1-1-1986

A Portfolio Balance Theory of Exchange Rate Determination The Efficacy of Fiscal Policy in an Open Economy

Hassan Khademian

Occasional Paper No. 8609
December, 1986

Occasional Papers

The Center for International Studies of the University of Missouri-St. Louis issues Occasional Papers at irregular intervals from ongoing research projects, thereby providing a viable means for communicating tentative results. Such "informal" publications reduce somewhat the delay between research and publication, offering an opportunity for the investigator to obtain reactions while still engaged in the research. Comments on these papers, therefore, are particularly welcome. Occasional Papers should not be reproduced or quoted at length without the consent of the author or of the Center for International Studies.

A Portfolio-Balance Theory of Exchange-Rate Determination: The Efficacy of Fiscal Policy in an Open Economy

by

Hassan Khademian

A PORTFOLIO-BALANCE THEORY OF EXCHANGE-RATE DETERMINATION:

THE EFFICACY OF FISCAL POLICY IN AN OPEN ECONOMY

Hassan Khademian
Assistant Professor of Economics, and
Fellow, Center for International Studies
University of Missouri-St. Louis
St. Louis, Missouri 63121-4499

Abstract

A synthesized Keynesian and portfolio-balance model in the spirit of Levin (1980), Frenkel, Gylfason, and Helliwell (1980), Gylfason and Helliwell (1983), Ahtiala (1984), Branson (1986), and Dornbusch (1986) is constructed. It is then shown that a fiscal policy-dominated recovery is weakened, not only due to disequilibrium conditions in the home, but also foreign security markets.

1. Introduction

Fiscal policies have become a divisive issue among industrialized economies (Feldstein, 1986). The September, 1985 "Plaza Accord" was inaugurated as a major shift in U.S. foreign exchange policy. Accordingly, it was agreed to realign the trade balances of these nations by reducing the value of the U.S. dollar. However, the precipitous fall in the U.S. dollar since 1985 has failed to have a significant impact toward a more balanced world trade growth.[1] The U.S. demands that her trading partners, those with huge trade surpluses, eliminate structural demand impediments.[2] The consequent prospects of high inflation and high real long-term interest rates in Europe, have been cause for concern. U.S. trading partners seem to indicate that the solution can be found in corrective macropolicies in the U.S. rather than the depreciation of the dollar.[3]

The purpose of this paper is to explain the above facts within an IS-LM analytical framework of Fleming (1962) and Mundell (1968). This study incorporates elements of Keynesian and portfolio-balance approaches similar to the models developed by Levin (1980), Frenkel, Gylfason, and Helliwell (1980), Gylfason and Helliwell (1983), Ahtiala (1984), Branson (1986), and Dornbusch (1986). It is then shown that a fiscal policy-dominated recovery is weakened, not only due to disequilibrium conditions

in the home, but also foreign security market.

A two-sector model of goods and financial markets is developed in section two.[4] Equilibrium conditions are studied in section three. Implications of fiscal policy-originated disequilibrium conditions are examined in section four.

2. A Synthesized Keynesian and Portfolio-Balance Model

The dynamics of a Mundell-Fleming single-country economy can be simultaneously specified in the commodities, domestic and foreign bond markets.

Based on the producers' responses to unexpected inventory changes, a goods market excess demand function is:[5]

$$(1) \qquad \dot{Y} = \alpha\{c[Y-tY+R] + I(r) + G + x(Y,[EP^{*}/P_{h}]) + f - Y\},$$

where c is the marginal propensity to consume; t, a tax rate; and R, real government transfer payments. The investment function I(r), is a negative function of the real interest rate (r) [$I_{r}<0$]. G measures real government expenditure. Net exports, x(Y,E), decline with real income (Y), and rise with the exchange rate (E)--the domestic currency price of foreign exchange [$x_{Y}<0$, $x_{E}>0$]. P^{*} and P_{h} are overall foreign and home goods price levels, respectively. f is an autonomous consumption. Finally, α is an adjustment parameter such that $1>\alpha>0$.

In the financial sector, private citizens hold portfolios of domestic real money balances (M/P), home bonds (B^{d}/P), and foreign denominated securities (F/P).

$$(2) \qquad w = M/P + B^{d}/P + EF/P$$

Here, w is real wealth, and B^d/P is the portion of domestic securities (B/P) held by home residents. P is the overall home price level, a weighted average of P^* and P_h.

