The NOW Account Experiment
and the Demand for Money

by

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Introduction

A central fact of recent American monetary history and monetary theory is that (narrowly defined) money bears no interest. The money demand equation--formulated with the implicit assumption that money does not bear interest--is the linchpin of much theoretical and empirical work in questions of macroeconomic policy. Legalization of interest on the demand deposit component of the money stock would be the most significant reform of our monetary system in the post-war period.

Since 1972, the law has permitted individuals in New England to hold the technical equivalent of an interest-bearing checking account, a NOW account. Since November 1, 1978, commercial banks throughout the nation have had authority to provide "automatic transfer" accounts to private individuals. These accounts, which allow transfer of funds from savings to checking when needed, are in effect interest-bearing checking accounts.

We regard the New England NOW account experience as an experiment. By analyzing this experiment, we hope to predict more accurately the changes in the monetary system which will result from the more general availability of interest bearing demand deposits. We consider three categories of questions. First, what was the pattern of adoption of NOW accounts? Second, how much did the demand for money rise in response to the availability of NOW accounts? Third, what can we learn from the experiment about the interest sensitivity of money demand?

The NOW experience comes remarkably close to being a pure controlled experiment, at least by the standards of experiments in economics. The United States serves as a control group for comparisons with the New England experimental area. We observe a large difference in the "dose" of the experimental variable, the deposit interest rate, applied to the two

rate is about one-half as large as the entire post-war range of market interest rates.

Naturally, there are limitations to general application of the New England experience. Since only individuals participated in the experiment, both the accuracy of measurements based on data aggregated over both businesses and individuals and the applicability of our answers to the (hypothetical) removal of the interest restriction for all classes of depositors are limited. Furthermore, the experiment did not allow a market determined interest rate, but it applied the five percent Regulation Q ceiling. Both commercial banks and thrifts could offer NOW'S, while, to date, only banks may offer automatic transfers. In addition, retail banking in New England is often regarded as more competitive than in much of the rest of the nation. Finally, bankers certainly have changed market strategies as they have learned from the New England experience. For example, most New England institutions offered free checking with or without a very low minimum balance along with five percent interest. Initial service charge schedules for the automatic transfer accounts are far less generous. These limitations not withstanding, the NOW account experience is one of the purer experimental situations available to economists.

The outline of the paper is as follows. In the next section, we survey the NOW account experiment with an emphasis on regulation. In the following section we present a quantitative description of the growth of NOW accounts per se. Sections IV through VIII deal with the estimation of the increase in total checkable accounts, that is demand deposits plus NOW'S, resulting from the experiment. We discuss the interest sensitivity of money demand in the ninth section. Section X considers the implications

for monetary policy of NOW'S or their equivalent. The last section provides a summary of our results.

II. Regulatory History

In 1970, the Consumer Savings Bank of Worcester, Massachusetts started what has evolved into the NOW account experiment in New England. The bank proposed a new type of account - a savings account with a monthly statement and an option enabling a customer to make a withdrawal by a negotiable draft. Previously, it had been customary practice for Massachusetts savings banks to waive the thirty-day notice for regular savings accounts and to allow withdrawal by countercheck, issued by the banks and made payable to the customer or to a third party. Therefore, the Worcester bank maintained that the use of negotiable orders of withdrawal would only change the site of the creation of a third-party payment. On May 2, 1972, the Massachusetts Supreme Judicial Court decided that the proposed account presented a "distinction without a difference" from existing withdrawal arrangements. In June 1972, the Consumer Savings Bank began to offer NOW accounts paying 5¼% interest and charged 15¢ a draft.

Savings banks in New Hampshire were able to follow suit quickly in September 1972, since New Hampshire state law did not specify the allowable form of withdrawal from savings deposits. Not all financial institutions accepted the NOW account idea as readily as did savings banks. Commercial banks, regulators and Congressmen opposed NOW's and tried to have legislation enacted which would ban them. However, their efforts failed and on August 16, 1973, PL 93-100 authorized commercial banks, mutual savings banks, savings and loan associations and cooperative banks in Massachusetts and New Hampshire to offer NOW accounts. It delegated the

responsibility of regulation to the Federal Deposit Insurance Corporation. Congress saw the possibility of using the development of NOW's in these two states as a test of the effect of increasing the powers of thrift institutions [Crane, p. 3]. The FDIC and the Federal Reserve Board issued regulations concerning the administration of NOW accounts in September, 1973. Under these regulations, banks could not offer NOW accounts to businesses nor pay more than the Regulation Q ceiling on savings accounts of 5 percent interest. The NOW account experiment was extended to the other four New England states effective March 1, 1976, by PL 94-222.

The first of several attempts to extend NOW account authority nation-wide occurred in 1975 with a U.S. House Committee on Banking Finance and Urban Affairs recommendation that the House pass such authority as part of H.R. 10024. In September, 1976, the U.S. Senate defeated by one vote a bill extending NOW authority nationwide. The Senate Banking Committee considered nationwide extension again in 1977, first with S1664, second with S1873 and third with S2055. Both S1664 and S2055 contained provisions for uniform reserve requirements on NOW account balances for all depository institutions and for payment of interest on required reserves. The first provision reflected an attempt to make the impact of reserve requirements more equitable. The second reflected the perceived need to lower the burden of membership in the Federal Reserve System. None of the recent bills reached the floor.

Since Congress did not provide legislation for nationwide NOW accounts, the Board of Governors, which had supported extension of NOW's, moved independently. On May 1, 1978, it approved a plan permitting "individual customers of member banks to transfer funds automatically from their savings to their checking accounts," as of Nov. 1, 1978. The Board

thus allowed member banks to offer a service which is the economic
equivalent of a NOW account. While banks do not offer a separate account,
called a NOW, upon which customers may draw checks, they will transfer
funds, when needed, from an interest-paying savings account to a checking
account. Thus, a customer effectively earns interest on an account against
which he or she may make orders of payment.

III. Quantitative History

Even though, for almost all consumers, NOW accounts offer higher
returns than regular checking accounts, full adoption of NOW's has
developed only gradually. We review here some of the history of
competition between commercial banks and thrifts for NOW balances. A more
extended study appears in Crane and Riley's book, NOW Accounts.

The Competitive Development of NOW Accounts

A) Massachusetts and New Hampshire

Massachusetts mutual savings banks began offering NOW accounts in
September 1972 paying 5¼% interest and charging a 15¢ per draft service
fee. In September 1973, the Home Savings Bank of Boston started a trend to
"free" NOW's by removing service charges. The application of Regulation Q
in January 1974 lowered the interest rate to 5%.

Commercial banks, savings and loan associations, and cooperatives
received authority to offer NOW's in January 1974. The commercial banks
originally did not offer free accounts, but the competitive pressure from
mutuals forced the commercial banks to eliminate charges. Although a number
of institutions were apparently willing to take early losses in order to
establish market shares, most commercial banks have since moved to some

variant of a conditional pricing schedule. A variety of schedules with charges scaled to balance size and activity now exists. Today, the thrifts have more NOW accounts than the commercial banks but the banks hold greater total balances. In New Hampshire, mutual savings banks offered NOW's as of November 1972, nonmember commercial banks and three member banks as of January 1974, and the remaining member commercial banks and savings and loan associations as of March 1974. The savings banks initially offered "free" NOW's paying 2-4% interest, a strategy which enabled them to compete for checking deposit funds and which tended to attract low balance, high activity accounts. Later, they continued free accounts but paid 5% interest. Commercial banks, as in Massachusetts, commenced with 5% NOW's with relatively high service charges. Subsequently, they matched the mutual savings banks' terms but finally moved to conditional pricing to attract higher balance accounts. By July 1975, commercial banks in New Hampshire had 50%, and by April 1978 64%, of total NOW balances--a higher percentage than that in Massachusetts. Thrifts, however, hold larger numbers of NOW accounts.

B) Connecticut, Maine, Rhode Island and Vermont

In March 1976, all institutions had the authority to offer NOW's. Most institutions paid 5% and required some minimum balance, but did not impose any service charge. In Connecticut, all three types of institutions adopted NOW's quickly but commercial banks were most aggressive. Mutual savings banks, which had the authority to offer checking accounts, emphasized checking rather than NOW accounts since the former were cheaper. Commercial banks have always held a majority of NOW balances and held 72% by April 1978.

In Maine, where NOW accounts began in May 1976, thrifts were not aggressive in offering NOW's since they already had checking account authority. Commercial banks gained 85.6% of total NOW balances in the first month. As of April 1978, they held a 77.8% share.

In Rhode Island, the growth of NOW accounts was more rapid than in the other three states, a fact which some attribute to the influence of advertising of NOW's by Massachusetts radio and television stations. The banking structure in Rhode Island is unusual. Most thrift institutions own commercial banks as subsidiaries. The thrifts generally chose not to offer NOW accounts to avoid competing with their own subsidiaries. Separate NOW account data for banks and thrifts in Rhode Island is not available.

Institutions in Vermont were slower to offer and to advertise NOW's. NOW accounts were offered with relatively restrictive requirements in terms of minimum balances, flat fees, and service charges. Due to the lack of separate commercial bank NOW account data, it is impossible to know the relative shares of NOW balances held by commercial banks and thrifts.

The Growth of NOW Balances

We are interested in examining both the growth of NOW accounts per se and the growth of NOW accounts relative to other checkable assets. Figure III-1 shows the level of NOW's in each of the six New England states (in 1967 dollars).

FIGURE III-1

LEVEL OF NOW ACCOUNTS IN SIX NEW ENGLAND STATES
MASSACHUSETTS (······), CONNECTICUT (———)
MAINE (— —), NEW HAMPSHIRE (——— —)
RHODE ISLAND (-----), VERMONT (- —)
MILLIONS OF 1967 DOLLARS
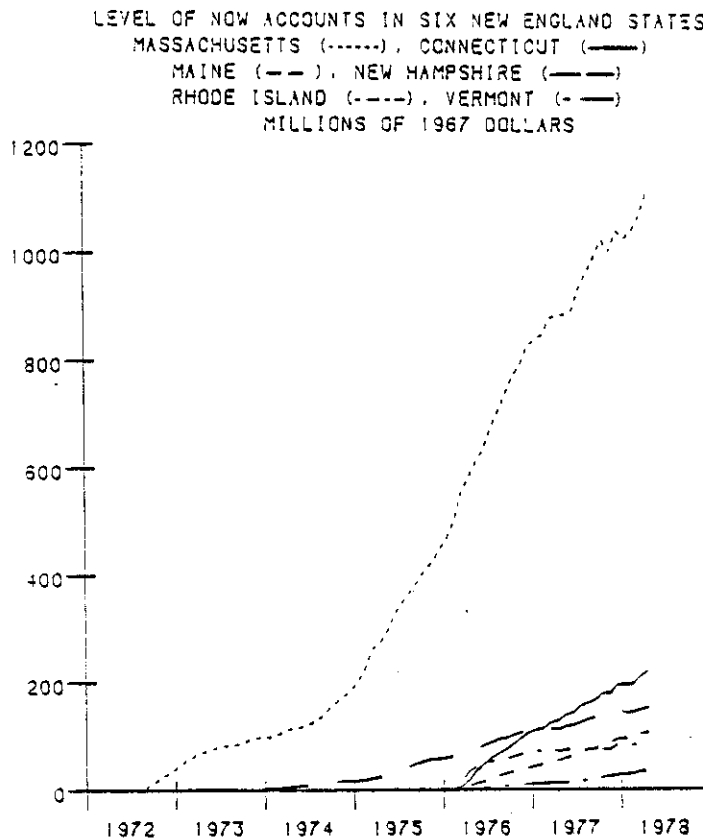
The importance of NOW accounts in each state is reflected in the ratio of NOW's to total third-party payment (TPP) balances, i.e., gross demand deposits plus NOW's. ("Gross" demand deposits are total demand deposits before netting out cash items in process of collection.) The ratios for the six states appear in Figure III-2A and the ratio for New England is shown in Figure III-2B.

