

BUDGET DEFICITS AND THE CURRENT ACCOUNT: AN INTERTEMPORAL DISEQUILIBRIUM APPROACH

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Abstract

The objective of the present paper is to develop an intertemporal disequilibrium model of a monetary economy to explain the effects of fiscal policy on the current account. We wish to emphasize the role of aggregate demand-determined output fluctuations and flexible exchange rates within a microtheoretic optimizing framework. Furthermore, the differing effects of monetary versus non-monetary (i.e. tax or bond) finance of government expenditures are considered.

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I. Introduction

It is widely believed that fiscal deficits have a negative impact on the current account of the balance of payments. The IMF, for example, typically requires that countries facing balance of payments problems reduce their fiscal deficits as part of comprehensive stabilization programs. The presumption that reducing fiscal deficits should reduce current account deficits is found not only in policy discussions involving debt-ridden LDCs but also in the context of industrialized nations.

The current policy debate within the United States concerns the impacts of substantial increases in government expenditure (due to increases in defense spending which more than offset reductions in non-defense outlays, all as percentages of GNP) coupled with reductions in government revenues (due to the Reagan tax cuts). According to the 1984 Economic Report of the President (p. 39), the resulting record-high fiscal deficits have had a pronounced effect on real interest rates, the real exchange rate, and the current account. The Federal Reserve Bank of Chicago International Letter (No. 523, April 6, 1984) notes:

...government officials and concerned observers have been pressing for measures that would reduce the [current account] deficit by addressing some of its root causes. A reduction in the federal budget deficit -- widely believed to be the main cause of the high U.S. interest rates, which in turn are the main reason for the relatively high value of the U.S. dollar and thus high imports, and low exports -- is believed by many to be a measure that would ultimately lead to a reduction in this country's increasingly problematic current account deficit.

Standard models provide a straightforward explanation of the fiscal policy current account linkage. (See e.g. Branson and Buiter, 1983 and Penati 1983). Fiscal stimulus increases national income and causes a strengthening of the domestic currency in the foreign exchange market. Both of these

effects contribute to an increase in the demand for import goods; hence, the trade balance deteriorates. Other analyses focus on the accounting identity that the current account equals the difference between national saving and national investment. Noting that fiscal deficits are public-sector dissaving, it is again claimed that increased fiscal deficits will show up--some claim dollar-for-dollar--in the form of increased current account deficits.^{1/}

In spite of the apparently uncontroversial nature of the above predictions, there is surprisingly little empirical evidence on the relationship between fiscal policy and the current account.^{2/} Furthermore, the analytical models that underlay this prediction have come under attack.

Recent intertemporal models of the current account (see, e.g. Obstfeld (1980), Helpman(1981), Sachs (1982), Dornbusch (1983), Svensson and Razin (1983)) emphasize that both saving and investment, and hence the current account (because of the above-mentioned accounting identity), are determined fundamentally by intertemporal considerations. In keeping with the view that macroeconomic analyses ought to be based on the optimizing behavior by individual agents, these theories develop simple intertemporal Walrasian equilibrium models to explain current account patterns. Not surprisingly, the implications of these models often differ from those based on the ad hoc atemporal models used in open-economy macroeconomics.^{3/} The recent work of Frenkel and Razin (1984) is the first to address the question of how fiscal deficits affect the current account in a (two-country) intertemporal equilibrium model with full employment. Their models, it should be noted, are barter models and hence are incapable of discussing money-financed fiscal deficits.

Although the wage-price flexibility or full employment assumption in the intertemporal Walrasian equilibrium models is a reasonable characterization of the long run, it appears to be empirically unrealistic as a description of the short run where the existence of unemployment is an undeniable fact. Within the intertemporal framework, therefore, non-Walrasian equilibrium models of the open economy have been developed, for example, by Persson (1982), Persson-Svensson(1983), van Wijnbergen (1984) and Cuddington-Viñals (1984). Persson (1982) focuses on the classical unemployment case and analyzes the effects of money-financed government spending and payroll tax changes on employment and welfare. His model, like ours, exploits the Clower cash-in-advance specification of money demand in an open economy which is developed in the seminal contribution of Helpman (1981)). Persson-Svensson(1983) extend the analysis of expectations of future quantity constraints (c.f. Neary-Stiglitz(1983)) to an open economy with Keynesian unemployment. Van Wijnbergen (1984) has analyzed the effects of fiscal policy on the current account in an intertemporal disequilibrium framework for both the classical and Keynesian unemployment cases. His analysis focuses on the real side of the economy and abstracts completely from monetary considerations.

