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The Effects of Financial Deregulation on Inflation, Velocity Growth, and Monetary Targeting

by

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I. Introduction

Enactment of the Depository Institution Deregulation and Monetary Control Act of 1980 (hereafter DIDMCA) dramatically altered the environment in which depository institutions operated. An important feature of DIDMCA was the availability of interest-bearing checkable deposits to the public. Contrary to the previous state of affairs where checkable deposit rates constrained to zero, deregulation created a market-determined price. Since these transactions accounts are included in the definition of money, introducing this price variable has obvious implications for the demand for money. In addition to changes in money demand induced via the budget constraint, the attributes of checkable deposits were altered. After deregulation, goods included in money became more heterogenous.

Existing differences between currency and checkable deposits were magnified by the introduction of explicit interest payments. Prior to DIDMCA, casual observation suggested that currency and checkable deposits were neither perfect substitutes nor perfect complements. The set of attributes associated with each good simply did not match.1/ Moreover, deregulation augmented the

set of characteristics associated with checkable deposits relative to those associated with currency. In a sense, the nature of the changes introduced by DIDMCA made checking balances more like bonds and less like currency. Adding the interest-bearing feature made transactions accounts a better store of value for the public. The subtle differences between currency and checkable deposits were overlooked in the definition of money by continuing to implicitly treat both goods as being identical. It was clear, however, that reasons for holding checkable deposits had changed.

One suspected effect of maintaining the definition of M1 was impact that "new" checkable deposits would have on money-income relationship. Judd (1983) and Thornton (1983) identified several likely effects that interest-bearing checking accounts would have on the demand for money. Making checkable deposits a better store of value will induce individuals to use their transactions accounts highly liquid savings accounts. Velocity links the changes in the demand for money to income. Thus, to no one's surprise, the effects of deregulation on the demand for money goods relative to income is reflected by aberrations as velocity.

Not coincidentally, instability in velocity growth occurred at about the same time as DIDMCA was enacted.2/ Greater variability in velocity growth hints at the macroeconomic effects that financial deregulation has on the economy. Fundamentally, deregulation altered the environment in which decisions are made. Yet, a thorough investigation of the effects attributable to the introduction of interest-bearing checking accounts has not been undertaken.

The purpose of this article to explore some the implications of interest-bearing checkable deposits on several key macroeconomic variables in

a more general analytical framework. Heretofore, the effect of deregulation on velocity growth has been investigated as a partial effect of changes in bond rates. In addition, we will compare differences in the responsiveness of the rate of inflation to exogenous shocks between the regulated and deregulated environments. Inevitably, the importance of the macroeconomic implications of financial deregulation will raise the question of what is appropriate policymaking. This paper will also look at how deregulation might affect monetary targeting.

II. Set-up of the Model

The model used here specified equilibrium conditions for two markets: high-powered money and checkable deposits. The real sector (and factors that influence behavior in this sector) is treated as exogenous. Central to our analysis is separating individual's desired holdings of currency and checkable deposits. This specification reflects the argument that currency and checkable deposits are different. Unifying these goods into composite money may disregard useful information.3/

Formally, the model is represented by the following equations:

(1) $D^s = \lambda^{-1}S(i,d)py$

(2) $D^d = D(i,d)py$

(3) $C = \lambda^{-1}C(i,d)py$

(4) $TR = R(i)D$

(5) $D^s = D^d$

(6) $H = C + TR$

where i denotes the marginal productivity of capital; d, the checkable deposit rate; p, the price level;, y, real income; λ, a liquidity parameter; C,

currency demand; TR, total reserve demand; H, high-powered money; and D, checkable deposits (with superscripts d and s denoting demand and supply, respectively).

Equations (5) and (6) represent equilibrium conditions for checkable deposits and high-powered money, respectively. Individuals choose between three financial assets: bonds, checkable deposits and currency. Bonds and checking balances pay interest at rates denoted i and i_{dd}, respectively. Currency, although not paying interest, does offer some unique services as a medium of exchange. For instance, transactions in currency are anonymous which motivates using currency in order to conduct transactions in the underground economy.6/

The rate of return on bonds is assumed to be equal to the marginal productivity of capital. Thus, since the desired capital stock is determined in the real sector of the economy, this assumption means that the real bond rate is treated as an exogenous variable. The rate paid on checkable deposits clears the checking balance market, whereas, the price level clears the market for base money.