FIGURE III-2A

RATIO OF NOW ACCOUNTS TO TOTAL CHECKABLE BALANCES
IN SIX NEW ENGLAND STATES
MASSACHUSETTS (·······), CONNECTICUT (————)
MAINE (———), NEW HAMPSHIRE (———)
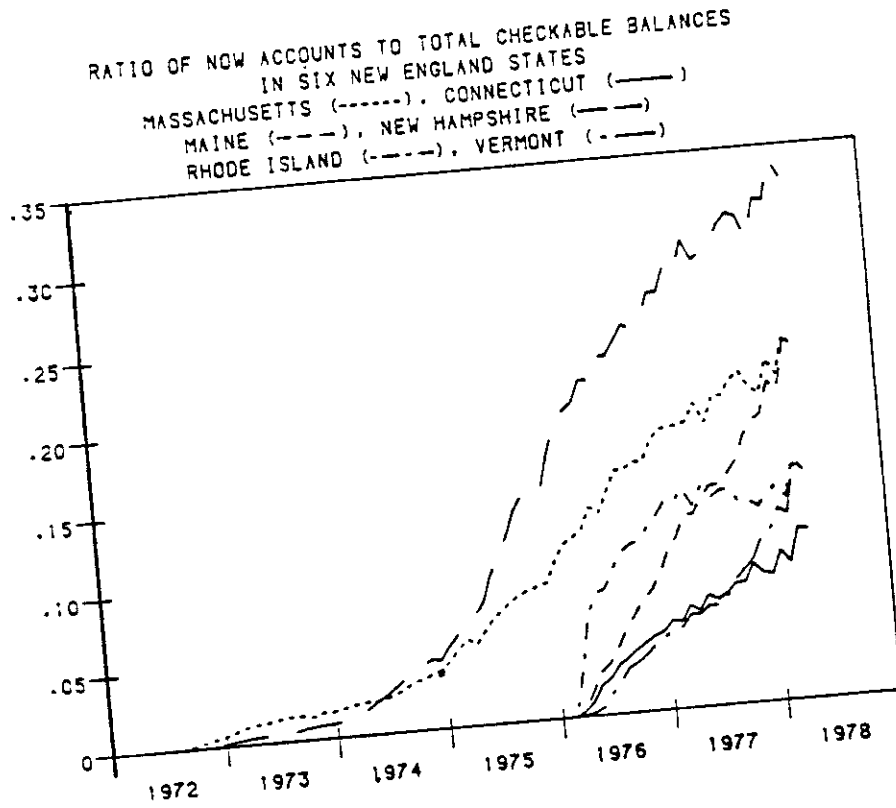RHODE ISLAND (—·—·—), VERMONT (·——)

FIGURE III-2B

RATIO OF NOW ACCOUNTS TO TOTAL CHECKABLE BALANCES
IN NEW ENGLAND
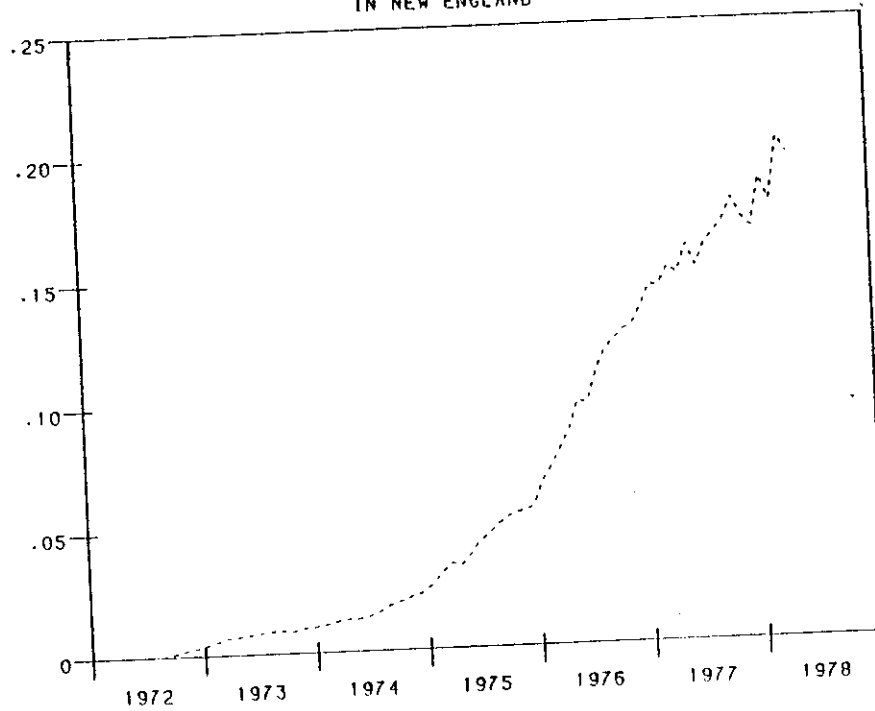
NOW's in New Hampshire reached 32.9% of TPP's by April 1978, well above Massachusetts at 22.4% and Maine at 22.6%. NOW accounts represented only 10% of TPP's as late as July 1975 in New Hampshire and January 1976 in Massachusetts. NOW's reached 10% of TPP's in Maine within 11 months after the March 1976 start.

NOW accounts in Rhode Island represented 14.6% of TPP's in April 1978, having already reached 10% with the first 6 months. NOW balances in Vermont have grown much more slowly as is apparent in the increase of the ratio from .1% in March 1976 (1st month) to 10% in December 1977. During 1978, the growth of the ratio to 14.2% (last month) shows a more rapidly increasing share of TPP's. The relative importance of NOW accounts in Connecticut has been the smallest. The ratio reached only 10.8% by April 1978, the last month of our sample.

We are interested in both the total growth in NOW balances and also the division of that growth into displacements of and additions to demand deposits. Figure III-3 shows gross demand deposits, NOW balances and total third-party payment balances for New England as well as demand balances for the United States.

FIGURE III-3

GROSS DEMAND DEPOSITS (———), NOW ACCOUNTS (-----)
AND
TOTAL CHECKABLE BALANCES FOF NEW ENGLAND (———)
DEMAND DEPOSITS OF THE UNITED STATES (············)
MILLIONS OF 1967 DOLLARS
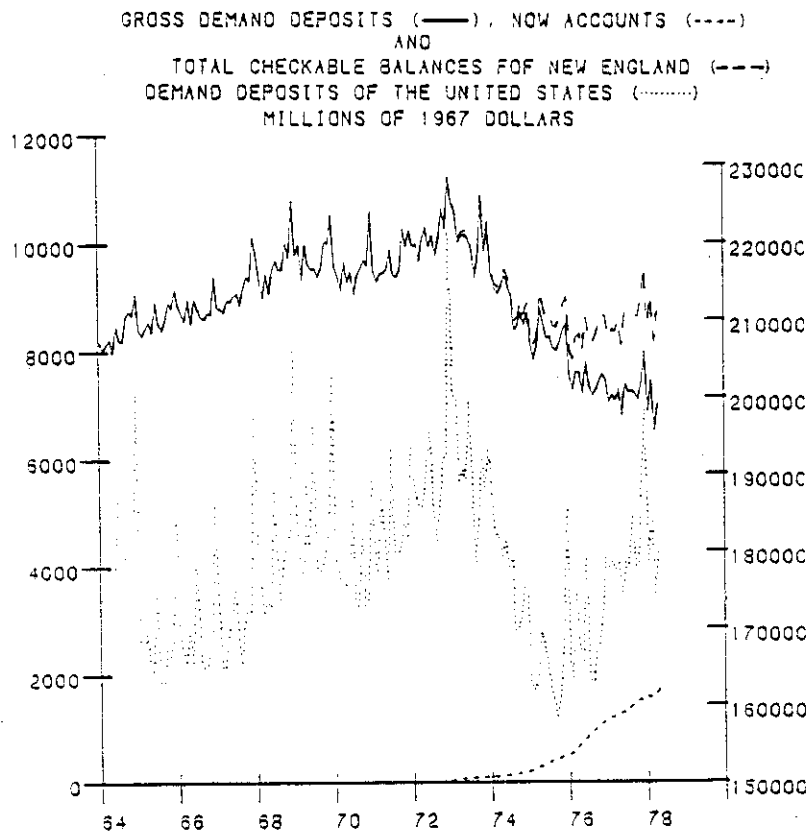
Since ownership of NOW accounts is limited to individuals and certain
non-profit organizations, NOW's are necessarily a more important element of
total individual checkable balances than of total third-party payment
balances. In New England, individual demand deposits represent a declining
portion of IPC (individuals, partnerships, and corporations) demand
deposits, falling over the period 1972 to 1978 from about 25 to 20% except
for 1978 when the ratio jumps back up to 23.4%.

We have constructed a series for individual demand deposits (see
Appendix for details) which appears in Figure III-4 with NOW's and total
individual checkable balances in New England as well as individual balances
in the United States. While the level of balances outside of New England
has been relatively trendless, New England balances exhibit a large
increase paralleling the growth in NOW's.

FIGURE III-4

INDIVIDUAL DEMAND DEPOSITS (·······),NOW ACCOUNTS (———)
AND
TOTAL INDIVIDUAL CHECKABLE BALANCES IN NEW ENGLAND (— —)
INDIVIDUAL DEMAND DEPOSITS IN THE UNITED STATES (··········)
MILLIONS OF 1967 DOLLARS
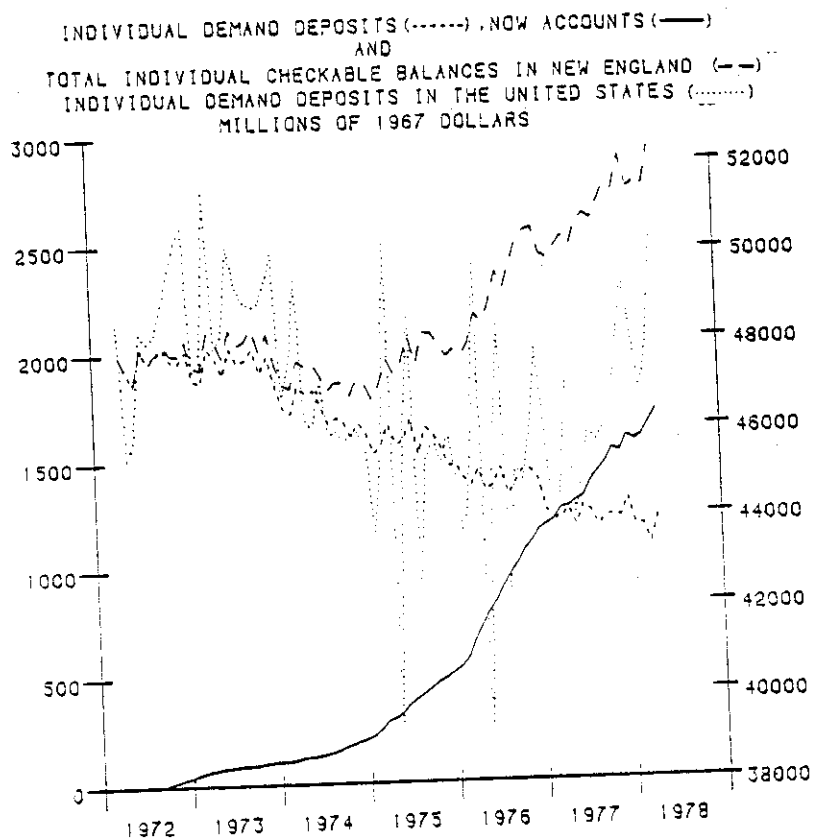
IV. A Simple Model of the Demand For Money

The New England NOW account experience provides as controlled an experiment as we are likely to see on the effect on money demand of allowing interest-bearing third-party payment accounts. We can use the evidence of the experiment to answer two related questions:

1. How much did the demand for money increase due to the availability of interest-bearing NOW accounts?

2. What is the own-interest elasticity of the demand for money?

We base our analysis on the assumption that the same money demand function applies to both the experimental area, New England, and the control area, the United States outside of New England. Let M^{NE} and M^{US} be the logarithm of real third-party payment accounts-checking plus NOW accounts in New England and checking accounts in the rest of the United States respectively. Let money demand include a regional effect a_i, a time effect b_t and a NOW effect N. ("US" is the United States net of New England).