The present paper and Cuddington-Viñals(1984) employ an intertemporal disequilibrium model of a monetary economy using the cash-in-advance specification of money demand to analyze economies suffering from Keynesian and classical unemployment respectively. In this context, the effects of temporary as well as permanent changes in government spending on the current account are discussed taking into consideration the differing effects of tax finance verses monetization of fiscal deficits. The presence of domestic and foreign monies in the model makes it possible to consider either a flexible or fixed exchange rate system; this cannot, of course, be done in barter models.

The present paper considers an economy with wage-price stickiness that give rise to Keynesian unemployment in the short run. In the long run, however, wages and prices adjust to their Walrasian equilibrium levels; rational economic agents are aware of this and act accordingly. The assumption of short-run Keynesian unemployment appears to fit the facts of a number of industrial countries including the United States reasonably well. Short-run fluctuations in output and the current account appear to have been demand determined, at least during some historic episodes, and the cyclical component of the current account, in particular the effect of income on import demand, is readily observable. (It is, of course, also the focal point of the traditional macro models of the balance of payments and a key ingredient in large scale, macroeconomic models.)

The paper proceeds as follows. Section II lays out the analytical framework, focussing on the optimizing behavior of households and firms, while Section III describes the market equilibrium of the model. Section IV considers the effects of temporary, expected future, and permanent increases in government spending on the current account. Section V concludes by comparing our results with those of ad hoc rational expectations models and the intertemporal equilibrium models. Three appendices take up some of the technical details of our analysis.

2. The Model

This paper considers a two-sector economy producing tradeables and nontradeables in each of two periods ($t = 1, 2$). The country is assumed to be small in the world market, implying that tradeables can be bought or sold freely at the fixed foreign-currency price. Adopting the arbitrary normalization that this price equals unity, the domestic-currency price at

time t can be taken as equal to the exchange rate e_t . It is assumed that the country maintains a flexible exchange rate regime.

In the "short run" represented by period 1, the price of nontradeables p_{n1} and the domestic wage rate are fixed. We focus on the case where the resulting disequilibrium is characterized by Keynesian unemployment, i.e., unemployment whose proximate cause is deficiency of domestic demand for nontradables (given the prevailing constellation of wages and prices).^{3/}

Although wages and the price of nontradables are fixed in the short run, they adjust to their Walrasian equilibrium levels in the "long run" represented by period 2. Furthermore, all economic agents have perfect foresight regarding future prices p_{n2} and e_2 when they make their decisions in period 1.

Financial considerations are of central importance in our model. Both the government and the private sector are assumed to be able to borrow or lend in a well-integrated world market at interest rate i_t^* when denominated in the foreign currency and i_t when denominated in the domestic currency. Given the absence of uncertainty in our framework, domestic and foreign bonds are perfect substitutes and the open interest parity condition holds:

$$(1) \quad (1 + i_t) = \frac{1}{e_t} (1 + i_t^*) e_{t+1} .$$

The economy is a monetary economy in the sense that all purchases of goods must be made using money; no direct barter transactions are allowed (presumably because of the prohibitive cost of achieving the so-called "double coincidence of wants" involved in barter). Furthermore, all goods must be paid for using the currency of the seller's country. Therefore all nontradables purchases require that purchasers use domestic money.^{4/} Domestic

demand for tradables, on the other hand, could give rise to a demand for domestic or foreign money depending on the source of tradeables supply. In aggregate, it is assumed that domestic residents demand foreign money only in periods when domestic demand for tradeables exceeds domestic production, implying a trade deficit.

This specification is, in short, the "S-system" described in the cash-in-advance models popularized in the open-economy context by Lucas, Helpman and Razin among others.^{5/} In this specification financial markets open at the beginning of the period so that agents can borrow the appropriate levels of domestic and foreign money balances to carry out commodity market transactions in the current period.^{6/} Also any superfluous money balances can be exchanged for interest earning assets.

After the foregoing financial transactions (made with the benefit of perfect foresight regarding the upcoming commodity market transactions) are complete, production and sale of commodities occurs. It is not until the beginning of the following period that the income from the latter transactions is distributed to households or paid to the government in the form of (lump-sum) taxes.^{7/}

A detailed discussion of the behavior of firms, households and the government follows.

