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Yeung-Nan Shieh, *San Jose State University*

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Yeung-Nan Shieh*

San Jose State University

Abstract According to the conventional wisdom, currency devaluation is expansionary (contractionary) if it improves (worsens) the trade balance. However, recent empirical studies suggest that currency devaluation may improve the trade balance and generate a depressing effect on domestic output. Under the assumptions that (1) the Marshall-Lerner condition is always met and (2) the import demand function is independent of disposable income, Hsing (2004, 2005a, 2005b, 2005c) extended the IS-MP-AS model (Romer, 2000, 2006) and the Taylor rule (Taylor, 1993, 1998, 1999) to examine the effects of currency devaluation and resolve the inconsistency between empirical findings and theoretical results. This note incorporates disposable income as an argument in the net export function and shows the modified Romer-Hsing-Taylor model can resolve the empirical findings without the assumption that the Marsall-Lerner condition is always met.

Keywords: The IS-MP-AS model, Taylor rule, currency devaluation

JEL Classifications: F13, F41, F42

1. Introduction

Currency devaluation is one of important economic stabilization policies that a government may undertake. According to the conventional wisdom, as Meade (1951) and Tsiang (1961) had shown, a currency devaluation improves the trade balance and expands domestic output if the Marshall-Lerner condition is satisfied, [see also Takayama (1972, chapter 11, appendix)]. However, recent empirical studies suggest that a currency devaluation may improve the trade balance and generate a depressing effect on domestic output, [see Cooper (1971), Edwards (1986) and especially Bahmani-Oskooee and Miteza (2003)]. Such findings attract the attention of many studies, Chen (1971, 1973), Krugman and Taylor (1978), Shieh and Mai (1979) and Lai and Chang (1989) have tried to explain this empirical phenomenon from theoretical models. In order to provide an alternative theoretical viewpoint, recently Hsing employed the IS-MP-AS model to examine the effects of currency devaluation. He showed that "the effects of currency depreciation on output is unclear and may depend upon the sensitivity of net export and the interest rate to a change in the exchange rate, the reaction of the interest rate to a change in the inflation rate, and other parameters." (Hsing 2004, p. 256) By applying the GARCH methodology, Hsing (2005a, 2005b, 2005c) further identified real GDP in Germany Singapore and Poland is positively affected by the real exchange rate appreciation. However, the Romer-Hsing-Taylor model is based on two restrictive assumptions: (1) the Marshall-Lerner condition is always satisfied, (2) the next export function is independent of disposable income. It is well-

known that the Marshall-Lerner condition and disposable income as an argument in the net export function play very important roles in the standard international macroeconomic model. For example, see Fleming (1962), Mundell (1961), Takayama (1972, chapter 11), and Krugman and Obstfeld (2005, chapter 16).

The purpose of this note is to introduce disposable income and the Marshall-Lerner condition into the net export function in the IS-MP-AS model and to reexamine the impact of currency devaluation on the trade balance and domestic output. It will be shown that the empirical findings of the contractionary devaluation can easily be resolved by the IS-MP-AS model without the assumption that the Marshall-Lerner condition must be met.

2. The IS-MP-AS Model and Effect of Devaluation

Following Romer (2000, 2006) and Hsing (2004, 2005a, 2005b, 2005c), the macroeconomic relationships in the IS-MP-AS model can be described by the following three equations

$$Y = C(Y-T, R, S) + I(Y, R, S) + G + NX(q, Y-T, Y^w) \quad (1)$$

$$R = R(\pi-\pi^*, Y-Y^*, e-e^*, R^w) \quad (2)$$

$$\pi = \pi^e + \theta(Y-Y^*) \quad (3)$$

where Y = domestic output, C = consumption, T = tax, Y-T = disposable income, R = real interest rate, S = stock values, I = investment, G = government expenditure, NX = net export (balance of trade), $q = ep^f/p$ = terms of trade, p^f = foreign price level, p = domestic price level, e = exchange rate (defined as the price of foreign currency in terms of domestic currency), Y^w = world output, π = inflation rate, π^* = target inflation rate, Y* = potential output, e* = target exchange rate, R^w = world interest rate, π^e = expected inflation rate, θ is a positive coefficient. Without loss of generality, assume that before currency devaluation, NX = 0 and $p = p^f = e = q = 1$. Including Y-T and Y^w in the net export function constitutes the only point of departure from the Romer-Hsing-Taylor model.[1]

Equations (1) – (3) can be solved for Y, R and π in terms of e and $v = v(T, S, p, p^f, R^w, Y^w, \pi^*, \pi^e, Y^*, e^*, \theta)$ where v is a vector of remaining parameters. Thus, the equilibrium Y can be given by

$$Y = Y(e, v) \quad (4)$$

The expression for the partial derivative such as $\partial Y/\partial e$ can be obtained by applying the standard comparative statics procedure; i.e., totally differentiate equations (1)-(3) and use Cramer's rule to obtain

$$\partial Y/\partial e = (1/J)[NX_q + R_e(C_R+I_R)] \quad (5)$$

where

$$J \equiv (1 - C_Y - I_Y - NX_Y) - (C_R + I_R)(\theta R_\pi + R_Y) > 0 \quad (6)$$

Note that $R_e \equiv \partial R/\partial e > 0$, $C_R \equiv \partial C/\partial R < 0$, $I_R \equiv \partial I/\partial R < 0$, $1 > C_Y \equiv \partial C/\partial(Y-T) > 0$, $I_Y \equiv \partial I/\partial Y > 0$, $NX_Y \equiv \partial NX/\partial(Y-T) < 0$, $(1 - C_Y - I_Y - NX_Y) > 0$, $\pi_Y \equiv \partial\pi/\partial(Y-T) = \theta > 0$, $R_\pi \equiv [\partial R/\partial(\pi-\pi^*)] > 0$, $R_Y \equiv \partial R/\partial(Y-Y^*) > 0$, and $NX_q \equiv \partial NX/\partial q$ can be expanded into $IM(\eta + \eta^* - 1)$ with η and η^* standing for domestic and foreign import demand elasticities and IM standing for initial value of imports.[2] It is clear that $NXq > (<) 0$ according to $(\eta + \eta^*) > (<) 1$. This is the well-known Marshall-Lerner condition.