Taking 1972 and 1977 as convenient end-points, we have

$$M_{72}^{US} = a_{US} + b_{72}$$
$$M_{72}^{NE} = a_{NE} + b_{72}$$
$$M_{77}^{US} = a_{US} + b_{77}$$
$$M_{77}^{NE} = a_{NE} + b_{77} + N$$

Since the dependent variable is in logs, N is the percentage increase in money demand due to legalization of NOW accounts.

$$(IV.1) \qquad N = (M_{77}^{NE} - M_{72}^{NE}) - (M_{77}^{US} - M_{72}^{US})$$

The critical assumption in this procedure, and an identifying

restriction throughout the paper, is that no shift in money demand unique

to New England occurred during the NOW experiment. We also assume that the

NOW experiment did not induce any substantial holdings of NOW balances by

individuals living outside the experimental region.

The primary determinants of money demand are prices, interest rates,

and income. To deflate, we use the national consumer price index.

The New England (Boston) and the United States consumer prices indices

have been almost identical throughout the NOW experiment except for 1976

when the New England index climbed above that of the U.S. for a period.

The January 1978 CPI (base 1967 = 100) stood at 186.9 for the United States

and 187.5 for New England.

Interest rate changes have no differential impact on New England and

the United States. Bond interest rates are set in a national market and

time deposit rates have been almost uniformly at the Regulation Q ceilings.

As the rates are equal in the control and experimental regions, they

disappear from the problem.

By contrast, the recession of 1974 and 1975 was far deeper in New

England than in the rest of the nation. Since the differential effect on

money demand might easily swamp the effect of the NOW account experiment,

we control for this influence by applying an estimate of the income

elasticity of money demand to the differential income growth. If the log

of real income is Y and c is the income elasticity, then

$$(IV.2) \qquad N = (M_{77}^{NE} - M_{72}^{NE}) - (M_{77}^{US} - M_{72}^{US}) - c \left[(Y_{77}^{NE} - Y_{72}^{NE}) - (Y_{77}^{US} - Y_{72}^{US}) \right]$$

Using this result, we can estimate the own-interest elasticity of the

demand for money. (Unless stated otherwise we use "money" to mean checking

plus NOW accounts. The question of other monetary aggregates is discussed

in Section X). From the viewpoint of the depositor, the advent of NOW
accounts meant an increase in the interest rate from zero to five percent.
It follows that the own-interest semi-elasticity of money demand is N/5,
holding in abeyance the possibility of offsetting changes in bank services.

The use of the controlled experiment resolves the problem of
simultaneous equations bias in this estimate. The own-interest elasticity
is the slope of the money demand curve. The introduction of NOW accounts
was an exogenous supply shift, raising the interest rate five points and
therefore sweeping out the money demand curve. Even though the institution
of interest-bearing checking accounts on a national basis would have
macroeconomic effects, if not fully accommodated by the Federal Reserve,
the impact on income and interest rates from the New England experiment is
presumably negligible.

We can find an approximate value for N by assuming that the response
of money demand to the deposit rate is equal and opposite to the response
to the market rate, and by applying the five point interest jump to
standard estimates of the interest semi-elasticity of money demand. In
equation (IV.3), we estimate a demand for demand deposit equation similar
to Goldfeld's [Goldfeld, 1976, Table 1]. The dependent variable is the log
of real gnp, the levels of the time deposit rate and the treasury bill
rate, and a lagged dependent variable to complete the Koyck specification.
The regression was estimated by iterated Cochrane-Orcutt on quarterly data
from 1953:II to 1973:IV.

(IV.3)

$$\log M = -.7443 + .1394 \log y - .0133 \ RTD - .0045 \ RTB + .7586 \log M_{-1}$$

$$rho = .45$$

The indicated long-run income elasticity is 0.577. The total long-run interest semi-elasticity, i.e., adding both interest semi-elasticities, is -0.0737. Multiplying this semi-elasticity times the five point interest rate differential and then dividing by four, since about one-fourth of New England demand deposits are held by consumers, we find that N, the percentage increase in total third-party payment balances should be on the order of 9.2 percent.

It is not clear, of course, that one can treat the experiment as if it simply raised interest rates five percent. In the absence of legal explicit interest, banks pay implicit interest by providing various services at less than cost. As changing interest rates affect the profit margin on each deposit dollar, banks partially compensate by adjusting the amount of implicit interest provided. The five-percent interest payment on NOW accounts induced banks to increase service charges to offset partially the smaller profit margin. Whether the above calculation is a proper way to estimate "the own interest" elasticity depends largely on whether banks changed the implicit interest rate on deposits in response to a five percent increase in the own rate by the same amount that they did in response to similar past change in the market rate. The problems raised by the question of implicit interest receive extended discussion in Section IX.

V.   Simple Quantitative Estimates of the Long-Run Increase in Money Demand

Simple estimates of the impact of the NOW account experiment can be made using equations IV.1 and IV.2. Since full adjustment to the presence of NOW accounts took several years, we consider only the long-run impact in this section. June 1972 and December 1977 are convenient endpoints to use

in making estimates since the former is the last FDIC call report before initiation of the NOW experiment and the latter is the most recent date for which call reports have been published by the FDIC. We treat Massachusetts and New Hampshire where NOW's first existed as one unit and the rest of New England as another unit.

Real demand deposits fell in the United States by 2.65 percent over the five year sample period. (Note: All "percent changes" are actually calculated as changes in natural logarithms). In Massachusetts and New Hampshire, the real value of actual demand deposits fell by 25.7 percent. However, the growth in real NOW accounts more than offset this decline. By 1977, real NOW balances had reached 26.4 percent of the 1972 demand deposit level. Therefore, third-party accounts in the two states rose by 3.69 percent. (The percentage changes do not add because of the difference between the log of a sum and the sum of logs). Therefore, using the simple formula IV.1, the net increase attributable to NOW accounts is 1.64 percent.

It is necessary at this point to adjust for differential income growth. During the five years, real personal income in the United States grew 16.8 percent; the increase in Massachusetts and New Hampshire was only 8.24 percent. The long-run income elasticity reported in (IV.3) is 0.577. Use of this figure in equation IV.2 indicates that money demand in the two states should have fallen by 4.94 percent relative to the rest of the nation. Thus the total increase in third party payment accounts due to the NOW experiment is 6.58 percent.

The choice of the true income elasticity has a non-trivial effect on the result. A somewhat higher income elasticity of about .7 would increase our estimate of the impact of the NOW account experiment to 7.02 percent

and the more monetarist assumption of unitary income elasticity would suggest an increase in money demand of 9.58 percent.

Our computations for the region formed by Connecticut, Maine, Rhode Island and Vermont use as a base the last call report before the advent of NOW's, December 1975. By December 1977, real demand deposits had fallen by 5.97 percent and real NOW accounts were 13.4 percent of the 1975 demand deposit base. Total third party payment accounts in the four state area rose 8.20 percent, compared to a 4.27 percent increase in the rest of the United States over the same two-year period. The use of equation IV.1 indicates that NOW accounts caused a 3.93 percent increase in third-party payment deposits. With the same three values for the income elasticity as above, the adjusted increases attributable to the NOW account experiment are 4.77 percent, 4.95 percent and 5.38 percent respectively.

VI. Econometric Estimates

The simple estimates of the preceding section are clearly limited by the paucity of data. Since monthly fluctuations in the level of demand deposits can be of the same order of magnitude as the NOW effect we are estimating, estimates based only on two observed points are not likely to be very efficient. In order to consider the trade-offs involved in different estimation methods, it is useful to cast the problem in an analysis of variance or regression framework. Assume that each observation of money demand includes an error term e_{it}, unique to the place and time, that the error is uncorrelated with the regional effect, the time effect, and the NOW effect and that the error has expectation zero. Using $\hat{N}$ and N to represent the estimate from formula IV.1 and the true NOW account effect, respectively, we have

$$\hat{N} = N + (e_{77}^{NE} - e_{72}^{NE}) - (e_{77}^{US} - e_{72}^{US})$$

If the errors are each of the same order as the NOW effect, then the estimator, while unbiased, may not be particularly accurate. We take two approaches to remedy this problem. First, we increase the number of observations to increase the efficiency of the estimator while trying several econometric techniques to achieve a more sophisticated specification. Second, we use data based on individual deposits, since the individual money demand is more directly related to the NOW account experiment. The results from this approach appear in the next section. A difficulty common to both approaches is that the data available at more frequent intervals has a larger measurement error than that drawn from the FDIC's Assets and Liabilities.

As a result of the Boston Federal Reserve Bank's careful monitoring of the NOW account experiment, the monthly NOW deposit data appears to be quite accurate. Since the call report data of Assets and Liabilities is based on the balance sheet data of all commercial banks, the deposit figures used in the previous section are probably accurate (although it is known that banks sometimes adjust their portfolios in anticipation of call reports). The monthly demand deposit data we have used is based on observations of Federal Reserve member banks only. We have blown-up this data, as described in detail in the appendix, so that it is consistent with all bank deposits by state and for the U.S. reported in Assets and Liabilities. As a result, even the best adjustments to member deposit data introduce some further error which reduces the efficiency of our econometric estimates. Nonetheless, the errors introduced with the monthly data may be more than offset by the increased sampling rate. Further,

investigation of some interesting questions about timing relies on the use of regressions which have more parameters to be estimated than would be possible without the monthly data. Therefore, we use the monthly data for our econometric estimates.

Our estimates follow the same form as the estimates from FDIC data in the previous section. We estimate a standard money demand equation jointly for the experimental area and for the United States net of the experimental area. If our assumption that the money demand schedule, except for scale, is the same in the New England area as it is in the rest of the nation is at all untrue, some inaccuracy will be introduced into our estimates.

