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THE DEMAND FOR TRANSACTIONS DEPOSITS: WAS THERE A SHIFT IN THE RELATIONSHIP?

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I.

Recent investigations on the instability of the U.S. short-run money demand function have shown that the cause of the problem lies in the non-currency component of the narrow monetary aggregate [1,2,3,4,11]. It has been argued that this instability arises from i) a breakdown in the marginal relationships between checkable deposits and real income and interest rates and/or ii) an incorrect definition of the money variable.

Our purpose in this paper is to show that there has not occurred a breakdown in the marginal relationships embodied in the conventional "Goldfeld" specification and that various institutional changes during the post-1974 period have not led to a change in the relationship. The results presented in this paper indicate that the function was subject to a level shift in early 1974 and that previous conclusions based on the presumption of an unstable demand function may be incorrect.

The format of the paper is as follows. Section II presents estimates of the conventional specification over the sample period 1960/I-1979/IV. Pertinent information detailing the extent of the supposed deterioration is provided. Evidence suggesting that the level equation was subject to a level, not a marginal, shift is presented in Section III. Concluding remarks are found in section IV.

II.

The equation under consideration is

$$\ln(TCD/P)_t = \alpha_0 + \alpha_1 \ln y_t + \alpha_2 \ln RCP_t + \alpha_3 \ln RCB_t \quad (1)$$
$$+ \ln (TCD/P)_{t-1} + \varepsilon_t$$

where TCD represents the non-currency component of M1B, P is the implicit GNP deflator (1972=100), y is real GNP ($1972), RCP is the 4-6 month commercial paper rate and RTD is a weighted average of the commercial bank passbook rates. Although a more correct specification may be obtained by using other measures for price and income, the specification given by (1) is generally recognized as a standard

function. Equation (1) does differ from previous uses in that we explicitly recognize the changing definition of transactions deposits. Thus, the total checkable deposits component of M1B--demand deposits, negotiable orders of withdrawl (NOW) accounts, automatic transfer system (ATS) accounts and credit union share drafts--is used as the dependent variable.

The advantage of using total checkable deposits, as opposed to only demand deposits, is that it allows us to test directly the hypothesis that financial innovations and regulatory changes beginning in the early 1970's blurred the distinction among various transactions oriented deposits. If this is true, then the relationship between total checkable deposits and income and interest-rates should evidence some changes during the 1970's. 1/

Initial estimates of equation (1) revealed a significant degree of first-order serial correlation among the residuals. Previous estimations of (1) have relied primarily on the Cochrane-Orcutt procedure to correct for this problem [1,2,3,4,11]. This technique, given the presence of a lagged dependent variable and autocorrelated errors, will yield coefficient estimates that are biased and inefficient [see 12; 413-14]. Consequently, we use Hatanaka's [7] procedure which yields estimates that are asymptotically efficient and unbiased 2/.

The 1960/I-1979/IV period estimates of equation (1) are (absolute value of t-statistics in parentheses)

$$\ln(TCD/P)_t = \underset{}{-0.317} + \underset{(2.61)}{0.059}\ln y_t - \underset{(2.80)}{0.025}\ln CPR_t - \underset{(4.22)}{0.044}\ln RCB_t + \underset{(1.94)}{1.021}\ln(TCD/P)_{t-1}$$
$$(21.43)$$

$$\bar{R}^2 = 0.872,\ SEE = 0.0061,\ h = -0.30,\ \hat{\rho}\ 0.43,$$

where $\bar{R}^2$ is the coefficient of determination adjusted for degrees of freedom, SEE is the standard error of the regression, h is Durbin's h-statistic and $\hat{\rho}$ is the final estimate of the serial correlation coefficient. These

regression results are quite similar to those presented in other studies [See 6]. The unacceptable nature of these results relative to earlier sample period findings stems from the dramatic fall in the point elasticity of real income and the value obtained on the lagged dependent variable. Interpreted in the stock-adjustment framework, this latter finding suggests that individuals continually adjust their actual real balances away from their desired level.

Further evidence of the breakdown may be obtained from the equation's forecasting ability [3/]. Estimating the equation through 1973/IV and statically forecasting the dependent variable [$\ln (TCD/P)_t$] from 1974/I through 1979/IV produces an root-mean-squared error (RMSE) of 0.021--a value almost 4 times the in-sample standard error. Not only does the RMSE indicate a poor forecasting performance, but the Theil decomposition statistics [See 13; 27-32] associated with this forecasting exercise indicate that almost 90 percent of the forecast error is attributable to bias, i.e., one-sided prediction errors. Finally, perfoming a standard F-test for structural stability allows us to reject the hypothesis that the regression is stable across the hypothesized 1973/IV break point: the calculated F-value is $F(6,68) = 4.12$, a value exceeding the 1 percent critical value of 3.60.

The results presented apparently support the notion of a deteriorating relationship between real checkable balances and income and interest rates. Moreover, the relationship forecasts poorly and is unstable by standard statistical criteria. In the following section, we demonstrate that the foregoing results, which lead to an apparently clear rejection of equation (1), are misleading.

III.