The excess supply in the home security market can be modelled as:

$$(3) \quad \dot{r} = \beta[B/P - b^d(r^+,[r^*]^-,Y^+)w - b^f(r^+,[r^*]^-,[Y^*]^+)Ew^*]$$

$$1 > \beta > 0, \quad 1 > b^d > 0, \quad 1 > b^f > 0$$

where β is an adjustment parameter. The terms $b^d(r,r^*,Y)$ and $b^f(r,r^*,Y^*)$ denote the domestic and foreign-desired fraction of domestic (w) and foreign (w^*) wealth, respectively, held in domestic securities. Given a single-country economy assumption, the foreign interest rate (r^*), real income (Y^*), and wealth (w^*) are determined exogenously. Superscripts "+" ("-") indicate the economic variables' impact on demand for financial assets.[6]

Finally, the excess demand function in the foreign security market is given by

$$(4) \quad \dot{E} = \lambda[b^*(r^-, [r^*]^+, Y^+)w^+ - (EF/P)],$$

where $1 \gg \lambda > 0$ is an adjustment parameter. $b^*(r,r^*,Y)$ denotes the domestic desired fraction of domestic wealth held in foreign securities.

The wealth constraint implies that the summation of the desired fractions of domestic wealth--those held in real cash balances, domestic, and foreign securities--total one. Hence

$$(5) \quad m(r,Y) + b^d(r,r^*,Y) + b^*(r,r^*,Y) = 1$$

where m(r,Y) describes the desired fraction of wealth held in domestic real balances.

Therefore, the dynamics of a single country economy can be

reduced to the following set of equations:

$$(1)\quad \dot{Y} = \alpha\{c[Y-tY+R] + I(r) + G + x(Y,[EP^*/P_h]) + f - Y\}$$

$$(3)\quad \dot{r} = \beta[B/P - b^d(r,r^*,Y)w - b^f(r,r^*,Y^*)Ew^*]$$

$$(4)\quad \dot{E} = \lambda[b^*(r,r^*,Y)w - EF/P]$$

3. Equilibrium Conditions

Equilibrium in this model requires that excess demand for all assets be equal to zero. This condition must therefore be met both in the (flow) goods market and in the (stock) financial markets (Foley, 1975). Hence, using the wealth constraint (equation 2), the market clearing condition for real balances can be dropped. Accordingly, given P, r^*, and Y^*; the equilibrium levels of real income, interest rate, and exchange rate are determined when equations (1), (3), and (4) are simultaneously set to zero.

The necessary and sufficient stability conditions require that the trace of the Jacobian matrix J be negative and that its determinant be positive. The Jacobian matrix, as well as the signs of the partial derivatives, are shown in Table 1.

[Table 1 approximately here]

It can be shown that this matrix satisfies both the necessary and sufficient stability requirements.[7] The equilibrium conditions of these markets in an E-r plane are given in Figure 1. Along the GG curve excess demand for goods is zero, $\dot{Y}=0$. Along

TABLE 1

Jacobian Matrix J

Partial Derivatives of the ...	With Respect To: Real Income	Interest Rate	Exchange Rate
Goods Market	$[-1+c(1-t)+x_Y]$ (-)	$[I_r]$ (-)	$[P^*/P_h]x_E$ (+)
Domestic Bond Market	$[-wb^d_Y]$ (-)	$[-wb^d_r-Ew^*b^f_r]$ (-)	$[-b^d(F/P)-b^f w^*]$ (-)
Foreign Bond Market	$[wb^*_Y]$ (+)	$[wb^*_r]$ (-)	$[-(1-b^*)(F/P)]$ (-)