An alternative approach might be used which would not rely on a jointly estimated money demand schedule. In principle, by assuming a stable money demand function in the experimental area over the entire sample period, we could estimate the NOW account effect by using a money demand equation for the experimental area alone which would include a dummy variable for the period of the NOW account experiment. However, deposit demand dropped across the nation more or less concurrently with the beginning of the NOW experiment. If we were to estimate the NOW account effect solely through a time series regression on the experimental area, the unexplained shift, the so-called "Case of the Missing Money" would more than swamp the NOW account effect. Using the combined time series/cross section technique, the shift washes out as long as the schedule fell proportionately in the experimental and control area.

Regression estimates of the NOW account effect are presented in Table VI-1. The dependent variable is the log of real third-party payment accounts. Independent variables are the log of real personal income and the logs of the time deposit rate and of the 3-month Treasury bill rate. The

experimental area is divided into two regions: Region 1, Massachusetts and New Hampshire, where NOW's started in September 1972 and Region 2 including Connecticut, Maine, Rhode Island and Vermont in which NOW's started in March 1976. Each regression includes a constant term and a regional dummy for each state concerned. The regression equations all take the general form of equation (VI.1).

$$(VI.1) \quad \log M_t^i = ND_t^i + c_1 \log Y_t^i + c_2 \log RTD_t + c_3 \log RTB_t$$
$$+ c + RD^i + TD_t$$

ND_t^i - dummy variables for the NOW effect

RD^i - dummy variables for the regional effect

TD_t - dummy variables for the time effect

The NOW account experiment developed gradually, especially in Massachusetts and New Hampshire. For this reason, we use a series of dummy variables to estimate the NOW effect. Five subperiods, with the last two subperiods corresponding to the experimental period for the four state area, make up the NOW account period. The number of subperiods represents a compromise between a desire to estimate the timing effect most accurately and the need to have enough months within each subperiod to estimate accurately the coefficient. Time effect dummies exactly match the NOW effect dummies, except that they apply to both the experimental and control regions.

TABLE VI-1
Third-Party Payment Balances

64:1 to 78:4	Equation 1 Mass., N.H.	Equation 2 Conn., Me., RI, Vt.
NOW Effect		
72:9 to 73:12	0.0558 (0.0176)	-
74:1 to 75:2	0.01813 (0.0194)	-
75:3 to 76:2	0.05357 (0.0194)	-
76:3 to 77:3	0.05088 (0.0194)	-0.01003 (0.0178)
77:4 to 78:4	0.06786 (0.0194)	0.00705 (0.0178)
Demand Variables		
Log y	0.9248 (0.0434)	0.6445 (0.0366)
Log RTD	-0.5632 (0.0657)	-0.05900 (0.0510)
Log TB	-0.04777 (0.0133)	-0.03521 (0.0109)
Constant	2.949 (0.397)	5.236 (0.339)
Regional Effects		
Mass.	-0.3454 (0.149)	-
N.H.	-1.016 (0.244)	-
Conn.	-	-1.827 (0.145)
Me.	-	-2.443 (0.199)
RI	-	-2.283 (0.195)
VT	-	-2.664 (0.228)
Time Effects		
72:9 to 73:12	-0.2766 (0.0158)	0.03970 (0.00827)
74:1 to 75:1	-0.05417 (0.0189)	-0.05982 (0.0111)
75:2 to 76:2	-0.1377 (0.0182)	-0.1153 (0.0103)
76:3 to 77:3	-0.1355 (0.0182)	-0.1546 (0.0175)
77:4 to 78:4	-0.1299 (0.0182)	-0.1350 (0.0175)

R-squared: 0.9996   SER: 0.054   R-squared: 0.9995   SER: 0.055

The income and interest elasticities are all of the expected size and have small confidence intervals, although the income elasticity and the time deposit rate elasticity are perhaps somewhat larger in absolute value than is usual. The shift in the money demand function, as measured by the time effect dummies, is rather large.

The regional effects for the experimental areas are negative and highly significant. While it is not surprising that there is some relative difference in money demand between New England and the rest of the United States, the population difference accounts for part of the estimated regional effect. If the true money demand equation is specified in per capita terms, with money demand and income divided by population, then the equation as we estimate it should include the term $(1-c)\log POP$, where c is the income elasticity. Since the relative population of the experimental states to the control area is almost a constant over the estimation period, the regional effect includes $(1-c)$ times the log of the ratio of state to US population. Using 1970 population figures, the regional effects for Massachusetts and New Hampshire should be -0.264 and -0.418, in equation 1. This population effect can explain most of the Massachusetts dummy, but only a small part of the New Hampshire dummy. The joint hypothesis that the population effect can account for both dummy variables can be rejected at any level of significance. Feige made the same finding in a broader time series cross section study [Feige].

The NOW effect coefficients demonstrate a large and significant increase in money demand in the last two subperiods. The estimates for the original two states are approximately the same as the point estimate done with the FDIC data. The estimated effect for the four state region is

TABLE VI-2
Third Party Payment Balances
(Shorter NOW Subperiods)

64:1 to 78:4	Equation 1 Mass., N.H.	Equation 2 Conn., Me., RI, Vt.
NOW Effect		
72:9 to 73:2	0.04778	-
	(0.0274)	
73:3 to 73:8	0.03589	-
	(0.0274)	
73:9 to 74:2	0.06977	-
	(0.0274)	
74:3 to 74:8	0.01410	-
	(0.0274)	
74:9 to 75:2	0.02109	-
	(0.0274)	
75:3 to 75:8	0.04702	-
	(0.0274)	
75:9 to 76:2	0.07013	-
	(0.0274)	
76:3 to 76:8	0.04717	-0.0028
	(0.0274)	(0.0254)
76:9 to 77:2	0.05624	-0.0082
	(0.0274)	(0.025)
77:3 to 77:8	0.05044	-0.0311
	(0.0274)	(0.0254)
77:9 to 78:4	0.07807	-0.0228
	(0.0239)	(0.0222)
Demand Variables		
log y	0.9429	0.6098
	(0.0454)	(0.0385)
log RTD	-0.6010	-0.0113
	(0.0692)	(0.0541)
log TB	-0.04759	-0.0219
	(0.0142)	(0.0117)
Constant	2.806	5.5241
	(0.411)	(0.3536)
Regional Effects		
Mass.	-0.2829	-
	(0.156)	
N.H.	-0.9145	-
	(0.255)	
Conn.	-	-1.9648
		(0.1529)
ME	-	-2.6316
		(0.2094)
RI	-	-2.8792
		(0.2400)
VT	-	-2.4676
		(0.2054)

TABLE VI-2 (continued)

	Equation 1	Equation 2
Time Effects		
72:9 to 73:2	-0.01036	0.0701
	(0.0230)	(0.0109)
73:3 to 73:8	-0.04674	0.0126
	(0.0234)	(0.0116)
73:9 to 74:2	-0.01688	-0.0064
	(0.0246)	(0.0134)
74:3 to 74:8	-0.03555	-0.0661
	(0.0252)	(0.0139)
74:3 to 75:2	-0.08929	-0.0923
	(0.0247)	(0.0135)
75:3 to 75:8	-0.1268	-0.1089
	(0.0243)	(0.0128)
75:9 to 76:2	-0.1423	-0.1300
	(0.0242)	(0.0127)
76:3 to 75:8	-0.1391	-0.1681
	(0.0241)	(0.0238)
76:9 to 77:2	-0.1257	-0.1486
	(0.0242)	(0.0238)
77:3 to 77:8	-0.1292	-0.1424
	(0.0241)	(0.0238)
77:9 to 78:4	-0.1258	-0.1344
	(0.0216)	(0.0211)

R-squared: 0.9996   SER: 0.05337   R-squared: 0.9995   SER: 0.05453

smaller than that with the FDIC data. Very small standard errors accompany the estimates of the NOW account effects (subject to the assumptions of the model). No significant effect appears in the first three subperiods, a fact which conforms directly with the observable growth in NOW's. By January 1976, almost the end of the third subperiod, NOW accounts were only 11 percent of total third party payment accounts in Massachusetts and New Hampshire. Since most NOW accounts displace demand deposits rather than add to them, the actual increase in third party payment accounts in this period was probably below the noise level in our estimates.

For the estimates reported in Table VI-2 we doubled the number of subperiods by cutting the length of each subperiod in half. The results are similar to those reported in Table VI-1. There is little evidence of any effect before September 1975 and the estimated long-run increase is 7.8 percent. The increase in third party payment balances occurred fairly smoothly. Figures III-2 (A & B) exhibit a similar smooth adoption of NOW's. Note that adjustment of demand to NOW account interest proceeded considerably more slowly than the rate of adjustment to market interest rates implied by equation (IV.3). Indeed, it is not fully clear whether the long-run equilibrium had been achieved by the end of our data sample.

There is ample evidence that money demand responds with a distributed lag to changes in income and interest rates. Goldfeld uses a Koyck distribution and reports a mean lag of approximately six months. We chose to use an Almon lag rather than a Koyck lag for several reasons. First, a Koyck lag estimation would co-mingle the lagged response to income and interest rates with the gradual response to the NOW account experiment itself. Second, since the relative income effects are important, we prefer not to constrain the lag patterns of income and interest rates to be

identical. Third, introduction of a lagged dependent variable on the right hand side opens the possibility of additional econometric problems without any compensating benefit.

Table VI-3 reports regressions using third-degree, 36 month, Almon lags. The long-run income and interest elasticities are quite similar to those estimates reported in earlier regressions. We interpret this result as confirmation of the idea that the elasticities in the regressions with contemporaneous right-hand side variables are estimates, as desired, of long-run values. The NOW effects estimated in the distributed lag regressions are approximately the same as those reported in Table VI-1.

All the preceding procedures mix the estimation of the NOW account effect with the estimation of the structural parameters of the money demand equation. In other words, we use all available data from the experimental and control regions and from both the experimental and pre-experimental periods. The most efficient statistical procedure requires the use of all available data generated by the true model.

Portions of our data may generate incorrect estimates of some of the parameters, particularly the income elasticity. The income elasticity of NOW accounts, which share some characteristics with time deposits, may be larger than the income elasticity for true demand deposits. The relevant income elasticity to adjust for what the level of deposits would have been in the absence of the experiment is the demand deposit elasticity. We have also observed that money demand equations estimated with data which includes the period of the "mysterious shift" in money demand tend to show income elasticities decidely different than previous estimates. Since our estimate of the income elasticity significantly affects our estimate of the NOW effect, we would like to use data which avoids these two problems.

TABLE VI-3
Almon Lags

64:1 to 78:4	Equation 1 Mass., N.H.	Equation 2 Conn., Me., RI, Vt.
NOW Effect		
72:9 to 73:12	0.0528	-
	(0.0150)	
74:1 to 75:2	0.0105	-
	(0.0166)	
75:3 to 76:2	0.0659	-
	(0.0194)	
76:3 to 77:3	0.0500	-0.0136
	(0.0165)	(0.0170)
77:4 to 78:4	0.0901	0.0200
	(0.0165)	(0.0171)
Demand Variables		
Sum of Coefficients for:		
Log y	1.5845	0.7825
	(0.0796)	(0.0226)
Log RTD	-1.2870	0.0292
	(0.8293)	(0.0164)
Log TB	-0.03151	-0.1830
	(0.0406)	(0.0081)
Constant	-2.7704	3.8912
	(0.7086)	(0.6538)
Regional Effects		
Mass.	1.9214	-
	(0.2664)	
N.H.	-	-
Conn.	2.6954	-1.2862
	(0.4379)	(0.2778)
Me.	-	-1.6951
		(0.3813)
RI	-	-1.5547
		(0.3765)
VT	-	-1.8003
		(0.4380)
Time Effects		
72:9 to 73:12	-0.0389	-0.0078
	(0.0210)	(0.0164)
74:1 to 75:2	-0.0072	-0.0732
	(0.0275)	(0.2259)
75:3 to 76:2	-0.0518	-0.1334
	(0.0267)	(0.0216)
76:3 to 77:3	-0.0560	-0.1876
	(0.0977)	(0.0238)
77:4 to 78:4	-0.0977	-0.1929
	(0.0291)	(0.0273)

R-squared: 0.9997   SER: 0.04518   R-squared: 0.9995   SER: 0.05001

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Since the data before the initiation of the NOW experiment is
unpolluted, we ran our demand equation on U.S. data through August 1972 to
obtain clean parameter estimates. We then used these parameter estimates
to constrain the coefficients on income and interest rates in a regression
covering the entire period. The resulting estimates of the NOW account
effect are unbiased even if the NOW experiment itself shifted the
elasticities on third-party payment accounts. Table VI-4 reports both
equations. The estimated NOW account effect is essentially the same as
previous estimates.