It is assumed that over time individuals observe a decrease in liquidity associated with currency and checkable deposits relative to that associated with bonds. Two factors appear to validate adopting this assumption. First, deregulation has provided an environment where bank competition leads to financial innovations in the form new products. Characteristically, each product innovation offers goods combining high liquidity with market rates. For example, mutual funds break up the ownership of government and other securities. Offering shares of ownership in these assets overcomes inherently illiquid attributes such as large minimum values. In this sense, deregulation

has played a critical role in making bonds more liquid relative to money.

Secondly, over time markets have become more highly developed and centralized which reduces search costs associated with matching prospective buyers and sellers. A reduction in the transactions costs involved with buying and selling a financial instrument is likely to reduce the time before it can be exchanged for money.7/

In principle, market equilibrium is satisfied when the quantity demanded equals the quantity supplied. In the model presented here, it is assumed that market equilibrium prevails for two goods: high-powered, or base, money and checkable deposits. (A mathematical representation of the equilibrium conditions is presented in the technical appendix.)

The supply of base money, defined as currency held by the public and bank reserves, is determined exogenously by the government. The public's demand for currency is assumed to be inversely related to changes in the bond rate and the checkable deposit rate. Currency demand is proportional to nominal income.

Banks hold total reserves as a percentage of checkable deposits. For simplicity, the reserve requirement ratio is assumed to be non-binding. The ratio of total reserves to checkable deposits is negatively related to the bond rate. Here, the bond rate represents the opportunity costs of holding reserves compared to buying bonds. A higher opportunity costs, for instance, will decrease the desired quantity of reserves.

In the market for checkable deposits, the nomenclature adopted here has the public supplying checking balances and banks demanding checkable deposits with the intention of purchasing loans (bonds) with "excess" reserves. The public's supply of checkable deposits is inversely related to the bond rate,

but directly related to changes on the checkable deposit rate. Like the demand for currency, the supply of checkable of deposits is proportional to nominal income.

For banks, checkable deposits are normal goods. This means that financial institutions wish to increase the quantity of checkable deposits, for instance, when the bond rate increases. The demand for checkable deposits, however, is inversely related to the checkable deposit rate. The bank's demand for checking balances is assumed proportional to nominal income.

The public's demand for currency and supply of checkable deposits both are assumed to be contracting equally at the rate 1, over time. This assumption reflects the growing liquidity of bonds relative to money. The greater liquidity associated with bonds means that transactions costs involved in turning bonds into money are decreased.8/ Lower transactions cost translate into increased demand for bonds. Conversely, the decreasing liquidity of money relative to other assets reduces the demand for holding the medium of exchange.

III. Implications of the Model

Using the equilibrium conditions and behavioral assumptions, the implications of the model described above are analyzed. Derivations of the equations presented in the following discussion are presented in the technical appendix.

The effects of interest-bearing checking balances are deduced by comparing the implications of this model in its "deregulated" and "regulated" states. This comparison is greatly simplified by the fact that prior to the introduction of interest-bearing checkable deposits, changes in the checkable

deposit rate were set equal to zero. This constraint means that the effects of changes in the checkable deposit rate on bank and individual behavior were conspicuously absent in the deregulated environment. Thus, in a general structure, the consequences of interest-bearing checking accounts are present when the checkable deposit is market-determined and ignored when the rate is fixed at zero. This treatment of the difference between regulated and deregulated states suggests that behavior before interest-bearing checking may be modeled as a special case of a general model where the effects of changes in the checkable deposits are allowed.9/