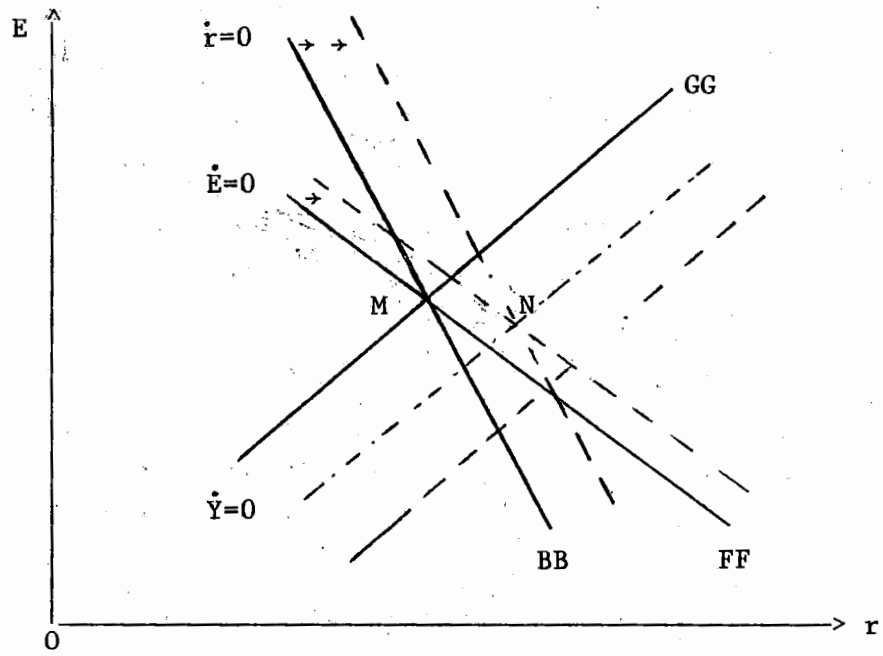

Figure 1

the BB (FF) curve excess demand for home (foreign) bonds is also equal to zero, $\dot{r}=0$ ($\dot{E}=0$).

[Figure 1 approximately here]

By applying the assumption of gross substitution between home and foreign securities, the FF curve, in Figure 1, is flatter than the BB curve [Branson, Halttunen, and Masson (1979)].

4. Implications

A solution for changes in real income, interest rate, and exchange rate as a result of a bond-financed fiscal policy is given by

$$[j_{ij}] \begin{pmatrix} dY \\ dr \\ dE \end{pmatrix} = [a_{ij}] \begin{pmatrix} dM \\ dF \\ dG \end{pmatrix} \tag{6}$$

Where $[j_{ij}]$ is the Jacobian matrix derived above, and $[a_{ij}]$, a parameter matrix is

$$[a_{ij}] = \begin{bmatrix} 0 & 0 & -1 \\ b^d/P & Eb^d/P & -(1-b^d)/P \\ -b^*/P & E(1-b^*)/P & -b^*/P \end{bmatrix} \tag{7}$$

To capture responses to a bond-financed fiscal policy, the solution conditions (6) and (7) are derived by replacing dB/P, in the parameter matrix $[a_{ij}]$, with its equivalence dG. Hence, real income adjustment pattern can be derived from the fiscal policy-disturbed goods market clearing conditions,

$$j_{11}dY + j_{12}dr + j_{13}dE = a_{13}dG,$$

with some rearrangements, as:

(8) $$(dY/dG) = [1/j_{11}][-j_{12}(dr/dG) - j_{13}(dE/dG) + a_{13}]$$

The Jacobian elements J_{11} and J_{12} are negative while j_{13} is positive. The parameter element a_{13} is equal to -1. Equation (8) implies that the real income responses to the fiscal disturbances depend clearly on the home and foreign security market disequilibrium behavior [(dr/dG) and (dE/dG)]. In the domestic security market, as shown in the appendix, fiscal expansion leads to higher real interest rates [$(dr/dG)>0$)]. And the appreciation of home currency [$(dE/dG)<0$] is the foreign security market response to a fiscal expansion.

In other words, an expansionary fiscal policy financed with issuing new bonds [B/P] would cause the GG curve to shift down (to the right) by $[a_{13}/j_{13}]$ ($[a_{13}/j_{12}]$), Figure 1. Both the BB and FF curve would shift up by $[a_{23}/j_{23}]$ and $[a_{33}/j_{33}]$, respectively. The economy would be disturbed from the original equilibrium point M. Financial market clearing conditions would be achieved more rapidly than the goods market [see Dornbusch (1976), Niehans (1977), Frankel (1979), and Driskill (1980)]. The economy would move instantaneously to point N, the intersection of the new BB and FF curves. However, at N the goods market is in disequilibrium. As long as excess demand for goods remains positive, real income (Y) rises. Such a rise in Y could be offset with the negative impact of stronger home currency and real interest rates on current account and domestic investment outlays [see equation (8)].

To sum up, a real and financial model of income, interest rate, and exchange rate determination has been constructed. Contrasting a portfolio-balance model of the exchange rate, real income is assumed to be an endogenous variable. It is then shown that, ceteris paribus, an expansionary fiscal policy produces ultimately high real interest rates and domestic currency. These (stock) adjustments in the asset sector and their feedbacks into the real market results in a weakened real income.