VII. Money Demand of Individuals

Only individuals may hold NOW accounts. The estimates in the previous
sections use gross demand deposit data which includes businesses and other
depositors as well. In fact, individuals hold only about a third of total
demand deposits. Whereas for some questions, such as the change in the
overall monetary aggregates, the total deposit figure is the relevant one,
individuals' deposits yield the most direct estimates of the NOW effect.

Although banks do not break down their balance sheets by ownership
categories, the Federal Reserve surveys banks and reports gross demand
deposit ownership based on the sample surveyed. For the nation, these
results appear in the Federal Reserve Bulletin. The Boston Federal Reserve
has made the New England survey figures available to us. Since the data on
individual deposits represents only sample results, and since large
reporting banks are sampled monthly while a broader sample is taken
quarterly, we have adjusted the raw figures to represent individuals' gross
demand deposits. The individual third-party payment accounts equal NOW's
plus these gross demand deposits. The details appear in the appendix.

TABLE VI-4

Using Constrained Income and Interest Coefficients

64:1 to 78:4	Equation 1 Mass., N.H.	Equation 2 Conn., Me., RI, Vt.
NOW Effect		
72:9 to 73:12	0.0535 (0.0209)	-
74:1 to 75:2	0.0123 (0.0229)	-
75:3 to 76:2	0.0400 (0.0229)	-
76:3 to 77:3	0.0471 (0.0229)	-0.0166 (0.0199)
77:4 to 78:4	0.0622 (0.0229)	-0.0046 (0.0199)
Constant	8.178 (0.0062)	8.161 (0.0052)
Regional Effects		
Mass.	-2.1845 (0.0083)	-
N.H.	-4.0122 (0.0083)	-
Conn.	-	-2.8313 (0.0069)
Me.	-	-3.8189 (0.0069)
RI	-	-3.6320 (0.0069)
VT	-	-4.2400 (0.0069)
Time Effects		
72:9 to 73:12	0.0334 (0.0171)	0.1045 (0.0073)
74:1 to 75:2	-0.0290 (0.0187)	0.0136 (0.0080)
75:3 to 76:2	-0.1057 (0.0187)	-0.0436 (0.0080)
76:3 to 77:3	-0.0853 (0.0187)	-0.0682 (0.0178)
77:4 to 78:4	-0.0511 (0.0187)	-0.03406 (0.0178)

R-squared: 0.9985   SER: 0.0637   R-squared: 0.9984   SER: 0.0615

Table VII-1 and Table VII-2 report the regression results of our standard equation with the timing broken down into five and eleven subperiods respectively. While the results are substantially the same, the regression using shorter subperiods yields the additional information that the NOW account effect appears to grow along a smooth path. These results should be our most accurate ones, except for the added measurement error in the sampling of deposit ownership.

The first regression in Table VII-1 shows an income elasticity of 0.88--in line with usual estimates. However, the standard errors on the interest elasticities are too large for meaningful results. The NOW account effect is trivial in the first two periods. There are two reasons. First, total NOW balances were in fact fairly small in the first year of the experiment (see Section III). Second, the percentage increase in New England is a weighted average of the increase in Massachusetts and New Hampshire and the zero change in the other four states where NOW's did not yet exist.

This understatement of the impact of the NOW account experiment occurs also in the third period. The 10 percent estimated effect probably represents an average of a 25 percent effect in Massachusetts and New Hampshire and the zero effect of the four states. The third, fourth and fifth periods show highly significant and progressively larger NOW account effects. By the end of our observation period, we estimate that personal deposits were 38 percent larger than they would have been in the absence of the experiment. The standard error of that estimate is only 4 percentage points.

Since data on demand deposits held by individuals is available for the New England region as a whole, but not on a state by state basis, the

TABLE VII-1

72:4 to 78:4   New England Individual Deposits

	OLS	GLS
NOW Effect		
72:9 to 73:12	0.0289	0.0125
	(0.0329)	(0.0271)
74:1 to 75:2	-0.0038	-0.0163
	(0.0336)	(0.0282)
75:3 to 76:2	0.0998	0.0774
	(0.0355)	(0.0300)
76:3 to 77:3	0.2725	0.2452
	(0.0355)	(0.0300)
77:4 to 78:4	0.3883	0.3534
	(0.0374)	(0.0321)
Demand Variables		
log y	0.8822	0.4537
	(0.2555)	(0.2356)
log RTD	-0.0499	0.0649
	(0.2154)	(0.2321)
log TB	0.0123	-0.0121
	(0.0411)	(0.0436)
Constant	1.1446	5.704
	(2.798)	(2.5637)
Regional Effect		
N.E.	-0.7891	-1.9508
	(0.694)	(0.6411)
Time Effects		
72:9 to 73:12	-0.0221	0.0144
	(0.0288)	(0.0264)
74:1 to 75:2	-0.0562	-0.0284
	(0.0316)	(0.0305)
75:3 to 76:2	-0.0951	-0.0720
	(0.0304)	(0.0282)
76:3 to 77:3	-0.1188	-0.0888
	(0.035)	(0.0220)
77:4 to 78:4	-0.1333	-0.0766
	(0.0425)	(0.0385)

R-squared: 0.9993   SER: 0.0440   R-squared: 0.9993

	SER	RHO
USNET	0.0431	0.0449
NE	0.0373	0.0389

TABLE VII-2

Individual Deposits
New England

72:4 to 78:4

NOW Effect

72:9 to 73:2	-0.0053 (0.0344)		75:3 to 76:8	0.0509 (0.0362)
73:3 to 73:8	0.0118 (0.0349)		76:9 to 76:2	0.1043 (0.0391)
73:9 to 74:2	0.0114 (0.0366)		76:3 to 77:8	0.1869 (0.0383)
74:3 to 74:8	-0.0173 (0.0346)		77:9 to 77:2	0.2883 (0.0365)
74:9 to 75:2	-0.0117 (0.0358)		77:3 to 77:8	0.3279 (0.0394)
			77:9 to 78:4	0.3637 (0.0383)

Demand Variables

Log y	0.3511 (0.2956) (3.329)	Constant	6.6757 (3.329)
Log RTD	0.1127 (0.3138)	Regional Effect N.E.	-2.2326 (0.8038)
Log TB	0.0486 (0.0527)		

Time Effects

72:9 to 73:2	0.0114 (0.0280)		75:3 to 76:8	-0.0888 (0.0398)
73:3 to 73:8	-0.0164 (0.0362)		76:9 to 76:2	-0.1000 (0.0429)
73:9 to 74:2	-0.0390 (0.0440)		76:3 to 77:8	-0.1043 (0.0445)
74:3 to 74:8	-0.0682 (0.0449)		77:9 to 77:2	-0.0884 (0.0477)
74:9 to 75:2	-0.0939 (0.0410)		77:3 to 77:8	-0.1086 (0.0532)
			77:9 to 78:4	-0.0768 (0.0562)

R-squared: 0.9995   SER 0.0396

simplest way to correct the underestimation of the early effects in Massachusetts and New Hampshire is to form a proxy for personal third party payment accounts in each state. Although we have gross demand deposits and NOW's for each state, we have the ratio of personal demand deposits to all demand deposits only for New England as a whole. The best assumption is that the personal to total deposit ratio in the four non-experimental states bore the same relation to the United States ratio as it did before the experiment. This assumption allows us to estimate the four state personal deposit total which we subtract from New England personal demand deposits to obtain the personal deposits in the two experimental states. This procedure is used until the initiation of NOW's in Connecticut, Maine, Rhode Island and Vermont, after which the New England ratio is applied to each state. This method obviously introduces some error into each state. However, since the level of personal deposits in the experimental region is correct. on average, the estimated coefficients ought to be more or less unbiased. Table VII-3 reports the regression results using total third-party payments by state equal to personal deposits plus NOW's.

The strength of our econometric results based on deposits owned by individuals stands in sharp contrast to our regressions based on all deposits. This is as expected, since only individually owned-accounts are eligible to participate in the NOW experiment. No significant increase in individual holdings of checkable accounts existed during the first 15 months of the experiment. By the end of our data period, the NOW experiment was responsible for a 35 to 40 percent increase in third party payment balances held by individuals. It also appears that the original Massachusetts and New Hampshire region maintained a larger NOW account effect than the other four states. However, the strength of this conclusion must be tempered somewhat in light of probable inaccuracies in our method of attributing individual demand deposit balances to the various states.

Table VII-3

Individual Balances
Six New England States

72:4 to 78:4	OLS	GLS
NOW Effect		
72:9 to 73:12	0.0268	0.0171
	(0.0404)	(0.0257)
74:1 to 75:2	0.1102	0.0927
	(0.0417)	(0.0321)
75:3 to 76:2	0.3085	0.1960
	(0.0417)	(0.0348)
76:3 to 77:3	0.5837	0.3775
	(0.0493)	(0.0406)
77:4 to 78:4	0.7175	0.4189
	(0.0493)	(0.0435)
76:3 to 77:3*	-0.5204	-0.3585
	(0.0421)	(0.0378)
77:4 to 78:4*	-0.4512	-0.3421)
	(0.0420)	(0.0402)
Demand Variables		
log y	1.6012	0.5535
	(0.1533)	(0.1186)
log RTD	-0.0308	0.2829
	(0.2472)	(0.2514)
log TB	-0.0057	-0.0498
	(0.0454)	(0.0450)
Constant	-6.7359	4.5598
	(1.724)	(1.3297)
Regional Effects		
Conn.	1.7475	-2.4883
	(0.6144)	(0.4744)
Maine	2.5637	-3.1834
	(0.833)	(0.6445)
Mass.	1.6781	-1.9352
	(0.5346)	(0.4105)
N.H.	2.5502	-3.2838
	(0.8538)	(0.6585)
R.I.	2.6959	-3.0045
	(0.8244)	(0.6373)
Vt.	3.0677	-3.5347
	(0.9553)	(0.7389)
Time Effects		
72:9 to 73:12	-0.0375	0.0163
	(0.0279)	(0.0269)
74:1 to 75:2	-0.1233	-0.0427
	(0.0331)	(0.0335)

Table VII-3 (continued)

75:3 to 76:2	-0.1485	-0.0873
	(0.0301)	(0.0310)
76:3 to 77:3	-0.1884	-0.1277
	(0.0416)	(0.0323)
77:4 to 78:4	-0.2407	-0.1021
	(0.0433)	(0.0339)

R-squared: 0.9982 SER: 0.09438 R-squared: 0.9994

	SER	RHO
USNET	0.0471	0.0707
Conn.	0.0492	0.7821
Maine	0.0527	0.8384
N.H.	0.0580	0.8213
R.I.	0.0519	0.8662
Vt.	0.0569	0.8295

*Coefficients of dummies unique to the four state region which show the difference between them and the two state region. Thus, the coefficients indicate that the NOW effect in the last period for Massachusetts and New Hampshire was 0.7175 while that for the other 4 states was 0.2663 or 0.4512 below that of the 2 states.

