Did the Swiss Demand for Money Function Shift?

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Abstract:

The purpose of this note is to test the stability of a short-run money demand function for Switzerland during the breakdown of tile fixed exchange rate system and for the OPEC crisis. The evidence suggests that the function was unstable due to intercept shifts that occurred during the breakdown of the Bretton Woods system but not during the OPEC crisis. The evidence provides a counterexample to other recent studies that conclude that money demand studies for other major industrialized countries besides the United States were apparently stable during this period.

Article:

Introduction

The question of the stability of the demand for money in the U.S. during the 1970s has led to parallel studies for other countries. Recently Boughton (1981) and Arango and Nadiri (1981) estimated demand for money functions for several of the major industrialized countries and tested for the stability of the function over the period 19711975. Arango and Nadiri concluded that while there was some deterioration in the stability of the money demand function 3 for the U.S. and Canada, the functions "for the U.K. and Germany remained highly stable through the financially stressful period of 1970-75 when significant international monetary crises came in succession" (p. 81). Similarly, Boughton concluded that none of the countries (Canada, France, Germany, Japan, or the U.K.) had money demand function which were as unstable as the U.S. money demand function (M_1) and that the M_1 functions in Germany, Japan, and the U.K. appeared to be stable throughout 1970-1977.[1] These studies support the conclusion that international factors such as floating exchange rates and the supply shocks and wealth transfers resulting from OPEC oil pricing did not cause significant shifts in the money demand functions for several major industrialized countries.[2]

The purpose of this note is to test the stability of a short-run money demand function for Switzerland during the breakdown of the fixed exchange rate system and for the 1974 OPEC crisis.[3] The evidence suggest that there is no structural instability due to the OPEC embargo and price hike in 1974, though the international monetary crises from 1969-1973 did cause three structural shifts in the intercept term of the money demand equation.[4] These results provide a counterexample to the conclusions reached by Boughton and by Arango and Nadiri concerning the relative stability of the money demand functions for several major industrial countries during the breakdown of the Bretton Woods system.

Log-Level Equation

Boughton assumes partial adjustment of actual to desired real money balances and employs a short-term interest rate, a savings deposit rate, the Eurodollar deposit rate, and an inflationary expectations variable (the lagged inflation rate) as opportunity cost variables. The Arango- Nadiri money demand function is derived from a general Portfolio model which considers the role of foreign monetary developments through three 'variables: short-term foreign interest rates, current exchange rates, and expected exchange rates. For our purposes these three variables are contained in one variable, the Euro Swiss .rote, which is the yield on three-month London Eurodollar deposits adjusted for the forward premium or discount (r_{ED}) and is considered to be exogenous to the

Swiss economy.[5] The results of estimating a short-run money demand equation where m_t is the demand for real money balances, y_t is real income, r_L is a long-term do domestic interest rate (the average yield on Federal Government obligations), and P_{t-1} is the inflationary expectation term is presented below for 1960/III-1976/IV[6] (the roman numerals indicate the quarter year).

$$\ln m_t = -1.40 + 0.488 \ln y_t - 0.114 \ln r_L - 0.010 \ln r_{ED} - 0.083 \ln P_{t-1}$$
$$(2.29) \quad (5.12) \quad (3.21) \quad (3.03) \quad (2.42)$$
$$+ 0.373 \ln m_{t-1}$$
$$(3.40)$$

$$SE = 0.00919 \qquad DW = 2.19 \qquad h = 1.70 \qquad SSR = 0.00499 \qquad \rho = 0.654 \qquad (1)$$

where t-scores are in parentheses, *h* is the Durbin *h* statistic, and SSR are the sum of the squared residuals. The results show significant coefficients with the correct signs for each variable. The log-level version of t he equation is tested for structural stability between 1969/II and 1973/IV. The F-statistics are reported in Table 1 for the Chow test for four separate breakpoints over this period. The choice of these periods are described in the next section. The results show that the null hypothesis of structural stability can be rejected at the 5% level of significance for 1971/II, or 1973/IV, as the breakpoint. This evidence suggests that the breakdown of the Bretton Woods system caused at least one structural shift in the Swiss money demand equation.

Table 1. Stability Test Results[a]

Breakpoint	Level	First-Difference
1969/II	1.70	0.39
1971/II	2.97	0.50
1973/I	2.40	1.54
1973/IV	2.27	0.33

[a] Critical values at the 5% and 1% levels of significance are $F_{7,52} = 2.20$ and 3.02 for the Hatanaka estimates of the level equations and $F_{5,56} = 2.39$ and 3.37 for the first difference equation.