The model provides an explanation of the recent U.S. economy experience concerning interest and exchange rates. A robust recovery of the U.S. economy might have been retarded as result of financial asset feedbacks into the real sector. Though capital inflows may have reduced the negative impact of higher real interest rates, the combination with a strong dollar may have dampened the efficacy of recent fiscal policy in the real sector. This situation would have been different if U.S. trade partners had followed a more balanced growth with less restrictive financial policies. From a dynamic point of view, the stance of U.S. fiscal policy in recent years has led to an unproportional change in the portfolio compositions of wealth holders in favor of home bonds. To realign their wealth, private citizens replace dollar-denominated assets with foreign-exchange denominated assets. This would lead to a depreciation of the dollar and appreciation of foreign exchanges.

Footnotes

1- In November, 1985, the weighted-average index of the U.S. dollar against the currencies of her eleven trading partners stood at 128.08. This index declined to 99.46 in February, 1987 (Federal Reserve Bulletin, recent issues).

2- Economic Report of the President, Feburary, 1987.

3- Blanchard and Dornbusch (1984) attribute a high real short-term interest rate to tight monetary stance. However, they single out future budget deficits as the most important factor in driving up future short-term interest rates and hence the current long-term interest rate. But Volcker (1984) argues that real long-term interest rates are higher than the current rate of inflation as a result of public skepticism of price stability. On a separate ground, Feldstein (1982), Aschauer (1985), and Hoelscher (1986) reject the Ricardian equivalence proposition revived by Barro (1974). According to this proposition, government spending has negligible effect on interest rates [see, besides Barro, Kormendi (1983) and Evans (1985)].

4- In examining the economics of fiscal policy, the Keynesain and portfolio-balance model developed here is based on Khademian (1987).

5- A dot-superscripted variable is the time derivative of that variable.

6- Khademian (1987) shows that, to meet both the theoretical consistency requirements of closed economy portfolio models and the stability conditions, real income should enter the demand for securities in a positive fashion.

7- Ibid.

Appendix

The purpose of this appendix is to show, that in response to a fiscal expansion, both home real interest and exchange rates rise [(dr/dG)>0 and (dE/dG<0)]. dr/dG is positive if,

$$[1/\det(J)]\begin{vmatrix} j_{11} & a_{13} & j_{13} \\ j_{21} & a_{23} & j_{23} \\ j_{31} & a_{33} & j_{33} \end{vmatrix} =$$

$$[1/\det(J)][j_{11}(a_{23}j_{33}-a_{33}j_{23}) - j_{21}(a_{13}j_{33}-a_{33}j_{13}) + j_{31}(a_{13}j_{23}-a_{23}j_{13})]$$

is positive. The det(J) in the first bracket and all terms (but the first) in the second bracket are positive. But it can be proved that a summation of the first, the first part of the second, and the fifth terms, shown below, is positive;

$$-(F/P)[(m/P)(-j_{11})-wb^{d}b^{*}_{Y}] > 0$$

dE/dG is negative if

$$[1/\det(A)]\begin{vmatrix} j_{11} & j_{12} & a_{13} \\ j_{21} & j_{22} & a_{23} \\ j_{31} & j_{32} & a_{33} \end{vmatrix} =$$

(A-1) $$[1/\det(J)][j_{11}(j_{22}a_{33}-j_{32}a_{23}) - j_{21}(j_{12}a_{33}-j_{32}a_{13}) + j_{31}(j_{12}a_{23}-j_{22}a_{13})]$$

is negative. Since the det(J) is positive, dE/dG is negative if the second bracket is negative. The latter requirment is met if

(A-2) $$(dr/dY)_{BB} > (dr/dY)_{GG}$$

(A-3) $$wb^{*}_{r}[((1-b)/P)(-1+c(1-t)+x_{Y}) + wb^{d}_{Y}] < 0$$

(A-4) $$wb^{*}_{Y}[-((1-b^{d})/P)I_{r} - wb^{d}_{r} - Ew^{*}b^{f}_{r}] < 0$$

These reqirements [(A-2), (A-3), and (A-4)] are derived by

comparing the first term with the third, the second with the fourth, and the fifth with the sixth, in the second bracket of (A-1) condition. Requirement (A-2) is met if one assumes that the home security market is more responsive than the goods market to changes in the financial variables, such as real interest rate. Conditions (A-3) and (A-4) also hold considering the magnitude of wealth, w.

References

Ahtiala, P. "A Synthesis of the Macroeconomic Approaches to Exchange Rate Determination." European Economic Review, March 1984, 24, 117-136.

Aschauer, D.A. "Fiscal Policy and Aggregate Demand." American Economic Review, March 1985, 75, 117-27.