We have assumed homoskedastic errors throughout. It seems unlikely that the error terms are truly independently and identically distributed. Even though ordinary least squares estimates are unbiased, a generalized least squares approach is more efficient and also leads to correctly reported standard errors. In the second column of Tables VII-1 and VII-3, we report generalized least squares results. The stochastic specification allowed for a cross-sectionally heteroskedastic, serially correlated, and contemporaneously correlated error structure. The results are quite similar to those found in the ordinary least squares results. (We ran similar tests on total, as opposed to individual, third party payment accounts. The point estimates of the NOW account effects were smaller than the ordinary least squares results and had large standard errors. As a result, the estimates were not significantly different from either zero or from the OLS results.)

VIII. Summary of money demand measurements

We have produced essentially three estimates of the "NOW account effect", the increase in third-party payment accounts due to the payment of interest in New England. The first estimate was of the increase in gross demand deposits plus NOW's of individuals, partnerships, and corporations using call reports before and after the experiment. The second estimate used monthly data on gross demand deposits plus NOW's. The third used monthly, survey-based data on personal demand deposits, plus NOW's. We employed each basic data source for several variants of the basic measurement. In this section, we review the general results and discuss the accuracy of our estimates.

In Section IV we calculated that the increase in gross demand deposits should be 9.2 percent, based on an estimate of the market semi-elasticity. Such an increase corresponds approximately to a 37 percent increase in personal deposits. The estimates from the call reports showed an increase in Massachusetts and New Hampshire of between 6.6 and 9.6 percent. The indicated increase in the shorter experimental period for Connecticut, Maine, Rhode Island, and Vermont was from 4.8 to 5.4 percent. Ordinary least squares regressions on the monthly gross demand deposit data show that the NOW account effect in Massachusetts and New Hampshire reached about 6.9 percent with a reported standard error of 1.9 percent. A very general stochastic specification reduced the point estimate to nearly zero and increased the standard error to 2.3 percent. Ordinary least square regressions on the other four New England states show no appreciable NOW account effect with a standard error of 1.8 percent. Regressions on the personal deposit data show an increase of 38 percent with an associated standard error of 4 percent. Regressions allowing for a very general stochastic specification produce the same result.

We can conclude that the NOW account effect measured against total deposits was small. Even if the true effect is two standard errors above the point estimates, the total increase in money demand is no more than 10 percent. Even a 10 percent increase, when due to such a large, 5 point, interest increase, must be considered very small. This increase took several years to develop. No change in interest payments limited to personal demand deposits is going to change aggregate money demand drastically.

The NOW account effect on personal deposits is much more clearly established, with a "t-statistic" of ten. As an interest elasticity this

effect, too, is modest. Even the estimated 40 percent increase in demand, relative to such a large interest rate increase, indicates a highly inelastic demand for money. If, on the other hand, general extension of the experiment caused a 40 percent increase in overall money demand, the effect on the economy would be most dramatic, unless adequately accommodated by the monetary authorities.

It is hardly surprising that the NOW effect shows up so much more clearly when the analysis is limited to those agents who may hold NOW accounts. A relatively small shift in business deposit demand in the United States versus New England is enough to swamp the NOW account effect. It is also not surprising that the use of monthly data does not add very much power to our tests. The month-to-month variation in deposits is great. The standard deviation of deposits around an exponential trend, was 5.8 percent for the United States and 12 percent for Massachusetts, in our sample. In other words, the typical monthly fluctuation in reported deposits is as large as the effect we are trying to detect.

IX. Estimates of the Own-Interest Elasticity of Money Demand

The NOW account experiment is the first, recent significant case of interest-bearing demand deposits. Having observed an N percent increase in deposits due to an increase in the deposit interest rate from zero to r_D, we calculate the own-interest semi-elasticity to be N/r_D.

Before the NOW account experiment, banks generally paid interest on deposits through the provision of free services. The observed N percent increase in deposits is due to the combination of the increase in explicit interest and the partially offsetting effect of the decrease in "implicit interest".

Measuring the increase in explicit interest is considerably easier than measuring the decrease in implicit interest. The notion of the own-interest elasticity is used to answer two different questions. First, how much would deposits increase if the NOW experiment were to be extended by a one-point, additional increase in the rate on NOW accounts, all other explicit rates held constant. The second question is, how much would deposits increase if the NOW account rate were to increase one percent holding explicit market and implicit deposit rates constant, as in a regime where implicit interest was replaced by marginal cost pricing?

The Regulation Q ceiling limits NOW accounts interest to a five percent maximum. This rate is essentially the effective rate as well. Although some banks experimented with lower rates, the mean rate has been about 4.95 percent. Using the results of the regressions of individual accounts, the semi-elasticity implied is 0.0776

To show just what we have and have not measured, we consider a deposit demand equation which includes both observable and unobservable elements. In equation (IX.1) r_x, r_m, and r are the explicit interest rate on deposits, the implicit rate on deposits, and the market interest rate respectively. Other arguments are omitted.

(IX.1) $\log D = a_x r_x + a_m r_m - ar$

The implicit rate r_m is generally unobservable and its coefficient a_m is generally inestimable. (For some exceptions, see [Becker], [Santomero], and [Startz]). Until the advent of NOW accounts, the explicit rate was zero. Suppose for simplicity that the implicit rate has been proportional to the market rate, as in (IX.2), where $0 \leq \beta_1 \leq 1$ and δ is the fraction of deposits available for investment after reserve requirements are satisfied.

(IX.2) $r_m = \beta_1 \delta r$

The estimate usually reported for the interest semi-elasticity is really an estimate of $a_m \beta_1 \delta - a$ rather than of just a. Analogously, our estimate of N is not $a_x r_x$, but rather $a_x r_x + a_m \Delta r_m$, where Δr_m is the (negative) change in implicit interest which partially offsets the explicit payments.

Our first question about the impact of an increase in the ceiling on explicit payments can be answered directly if we assume that the drop in implicit interest is proportional to the increase in the explicit rate, as in (IX.3)

(IX.3) $r_m = \beta_1 \delta r - \beta_2 r_x$

Our reported semi-elasticity is actually $a_x - \beta_2 a_m$. This reported estimate is also the correct estimate for considering how much deposits will increase with a further increase in the deposit rate.

If the Regulation Q ceiling were abolished rather than simply raised, we might expect to see implicit interest largely disappear in favor of marginal cost pricing. To predict in advance the behavior of money demand in such a world, it would be convenient to have an estimate of a_x not confounded by the contribution of implicit interest. [Santomero] reports regression results which indicate a value of a_m in the neighborhood of 0.1 to 0.2. By combining Santomero's estimate of the implicit interest semi-elasticity with data on the actual change in implicit interest, we can indirectly estimate the semi-elasticity of explicit interest, a_x.

Two different estimates of the change in implicit interest are available. The first is a direct estimate based on the Functional Cost Analysis program of the Federal Reserve System. The second is based on NOW account service charge revenue data collected by the Boston Federal Reserve Bank.

Estimates of the costs and revenues associated with NOW accounts and regular personal checking accounts are made annually as part of the Functional Cost Analysis program of the Federal Reserve. The data, intended as a guide for bank management, is not perfectly comparable across time and regions, but probably represents the most successful effort to attribute total bank costs directly to the various bank services. Table IX-1 shows estimates for personal accounts in New England and the United States in 1972, for NOW accounts in New England and for personal accounts in the United States in 1977. (The U.S. figures include New England).

TABLE IX-1

Implicit Interest on Personal Checking
(Annual Percentage Rates)

| | New England | | National | |
	1972	1977	1972	1977
Gross Expenses	6.19	2.12	4.29	6.82
Service Charge Revenue	2.52	0.21	1.60	1.71
Net Expenses (r_m)	3.67	1.91	2.69	5.11
Explicit Interest (r_x)	-	4.79	-	0.14

Source: Functional Cost Analysis, 1972 and 1977. (See appendix note).

As with relative changes in income in earlier sections of the paper, we need to find the relative change in implicit interest in the experimental and control areas. In New England, implicit interest fell by 1.76 points, while nationally it rose by 2.42 points. The relative change, 4.18 points, is undoubtedly too large for the reasons indicated below. Depending on the value chosen for a_m, the value of $a_m \Delta r_x$ is -0.42 to -0.84. Using 0.39 as the total NOW account effect and 5.0 as the explicit interest rate, the value of the explicit interest semi-elasticity is 0.16 to 0.25. Note that these figures correspond to elasticities, taken around 5 percent, of 0.81 and 1.2, respectively.

The calculation of implicit interest is complicated considerably by the fact that implicit interest is not paid by supplying services proportional to balances. The implicit interest rate, net expenses per account divided by average account size, can be large either if services are large or balances are small. In 1972, the average New England account was about 80 percent as large as the national average account. In 1977, NOW accounts were 275 percent as large as the national average. Suppose we were to make the extreme assumption that the numerator of the implicit rate, net service costs, is the true measure of implicit interest. The measures of implicit interest reported in Table IX-1 would have to be adjusted to reflect the size of New England versus U.S. accounts. The resultant drop in implicit interest in New England versus the entire nation is indistinguishable from zero. The explicit interest semi-elasticity would be about 0.08.

Although evidence on the relative changes in implicit interest payments in New England versus the United States is limited, it points strongly toward a conclusion that very little relative change occurred. The FCA survey includes estimates of activity directly in terms of the

number of checks and deposits per account. Nationally, activity was about
equal to that in New England before the experiment and was about eleven
percent greater than that in New England by 1977. These figures probably
contain substantial measurement error. Nationally, gross expenses per
account were about two percent more than in New England in 1972 and about
twenty percent more in 1977. The net expense figures were five percent
higher for the U.S. than New England in 1972 and equivalent in 1977.

The appropriate economic measurement is probably some compromise
between net expenses per dollar and net expenses per account. Casual
observation suggests that implicit interest has not fallen in New England
relative to the United States. A study by Kimball, [Kimball, especially
section III], on New England bank profitability, provides some concurring
evidence. New England banks, especially in the Boston area, continue to
offer consumer oriented services which compare favorably with other areas
of the country. If anything, New England banks have lowered service charge
schedules more aggressively. Despite much publicity about the elimination
of free NOW accounts, collected service charges on NOW accounts remain
negligible. Boston Federal Reserve figures show service charge collections
running at about a 25 basis point annual rate as late as August 1978. To
some extent, larger NOW balances may indicate opportunity costs for
consumers. Even those banks which impose minimum balance requirements
typically set those minimum levels well below the average size of NOW
accounts.

Inconclusive as the evidence may be, a guess of a half-point drop in
implicit interest due to the NOW account experiment seems more reasonable
than a four point drop. A reasonable estimate for the semi-elasticity of
demand deposits with respect to the explicit own-interest rate, a_x, is then
0.09. Thus the elasticity of deposit demand with respect to explicit deposit
interest, evaluated at the 5 percent ceiling, is a little under one-half.

