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Foreign Capital Inflow and Domestic Savings: A Model with a Latent Variable

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In this paper we have constructed and estimated a reduced form equation based on a macroeconomic model to examine the effect of foreign savings on the saving behavior of a small scale advanced economy with a developed capital market. In addition to the conventional macroeconomic variables our model contains a latent variable collectively reflecting time and country specific risk and policy factors as well as other unobservable variables. All estimations were done based on a set of pooled data on eight small developed countries covering the period 1965 through 1986.

Our results generally suggest that contrary to the findings by Gupta and others, which were mostly based on their study of developing countries, foreign savings do not substitute domestic savings. We showed that government expenditures and export positively influence domestic savings. According to our estimation exchange rate has a positive effect on domestic savings whereas interest rates seem to affect the savings income ratio negatively.

I. Introduction

Any attempts to investigate the effect of foreign capital inflows on the levels of domestic savings and investment, we believe, should involve the analysis of the interactions among basic macroeconomic aggregates. Some previous studies — e.g., Leff and Sato (1980) and Fry (1980) —, addressing these relationships from the perspective of developing countries, take

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OECD countries were quite deliberate. Unlike the developing countries — where capital transfers are more of a "policy variable" and other effects on domestic savings and other macroeconomic aggregates depend on the fiscal and monetary "policies" taken by the government in direct connection with such transfers — the selected OECD countries all have reasonably developed financial markets well connected to the international financial centers with little or no controls.

The pooled data allows us, first, to estimate the model free from any error components. Second, a transformed version of the data set enables us to look at the dynamics of the relationships among some of the variables.

II. The Model

An exogenously effected capital inflow could both directly and indirectly, through its impact on interest rates, affect the level of output which would in turn increase domestic consumption, the level of import, and domestic saving. On the other hand, the lower interest rates brought about by capital inflow could have a negative effect on domestic savings. This will make the net effect of capital inflow on domestic savings ambiguous. Alternatively, a capital inflow (or outflow) could be regarded as a response to domestic macroeconomic changes — i.e., an economic expansion and increased demand for loanable funds and, thus, higher interest rates, with the exchange rate and foreign interest rates remaining the same. In the context of a simple Keynesian model, we will try to disentangle some of these relationships and identify and estimate the model.

We assume a small open economy with perfect capital mobility. That is, at equilibrium only one effective interest rate prevails. Short run interest rate discrepancies will result in the movements of funds into or out of the country. We further assume a constant return to scale and fixed prices: changes in the level of output will not result in price changes. The economy consists of three markets: the commodity market, the money market and the exchange market. We will analyze each market separately.

A. The Commodity Market

Let us begin by writing a Keynesian equilibrium equation for the commodity market of the ith country at time period t.

$$(1.1) \qquad S_{it} + T_{it} + M_{it} = I_{it} + G_{it} + X_{it}$$

Again, assuming a proportional tax rate, we can write (1.7) as a linear function:

$$(1.8) \quad I = \bar{I} + (\phi - \phi\zeta)Y + \gamma r$$

where ϕ is the marginal propensity to invest and γ is the interest coefficient which is expected to be negative. Substituting (1.4), (1.6) and (1.8) into the equilibrium equation, we can write the IS curve equation as:

$$(1.9) \quad r = \frac{1}{\varphi - \gamma}\,\bar{Z} - \frac{s + m + \zeta(1 - s - m + \phi) - \phi}{\varphi - \gamma}$$

where $\bar{Z}$ represents all of the exogenous variables. That is:

$$\bar{Z} = \bar{I} + G + X - \bar{M} - \bar{S}.$$

It is important to note that a devaluation (or depreciation) of the country's currency will result in a shift of the IS curve to the right.

B. The Money Market

Our demand for money is defined by a typical Keynesian money demand equation with asset and transaction demands:

$$(1.10) \quad H^d = \alpha Y + \beta r \; ; \; \alpha > 0 \; ; \; \beta < 0$$

where H^d represents demand for money and Y and r, as before, denote output and interest rate respectively.