2.A. The Production Sector

In each of the two periods, tradeables and nontradeables are produced using labor as the only variable factor of production. By assumption, the wage rate in the first period w_1 is fixed.^{8/} The price of nontradeables at $t = 1$, p_{n1} , is also fixed and is above the market clearing level. Hence firms find that domestic demand for nontradeables falls short of notional

supply. Because all output is nonstorable, nontradeables producers limit production to \bar{Y}_{n1} , the sales constraint implied by the level of aggregate demand.

In the long run ($t = 2$) wage and price flexibility insure that notional supply and demand for nontradeables are brought into equality; firms no longer face sales constraints.

In both the short and long runs, domestic production of tradeable goods is unconstrained due to the small country assumption. Hence tradeables producers continually operate on their notional supply curves implied by profit maximization.

At $t = 1$, tradeables supply Y_{T1} depends positively on the real product wage w_1/e_1 . Given that the price of nontradeables in period 1, p_{n1} , is fixed and will be used as a numeraire below, it is convenient to note that $w_1/e_1 = (w_1/p_{n1})/\rho_1$, where $\rho_t \equiv e_t/P_{nt}$ is the relative price of tradeables in terms of nontradeables or the real exchange rate, and write Y_{T1} as a positive function of ρ_1 :

$$(2) \quad Y_{T1} = Y_{T1}(\rho_1) \quad \partial Y_{T1} / \partial \rho_1 > 0 .$$

In period 2 where full employment prevails, the outputs of both tradeables and nontradeables depend on the relative price ρ_2 in the usual fashion:

$$(3) \quad Y_{T2} = Y_{T2}(\rho_2) \quad \partial Y_{T2} / \partial \rho_2 > 0$$

$$(4) \quad Y_{n2} = Y_{n2}(\rho_2) \quad \partial Y_{n2} / \partial \rho_2 < 0 .$$

2.B. The Household Sector

The representative consumer is assumed to have an additive time-separable^{9/} utility function of the log-linear form:

$$(5) \quad U = (\alpha \ln C_{n1} + (1-\alpha) \ln C_{T1}) + \frac{1}{1+\delta} (\alpha \ln C_{n2} + (1-\alpha) \ln C_{T2})$$

where $0 < \alpha < 1$ and

δ is the constant time preference rate.^{10/} C_{nt} and C_{Tt} are the consumption of nontradeables and tradeables respectively in period t .

The individual must engage in financial transactions at the beginning of the period in order to secure enough domestic and foreign money to buy the desired quantities of nontradeables and tradeables during the period.^{11/} As mentioned above, it is assumed that goods are paid for using the seller's currency. In equilibrium there will be a domestic (foreign) demand for foreign (domestic) currency when the economy runs a balance of trade deficit (surplus). Hence, the cash-in-advance restrictions take the form:

$$(6) \quad p_{nt} C_{nt} + e_t Y_{Tt} - (1-\lambda_t) e_t (Y_{Tt} - C_{Tt}) \leq M_t^H$$

$$(7) \quad -\lambda_t (Y_{Tt} - C_{Tt}) \leq M_t^{*H} \quad t = 1, 2$$

where M_t^H, M_t^{*H} are the demands for domestic and foreign money by household.

λ_t is a binary variable that takes the value zero when there is a domestic excess supply of tradeables and one when there is an excess demand:

$$(8) \quad \begin{array}{ll} \lambda_t = 0 & \text{when } (Y_{Tt} - C_{Tt}) > 0 \\ \lambda_t = 1 & \text{when } (Y_{Tt} - C_{Tt}) < 0 \end{array} \quad ; t = 1, 2 .$$

Provided the equilibrium interest rate is positive and there is no uncertainty, households will hold money only for transaction purposes. They will not carry idle money balances forward from one period to another. Thus (6) and (7) will hold with strict equality; we assume this to be the case throughout our analysis.

In addition to (8), there is a particular relationship among the λ 's in different periods which comes from the intertemporal budget constraint of the economy. In a two period model, a balance of trade surplus today must be accompanied by a balance of trade deficit tomorrow of the same present value. Therefore, using expression (8) it must be the case that λ_1 and λ_2 satisfy:

$$(9) \quad \lambda_1 = 1 - \lambda_2$$

in equilibrium.

At the beginning of the period, the household obtains domestic and foreign money from firms in the form of after-tax income generated in the previous period, plus any net increase in borrowing denominated in either the domestic or foreign currency. This implies the following financial transactions constraint:

$$(10) \quad \begin{aligned} e_t M_t^{*H} + M_t^H &\leq (P_{n,t-1} Y_{n,t-1} + e_{t-1} Y_{T,t-1}) - T_t \\ &- (1+i_{t-1}) B_{t-1} - (1+i_{t-1}^*) e_t B_{t-1}^* \\ &+ (B_t + e_t B_t^*) \quad ; \quad t = 1, 2 \end{aligned}$$

Assuming no superfluous borrowing occurs, (10) holds with strict equality.

