The Tight Money Effect of Devaluation: An Alternative Interpretation of Contractionary Devaluation

Yeung-Nan Shieh
San Jose State University

This paper explicitly incorporates the tight money effect of devaluation into the standard Mundell-Fleming model and evaluates the effects of currency devaluation on domestic output and the trade balance. It shows that a currency devaluation will depress domestic output in the presence of the tight money effect. This revised Mundell-Fleming model can be viewed as a theoretical framework in explaining the empirical findings of contractionary devaluation.

INTRODUCTION

It is well known that in the Keynesian open-economy macroeconomic model devaluation will contribute an expansionary effect on domestic output and a improvement in the trade balance, provided the Marshall-Lerner condition is satisfied, see (Meade, 1951), (Tsiang, 1961), (Fleming, 1962), (Mundell, 1968) and (Takayama, 1972, chapter 11). However, empirical evidences from developing countries suggest that a currency devaluation may generate a contractionary effect on domestic output in short run. Recently, Bahmani-Oskooee and Miteza (2003) (henceforth BM) reviews the existing theoretical and empirical literature on the impact of devaluation on domestic output. According to BM, one of the most important reasons for a devaluation to cause a contract of the aggregate demand is that the devaluation causes a 'reduction in real wealth and real cash balance' (BM, 2003, p. 8). This is the so-called tight money effect.[1] However, most of studies mentioned by BM mix the tight money effect with other effects. The significance of tight money effect in contractionary devaluation sinks into oblivion.

This paper attempts to incorporate the tight money effect into the familiar Mudell-Fliming model presented by Mankiw (2003) in his widely adopted macroeconomics textbook. Within this theoretical framework, it will be shown that the tight money effect can be viewed as an important feature in explaining the empirical findings of contractionary devaluation.

[1]. Mundell points out that '[t]he devaluation raises prices thus reduces the real value of the money supply, making money *tight*' (Mundell, 1971, p. 92).

THE BASIC MODEL

Following Mankiew (2003, chapter 12), assume that the open economy is operating under fixed exchange rate and can not affect the foreign price level and the foreign interest rate. The macroeconomic relationships of this familiar Mundell-Fleming type can be described by the following three equations:[2]

$$Y = C(Y\text{-}T) + I(r) + G + NX(Y\text{-}T, q) \qquad (1)$$
$$L(r, Y) = M/g + B \qquad (2)$$
$$NX(Y\text{-}T, q) - CF(r) = B \qquad (3)$$

where Y = domestic output, C = consumption, T = tax, Y – T = disposable income, I = investment, r = interest rate, G = government purchases, NX = next export, $q = eP_f/P$ = terms of trade, e = exchange rate defined to be the price of foreign currency in terms of the price of domestic currency, P = the price of domestic goods, P_f = price of foreign goods in foreign currency, L = demand for money, M = nominal money supply, $g = (1-\lambda)P + \lambda eP_f$ = general price level, $1 \geq \lambda \geq 0$, CF = net capital outflow, B = balance payment. As usual, it is assumed that $1 > C' \equiv dC/d(Y\text{-}T) > 0$, $I_r \equiv dI/dr < 0$, $NX' \equiv \partial NX/\partial(Y\text{-}T) < 0$, $L_r \equiv \partial L/\partial r < 0$, $L_Y \equiv \partial L/\partial Y > 0$, $CF_r \equiv dCF/dr < 0$, $NX_q \equiv \partial NX/\partial q = IM(\eta + \eta^* - 1) > (<) 0$ with IM = the initial value of imports, and η and η^* representing domestic and foreign import elasticities, respectively. Without loss of generality, it is also assumed that $P = P_f = e = q = 1$, NX = 0 and B = 0 initially. It is worth noting that the inclusion of the exchange rate (e) as an argument in the real money supply constitutes the only point of departure from the conventional Mundell-Fleming model.

Equations (1) and (2) describe the IS and LM curves. We assume that any balance of payments surplus or deficit will feed into the nominal money supply. Equation (3) specifies that the overall balance of payments is the sum of the current account and capital account. To ease our analysis, we substitute (3) into (2) and obtain

$$L(r, Y) = M/g + NX(Y\text{-}T, q) - CF(r) \qquad (2')$$

The short-run equilibrium values of Y and r are determined from two equations (1) and (2') for given values of e and $v = (T, M, P_f, P)$ where v is a vector of remaining parameters not involving Y, and r. We may denote these by

$$Y = Y(e, v) \qquad r = r(e, v) \qquad (4)$$

The expressions for the partial derivatives such as $\partial Y/\partial e$ and $\partial r/\partial e$ can be obtained by applying the standard comparative static procedure. This completes our modeling of the basic analytical framework for studying the tight money effect of devaluation.

