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Authors	Dallas S. Batten, and R. W. Hafer
Working Paper Number	1984-024A
Creation Date	January 1984
Citable Link	https://doi.org/10.20955/wp.1984.024
Suggested Citation	Batten, D.S., Hafer, R.W., 1984; Currency Substitution and the Link Between Money and GNP in the U.S.: 1972-83, Federal Reserve Bank of St. Louis Working Paper 1984-024. URL https://doi.org/10.20955/wp.1984.024

CURRENCY SUBSTITUTION AND THE LINK BETWEEN MONEY AND GNP IN THE U.S.: 1972-83

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84-024

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We would like to thank Larry DiMariano for his research assistance. The views expressed are the authors' and may not reflect those of the Federal Reserve Bank of St. Louis or the Board of Governors of the Federal Reserve System.

I. INTRODUCTION

It has been argued recently that the existence of currency substitution has reduced the effectiveness of domestic U.S. monetary policy [McKinnon (1982, 1984); Miles (1978, 1981)]. Currency substitution, it is argued, arises as international investors continually alter their portfolio of financial assets from one currency to another. Consequently, as McKinnon has stated, "international currency substitution destabilizes the demand for individual national monies so that one can't make much sense out of year-to-year changes in purely national monetary aggregates..." (1982, p. 320).

The purpose of this paper is to examine the credibility of such a position by investigating the evidence presented by McKinnon (1984). The evidence presented in this study suggests that the empirical foundation for the currency substitution argument is not robust. Based on the same annual data used by McKinnon, we show that the conclusions concerning the existence and importance of currency substitution change dramatically with slight changes in the estimation period. Furthermore, a closer examination of McKinnon's results suggests that they reflect primarily the impact of financial innovation in the United States during the 1980s, not currency substitution.

II. TESTING FOR CURRENCY SUBSTITUTION

After initially suggesting that a measure of world money growth adequately captures the effects of currency substitution, McKinnon (1984) has argued that changes in a world money measure may not adequately reflect the underlying shifts in international investor's financial portfolio.[1/] He suggests that a more appropriate alternative is the percentage change in the effective dollar exchange rate. To investigate this proposition, changes in the exchange rate are included along with domestic U.S. money growth to explain the growth of U.S. nominal GNP. The estimating equation is the following:

$$(1)\ \dot{Y}_t = \alpha_o + \beta_1 \dot{M}_t + \beta_2 \dot{M}_{t-1} + \beta_3 \dot{E}_t + \beta_4 \dot{E}_{t-1} + \varepsilon_t,$$

where Y is nominal GNP, M is the narrowly defined money stock (M1), E is the IMF's weighted measure of the dollar exchange rate, and ε is an error term.[2/] The dots above each variable denote growth rates, calculated as annual percentage rates of change.

McKinnon argues that equation 1 yields a statistically superior fit for the period 1972-83--the floating exchange rate period--than does an equation without the exchange rate information. To test this conjecture, McKinnon estimated equation 1 with and without the exchange rate measure using two methods to construct money growth, labelled here as M1FED and M1StL. Both of these are measures of annual U.S. M1 growth. M1FED, however, is centered on the beginning of each year while M1StL is centered on the midpoint of the year. In other words, M1FED's construction adds an additional two quarter lag to M1StL.[3/]

The results of these estimations, reported in table 1, generally support McKinnon's hypothesis. In particular, neither estimated equation excluding the exchange rate is statistically significant (columns 1 and 2). When the exchange rate is included, the equation with M1FED (column 3) is significant at the 5 percent level and the one with M1StL (column 4) is significant at the 6 percent level. Moreover, the addition of the exchange rate significantly increases the explanatory power of each equation.[4/]

Given these results, two questions arise immediately: First, since the data are annual and the sample consists of only 12 observations, how sensitive are these results to the estimation period? Second, quarterly models consistently find that U.S. money growth is an important explainer of U.S. GNP growth. Consequently, what explains the apparent breakdown in the money-GNP link illustrated by columns 1 and 2 of table 1?