3.1 Inflation

Using the market equilibrium conditions, we derive the following inflation rate equation in the technical appendix

$$(1) \qquad \hat{P} = \hat{H} - \hat{y} + \beta_0 \hat{\lambda} - \beta_1 \hat{i} \quad ,$$

where $\beta_0 = 1 - \eta^k_{idd} / \eta_{idd}$ and $\beta_1 = \eta^k_i - \eta_i (\eta^k_{idd} / \eta_{idd})$. Equation (1) indicates the rate of inflation is positively related to the rate of growth in base money, the rate of decline in liquidity associated with money relative to that associated with bonds and the rate of change in the bond rate.10/

Consider the factors influencing the rate of inflation before financial deregulation. Without the effects of changes in the checkable deposit rate, equation (1) indicates that the rate of inflation is positively related to the declining liquidity associated with money balances relative to bonds and to the bond rate.

The upward pressure on the price level stems from the reduced demand for base money. Recall that the increasing liquidity associated with bonds

relative to that associated with currency and checkable deposits induced the public to hold fewer money balances. Similarly, an increase in the bond rate raises the opportunity costs of holding money balances and hence reduces the demand for money. The reduced demand for currency and checkable deposits also means that the demand for base money falls. To equilibrate the demand for and supply of base money, the price level adjusts. In the case of reduced demand for base money, the price level rises.

The effect that interest-bearing checking balances has on the rate of inflation is observed by noting that the ratio, $\eta^{k}_{idd} / \eta_{idd}$ is not disregarded in the deregulation case. This ratio of elasticities represents the effect of a change in the checkable deposit rate on the demand for base money (i.e., the numerator) and the excess supply of checkable deposits (the denominator). The effect of interest-bearing checkable deposits on the rate of inflation obviously depends on the sign of this ratio.

An increase in the checkable deposit rate induces a greater supply of checking balances from the public and a smaller demand by banks. Thus, the excess supply of checkable deposits is positively related to changes in the checkable deposit rate. Therefore, the sign of the denominator is positive.

A change in the checkable deposit rate affects the demand for currency and the supply of checkable deposits in opposite directions. Since the demand for total reserves is directly related to supply of checkable deposits, the effect of a change in the checkable deposit rate on the demand for base money is ambiguous. The effect on the supply of checkable deposits induced by a change in the checkable deposit rate is likely to be greater than that observed for the demand for currency. It seems reasonable, therefore, to assume that the sign of the numerator, and hence the ratio, is positive.

Accordingly, equation (1) indicates that interest-bearing checking balances decrease the rate of inflation relative to when transaction accounts did not pay interest. This finding is due to the introduction of a new market "price". Consider the effect of a shock to growth in the real bond rate. With the checkable deposit determined by market forces, an increase in the growth of the real bond rate puts upward pressure on the checkable rate (see Equation (A1) in the technical appendix). This upward movement in the checkable deposit rate also increases the demand for base money. Consequently, the price level increase necessary to restore equilibrium in the market for base money is smaller. In general, the effects of exogenous shocks on the rate of inflation are diluted by the presence of another market price adjustment.

3.2 Velocity growth

Next, consider the effects of interest-bearing checking balances on velocity growth. A reduced-from velocity growth equation is represented by the following equation:

$$(2)\quad \hat{V} = \Gamma_0 \hat{\lambda} + \Gamma_1 \hat{i} ,$$

where $\Gamma_0 = 1 - \eta^m_{idd} / \eta_{idd}$ and $\Gamma_1 = \eta^m_i - \eta_i (\eta^m_{idd} / \eta_{idd})$. In the regulated environment prior to DIDMCA, $\Gamma_0 = 1$ and $\Gamma_1 = \eta^m_i$. In this setting, velocity is positively related to the decline liquidity associated with money. In practice, individuals will tend to hold more bonds as they become more liquid relative to money. For a given rate of nominal output growth, the greater liquidity associated with bonds reduces the demand for money and hence, means

that velocity growth is more rapid.

A second implication of equation (2) is that velocity growth is directly related to changes in the growth rate in the bond rate. People will also economize on money balances when the opportunity costs of holding money increases which also results in faster velocity growth.