X. Implications of interest bearing accounts for the conduct of monetary policy

How should the Federal Reserve change its conduct of monetary policy with the initiation of automatic transfer accounts? These new accounts are in most, but not all, ways the same as NOW accounts. The New England experiment at least provides guidelines.

Adoption of interest bearing checking accounts takes time. Two years after commercial banks received authority to issue NOW accounts in Mssachusetts, NOW's had reached about 10 percent of gross demand deposits. Two years after NOW's were authorized in Connecticut, they had reached about 12.5 percent of gross demand deposits. By this later date, April 1978, NOW's in Massachusetts were almost thirty percent of gross demand deposits. Interest bearing deposits grew slowly, but now constitute a major fraction of total deposits.

The best organization for a discussion of the conduct of monetary policy centers on the demands for the various monetary aggregates. First, we discuss the demand for bank reserves and, second, we look at rules controlling M_1 and higher aggregates (current, rather than reformed, definitions). A more extended discussion may be found in [Tatom].

The demand for bank reserves can be expected to fall sharply. Consider first the case in which all personal deposits converted to NOW's, or the equivalent, and in which there is no increase in checkable accounts from other assets. For a member bank, the average reserve requirement against a true demand deposit is approximately 13 percent, while that against NOW's, technically savings deposits, is only 3 percent. Since individuals hold

about one-third of demand deposits, conversion would lower reserves required against checkable accounts by one-quarter. Since reserves against demand deposits are approximately three-quarters of total bank reserves, one would expect the demand for reserves by banks to fall by about 20 percent. Unless the central bank accommodates this drop, a large, unintended expansion will occur. By the same token, one should not interpret a contraction of bank reserves, intended to accommodate the change in demand, as an attempt to contract the money supply.

If we take 7 percent as the best estimate of the likely increase in third party payment accounts due to the experiment and if the increase comes totally from assets not presently subject to reserve requirements, then the demand for bank reserves would increase about 1.2 percent. However, since some part of the increase comes from time and savings deposits already subject to reserves at the 3 percent rate, this small offsetting effect would be even smaller.

An additional possibility for large changes in reserve demand stems from the peculiar reserve structure of our banking system. Institutions, similar from the viewpoint of the public, face very different reserve requirements so that movements from one type of institution to another cause changes in reserve demand. Moreover, the increase in third party payment powers for thrifts reduces the distinction between thrifts and commercial banks. In New England, thrifts started NOW accounts and held 35 percent of NOW balances as of April 1978. Any money transferred from member banks to thrifts lowered the demand for reserves against these deposits to zero.

Transfers of funds in the other direction however, from thrifts to commercial banks, would raise the demand for reserves. The newly

authorized "automatic transfer" service are somewhat different from NOW's. The primary difference is that the new service is limited to commercial banks. This distinction gives commercial banks a great competitive advantage over thrifts.

Evidence from the New England experiment suggests that some consumers moved their regular savings accounts from thrifts to commercial banks, despite the thrifts offering of NOW's. This suggests that people have tended to consolidate their accounts in commercial banks more than in thrifts. Such shifts would have raised the demand for bank reserves. With automatic transfers available only in commercial banks, commercial banks will not lose checking deposits to thrifts. To the extent that consolidation of accounts in commercial banks occurs, the demand for bank reserves will rise.

The fact that nonmember banks do not hold reserves at the Fed introduces another complication. It has been suggested that the introduction of NOW's hastened the decline in membership. One explanation given is that lower profit margins have induced banks to lower costs. Banks previously able to absorb the costs of membership no longer can do so. A suggested second, related, cause is that the introduction of interest-bearing accounts encourages managements to review their entire cost structure. Banks which might have left the Fed eventually, do so immediately. Working in the other direction is the fact that the lower reserve requirement on NOW's reduces the prime burden of Fed membership, non-interest bearing reserves.

The Federal Reserve Board lacks the authority to allow NOW's nationwide. It remains to be seen whether there is an economic as well as a legal distinction between NOW and automatic transfer accounts. Conceivably,

there could be a nontrivial cost to making the "transfer" between savings
and checking. It is also possible that consumer confusion about the new
accounts could slow adoption. (Congress has given permission, for no
apparent logical reason, for NOW accounts for Federally chartered banks in
New York State. Some of these banks have announced plans to offer NOW's
instead of the automatic transfer plan.)

Changes in broader monetary aggregates will be less dramatic, but
still substantial. We discuss the expected changes first and some new
problems of measurement second.

Traditionally, the most important monetary aggregate has been M_1. Our
estimates indicate that total checkable accounts in New England rose by
about seven percent. Assuming that the increase takes place over a couple
of years, failure by the central bank to accommodate this increase in money
demand would cause a large economic contraction. Therefore, one should not
interpret a gradual increase in the money supply for the purposes of
accommodating the change in demand as inflationary policy. (Note that we
implicitly assume that little of the increase in checkable accounts
displaces public currency holdings.)

Individuals hold a smaller fraction of total demand deposits in New
England than in the rest of the nation, about one-fourth versus one-third.
If our 38 percent estimate of the increase in individual accounts is
accurate, then the national increase in checkable accounts ought to be
closer to 12 percent than to 7 percent. A very substantial increase in
checkable accounts is therefore possible.

The increase in M_2 is clearly going to be much smaller than the in-
crease in M_1, as shifts from regular commercial bank savings deposits into
NOW's do not affect M_2. The change in M_3 will be even smaller, a _fortiori_.

As a result, the central bank should be looking at a broader monetary aggregate during the transition period than it usually does. By extension, this may be a relatively good time to stress interest rate targets rather than money supply targets.

The national availability of automatic transfer and NOW accounts eliminates the usefulness of some of the conventional monetary aggregates. In recognition of this problem, the Federal Reserve has proposed a redefined set of monetary aggregates. (See January 1979 Federal Reserve Bulletin). These new definitions are superior to the conventional ones, but the best possible new aggregate cannot be perfectly comparable to an aggregate defined before the introduction of interest-bearing transaction balances. Special caution ought to be used in interpreting growth rates of the new aggregates during the transition period while the public and banks learn about and adapt to the new types of deposits.

The changes in monetary policy we have discussed here all assume that while the deposit rate is changed from zero to five percent, it continues to be held at five percent by regulation and is not allowed to respond to market interest rates. As long as Regulation Q remains in force, the interest rate on checkable accounts remains fixed. If the interest rate ceiling were to be removed, then the deposit rate would vary with market interest rates, substantially changing the rules of monetary policy. (Essentially, the LM curve would become more vertical in real income, market interest rate space.) Regulation Q is currently scheduled to expire in several years. However, it has been "shortly" about to expire for quite some time now. There may not be any real reason to think the restriction actually will be lifted in the near future.

In summary, the Federal Reserve should be prepared to accommodate simultaneously a large decrease in the demand for bank reserves and a more moderate increase in the demand for money. Considerable uncertainty will accompany these changes, particularly with respect to timing. Adoption of interest rate targets may be the best course of action for the Fed.

XI. Concluding Remarks

Perhaps our results are most noteworthy for their general compatibility with the conventional predictions of economic theory. Our measured values of the NOW account effect are quite close to a`priori predictions based on known interest elasticities. The estimated forty percent increase in checkable balances is large on an absolute scale, but modest relative to the change in interest rates which induced the shift. The only serious puzzle is why individual holdings of regular demand deposits continue to be so high.

Automatic transfer authorization extends a version of the NOW experiment throughout the nation. The changes in the various monetary aggregates, except bank reserves, will be small on an absolute scale, but large relative to typical annual rates of change in the aggregates. The monetary authorities must attempt to accommodate these shifts, especially in the demand for bank reserves, to avoid unintended expansion or contraction of the economy.

Appendix
Notes on Data and Variables

Data:

All data is in millions of 1967 dollars, is not seasonally
adjusted, and is monthly. All series, unless otherwise
specified, have been collected for the United States and the six
New England states (Connecticut, Massachusetts, Maine, New
Hampshire, Rhode Island, and Vermont). Data for New England as a
whole, unless otherwise specified, represents the sum of data for
the six New England states. Data for 'USNET' equals the total
for the United States minus that of New England.

1) Demand Deposits: Period = 1964:1 to 1978:4. Available data is
for gross demand deposits net of Items in Process of Collection
for a sample of banks belonging to the Federal Reserve System.
The Federal Reserve Bank of Boston, which provided the data,
adjusts the raw data for the size of the 'current sample' of
member banks. The data shows deposits of a representative sample
adjusted over time. Therefore, unadjusted for all members, the
data is uninformative.

Since the data is for some Member Banks only, adjustments were
made to create series representative of All Commercial Banks. The
demand deposits of the Member Bank sample were divided by the
percentage they represented of All Commercial Bank demand
deposits. These percentages were obtained yearly by taking the
average of June and December Member Bank demand deposits for the
United States and the six states individually and dividing it by
the appropriate average of June and December Commercial Bank
demand deposits. Source = Assets and Liabilities of All
Commercial Banks and Mutual Savings Banks, Federal Deposit
Insurance Corporation. The use of these adjustment factors
assumes that the deposits of Mutual Savings Banks not in the Fed
'sample' varied in the same manner as those in the 'sample.'

2) NOW accounts: NOW accounts are held in Commercial Banks (Member
and non-member), Mutual Savings Banks, Savings and Loan Associa-
tions and Cooperatives. Authority for issuing NOW accounts was
granted by the Comptroller of the Currency to institutions in
Massachusetts in September 1972. Mutual Savings Banks started
NOWs in Massachusetts in January 1974 along with Savings and Loan
Associations and Cooperatives. Nonmember Commercial Banks and
three Member Banks in New Hampshire offered NOWs also as of
January 1974. Savings and Loan Associations started in March
1974 and the remaining Member Commercial Banks in June 1975.
Connecticut, Maine, Rhode Island, and Vermont received permission
to offer NOW accounts in March 1976.

The period covered for NOW accounts in New England,
Massachusetts, and New Hampshire runs from 1972:9 to 1978:4 and
for the other four states from 1976:3 to 1978:4.

Data for NOW accounts held in Commercial Banks exists for New
England (separately), Massachusetts, New Hampshire, Connecticut,
and Maine. The Federal Reserve Bank of Boston sample does not
include banks in Rhode Island and Vermont. In Rhode Island, the
Commercial Banks are owned by Mutual Savings and tended not to
offer NOWs.

3) Demand Deposits held by Individuals: Period = 1972:4 to 1978:4
    Data, provided by the Federal Reserve Bank of Boston, exists for
    the Individual component of demand deposits held by Individuals,
    Partnerships and Corporations for New England only. Monthly data
    exists only for a sample of Weekly Reporting Banks (i.e., some
    Member Banks of the First FR District). Quarterly individual
    data exists for a sample of All Commercial Banks, the sample
    included some Member banks of the First FR District. In neither
    case did the Federal Reserve Bank of Boston adjust the sample
    data to estimate holdings in All Commercial Banks. However, the
    Board of Governors makes such an adjustment to create the
    quarterly series of Individual Deposits and of the total of
    Individuals, Partnerships and Corporations for All Commercial
    Banks in the United States and publishes these series in the
    Federal Reserve Bulletin.