Given evidence such as that presented in the preceding section, the general conclusion is that equation (1) is no longer a viable representation of the money demand function. Consider, however, the possibility of only an intercept

shift, as opposed to marginal shifts, in the relationship. If such a shift occured in the mid-1970's, then the estimates presented above are incorrect in that failure to account for the shift--essentially a missing variable problem--will lead to biased estimates of the coefficients and to a rejection of the hypothesis of structural stability. [4/]

A straightforward procedure to test for the presence of a intercept shift as opposed to a slope (marginal) shift is to re-estimate equation (10 in first-differenced form. First-differencing equation (1) gives

$$\Delta \ln (TCD/P)_t = \alpha_1' \Delta \ln y_t + \alpha_2' \Delta \ln RCP_t + \alpha_3' \Delta \ln RCB_t \qquad (2)$$
$$+ \alpha_4' \Delta \ln (TCD/P)_{t-1} + \Delta \varepsilon_t$$

where Δ is the first-difference operator. Note that the crucial difference between equations (1) and (2) is that the latter does not contain the constant term α_0: first-differencing transforms the constant term to a vector of zeros. Therefore, if an intercept shift does occur in the level equation, that shift will appear as a large residual in equation (2). If, however, the slope coefficients of equation (1) have changed, as many have argued, then estimating equation (2) will not alter the deterioration in the estimates and will not provide a stable relationship. Thus, the first-difference specificaton can be used to test the hypothesis that equation (1) was subject to only an intercept shift sometime in the mid-1970's. Moreover, because an intercept shift will appear as a large residual outlier in equation (2), this information can be used in an attempt to locate the most likely intercept shift-point.

The ordinary least squares (OLS) estimates of equation (2) over the period 1960/I-1979/IV are (absolute value of t-statistics in parentheses)

$$\Delta \ln (TCD/P)_t = 0.181 \Delta \ln y_t - 0.023 \Delta \ln RCP_t - 0.046 \Delta \ln RCB_t + 0.611 \Delta \ln (TCD/P)_{t-1}$$
$$(2.91) \qquad (3.30) \qquad (1.69) \qquad (6.37)$$

$R^{-2} = 0.440$, SEE = 0.006, h = -0.61.

These results, based on the same sample period as equation (1) estimates, is remarkably similar to those found by Goldfeld [4]. Although there is slight difference in the point elasticities, the long-run elasticities for real income, the commercial paper rate and the commercial bank passbook rate as estimated by Goldfeld and calculated from the above result differ, at most, by 0.02 percent. In fact, the only difference in the elasticities is for the passbook rate variable.

These results, which suggest a stable marginal relationship between real checkable balances and its arguments, are supported by the post-1973/IV forecast results. Again statically forecasting the dependent variable [$\Delta \ln (TCD/P)_t$], the RMSE for equation (2) is 0.008, a value well within two times the 1960/I - 1973/IV in-sample standard error of 0.006. Further, whereas the forecast results from the levels equation indicated that the problem was one of bias, the Theil bias coefficient for the first-difference's forecasts is only 0.10. In contrast, the amount of error due to covariation is over 65 percent.

As a further indication of the marginal relationships' stability , the F-test was applied to the first-difference equation with 1973/IV again chosen as the hypothesized break point. The outcome of this test, $F(4,72) = 0.15$ (F-critical = 3.60 at 1 percent), indicates that the hypothesis of a stable marginal relationship is not rejected. Thus, the maintained hypothesis of an intercept shift in the level equation is supported.

It was noted above that intercept shifts in the level equation will appear as large outliers in the first-difference residuals. Using two standard errors as an arbitrary boundry ($\neq 0.013$), four possible points of intercept shift were located: 1974/II, 1975/I, 1975/IV and 1979/II. Using zero-one dummy variables, these points were entered into the level equation as once-and-for all types of change. Thus, D1 = 1 for the 1960/I - 1974/I period, 0 otherwise; D2 = 1 for 1974/II - 1974/IV, 0 otherwise; and so on. Upon re-estimating equation (1) with these dummy variables, it was found that the dummies relating to the 1975/I,

1975/IV and 1979/II shift points were not statistically different from zero. Consequently, we report only the equation that uses the dummy variable to capture the apparent shift in 1974/II. The results of estimating the shift-adjusted log-level equation are (absolute value of t-statistics in parentheses)

$$\ln (TCD/P)_t = -0.637 + 0.015\ D1 + 0.117\ \ln y_t$$
$$\qquad\qquad (5.00) \quad (3.39) \qquad (5.15)$$
$$-0.022\ \ln RCP_t - 0.033\ \ln RCB_t + 0.783\ \ln (TCD/P)_{t-1}$$
$$(4.44) \qquad\qquad (1.82) \qquad\qquad (10.65)$$

$\bar{R}^2 = 0.920$, SEE = 0.002, h = -0.02 $\hat{\rho} = 0.36$

where D1 = 1 for 1960/I - 1974/I, 0 otherwise.

These results support the contention that the levels function was subject to a large downward shock in the mid-1970's. Indeed, the evidence from the above regression indicates that the intercept term decreased from -0.622 to a value of -0.637 in 1974/II. While there is some difference in the estimated coefficients between the first-difference specification and the above equation, the log-level equation adjusted for the intercept shift does not show the marked deterioration in the coefficient estimates and regression standard error as evident from equation (1) estimates not including the intercept shift term. Moreover, the long-run elasticities derived from the above equation are quite consistent with received theory and previous empirical estimates.

IV

The purpose of this paper is to re-examine the evidence showing a breakdown in the U.S. demand for money function. Using the non-currency component of M1B as the definition of money, the results presented here indicate that the conventional specification underwent a level shift in early 1974, not a shift in the marginal relationships. This finding, based on the use of a first-difference

specification and a suitably adjusted log-level equation, suggests that arguments of marginal shifts due to changes in regulatory or institutional factors, improperly defined money measures or volatile interest rates are seriously called into question.

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