Similar to the inflation rate equation, the effects of interest-bearing transaction accounts are captured by a ratio of two elasticities. The denominator of the ratio is identical to that found in the inflation rate case. Here, the numerator reflects the effect of a change in the checkable deposit rate on the demand for money balances. Since, the denominator is positive, the sign of this elasticity is tantamount to determining the direction of the effect that deregulation had on velocity growth.

Here, the numerator reflects the effect of a change in the checkable deposit rate on the demand for money balances. A higher checkable deposit rate induces the public to hold a larger quantity of checking balances, but a smaller quantity of currency. It is assumed that the demand for money balances is positively related to changes in the checkable deposit rate. Therefore, the ratio is positive. Accordingly, equation (2) indicates that the effect of interest-bearing checking accounts is to reduce velocity growth compared to when the rate was fixed at zero.

A smaller change in velocity growth to exogenous shocks reflects the smaller changes in money demand. For example, consider the effect of faster growth in the bond rate. Without interest-bearing checking accounts, an increase in the bond rate, would reduce the demand for currency and supply of checking balances. Velocity would correspondingly rise. In the deregulated environment, however, a higher bond rate would put upward pressure on the

checkable deposit rate. This price movement partially offsets the checkable deposit outflow. Comparatively, money demand falls by a smaller amount with a market determined checkable deposit rate, and hence velocity growth is less dramatic.

It is also possible to investigate the effect of interest-bearing checking accounts on the overall variability of velocity growth. The equation characterizing the variance in velocity growth is:

$$(3)\quad [\hat{V} - E(\hat{V})]^2 = (1 - \eta^m_{idd} / \eta_{idd})^2 \quad \sigma^2_e \ .$$

Equation (3), therefore, indicates that including interest-bearing checkable deposits in the model reduces the variance in velocity growth.

In principle, the model highlights the fundamental difference between the regulated and deregulated environments. Equilibrium in the market for checkable deposits relied on quantity and other price adjustments. Including a market-determined "price" for checkable deposits meant that interest rate movements would absorb some of the shock previously observed as movements in checkable deposit quantity and other prices. The commingling of checkable deposit rate and quantity adjustments translates into moderated quantity adjustments in the checkable deposit market and into less dramatic movements in other market-determined prices in order to restore checkable deposit equilibrium.

3.3 Monetary targeting

The discussion has focused on the effects of financial on private sector behavior. A policy change is also likely to induce changes in private sector

behavior which impinge upon policymakers' ability to conduct policy. In other words, the process of formulating policy is affected by the changes in introduced.

The reduced form of the monetary growth equation is represented as:

$$(4)\quad \hat{M} = \hat{H} + \Delta_0 \hat{\lambda} + \Delta_1 \hat{i} ,$$

where $\Delta_0 = (\eta^m_{idd} - \eta^k_{idd}) / \eta_{idd}$ and $\Delta_1 = \eta^m_i - \eta^k_i + (\eta^m_{idd} - \eta^k_{idd})\eta_i / \eta_{idd}$. Not surprisingly, equation (4) indicates that money growth is positively related to base money growth.

In the regulated regime, equation (4) suggests that money supply growth is positively related to changes in the bond rate. This characteristic simply reflects banks willingness to hold fewer reserves as the opportunity costs rises. It is interesting to note that equation (4) indicates that for the same rate of base growth, money supply will grow faster with interest-bearing checking than without. Apparently, offering market rates of return on transactions accounts induces people to hold larger quantities than otherwise. With the reserve to checkable deposit ratio less than one, banks are using the additional funds to create more money.

To illustrate why monetary growth may rise with interest-bearing checking balances, consider the effect of an increase in the rate of change in the bond rate. Initially, the higher bond rate depresses the demand for currency and checkable deposits. The induced excess demand for transactions balances puts upward pressure on the checkable deposit which exacerbates the outflow of currency. Meanwhile, the spread between the return on checkable deposits and currency is widened, and the ratio of currency to checkable

deposit falls. Other things being equal, the money multiplier rises meaning that the same level of base money will now give rise to a larger quantity of money.

IV. An Empirical Test

The findings presented above represent testable hypotheses comparing the two financial regimes under investigation. In this section, we will look at whether the data support the theoretical result that the overall variability in velocity growth will decline with interest-bearing checking available.