To investigate the sensitivity of the results to a change in the estimation period, the equations are re-estimated for the period 1972-80. Our reason for ending the sample in 1980 comes from an examination of the exchange rate's growth in 1981 and 1982. During these two years, the exchange rate increased at rates of 12.6 percent and 11.7 percent, respectively. In contrast, from 1972 to 1980, the growth of the exchange rate averaged -2.22 percent. More importantly in terms of the regression equations, merely adding the 1981-83 exchange rate data increases the variance of the series from 21.3 percent to

47.6 percent. Because of the small number of observations, such an increase may enhance the exchange rate series apparent explanatory power.

The results of re-estimating the equations for the 1972-80 period are presented in table 2. In contrast to the previous outcome, money growth is highly significant: see columns 1 and 2. It also is interesting to note that the cumulative impact of a one-percentage point increase in M1FED growth is only a 0.18 percentage point increase in GNP growth. Using M1StL, however, the summed coefficient is unity.[5/]

The results of including the exchange rate are reported in columns 3 and 4. Note that the estimated coefficients of the exchange rate variables are not statistically significant at any conventional level. Moreover, F-tests for adding the distributed lag of exchange rate changes also reject the hypothesis that it improves the equations' explanatory power.[6/] Thus, this change in the sample period yields results that reject the notion that currency substitution has been an important factor throughout the floating exchange rate period.

Given the results for the 1972-80 period, the money-GNP link appears to break down only when the 1981-83 data are included. Recent evidence suggests that M1 growth may have been affected by financial innovations during this period. Indeed, there is some evidence indicating that the deterioration in the money-GNP relationship in this period disappears when M1 growth is adjusted to account for these financial innovation effects [Judd and McElhattan (1983), Hafer (1984)]. To see how sensitive the results in table 1 are to such changes we re-estimated the relevant equations substituting a measure of narrow money that reduces the effects of financial innovations on observed M1 growth: this alternative measure is known as MQ.[7/] The regression results for the 1970-83 period are reported in table 3.

Comparing column 1 in table 3 with columns 1 or 2 in table 1 indicates that the deterioration in the fit is explained by the behavior of observed M1 during 1981-83. Although there is a decline in the fit relative to the 1970-80 equations, the estimated $\bar{R}^2$ using MQ is over 40 percent. More importantly, when the exchange rate variables are included in the equation with money measured by MQ, the fit of the model declines dramatically: the F-statistic for testing the hypothesis that the estimation is significant is 2.15, well below the 5 percent critical value of 3.36. Notice also that including the exchange rate variables affects the significance of the money measures. This impact, a sign of multicollinearity, suggests that much of the exchange rate's significance in table 1 derives from its ability to proxy the shift in observed M1 velocity during this period. When this velocity behavior is accounted for in a measure of money, the influence of the exchange rate becomes insignificant.

III. CONCLUSION

We have investigated the robustness of McKinnon's recent findings concerning the importance of currency substitution on the ability of domestic monetary authorities to influence the path of nominal GNP. Two conclusions are reached: First, the significance of the exchange rate comes only from the 1981-83 period when its growth deviated dramatically from 1972-80 patterns. When we estimated equation 1 for the 1972-80 period, the exchange rate information was insignificant in explaining GNP growth. Second, the use of an alternative money measure--one that accounts for the impacts of financial innovations on observed M1 growth during 1981-83--also reduced the effect of the exchange rate to statistical insignificance for the 1972-83 sample.

These results indicate that the evidence supporting the proposition of currency substitution is tenuous. Our results show that U.S. nominal GNP growth is explained primarily by domestic money growth and that the effects of currency substitution, if they exist, should not deter monetary policy from focusing on domestic concerns.

FOOTNOTES

1/ An alternative approach is to examine the impacts of foreign interest rate effects in a domestic money demand function. This approach, suggested in Miles (1978, 1981), has been tested in Bordo and Choudri (1982), Cuddington (1983) and Batten and Hafer (1984). In these latter studies, only limited evidence of currency substitution has been found.

