The Positively Sloped IS Curve and the Balance of Payments: An Extension of Cebula's Model

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I. Introduction

In his paper entitled "The Upward Sloping IS Curve and the Control of Income and the Balance of Payments" *Barrows* (1974) investigated, among others, the effects of monetary and fiscal policy on the balance of payments. He assumed (following *Silber* (1971)), that the positively sloped IS curve is obtained if all the propensities to spend out of income sum to more than unity. However, in another contribution, *Cebula* (1976) retained the standard assumption that the propensities to spend out of income sum to less than unity, but following the suggestions by *Yarrow* (1975) and *Weber* (1970) he assumed that consumption and investment are increasing functions of the rate of interest. These assumptions are also consistent with a positively sloped IS curve. The policy implications of *Cebula*'s model in a closed economy have been investigated by *Cebula* himself (*Cebula* 1976), and *Tavlas* (1980). The purpose of this paper is to extend the analysis, within the framework of *Cebula*'s model, to include the effects of monetary and fiscal policy on the balance of payments, under a fixed exchange rate regime.

II. Cebula's Model and its Extension

Following *Barrows* (1974) we can write a model for an open economy, the equilibrium conditions of which are:

$$Y = C_0 + C(Y, i) + I_0 + I(Y, i) + B(Y) + G \quad \text{(commodity market)} \tag{1}$$

$$L_0 + L(Y, i) = M_0 + K(i) \quad \text{(money market)} \tag{2}$$

$$F = B(Y) + K(i) \quad \text{(balance of payments)} \tag{3}$$

The notation is standard:

Y = income, I = investment, C = consumption, i = the rate of interest, L = the demand for money, M_0 = the supply of money, G = gov-

ernment spending, B = the net balance of trade, K = the net capital inflow, and F = the balance of payments function. C_0, I_0, L_0 are levels of consumption, investment and demand for money, respectively, which do not depend on changes in income or the rate of interest. Differentiating equations (1), (2) and (3) give:

$$dY = dC_0 + C_y\,dY + C_i\,di + dI_0 + I_y\,dY + I_i\,di + B_y\,dY + dG \tag{4}$$

$$dL_0 + L_y\,dY + L_i\,di = dM_0 + K_i\,di \tag{5}$$

$$dF = B_y\,dY + K_i\,di \tag{6}$$

where C_y is the marginal propensity to consume out of income I_y the marginal propensity to invest out of income, C_i and I_i the response of C and I to a change in the rate of interest, L_i the response in the demand of money to a change in the rate of interest, L_y the response in the demand of money to a change in income, K_i the response of net capital flow from abroad to a change in the rate of interest and B_y the response of the balance of trade to a change in income.

The following restrictions are imposed on the system:

$$1 > C_y > 0\ ,\quad 1 > I_y > 0\ ,\quad L_y > 0\ ,\quad L_i < 0\ ,\quad K_i > 0\ ,\quad B_y < 0$$

Cebula (1976), however, assumes that interest responsiveness of both consumption and investment are positive (i.e. $C_i > 0$, $I_i > 0$) and the propensities to spend out of income sum to less than unity (i.e. $C_y + I_y < 1$) so that the slope of the IS curve:

$$\frac{di}{dY} = \frac{1 - C_y - I_y - B_y}{C_i + I_i} > 0 \tag{7}$$

This is consistent with the condition for stability in *Cebula*'s model:

$$\left| \frac{1 - C_y - I_y - B_y}{C_i + I_i} \right| > \left| \frac{-L_y}{(L_i - K_i)} \right| \tag{8}$$

which says that the system is stable if the slope of the LM curve (the right hand term) is less than the slope of the IS curve (the left hand term).

The equations (4), (5), and (6) can be solved for the three endogeneous variables dY, di and dF. *Barrows* (1974, p. 957) gives the solution for dF (which interests us here), from which he derives the following policy multipliers (*Barrows*, 1974 p. 958 and p. 960):

$$\frac{\vartheta F}{\vartheta M_0} = \frac{-\{(1 - C_y - I_y - B_y) K_i + B_y (C_i + I_i)\}}{-\{(1 - C_y - I_y - B_y) (L_i - K_i) + (C_i + I_i) L_y\}} \tag{9}$$

$$\frac{\vartheta F}{\vartheta G} = \frac{L_y K_i - B_y (L_i - K_i)}{-\{(1 - C_y - I_y - B_y) (L_i - K_i) + (C_i + I_i) L_y\}} \tag{10}$$

It can be easily shown that, under *Cebula*'s assumptions and given the condition (8), the denominator in the multipliers (9) and (10) is positive. Whether the net outcome of an increase in money supply (or the government expenditure) on the balance of payments is unfavourable $\left(\frac{\vartheta F}{\vartheta M_0} < 0, \frac{\vartheta F}{\vartheta G} < 0\right)$ or favourable $\left(\frac{\vartheta F}{\vartheta M_0} > 0, \frac{\vartheta F}{\vartheta G} > 0\right)$ will depend on the numerator of the multipliers (9) and (10).