To examine the empirical validity of this result, two equations will be estimated: a currency equation and a checkable deposit equation. Over the sample period 1983.1 through 1988.4, monthly values of NOW account rates are reported. Using actual values for the NOW accounts as the appropriate checkable deposit rate, predicted values of currency and checkable deposits are used to construct a time series for velocity growth monthly.11/ In contrast, to characterize the velocity growth path under a regulated policy environment, the checkable deposit rate used is zero. A counterfactual time series is calculated for currency and checkable deposits in the regulated environment.12/

The results of this exercise are presented in Table 1. The predicted series using actual data for checkable deposits belies the poor fit indicated by the regressions statistics. Predicted velocity growth and actual velocity growth are highly correlated despite the R^2 being relatively low.13/

The variance of velocity growth are calculated for the deregulated predicted series and the regulated counterfactual series. As Table 2 shows, the standard error for velocity growth is nearly three times the value of the

standard error calculated using the counterfactual approach. This difference would seem consistent with the hypothesis that the overall variability in velocity growth is smaller with interest-bearing transactions accounts than without.

V. Conclusion

This article focuses on the effects of interest-bearing checkable deposits on several key macroeconomic variables. With respect to the rate of inflation and velocity growth, the findings suggest that these variables respond less dramatically to exogenous shocks with market-determined checkable deposit rates available than without.

The interest-rate on checkable deposits provides another "price" variable. Before financial deregulation, quantity adjustments played a greater role in the process of restoring equilibrium. This role was necessitated by institutional constraints on certain market prices. Relaxing these constraints means smaller quantity adjustments which helps to explain why the effects of exogenous shocks are diluted in the deregulated regime.

The other main conclusion drawn is this article pertains to the issue of monetary targeting. Here, the results indicate that the same rate of base growth will give rise to faster money growth since the introduction of checkable deposit rates. For policymakers, this means that old rules of thumb regarding the relationship between base growth and money growth need to be re-evaluated.

FOOTNOTES

1. Differences between currency and checkable deposits existed prior to financial deregulation. Institutional arrangements had developed which inhibited substituting means of payment in certain situations. For a more complete documentation of acceptable payment methods and their implications, see Porter and Bayer (1984).

2. It has been argued that banks implicitly offered positive rates of return to depositors prior to financial deregulation. To circumvent legal prohibition of payment of explicit payment of interest, banks often offered "gifts". Alternatively, service charges, or lack thereof, were also interpreted as evidence of a rate of return on checkable deposits. For these arguments, see Boyd (1976). For our purposes, only explicit rates of return are considered, and these were not legally sanctioned until passage of DIDMCA.

3. An extensive literature has been devoted to the importance of the ratio of currency to checkable deposits in macroeconomic analysis. Closely related to this study is the implication that changes in the ratio of currency to checkable deposits has with respect to money supply growth. For further discussion of the money supply process, and the potential macroeconomic implications see Johannes

and Rasche (1979).

4. For an example of this modelling approach, see Horrigan (1988).

5. The assets comprising money are neither perfect substitutes nor perfect complements. One can look at the means of payment function to see that these goods are not perfectly interchangeable. A more detailed discussion of the differences between the means of payments is found in Avery, Elliehausen, Kennickell and Spindt (1987).

6. See, for example, Feige (1979).

7. See Mishkin (1986).

8. This view of liquidity is consistent the definition forwarded by Lippman and McCall (1986).

9. Of course, the regulated model is not "nested" inside our general model in the usual sense of the word. Here, nesting refers to special form of the reduced from equation which is operationally equivalent to the regulated case. Fixing the rate of return to zero preempts investigating the effects of changes in checkable deposit rate on either bank or individual behavior. In the sense that these additional behavioral terms are absent from the reduced form equation, the regulated state is a special case of the

general (i.e., deregulated) environment.