Unlike the Keynesian money supply, the supply of money in our model is not totally exogenous. We assume that the money supply is at least partially dependent upon the changes in the country's reserve, E, where:

$$(1.11) \quad E = X - M + F$$

and F is the net capital flow.[3]

[3] It is assumed that if the central bank adopts an accommodating policy then the money supply will also be directly dependent upon the level of output. Even if the central bank does not adopt an accommodating policy, the money supply will be indirectly affected by the level of output through its effect on import.

changes in the money supply. On the other hand, the imbalances in the balance of payments (That is the imbalance between the trade balance and capital flow) under a flexible exchange rate system is expected to affect the exchange rate. So assuming that the demand for foreign exchange comes from import, capital outflow and official purchases, and that the supply of foreign exchange is a function of export, capital inflow and official selling, we write:

(1.17) $R = R(X, M, F, W)$

where R, X, M, F are defined as before and W represents some measure of the central bank's intervention in the exchange market. Recalling that import, M, was a function of Y and the capital flow, F, was at least partially determined by the interest rate (1.17) can be rewritten as:

(1.18) $R = F(X, Y, r, W)$.

III. The Estimation

A reduced form equation resembling Gupta's model was derived from equations (1.3), (1.9), (1.13), (1.14) and (1.17). For easy reference let us rewrite them:

(1.3) $S = \bar{S} + (s - s\zeta)\, Y + \phi r$

(1.9) $r = \dfrac{1}{\varphi + \gamma} Z - \dfrac{s + \zeta(1 - s - m + \phi) - \phi}{\varphi + \gamma} Y$

(1.15) $r = \dfrac{-1}{\delta w - \beta} (\bar{H} + w\bar{X} - w\bar{M} + w\bar{F}) + \dfrac{\alpha + w(m - \zeta m)}{\delta w - \beta} Y$

(1.13)′ $F = \bar{F} + \delta r$

(1.18) $R = R(X, Y, r, w)$.

We can simplify (1.3), (1.9) and (1.13) as follows

(1.3)′ $S = a_0 + a_1 Y + a_2 r$

(1.9)′ $r = b_0 - b_1 Y$

(1.15)′ $r = c_0 + c\dot{Y}$.

Table 1

$S/Y = F(G/Y, X/Y, F/Y, R, r)$

	Const	G/Y	X/Y	F/Y	R	r	SE
2SLS	−0.0150	0.1689	0.3543	−0.00058	0.00211	−0.0161	0.0722
	(−0.238)	(1.839)	(4.461)	(−1.154)	(4.181)	(−3.146)	
MAX.	0.1328	0.0907	0.2663	0.00027	0.00008	(−.00166)	0.8353
LIK.	(9.129)	(1.844)	(5.924)	(2.000)	(1.027)	(−1.432)	
OLS	0.1218	0.1221	0.2607	−0.00031	0.00031	−0.0041	0.0431
	(8.505)	(2.720)	(7.474)	(−0.026)	(0.2997)	(−3.155)	

influences the saving income ratio. This implies that a devaluation of a currency directly, and possibly indirectly, through its effect on capital flows results in a reduction in domestic savings.

We believe mostly due to endogenity and multicollinearity problems these estimation fail to produce consistent estimates for the coefficient of interest rate. The 2SLS estimates, however, indicate that interest rates have a negative impact on savings.

Now let us turn to capital flow which is the primary focus in this work. The results of both OLS and 2SLS estimations seem to suggest that capital flows have no signficant impact on domestic saving behavior. These results imply that Haavelmo's argument that in developing countries foreign capital is not necessarily a substitute for domestic savings is also valid in the case of more advanced economies. In fact, our maximum likelihood estimate of capital flow coefficient suggests that a capital inflow could intensify domestic saving. These results are in contrast with those of Gupta (1985) which were based on a cross-section study of forty developing countries. Gupta found a strong negative relationship between capital inflows and domestic savings.