The condition for $\frac{\vartheta F}{\vartheta M_0} < 0$ is:

$$(1 - C_y - I_y - B_y) K_i > B_y (C_i + I_i) \tag{11}$$

or

$$\left| \frac{(1 - C_y - I_y - B_y)}{C_i + I_i} \right| > \left| \frac{B_y}{K_i} \right| \tag{12}$$

This means that a deficit in the balance of payments after a monetary expansion occurs if the slope of the IS curve (the left hand term of (12)) is greater than the slope of the FF′ curve (the right hand term of (12)), i.e. the curve expressing the conditions of equilibrium in the foreign sector.[1]

And the condition for $\frac{\vartheta F}{\vartheta M_0} > 0$ is:

$$(1 - C_y - I_y - B_y) K_i < B_y (C_i + I_i) \tag{13}$$

or

$$\left| \frac{1 - C_y - I_y - B_y}{C_i + I_i} \right| < \left| \frac{B_y}{K_i} \right| \tag{14}$$

Which says that the slope of the FF′ curve is greater than the slope of the IS curve.

These conditions are not the same with those derived by *Barrows* (1974) for the *Silber-Barrows* model. To be more precise the condition

[1] The FF′ curve is the locus of pairs of i and Y which produce balance of payments equilibrium. Its slope is obtained by differentiating equation (3). FF′ curve is the same with *Barrow*'s HH curve (*Barrows*, 1974, p. 958).

for a deficit in the balance of payments after a monetary expansion in *Cebula*'s model in the same with the condition for a surplus in the *Silber-Barrows* model; and the condition for a surplus in the balance of payments after a monetary expansion in *Cebula*'s model is the same with the condition for a deficit in the *Silber-Barrows* model.

The condition for $\frac{\vartheta F}{\vartheta G} < 0$ is:

$$L_y K_i < B_y (L_i - K_i) \tag{15}$$

or

$$\left| \frac{L_y}{L_i - K_i} \right| < \left| \frac{B_y}{K_i} \right| \tag{16}$$

i.e. a deficit in the balance of payments occurs, following an expansion in the government expenditure when the slope of the LM curve is less than the slope of the FF′ curve. And it is easily verified that a surplus in the balance of payments occurs when the slope of the LM curve is greater than the slope of the FF curve. These conditions are the same with those derived by *Barrows* (1974).

III. Conclusions

It turns out that the different assumptions on which *Cebula*'s and *Silber*'s models are based affect only the conditions under which an expansionary monetary policy affects the balance of payments. The conditions for the effects of the fiscal policy remain the same in both models.

References

Paul Barrows (1974): "The upward sloping IS curve and the control of income and the balance of payments". The Journal of Finance. — *Richard J. Cebula* (1976): "A brief note on economic policy effectiveness" Southern Economic Journal. — *William L. Silber* (1971): "Monetary policy effectiveness: the case of a positively sloped IS curve". The Journal of Finance. — *George Tavlas* (1980): "Economic policy effectiveness in Hicksian analysis: an extension" Kredit und Kapital. — *Warren Weber* (1970): "The effects of interest rates on aggregate consumption" American Economic Review. — *George Yarrow* (1975): "Growth maximisation and the firm's investment function" Southern Economic Journal.

Zusammenfassung

Positiv verlaufende IS-Kurven und die Zahlungsbilanz: eine Erweiterung des Cebulaschen Modells

Dieser Beitrag befaßt sich mit den bei festen Wechselkursen im Rahmen des *Cebula*schen Modells auftretenden Auswirkungen der Geld- und Finanzpolitik auf die Zahlungsbilanz und vergleicht sie mit den von *Barrows* erhaltenen Ergebnisse für das Modell von Silber-*Barrows*.

Es wird festgestellt, daß die unterschiedlichen Annahmen des *Cebula*schen und des Silber-*Barrow*schen Modells lediglich die Bedingungen beeinflussen, unter denen eine expansionistische Geldpolitik eine Wirkung auf die Zahlungsbilanz ausübt. In beiden Modellen bleiben die Bedingungen für eine Beeinflussung durch die Finanzpolitik gleich.

Summary

The Positively Sloped IS-Curve and the Balance of Payments: An Extension of Cebula's Model

This paper deals with the effects of monetary and fiscal policy on the balance of payments within the framework of *Cebula*'s model, under a fixed exchange rate regime, and compares them with the results obtained by *Barrows* for the *Silber-Barrows* model.

It is found that the different assumptions on which *Cebula*'s and *Silber-Barrows* model are based affect only the conditions under which an expansionary monetary policy affects the balance of payments. The conditions for the effects of the fiscal policy remain the same in both models.

Résumé

Les courbes positives Investissement-Epargne et la balance des paiements: une extension du modèle de Cebula

L'article s'intéresse dans un régime de taux de change fixes et dans le contexte du modèle de *Cebula* aux effets de la politique monétaire et financière sur la balance des paiements et les compare aux résults obtenus par *Barrows* sur le modèle de Silber-*Barrows*.

L'auteur établit que les diverses hypothèses des modèles de *Cebula* et de Silber-*Barrows* n'influent que sur les conditions dans lesquelles une politique monétaire expansionniste exerce une action sur la balance des paiements. Dans les deux modèles, les conditions d'intervention de la politique financière demeurent identiques.