10. Notice that equation (1) yields an inverse relationship between output growth and the inflation rate. This result is in direct contrast to the relationship espoused in a short-run Phillips curve. Increases in output increase the demand for base money. In the financial market model presented here, the price must fall in order to equilibrate the demand for base money its supply. A model which yields results that are consistent with a downward sloping Phillips curve would incorporate factors that determine output. Specifying such a model, however, would a) complicate the algebra involved and b) not alter the basic results regarding changes in the checkable deposit rate.

11. Personal income is used as the measure of economic activity in constructing the monthly velocity series.

12. The methodology used to construct the counterfactual series fails to satisfy the Lucas' critique. Lucas argued that analyzing a policy shock should recognize that individuals will react differently under the regime. Indeed, a policy change is likely to have effects on the other estimated parameters in the model. Consequently, characterizing the system as having the same values for the parameter estimates in both the regulated and deregulated environments may not be appropriate.

13. The equations were estimated using three-stage least squares. Each variable used in the regressions are in stationary form so as to minimize the spurious correlation argument. Moreover, exogeneity tests were performed to determine whether output and the 3-month Treasury bill rate were truly exogenous. Using the procedure specified by Hsiao (1981), it was examined whether the T-bill rate should be treated as exogenous. While this hypothesis could not be rejected, this approach did indicate the hypothesis that output was exogenous could be rejected.

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TECHNICAL APPENDIX

The model used to describe behavior in the markets for checkable deposits and high-powered money may be represented as:

(1) $DD^s = \lambda^{-1}S(i, i_{dd})\ py$

(2) $DD^d = D(i, i_{dd})\ py$

(3) $DD^s = DD^d$

(4) $CU^d = \lambda^{-1}C(i, i_{dd})py$

(5) $RB^d = R(i)DD$

(6) $H = CU^d + RB^d$

The variables in equations (1) through (6) are defined as follows:

- i = bond rate of interest
- i_{dd} = rate of interest on checkable deposits
- p = price level
- y = real income
- λ = liquidity effect parameter
- DD = checkable deposits (with superscripts s and d denoting supply and demand, respectively)
- CU = currency held by the public
- RB = total reserves
- H = high-powered (or base) money

EQuation (3) and (6) are the equilibrium conditions. Substituting equations (1) and (2) into (3) yields

(7) $\lambda^{-1}\ S(i, i_{dd}) = D(i, i_{dd})$

Similarly, substituting equations (4) and (5) into (6) yields

(8) $\lambda^{-1}\ k(i, i_{dd})\ py = H,$

where k(.) is the composite function [i.e., $k(.) = C(.) \circ R(.)S(.)$].

Logarithmic differentiation of equation (7) yields

(9) $-\hat{\lambda} + \eta_{idd}\,\hat{i}_{dd} = \eta_i\,\hat{i}$

where $\eta_{idd} = \eta^s_{idd} - \eta^d_{idd} > 0$ and $\eta_i = \eta^d_i - \eta^s_i > 0$.

[Note that hats above variables denote growth rates; hence, it is natural to interpret η_{idd} and η_i as elasticities.] Solving equation (9) for $\hat{i}_{dd}$ provides the following "reduced-form"

(10) $\hat{i}_{dd} = \eta_i / \eta_{idd}\,\hat{i} + \hat{\lambda} / \eta_{idd}$.

According to equation (10), growth in the rate of interest on checkable deposits is positively related growth in the bond rate.

Inflation Rate

Using equation (8), we can solve for the direction of change in the rate of inflation. Logarithmic differentiation of equation (8) gives

(11) $\hat{H} = \hat{p} + \hat{y} = \hat{\lambda} + \eta^k_i\,\hat{i} + \eta^k_{idd}\,\hat{i}_{dd}$.

Substituting for $\hat{i}_{dd}$ from equation (10) into equation (11) and rearranging terms yields

(12) $\hat{p} = \hat{H} - \hat{y} + (1 - \eta^k_{idd} / \eta_{idd})\,\hat{\lambda} - [\eta^k_i - \eta^k_{idd}\,(\eta_i/\eta_{idd})]\hat{i}$.