First-Difference Equation

Hafer and Hein (1980, 1981) show that when the log-level equation is found to be unstable, it is possible to distinguish between an intercept shift aid a shift in one of the slope coefficients of the level equation by estimating the first-difference ice (FD) form of the equation and testing for structural stability. The FD equation will remain stable if the instability of the level equation is attributed only to an intercept shift, and it will be unstable if the instability of the level equation is attributed to a shift in the slope coefficients. If an intercept shift occurs, the shift will result in a large residual. Therefore, the first-difference equation can be used to locate the most likely dates of intercept shifts by identifying the period that has large residuals.

The results of estimating the FD form of equation (1) by ordinary least squares for 1960 /III- 1976 /IV where Δ is the first-difference operator are presented below ((t-statistics are in parentheses).

$$\Delta \ln m_t = 0.50\ \Delta \ln y - 0.146\ \Delta \ln r_L - 0.007\ \Delta \ln r_{ED}$$
$$(3.49) \qquad (4.19) \qquad (2.39)$$
$$- 0.008\ \Delta \ln P_{t-1} 0.361\ \Delta \ln m_{t-1}$$
$$(0.08) \qquad (3.72)$$

$$SE = 0.0102 \qquad DW = 2.44 \qquad h = -2.91 \qquad SSR = 0.00632. \qquad (2)$$

The F-statistics which were computed t test for the structural stability of the FD equation for these break points also are reported in Table 1. The results show that the null hypothesis of structural stability cannot be rejected at the 5% level at any breakpoint. This evidence from the stability tests of the FD equation suggests that the marginal relationships; the slope coefficients, may be stable.[7] The stability tests for the log-level equation, however, suggests that there may have been more than one intercept shift in the money demand function during the late '60s and early '70s. A plot of the residuals reveals two quarters or which the residuals are over twice the size of the standard error (SE): 1970/I and 1971/III. Residuals between one and two times the standard error are reported for the two quarters immediately preceding 1970/I, which leads to 1969/II as a possible breakpoint, and for the quarter preceding 1971/III, which leads to 1971/II as another possible breakpoint.

The underlying disequilibrium in the final years of the Bretton Woods system caused substantial flows oil speculative capital into countries like Switzerland and Germany. For example, the second half of 1969 was a period of substantial capital inflows into both Switzerland and Germany. The return flow of capital into Switzerland from the Eurodollar market created a capital account surplus. Furthermore, there were periods of speculative inflows of capital into Germany and Switzerland after DeGaulle's defeat in France and the rumor of possible revaluation of the mark and Swiss franc. Germany did float and then revalue the mark in 1969/III-IV. The problem of speculative capital flows out of weak currencies and into strong currencies based on rumor of impending currency realignments also occurred prior to the revaluation of the mark, Swiss franc, Dutch guilder and Austrian schilling in May 1971 and the devaluation of the dollar that August.[8] The crisis and flows of speculative capital into Germany and Switzerland which led to the German float and revaluation in 1969/III-IV and to the initial breakdown of the system in 1971 would account for a great deal of the variation between actual fitted values during these episodes.

The first-difference form of the money demand equation also had large residuals which were nearly twice the standard error in 1972 /IV and 1973/II. Therefore, 1973/I is also tested as breakpoint between fixed and managed exchange rates for the transition quarter. The only evidence of a residual greater than 1 1/2 times the standard error during the OPEC crisis is a residual of - 0.017 for 1974/I, which leads to 1973/IV as a fourth possible breakpoint. A direct test for intercept shifts for each of the four breakpoints can be made by specifying zero-one intercept dummies where

D1 =1 for 1969/III- 1976/IV; 0 otherwise
D2 = 1 for 1971/III- 1976/IV; 0 otherwise
D3 = 1 for 1973 /II-1976 /IV; 0 otherwise
D4 = 1 for 1974/I-1976/IV; 0 otherwise

and including these variables in equation (1). The predicted signs of the coefficients are positive for D_1 and D_2 to capture the impact of speculative flows of capital into Switzerland, negative for D_3 to capture any outflow of capital from Switzerland after the dollar was floated by the United States, and negative for D_4 to capture any reduction in real money balances due to the OPEC price increase.