---

[2]. To facilitate the graphic presentation, Mankiw did not present a short-run model like (1)-(3) in chapter 12 of his textbook. However, from questions 5 and 6 in his problems and applications section on p. 340 and appendix on p. 341, we can figure out the Mundell-Fleming model under fixed exchange rates can be described as (1) - (3). For details, see also (Takayama, 1978, p. 119 and pp. 124-125) and (Romer, 2006, pp. 228-241).

EFFECTS OF DEVALUATION

Totally differentiating (1) and (2') with respect Y, r and e and using Cramer's rule, we obtain

$$(\partial Y/\partial e) = (1/J)[NX_q(L_r+I_r+CF_r) - \lambda I_rM] \quad (5)$$
$$(\partial r/\partial e) = (1/J)[NX_q(1\text{-}C'\text{-}L_Y) - \lambda M(1\text{-}C'\text{-}NX')] \quad (6)$$

Substituting (4) into the net export function, we obtain

$$NX = NX[Y(e,v)\text{-}T, e] \quad (7)$$

Take partial derivative of NX with respect to e, we have

$$(\partial NX/\partial e) = (1/J)\{NX_q[(1\text{-}C')(L_r+CF_r)+L_YI_r] - \lambda I_rMNX'\} \quad (8)$$

Similarly, substituting (4) into (3) and taking derivative of B with respect to e, we obtain

$$\begin{aligned}(\partial B/\partial e) &= (\partial NX/\partial e) - CF_r(\partial r/\partial e)\\ &= (1/J)\{NX_q[(1\text{-}C')L_r+L_Y(I_r+CF_r)]+\lambda M[(1\text{-}C')CF_r\text{-}NX'(I_r+CF_r)]\}\end{aligned} \quad (9)$$

where $J = (1\text{-}C'\text{-}NX'')(L_r+CF_r)+I_r(L_Y\text{-}NX') < 0$ (10)

If the tight money effect is ignored, i.e., $\lambda = 0$, it follows from (5), (6), (8), and (9) that

$$(\partial Y/\partial e) > 0, (\partial r/\partial e) < 0, (\partial NX/\partial e) > 0, (\partial B/\partial e) > 0, \text{ if } NX_q > 0 \quad (11)$$
$$(\partial Y/\partial e) < 0, (\partial r/\partial e) > 0, (\partial NX/\partial e) < 0, (\partial B/\partial e) < 0, \text{ if } NX_q > 0 \quad (12)$$

Thus, we obtain the conventional result that a devaluation expands domestic output and improves the balance of payments if the Marshall-Lerner condition is satisfied.

If the tight money effect is brought into consideration, i.e., $\lambda \neq 0$, and $NX_q > 0$, then it follows from (5), (6), (8), and (9) that

$$(\partial Y/\partial e) > (<)\ 0, \text{ as } - NX_q(L_r+I_r+CF_r) > (<) - \lambda I_rM \quad (13)$$
$$(\partial r/\partial e) > (<)\ 0, \text{ as } NX_q(1\text{-}C'\text{-}L_Y) < (>)\ \lambda M(1\text{-}C'\text{-}NX') \quad (14)$$
$$(\partial NX/\partial e) > 0, \quad (15)$$
$$(\partial B/\partial e) > 0. \quad (16)$$

Equation (13) shows that a devaluation can depress domestic output because it reduces real money supply and then absorption. To see this, from (1), we can derive

$$(1\text{-}C'\text{-}NX')(\partial Y/\partial e) = I_r(\partial r/\partial e) + NX_q \quad (17)$$

It is obvious that the first term in the right hand side is the expenditure-reducing effect (i.e., the real balance effect) and the second term is the expenditure-switching effect (i.e., the Marshall-Lerner condition effect). The contractionary devaluation happens when the expenditure-reducing effect exceeds the expenditure-switching effect.

Alternatively, if $\lambda \neq 0$, and $NX_q < 0$, then

$(\partial Y/\partial e) < 0,$ (18)
$(\partial r/\partial e) > 0,$ (19)
$(\partial NX/\partial e) < (>) \ 0$, as $NX_q[(1\text{-}C')(L_r+CF_r)+L_Y I_r] > (<) \lambda I_r M NX'$ (20)
$(\partial B/\partial e) < (>) \ 0$, as $NX_q[(1\text{-}C')L_r+L_Y(I_r+CF_r)] > (<) -\lambda M[(1\text{-}C')CF_r\text{-}NX'(I_r+CF_r)]$ (21)

It is clear from (13)-(21) that a devaluation may improve the trade balance and depress domestic output. A comparison of the results in (11) and (12) with those in (13)-(16) and (18)-(21) leads us to conclude that empirical findings of contractionary devaluation can be easily resolved by the tight money effect. Furthermore, the results in (19) and (20) appear in that the Marshall-Lerner condition is no longer a necessary condition for the trade balance and the balance of payments improvement.