    Although it is impossible to create a comprehensive series from
    the existing New England data, one can estimate one for New
    England (and the six states separately). The Board publishes
    monthly Individual and IPC data for All Weekly Reporting Bank
    (AWRB), a subset of all members and of All Commercial Banks
    (ACB). Since the quarterly series are derived from adjustments
    made to estimated deposits for all commercial banks, they can be
    used to adjust the monthly data of AWRB to be all inclusive. The
    ratio of the quarterly figure for ACB to a quarterly average of 3
    months of deposits of AWRB is used to adjust the monthly series
    upward. This adjustment is made each quarter to IPC deposits as
    a first step.

    Second, the monthly ratio of the estimated IPC series (in real
    terms) to Gross Demand Deposits for All Commercial Banks in the
    United States (in real terms) is calculated. Third, this ratio
    is multiplied times Gross Demand Deposits for All Commercial
    Banks in New England (and the six states) to generate a series of
    IPC deposits for New England (and the six states). This process
    assumes that the fraction of IPC demand deposits to gross demand
    deposits in the U.S., New England, and the six states are not
    significantly different. If they are, the estimated series over-
    state or understate total IPC deposits. Fourth, a quarterly
    ratio of Individual Demand deposits to IPC demand deposits, from
    the existing New England data, is used monthly, multiplied times
    the estimate IPC deposits to estimate Individual demand deposits
    for New England as a whole and for the six states after 1976:3.
    To calculate the states' series before 1976:3 the following steps
    were taken. For Conn., Me. RI., and Vt., the average ratio of
    individual to IPC deposits for the U.S. prior to 1972:9 was used
    to estimate individual from IPC deposits by states from 1972:9 to

1976:2. Their sum, subtracted from total New England individual deposits equals those of Massachusetts and New Hampshire. The ratio of the Gross Demand Deposits of New Hampshire to the sum of the two was used to obtain the individual state series.

4) Time Deposits: Period = 1968:1 to 1978:4. Time deposits equals the sum of Savings and Club Deposits and other Time Deposits of FRS Member Commercial Banks. Source: Federal Reserve Bank of Boston. Since these deposits are for a sample of members only, they must be adjusted to represent those of All Commercial Banks. The adjustment consists of dividing Member Time Deposits by the percentage of All Commercial Bank Time Deposits which they represent. These ratios, calculated annually, equal the average for All Commercial Bank Time Deposits (United States and six New England). The data for all banks comes from Assets and Liabilities of All Commercial Banks and Mutual Savings Banks FDIC.

5) Negotiable Certificates of Deposit: Period: 1968:1 to 1978:4. The above Time Deposit totals include Negotiable Certificates of Deposit (NCD's) which are negotiable assets of more than $100,000. Source: For New England, Federal Reserve Bank of Boston; for the United States, Data Resources, Inc. The data is unobtainable for the six New England states.

6) Savings Deposits of Savings and Loan Associations: Period: 1969:1 to 1978:4. Includes savings at greater than or equal to the regular passbook rate. Source: Monthly Financial Data: FSLIC (Federal Savings & Loan Insurance Corporation) Insured S&L's. Federal Loan Bank Board

7) Savings and Time Deposits of Mutual Savings Banks: Period: 1969:1 to 1978:4. Source of U.S. and New England states except Massachusetts is the Federal Reserve Bank of Boston. Source for Massachusetts is 'Blue Sheets' of the Massachusetts Mutual Savings Central Fund.

The Fed data represents deposits of only a sample of Mutual Savings Banks for the five of the New England states. The figures for the U.S. represent the totals of all Mutual Savings Banks in the U.S. The deposit totals for Massachusetts are those of all Mutual Savings Banks, those insured by the State of Massachusetts plus those insured by the Federal Deposit Insurance Corporation.

To make the five New England state data representative for all Mutual Savings Banks, it was necessary to adjust the deposit totals upwards. The adjustment was made by dividing individual state deposits by the percentage of all Mutual Savings Bank deposits that they represented in that state. The adjustment factors were obtained annually by taking the ratio of the 'sample' deposits to all Mutual Savings Deposits (FDIC - Assets & Liabilities of All Commercial Banks and Mutual Savings Banks) in June and December and by averaging these two.

The use of these adjustment factors assumes that the deposits of Mutual Savings Banks not in the Fed 'sample' varied in the same manner as those in the 'sample'.

8) Income: Period = 1961:1 to 1978:4. Personal Income at a monthly rate. Source: McGraw-Hill Publishing Co. This series is the base for the Personal Income Series published by the Federal Reserve Bank of Boston in the New England Economic Indicators.

9) Treasury Bill Rate: Period = 1961:1 to 1978:4. Source: Data Resources, Inc.

10) Savings Deposit Rate: Period = 1961:1 to 1978:4. Interest rate paid on Savings Deposits by Commercial Banks. Source: MPS Data Bank, Massachusetts Institute of Technology.

Variables:
1) Dependent Variables used in Regressions Total (Expressed in Logs)

1) Third Party Payment deposits (TPP): Period = 1964:1 to 1978:4. Total accounts upon which checks may be drawn equal the sum of Gross Demand Deposits and Now Accounts (Negotiable order of withdrawal) held in S&L's, MSB's & Comm. Banks. Series for the six New England states and the U.S. net of New England (USNET).

2) Total Individual Demand Deposits (TIND): Period = 1972:4 to 1978:4. For the U.S. where there are no NOW accounts, total Individual third party payment deposits equals Individual Demand Deposits. For New England, the total equals the sum of Individual Demand Deposits and Now accounts held in Savings and Loan Associations, Mutual Savings Banks and Commercial Banks. There are no deposit series for the six New England states individually.

Dummy Variables
1) Regional Dummies
Regions: USNET, Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont.
Dummies exist for the inclusion/noninclusion of a particular region. A regional dummy equals one when the pooled regression runs for that region but equals zero when the regression runs for another included region. Eg., RDMASSMASS = 1, RDNHMASS = 0, RDUSNETMASS = 0, RDMASSNH = 0, RDMASSUSNET = 0.

2) Dummies for existence of NOW accounts.
Period of NOW accounts (N.E., Mass., N.H.) 1972: 9 to 1978:4.
Period of NOW accounts (Conn., Maine, R.I., N.H.) 1976:3 to 1978:4.

Regressions using five subperiods of NOW accounts.

A) NOW account dummies for five periods are used. NOW account dummies = 0 everywhere, 1964:1 to 1978:4 except for one period when = 1. The first period coincides with the be-

ginning of NOW accounts in Massachusetts, New Hampshire, and New England. The fourth period marks the beginning of NOW accounts in Connecticut, Maine, Rhode Island, and Vermont.

Values of NOW account Dummies

Period	Regions (Mass., N.H., N.E.)	(Conn., Maine, R.I., Vt.)
1972:9 to 1973:12	NOWD1 = 1	NOWD1 = 0
1974:1 to 1975:1	NOWD2 = 1	NOWD2 = 0
1975:2 to 1976:2	NOWD3 = 1	NOWD3 = 0
1976:3 to 1977:3	NOWD4 = 1	NOWD4 = 1
1977:4 to 1978:4	NOWD5 = 1	NOWD5 = 1

The NOW dummy for Region = USNET equals zero everywhere. An additional set of dummies is used in the regressions involving all seven regions for the 4 states (Conn., Maine, R.I., Vt.) exist for the period 1976:3 to 1978:4 to measure differences in behavior compared to Mass. and N.H. The value of these dummies equal zero except in one period: NO 2D4 = 1 < 1976:3 to 1977:3 >; NOW2D5 = 1 < 1977:4 to 1978:4
Each dummy = 1 for one subperiod and zero everywhere else.

Values of NOW account Dummies

Period	Regions (Mass., N.H., N.E.)	(Conn., Maine, R.I., Vt.)
1972:9 to 1973:2	NOWDD1 = 1	NOWDD1 = 0
1973:3 to 1973:8	NOWDD2 = 1	NOWDD2 = 0
1973:9 to 1974:2	NOWDD3 = 1	NOWDD3 = 0
1974:3 to 1974:8	NOWDD4 = 1	NOWDD4 = 0
1974:9 to 1975:2	NOWDD5 = 1	NOWDD6 = 0
1975:9 to 1976:2	NOWDD6 = 1	NOWDD7 = 0
1976:3 to 1976:4	NOWDD7 = 1	NOWDD8 = 1
1976:9 to 1977:2	NOWDD8 = 1	NOWDD9 = 1
1977:3 to 1977:8	NOWDD10 = 1	NOWDD10 = 1
1977:9 to 1978:4	NOWDD11 = 1	NOWDD11 = 1

The NOW dummy for Region = USNET = 9 everywhere.

An additional set of dummies is used in the regressions involving all seven regions for the 4 states (Conn., Maine, R.I., Vt.) which started NOW accounts in 1976:3 to measure behavioral differences compared to Massachusetts and New Hampshire. The values of these dummies equal zero except for one of the four periods after 1976:3 (NOW2DD8 = 1 < 1976:3 to 1976:8 >; NOW2DD9 = 1 < 1977:2 >; NOW2DD10 = 1 < 1977:3 to 1977:8 >; NOW2DD11 = 1 < 1977:9 to 1978:3 >).

3) Time Dummies

Time dummies are used for all regions to account for the non-existence and then existence of NOW accounts over time. These dummies are included to pick up the effects on the dependent variable of factors, other than the introduction of NOW accounts, which occur during the same period and would affect all regions.

A) Regressions using five subperiods of NOW accounts.

Period	USNET and 6 states
1972:9 to 1973:12	TimeD1 = 1
1974:1 to 1975:1	TimeD2 = 1
1975:2 to 1976:2	TimeD3 = 1
1976:7 to 1977:3	TimeD4 = 1
1977:4 to 1978:4	TimeD5 = 1

The dummies, TimeD1, 2, 3, 4, 5 equal zero everywhere except in the one period shown above.

B) Regressions using eleven subperiods of NOW accounts.

Period	USNET and 6 states
1972:9 to 1973:2	TimeDD1 = 1
1973:3 to 1973:8	TimeDD2 = 1
1973:9 to 1974:2	TimeDD3 = 1
1974:2 to 1974:8	TimeDD4 = 1
1974:9 to 1975:2	TimeDD5 = 1
1975:3 to 1976:8	TimeDD6 = 1
1975:9 to 1976:2	TimeDD7 = 1
1976:3 to 1976:8	TimeDD8 = 1
1976:9 to 1977:2	TimeDD9 = 1
1977:3 to 1977:8	TimeDD10 = 1
1977:9 to 1978:4	TimeDD11 = 1

The dummies, TimeD1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 equal zero everywhere except in the one period shown above.

Note on Money Supply Aggregates.

M_1: Averages of daily figures for (1) demand deposits of commercial banks other than domestic interbank and U. S. Government, less cash items in process of collection and F.R. float; (2) foreign demand balances at F.R. Banks; and (3) currency outside the Treasury, F.R. Banks, and vaults of commercial banks.

M_2: Averages of daily figure for M_1 plus savings deposits, time deposits open account, and time certificates other than negotiable CD's of $100,000 of large weekly reporting banks.

M_3: M_2 plus mutual savings bank deposits, savings and loan shares, and credit union shares (nonbank thrift).

M_4: M_2 plus large negotiable CD's.

M_5: M_3 plus large negotiable CD's.

Source: <u>Federal Reserve Bulletin</u>

Notes on Table IX-1.

Data is a weighted average of different bank classes in the original source. The weights are 23%, 18% and 59% for banks with deposits under 50. mil., 50-200 mil. and over $200 mil., respectively.

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