2/ Equation 1 is similar to the standard St. Louis equation but excludes a distributed lag of high-employment government spending growth. This omission was made because the sample contains only 12 observations and the hypotheses tested do not involve the impact of lags in government expenditure growth on nominal GNP growth.

The exchange rate is the IMF's 17 country dollar exchange rate index with weights derived form the IMF's multilateral exchange rate model.

3/ Because annual data are used, McKinnon constructs M1FED to introduce an additional lagged effect by calculating the annual growth rate for, say, 1980, as the growth from the average level over the period III/1978 to II/1979 to that over the period III/1979 to II/1980. In contrast, M1StL is calculated as the percentage change from annual average to annual average.

4/ An F-test for adding the exchange rate variables yields a statistic of 12.05 using M1FED and 7.44 using M1StL. Each F-value is well-above the 5 percent critical value of 4.74.

5/ This latter result is consistent with previous results using so-called St. Louis reduced-form GNP equations. See, for example, Batten and Thornton (1984). It also should be noted that Durbin-Watson statistic reported for equation (2) in table 2 indicates significant serial correlation. Re-estimating the equation using a GLS procedure yielded the results

$$\dot{Y}_t = \underset{(3.95)}{4.12} + \underset{(8.56)}{1.464}\ M1StL_t - \underset{(2.89)}{0.493}\ M1StL_{t-1}$$

Clearly, the correction for first-order serial correlation does not affect the conclusions reached in the text.

6/ An F-test for adding the exchange rate variables yields a statistic of 0.88 using M1FED and 1.34 using M1StL, each well below the 5 percent critical value of 4.46.

7/ MQ is a weighted index of transactions monetary assets with the weights being final product turnover rates. See Spindt (1984).

Table 1
Estimates of Equation 1: 1972-83

Variable	1	2	3	4
Constant	9.40(1.94)	8.63(1.53)	15.05(5.29)*	11.02(2.96)*
M1FED	0.709(1.29)		0.790(2.46)*	
$M1FED_{-1}$	-0.669(1.07)		-1.598(3.91)*	
M1StL		0.239(0.46)		0.981(2.37)*
$M1StL_{-1}$		-0.080(0.10)		-0.209(2.01)
EXRATE			0.015(0.20)	-0.058(0.63)
$EXRATE_{-1}$			-0.334(4.03)*	-0.324(2.85)*
$\bar{R}^2$	0.019	-0.194	0.716	0.509
SE	2.494	2.752	1.342	1.764
DW	1.02	1.41	1.80	1.04
F	1.11	0.11	7.94*	3.85

Absolute value of t-statistics in parentheses.
* Statistically significant at the 5 percent level.

Table 2
Estimates of Equation 1: 1972-80

Variable	1	2	3	4
Constant	9.24(4.38)*	3.87(2.18)*	12.83(2.59)*	4.66(2.07)
M1FED	1.171(3.66)*		1.086(1.68)	
$M1FED_{-1}$	-0.986(3.09)*		-1.520(2.92)*	
M1StL		1.478(5.52)*		1.754(5.30)*
$M1StL_{-1}$		-0.478(1.79)		-0.915(2.38)
EXRATE			-0.008(0.05)	0.026(0.34)
$EXRATE_{-1}$			-0.200(1.19)	-0.134(1.59)
$\bar{R}^2$	0.625	0.791	0.609	0.812
SE	1.077	0.803	1.099	0.762
DW	1.86	2.75	1.58	2.31
F	7.66*	16.15*	4.12	9.65*

Absolute value of t-statistics in parentheses.
* Statistically significant at the 5 percent level.

Table 3
Estimates of Equation 1: 1972-83
Money Definition is MQ

Variable	1	2
Constant	1.66(0.53)	1.55(0.22)
MQ	0.042(0.11)	-0.289(0.42)
MQ_{-1}	1.240(3.05)*	1.606(1.58)
EXRATE		-0.081(0.46)
$EXRATE_{-1}$		0.131(0.60)
$\bar{R}^2$	0.419	0.296
SE	1.920	2.114
DW	1.87	1.98
F	4.96*	2.15

Absolute value of t-statistics in parentheses.
* Statistically significant at the 5 percent level.

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