GRAPHIC DEPICTION

The analysis in the preceding section can be illustrated graphically by using the familiar IS-LM-BP diagram. To ease our exposition, we only demonstrate the case of $NX_q > 0$, i.e., the Marshall-Lerner condition is satisfied, and leave the case of $NX_q < 0$ to the interested reader.[3]

In Figure 1, each of the three lines graphs on of three equations (1) – (3): IS for (1), LM for (2), and BP for (3), with B set at zero. The equilibrium is established at E, with an appropriate exchange rate that will make BP pass through the intersection of IS and LM curves. It is easy to see that any point to the right (left) of BP represents a point of the balance of payments deficit (surplus).

A devaluation means an increase in e. If the tight money effect is absent, i.e., $\lambda = 0$, a devaluation shifts IS, LM and BP rightward to IS_1, LM_1 and BP_1. But LM_1 shifts to the right by less than BP_1.[4] The new equilibrium will be established at E_1, which lies to the left of BP_1 and to the right of E. Thus, domestic output rises and the balance of payments improves as a result of devaluation.

[3]. In their recent study, Bahmani-Oskooee and Niroomand (1998) applied the Johansen and Juselius cointegration technique to estimate the trade elasticities for 30 countries and found that the Marshall-Lerner condition is satisfied in almost all countries.

[4]. From (1)-(3), it is easy to obtain that IS_1 shifts horizontally by $[NX_q/(1\text{-}C'\text{-}NX')] > 0$, LM_1 shifts horizontally by $[NX_q/(L_Y\text{-}NX')] > 0$ and BP shifts horizontally by $(-NX_q/NX') > 0$. Further, it can be shown that LM_1 shifts to the right by less than BP_1 as $(-NX_q/NX') > [NX_q/(L_Y\text{-}NX')]$.

FIGURE 1
THE TIGHT MONEY EFFECT IS ABSENT

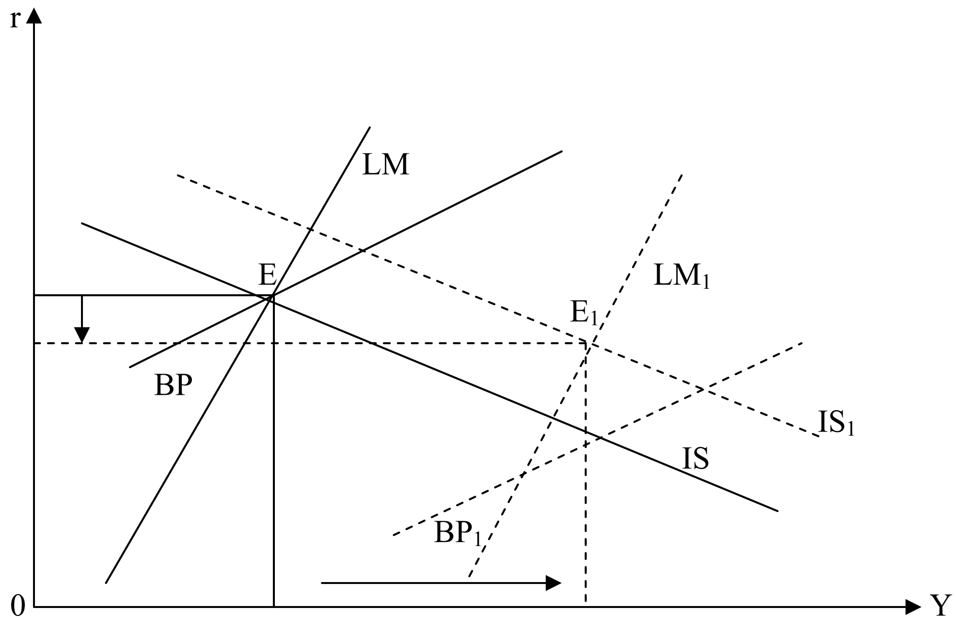
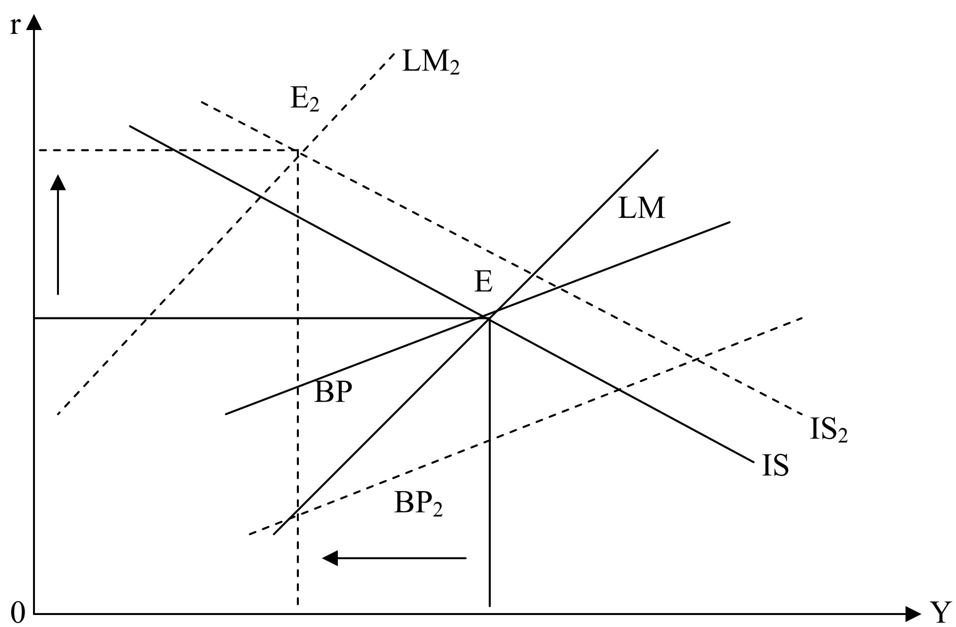


