand deposits, using weekly data over a 53-week period. The three largest sources of variability were due to time deposits, Treasury deposits, and interbank deposits, in order of importance.

12. Variability in the coefficient (t) could have been responsible for the results of the influential study of the impact of nonmember banks conducted by Dennis Starleaf [14]. For the period 1962-73, he found less variability in the ratio of aggregate reserves to demand deposits than in the ratio of member-bank reserves to deposits. He concluded that nonmember banks were not a monetary-control problem.

The beneficial impact of nonmember banks may have been due to the fact that Federal Reserve reserve requirements set $q_t > 0$ during the period of study. Since the *base-money* reserve requirements against time deposits were smaller for nonmembers than for members, the presence of nonmembers could have insulated the narrow money stock from variability in (t).

13. Denote by H the matrix of second-order partial derivatives of the profit function. By the second-order condition, the determinant of H (det H) must be positive. Differentiating (9) and (10) with respect to q_d and assuming that D and T are linear in their respective arguments, we derive

$$dr_d/dq_d = [(T_1 + D_2)D_2r_g - 2T_2D_1r_g]/\det H$$

and

$$dr_t/dq_d = [(D_2 + T_1)D_1r_g - 2D_1D_2r_g]/\det H$$

To simplify the analysis, assume the cross-rate effects are approximately zero. That is, $D_2 = T_1 = 0$. Thus

$$dr_d/dq_d < 0$$

$$dr_t/dq_d = 0$$

14. If we assume, once again, that $T_1 = D_2 = 0$,

$$dr_d/dr_g = 2T_2[(1 - q_d)D_1 - D_3]/\det H > 0$$

and

$$dr_t/dr_g = 2D_1[T_2 - T_3]/\det H > 0$$

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