As indicated earlier, we see no theoretical basis to assume that a capital flow as a perfectly inelastic variable results in reductions in domestic savings. Even if, because of domestic economic and political factors, capital flows into and out of a country are totally unaffected by macroeconomical factors, their impact on domestic saving income ratio should at best be ambiguous — i.e., an inflow of capital, ceteris paribus, is expected to result in an increase in income; its impact on savings will be through income, interest rate and exchange rate.

will yield consistent estimates of β_1 and β_2 free of the "policy" bias. However, this technique will give inefficient estimates because (2.5) is used only within variations. This technique can also be interpreted as 2SLS with dummy variables (2SLSDV).

In the context of (2.1) where none of the error components are correlated with any of the explanatory variables, Fuller and Battese (1974) have proposed a very convenient means for calculating the GLS estimator. The procedure amounts to running an OLS on:

$$(2.7) \quad S^*_{it} = \beta^*_0 + \beta_1 Y^*_{it} + \beta_2 X^*_{it} + U^*_{it}$$

where $S^*_{it} = S_{it} - \alpha_1 \bar{S}_{i.} - \alpha_2 \bar{S}_{.t} + \alpha_3 \bar{S}_{..}$

and $\alpha_1 = 1 - (\sigma_U / \sigma_1)$, $\alpha_2 = 1 - (\sigma_U / \sigma_2)$

$\alpha_3 = \alpha_1 + \alpha_2 - 1 + (\sigma_U / \sigma_3)$

$\sigma_1^2 = T\sigma_U^2 + \sigma_U^2$, $\sigma_2^2 = N\sigma\lambda^2 + \sigma_U^2$ and

$\sigma_3^2 = \sigma_U^2 + T\sigma\mu^2 + N\sigma\lambda^2$

Y^*_{it} and X^*_{it} are defined in a similar fashion. In this case, since we expect Y_{it} to be highly correlated with the error components, we apply an instrumental variable technique (2SLS) to the GLS transformed equation (cf. Hausman and Taylor (1981)). We estimated σ^2_U from the residuals ζ_{it} in (2.6) after applying the 2SLDV technique to (2.5). σ_1^2 and σ_2^2 were directly estimated by applying 2SLS to (2.2) and (2.3) respectively. The following is the GLS estimation of our reduced form equation free from any error components caused by possible unobservable variables.

$$\frac{S}{Y} = \underset{}{0.0164} + \underset{(3.767)}{0.2731}\,\frac{G}{Y} + \underset{(3.170)}{0.2707}\,\frac{X}{Y} + \underset{(2.476)}{0.0036}\,\frac{F}{Y}$$

$$\underset{(-.373)}{-0.00004R} \underset{(-3.297)}{-0.0100r} \qquad \bar{R}^2 = 0.1299$$

Again, as our earlier results indicated, both government expenditures and export positively affect the saving income ratio. In this estimation the sign and significance level of interest rate are also consistent with the results of the 2SLS estimation of the original model; that is negative and significant.

The elimination of the error components appears to have affected our

terest rate on saving income ratio is negative and significant. That would mean that an increase in interest rates attracts foreign savings which in turn result in higher income. When the impact of such increase on income (via capital inflow) is greater than its possible (positive) effect on savings, the saving income ratio would go down.

IV. Conclusion

In this paper we have constructed and estimated a reduced form equation based on a macroeconomic model to examine the effect of foreign savings (capital inflows) on the saving behavior of a small scale advanced economy with a developed capital market. In addition to the conventional macroeconomic variables our model contains a latent variable collectively reflecting time and country specific risk and policy factors as well as other unobservable variables. Using a technique suggested by Hausman and Taylor (1977), the model was estimated free from any time and/or country specific error components caused by the latent variable. In order to eliminate the possibility of any measurement errors, we also estimated the model using the indexed value of the variables. All estimations were done based on a set of pooled data on eight small developed countries covering the period 1965 through 1986.

Our results generally suggest that contrary to the findings by Gupta and others, which were mostly based on their study of developing countries, foreign savings do not substitute domestic savings. We showed that government expenditures and export positively influence domestic savings. According to our estimation exchange rate has a positive effect on domestic savings whereas interest rates seem to affect the savings income ratio negatively.

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