Barro, R.J. "Are Government Bonds Net Wealth?" Journal of Political Economy, November/December 1974, 82, 1095-117.

Blanchard, O. and Dornbusch, R. "U.S. Deficits, the Dollar and Europe." Banca Nazionale Del Lavoro Quarterly Review, March 1984, 148, 89-113.

Branson, W. "The Limits of Monetary Coordination As Exchange Rate Policy." Brookings Papers on Economic Activity, 1986, 1, 175-94.

Branson, W.H. Halttunen, H. and Masson, P. "Exchange Rates in the Short Run the dollar-Deutschemark Rate." European Economic Review, December 1977, 10, 303-24.

Brown, J.A.C. and Helou, A. "The Fiscal Policy of Japan since 1970." Oxford Bulletin of Economics and Statistics, May 1984, 46, 89-124.

Dornbusch, R. "Expectations and Exchange Rate Dynamics." Journal of Political Economy, December 1976, 84, 1161-76.

_____ "Flexible Exchange Rates and Excess Capital Mobility." Brookings Papers on Economic Activity, 1986, 1, 209-26.

Driskill, R. "Exchange Rate Dynamics, Portfolio Balance, and Relative Prices." American Economic Review, September 1980, 70, 776-83.

Evans, P. "Do Large Deficits Produce High Interest Rates?" American Economic Review, March 1985, 75, 68-87.

Feldstein, M. "Government Deficits and Aggregate Demand." Journal of Monetary Economics, January 1982, 9, 1-20.

_____ "U.S. Budget Deficits and the European Economies: Resolving the Political Puzzle." American Economic Review Papers and Proceedings, May 1986, 342-6.

Fleming, M. "Domestic Financial Policies under Fixed and under Floating Exchange Rates." International Monetary Fund Staff Papers, 1962, 9, 369-80.

Foley, D. "On two Specifications of Asset Equilibrium in Macroeconomic Models." Journal of Political Economy, April 1975, 83, 303-24.

Frankel, J. "On the Mark: A Theory of Floating Exchange Rates Based on Real Interest Differentials." American Economic Review, September 1979, 69, 610-22.

Frenkel, J. Gylfason, T. and Helliwell, J. "A Synthesis of Monetary and Keynesian Approaches to Short-Run Balance-of-Payments Theory." Economic Journal, September 1980, 90, 582-92.

Frenkel, J. and Razin, A. "Government Spending, Debt, and International Economic Interdependence." Economic Journal, September 1985, 95, 619-36.

_____ "Fiscal Policies in the World Economy." Journal of Political Economy, 1986, 94, 564-94.

_____ "The International Transmission and Effects of Fiscal Policies." American Economics Review Papers and Proceedings, May 1986, 330-5.

Gylfason, T. and Helliwell, J. "A Synthesis of Keynesian, Monetary, and Portfolio Approach to Flexible Exchange Rates." Economic Journal, December 1983, 93, 820-31.

Hoelscher, G. "New Evidence on Deficits and Interest Rates." Journal of Money, Credit, and Banking, February 1986, 18, 1-17.

Hooper, P. "International Repercussions of the U.S. Budget Deficits." Aussenwirtschaft, 1985, 40, 117-55.

Khademian, H. "Changes in Real Income and the Demand for Domestic and Foreign Securities in a Synthesized Exchange Rate Model: An Alternative View." Unpublished, 1987.

Kormendi, R.C. "Government Debt, Government Spending, and Private Sector Behavior." American Economic Review, December 1983, 73, 994-1010.

Levin, J. "The Dynamics of Stabilization Policy under Flexible Exchange Rates: A Synthesis of the Asset and Neo-Keynesian Approaches." Oxford Economic Papers, November 1980, 32, 411-427.

Mundell, R. "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates." Readings in International Economics. R.E. Caves and H.G. Johnson, eds. Homewood: Illinois, Richard D. Irwin, Inc. 1968.

Niehans, J. "Exchnage Rate Dynamics with Stock/Flow Interaction." Journal of Political Economy, December 1977, 85, 1245-57.

Trunvosky, S. "The Dynamics of Fiscal Policy in an Open Economy." Journal of International Economics, May 1976, 6, 115-42.

_____ "Monetary and Fiscal Policy under Perfect Foresight: A Symmetric Two-country Analysis." Economica, May 1986, 53, 139-57.

Volcker, P.A. "Facing Up to the Twin Deficits." Challenge, March-April 1984, 4-9.