The results reported below show that D_1-D_3 are significant at the 5% level for a one-tailed test:

$$\ln m_t = \underset{(0.99)}{-0.585} + \underset{(4.60)}{0.415} \ln y_t - \underset{(3.66)}{0.119} \ln r_S - \underset{(2.78)}{0.008} \ln r_{ED} - \underset{(0.75)}{0.032} \ln P_{t-1}$$

$$+ \underset{(3.50)}{0.333} \ln m_{t-1} + \underset{(2.05)}{0.016} D1 + \underset{(1.95)}{0.018} D2 - \underset{(2.46)}{0.022} D3 - \underset{(1.00)}{0.010} D4$$

$$SE = 0.00841 \qquad DW = 2.15 \qquad h = -0.96 \qquad SSR = 0.00389 \qquad \rho = 0.614. \quad (3)$$

With the inclusion of the dummy variables, the null hypothesis of zero autocorrelation cannot be rejected because the Durbin *h* statistic is below the 5% critical value. Furthermore, the slope coefficients in equation (3) are similar to the coefficients in equation (1), which suggests that the marginal relationships have not changed.

The dummy variable to test for the OPEC shock, D_4, is the wrong sign and insignificant. Therefore, there is no evidence that the OPEC price hike caused a one-shot reduction in the demand for real balances.[9] The positive and significant coefficients for D_1 and D_2 capture the increasing inflows of speculative capital which occurred in the second half of 1969' and during the breakdown of the Bretton Woods system in the second half of 1971. The negative and significant coefficient of D3 which tests for a structural shift in 1973/II captures the impact of the change in exchange rate regime on the Swiss demand for money. Because ten of the 16 residuals from 1969 /III through 1973/II for the FD equation have values greater than one standard error. the money demand equation underwent a period of instability due to the breakdown of the Bretton Woods system which may not be sufficiently captured by even these three intercept shifts. The evidence does show that the Swiss demand for money was impacted by the breakdown of the system.

Conclusion

The major purpose of this note has beer, to provide a single counterexample to several recent studies by Boughton and by Arrango and Nadiri who have investigated the stability of money demand functions in other major industrial countries. The evidence suggests that the Swiss money demand function was unstable due to intercept shifts that occurred as a result of the evolution of the international monetary system from a fixed to a floating (managed) exchange rate system. No intercept shift was detected for the 1973/IV-1974 period due to the OPEC embargo and price increase. The fact that these results find instability in the Swiss money demand function for the period of the evolution of the international financial system may provide incentive for future researchers to consider more closely the pattern of residuals for this transition period.

Notes:

[1] Institutional factors pertinent for the U.S. are suggested by Boughton to provide one reasonable explanation for the instability associated with the M_I definition of money for the U.S.

[2] Boughton notes that the 1969 exchange rate crisis when France devalued and Germany revalued resulted in one-time shifts for M3 in Germany and for both 14_1 and M2 in France. He concludes "that none of the severe exchange crises in the United Kingdom, neither of the switches between pegging and floating in Canada, nor the collapse of the Bretton Woods system can be identified as having produced any significant alteration of money demands" p 593).

[3] The study tests the demand-for -money function through 1976/IV because of the availability of a consistent data series from Vital (1978). Any attempt to test for structural shifts during the 1977-1981 period would require splicing several data series which could present problems in identifying the shifts in the function.

[4] Hafer and Hein (1980) argued that the instability of the U.S. M_B function is a result of a one-time negative intercept shift in 1974/II due to the OPEC oil price hike and one-time wealth loss to the U.S. economy (see also Hafer 1982) A similar shift did not occur for Switzerland, though Hafer and Hein never suggest that other countries suffered the same shock to their production function.

[5] Arango and Nadin employ separate variables because domestic interest rates and exchange rate variables are endogenous in their general ₚortfolio model.

[6] Alternative specifications or functional forms were not tested because of the desire to have an equation cᵒmparable to the work of Boughton which covers the 1960- 1977 period and of Arango and Nadiri which covers the 1960-1975 period. Equation (1) is estimated by the Hatanaka (1974) procedure which yields consistent and asymptotically efficient coefficients when there is a lagged dependent variable and autocorrelated error terms The instruments employed are the lagged values of each right-hand side variable, plus reserves, time deposits, two other interest rates, time, and time squared. The data is from Vital.

[7] Because the null hypothesis of zero autocorrelation can be rejected at 5% level (the Durbin *h* statistic is below the critical value of — 1.645) the stability results are only suggestive. The autocorrelation problem will he corrected later.

[8] See Yeager (1976. pp. 508-514) for a discussion of the German situation.

[9] This evidence does not disprove that OPEC caused the intercept shift in the U.S. money demand function

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