Next, we examine the impact of currency devaluation on the trade balance. Substituting (4) into $NX = NX(q, Y-T, Y^w)$ and taking partial derivative of NX with respect to e, we obtain

$$\partial NX/\partial e = NX_Y(\partial Y/\partial e) + NX_q \quad (7)$$

Combining this equation with (5), we obtain

$$\partial NX/\partial e = (1/J)\{NX_q[(1-C_Y-I_Y) - (C_R + I_R)(\theta R_\pi + R_Y)] + NX_Y(C_R+I_R)R_e\} \quad (8)$$

It follows immediately from (5) and (8) that

$$\partial Y/\partial e > (<) 0, \partial NX/\partial e > 0, \quad \text{if } NX_q > 0 \quad (9)$$

$$\partial Y/\partial e < 0, \quad \partial NX/\partial e > (<) 0, \text{ if } NX_q < 0 \quad (10)$$

In other words, currency devaluation may improve the trade balance while depressing the domestic economy. Assuming $NX_q > 0$, i.e., the Marshall-Lerner condition is satisfied, Hsing pointed out that $\partial Y/\partial e < 0$ shows a currency devaluation depresses the domestic output. It is clear from (9) and (10) that the empirical findings of the contractionary devaluation can easily be resolved by the IS-MP-AS model without the assumption that the Marshall-Lerner condition must be met. However, it seems worth further specifying more precisely the exact conditions under which the conventional results (i.e., a successful devaluation is expansionary) will be reversed.

In the case of $NX_q > 0$, devaluation is bound to improve the trade balance because an increase in the interest rate due to a depreciation of domestic currency reduces the domestic spending and produces further improvement in the trade balance. This can be seen from (8) where, with $NX_q > 0$, $NX_q[(1-C_Y-I_Y) - (C_R+I_R)(\theta R_\pi+R_Y)]$ and $NX_Y(C_R+I_R)R_\pi$ have the same sign. However, a rise in the interest rate may depress the economy so much that it outweighs the expansionary effect of successful devaluation. From (5), we can see this will happen when

$$-R_e(C_R+I_R) > NX_q \quad (11)$$

In the case of $NX_q < 0$, i.e., the Marshall-Lerner condition is not satisfied, a devaluation is bound to be contractionary because the trade balance effect, $NX_q < 0$, and the higher interest rate effect, $R_e(C_R+I_R) < 0$, work in the same direction, as can be seen from (5). However, the trade balance

may still improve in spite of $NX_q < 0$ because the improvement in the trade balance due to the reduction in expenditure may outweigh the deterioration in the trade balance produced by devaluation with $NX_q < 0$. From (8), we can see this will happen when

$$NX_Y(C_R+I_R)R_e > - NX_q[(1-C_Y-I_Y) – (C_R + I_R)(\theta R_\pi+R_Y)] \quad (12)$$

Equation (12) also can be rewritten as

$$(\eta + \eta^*) > 1 – \{NX_Y(C_R+I_R)R_e/IM[(1-C_Y-I_Y) – (C_R + I_R)(\theta R_\pi+R_Y)]\} < 1 \quad (13)$$

This indicates that the interest rate effect of devaluation has a favorable effect of the trade balance so that the critical value of the sum of import demand elasticities is reduced to less than one.

3. Conclusions

We have attempted a simplified synthesis of the Mundell-Fleming model and the IS-MP-AS model by incorporating the Marshall-Lerner condition and disposable income into Romer and Hsing's net export function. The modified Romer-Hsing-Taylor model enables us to resolve the empirical findings that currency devaluation may improve the trade balance and depress domestic economic activity without the assumption that the Marshall-Lerner condition must always be satisfied.

More importantly, we show that the modified Romer-Hsing-Taylor model is an important alternative short-run international macroeconomic model. Like Hsing (2005a, 2005b, 2005c) demonstrates clearly that this model can be applied to analyze the impacts of changes in macroeconomic variables on domestic output. Empirical outcomes of Germany, Singapore and Poland show that the IS-MP-AS model seems to be working very well.

Footnotes

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1. Recently Romer points out that NX(q) can be replaced by the more general equation NX = (Y, R, G, T, q) with $NX_Y < 0$. For details, see Romer (2006, p. 241, footnote 14.)

2. Let NX = X(q) – qIM(q), where X stands for export, i.e., foreign country's import. Taking derivative of NX with respect to q, we have $NX_q \equiv (dNX/dq) = X_q – qIM_q – IM = X_q(q/X)(X/q) – qIM_q(q/IM)(IM/q) – IM = IM\eta + (X/q)\eta^* - IM = IM(\eta + \eta^* – 1)$ as X = qIM, i.e., NX = 0 initially.

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