Velocity

The definition of velocity is py/M. For simplicity, we define $M = CU^d + DD^s$. Using equation (1) and (4) and substituting into the definition of velocity yields

(13) $V = \lambda/[C(i,i_{dd})+S(i,i_{dd})] = \lambda/M(i,i_{dd})$.

Logarithmic differentiation of equation (13) gives the following expression:

(14) $\hat{V} = \hat{\lambda} + \eta^m_i\,\hat{i} + \eta^m_{idd}\,\hat{i}_{dd}$.

Substituting for $\hat{i}_{dd}$ gives us the following reduced-form equation:

$$(15)\quad \hat{V} = [1 - (\eta^m_{idd} / \eta_{idd})]\,\hat{\lambda} + [\eta^m_i + \eta^m_{idd}(\eta_i / \eta_{idd})]\hat{i}.$$

To see the effect of deregulation on the variability of velocity, let $V = \bar{V}\epsilon$, where $\bar{V}$ is the mean rate of velocity growth and ϵ is an error term. After logarithmic differentiation, we see that

$$\hat{V} = \hat{\bar{V}} + \hat{\epsilon}\ .$$

Assume that $\hat{\epsilon}$ possesses the following properties:

$$E\hat{\epsilon} = 0 \text{ and}$$

$$E(\hat{\epsilon}^2) = \sigma^2_\epsilon\ .$$

Then we may write $\hat{V}$ as

$$(16)\quad \hat{V} = [1 - (\eta^m_{idd} / \eta_{idd})]\,\hat{\lambda} + [1 - (\eta^m_{idd} / \eta_{idd})]\hat{\epsilon} - [\eta^m_i + \eta^m_{idd}(\eta_i / \eta_{idd})]\hat{i}.$$

With

$$E(\hat{V}) = [1 - (\eta^m_{idd} / \eta_{idd})]\,\hat{\lambda}$$

then

$$(17)\quad \sigma^2_v = [1 - (\eta^m_{idd} / \eta_{idd})]\,\sigma^2_\epsilon - [\eta^m_i + \eta^m_{idd}(\eta_i / \eta_{idd})]\hat{i}.$$

Monetary Targeting

The equation for the growth rate in the money supply is given by

$$(18)\quad \hat{M} = \hat{H} + [(\eta^m_{idd} - \eta^k_{idd}) / \eta_{idd}]\,\hat{\lambda} + [(\eta^m_i - \eta^k_i) + (\eta^m_{idd} - \eta^k_{idd})(\eta_i / \eta_{idd})]\hat{i}.$$