FIGURE 2
THE TIGHT MONEY EFFECT EXISTS



Next, we turn to the case of the tight money effect, i.e., $\lambda \neq 0$, which is represented in Figure 2. A devaluation shifts both IS and BP rightward to IS_2 and BP_2, and LM will shift upward and to the left, (i.e., the expenditure-reducing effect exceeds the expenditure-switching effect). If the leftward shift of LM_2 is substantial, the new equilibrium E_2 may lie to the left of E.[5] Thus, domestic output decreases while the balance of payments improves. Devaluation generates a contractionary effect on domestic output.

CONCLUSIONS

We have attempted to reexamine the effects of devaluation on domestic output and the trade balance by explicitly incorporating the tight money effect into the standard Mundell-Fleming's IS-LM-BP model. It has been shown that a devaluation stimulates the economy if the tight money effect is absent, but a devaluation may depress the economy if the tight money effect exists. This modified IS-LM-BP model can be viewed as a theoretical structure in explaining the empirical findings of contractionary devaluation. Our results shed light on some interesting insights of the exchange rate policy for the public and private decision makers.

REFERENCES

Bahmani-Oskooee M and Niroomand F (1998). Long-Run Price Elasticites and the Marshall-Lerner Condition Revisited. Economics Letters, 14 (1), 51-61.

Bahmani-Oskooee M and Miteza I (2003). Are Devaluations Expansionary or Contractionary? A Survey Article. Economic Issues, 8 (2), 1-28.

Fleming, J M (1962). Domestic Financial Policies under Fixed and under Flexible Exchange Rates. Staff Papers, International Monetary Fund, 9 (Nov.), 369-379.

Mankiw, N G (2003). Macroeconomics, New York: Worth Publishers.

Mead, J E (1951). The Balance of Payments: Mathematical Supplement. London: Oxford University Press.

Mundell, R A (1968). International Economics. New York: MacMillian.

Mundell, R A (1971). Monetary Theory: Inflation, Interest and Growth in the World Economy. Pacific Palisades: Goodyear.

Romer, D (2006). Advanced Macroeconomics. third edition, Boston: McGraw-Hill, Irwin.

---

[5] . If $\lambda \neq 0$, it is easy to obtain that IS_1 shifts horizontally by $[NX_q/(1-C'-NX')] > 0$, LM_1 shifts horizontally by $[(-\lambda M+NX_q)/(L_Y-NX')] < (>) 0$ as $\lambda M > (<) NX_q$ and BP shifts horizontally by $(-NX_q/NX') > 0$. Further, it can be shown that LM_1 shifts to the left if $[(-\lambda M+NX_q)/(L_Y-NX')] < 0$ as $\lambda M > NX_q$, i.e., the tight money effect dominates the Marshall-Lerner effect.

Takayama, A (1972). International Trade: An Approach to the Theory. New York: Holt, Rinehart, and Winston.

Takayama, A (1978). The Wealth Effect, the Capital Account, and Alternative Policies under Fixed Exchange Rates. Quarterly Journal of Economics, 92 (1), 117-147.

Tsiang, S C (1961). The Role of Money in Trade Balance Stability: Synthesis of Elasticity and Absorption Approaches. American Economic Review, 51 (5), 912-936.