VELOCITY OF M1

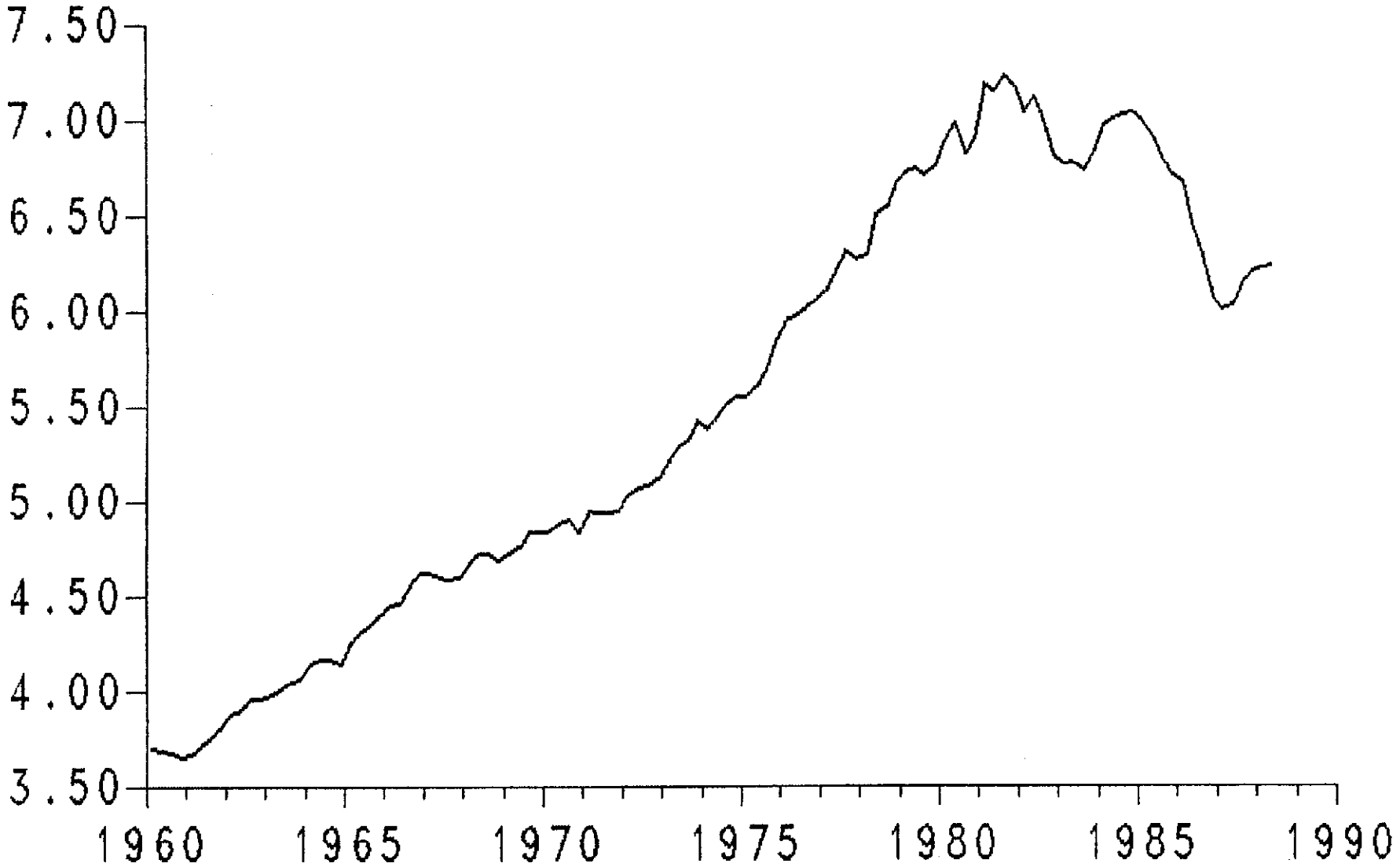

Table 1

Coefficient Estimates from Currency and Checkable Deposit Equations

Dependent Variable:	Currency			Checkable Deposit	
Independent Variables	Coefficients	Standard Errors	Independent Variables	Coefficients	Standard Errors
Intercept	.0045	.0026	Intercept	.0035	.0171
$CURR_{t-1}$	.0024	.1629	CD_{t-1}	.0757	.2804
$CURR_{t-2}$	.305	.1819	CD_{t-2}	.1031	.3124
$CURR_{t-3}$	.429	.1774	CD_{t-3}	.323	.2073
$CURR_{t-4}$	-.3765	.1814	EMP_t	4.5383	5.836
EMP_t	-.4142	.8238	EMP_{t-1}	2.9096	2.9874
EMP_{t-1}	.288	.3755	EMP_{t-2}	-2.9251	2.4069
EMP_{t-2}	.0474	.4621	CPI_t	-1.8857	2.1808
EMP_{t-3}	-.017	.362	CPI_{t-1}	-1.5157	1.5522
CPI_t	-.1754	.364	$T\text{-}BILL_t$	.1519	.1148
CPI_{t-1}	.065	.2478	$T\text{-}BILL_{t-1}$	.1479	.0983
$T\text{-}BILL_t$	.0023	.1046	$T\text{-}BILL_{t-2}$	-.0774	.0589
NOW_t	.0002	.1629	NOW_t	-.8154	.622
			NOW_{t-1}	-.1198	.1474

Legend:
CURR ≡ Currency held by public
EMP ≡ Non-agricultural employment
CPI ≡ Consumer price index
T-BILL ≡ 3-month Treasury bill rate (monthly average)
NOW ≡ NOW account rates (monthly average)

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