The initial supply of domestic money in the economy \bar{M}_0 will be exactly equal to the amount paid out by firms at the beginning of period 1:

$$(P_{n0} Y_{n0} + e_0 Y_{T0}) \cdot B^t \text{ and } B^{t*} \text{ are domestic and foreign currency borrowing}$$

by households. It is assumed that there are no initial outstanding household debts ($B_0 = B_0^* = 0$) and that all domestic and foreign debt is repaid at the end of period 2 ($B_2 = B_2^* = 0$) .12/

2.C. The Government Sector

For simplicity we assume the government purchases only nontradeable goods, financing these purchases by (lump-sum) taxes, debt or money creation. Like the private sector, the government is bound by the cash-in-advance constraint that characterizes our monetary economy:

$$(11) \quad p_{nt} g_t \leq M_t^g ; \quad t = 1, 2$$

where g_t is the nontradeable output purchased by the government and M_t^g is the amount of money that the government has available to carry out such purchases. Equation (11) holds with equality if the government holds no excess money balances, which would clearly be inefficient if the interest rate on nonmonetary assets is positive.

At the beginning of the period, the government has to raise enough money--through tax collections (T_t), money creation (X_t) and debt issues (B_t^g) --to finance its desired purchases during the rest of the period, as indicated by equation (11). The beginning-of-period borrowing/lending required to obtain the appropriate amount of transactions balances for the government, given its tax revenue and new money creation, is given by the financial transactions constraint:

$$(12) \quad M_t^g \leq T_t + X_t + B_t^g - (1 + i_{t-1}) B_{t-1}^g ; \quad t = 1, 2$$

Equation (12) holds with strict equality if there is no superfluous borrowing.^{13/}

It is assumed that the government levies taxes at the beginning of the period. Hence they must be paid out of factor incomes generated in the previous period. This tax revenue plus the amount of money created and the proceeds from net borrowing at time t , i.e., $(B_t^g - (1+i_{t-1}) B_{t-1}^g)$, provide the government with money for current transactions M_t^g .

In what follows, it is assumed that the initial stock of government bonds outstanding is zero ($B_0^g = 0$). When (11) and (12) hold with strict equality (as efficiency requires), the following intertemporal budget constraint emerges:

$$(13) \quad P_{n1} g_1 + \frac{P_{n2} g_2}{1+i} = (T_1 + \frac{T_2}{1+i}) + (X_1 + \frac{X_2}{1+i}) .$$

The terminal condition $B_2^g = 0$ has been imposed in obtaining (13), implying that all government debt is fully repaid at the end of the last period.

Equation (13) reflects the fact that since the interest rate that applies to the government and households is the same, and since taxes are lump-sum, the Ricardian Equivalence proposition holds in this model. In what follows, therefore, tax/bond financing of government spending have identical economic effects and will be lumped together under taxes.

2.D. Foreign Sector

Since foreigners have an infinitely elastic demand-supply for tradeables, their demand for domestic money (M_t^F) is positive only when they are running a trade deficit:

$$(14) \quad (1 - \lambda_t) e_t (Y_{Tt} - C_{Tt}) \leq M_t^F \quad t = 1, 2$$

where λ_t is defined by (8) and (9).

3. Market Equilibrium

The use of the open interest parity condition in (1) allows equations (6) - (10) to be combined to form a single, overall budget constraint for the household (provided all of the weak inequalities hold as strict equalities as assumed above):

$$(15) \quad (p_{n1} C_{n1} + e_1 C_{T1}) + \frac{1}{1+i} (p_{n2} C_{n2} + e_2 C_{T2}) = \\ = \bar{M}_0 + \frac{1}{1+i} (p_{n1} Y_{n1} + e_1 Y_{T1}) - (T_1 + \frac{T_2}{1+i}) \equiv W_0 .$$

That is, the present value of private spending equals initial wealth net of the present value of tax obligations. Appendix I shows that in equilibrium and after internalizing the government budget constraint, the overall household budget constraint can be reduced to the following nonmonetary form:

$$(16) \quad (p_{n1} C_{n1} + e_1 C_{T1}) + \frac{1}{1+i} (p_{n2} C_{n2} + e_2 C_{T2}) = \\ = p_{n1} (Y_{n1} - g_1) + e_1 Y_{T1} + \frac{1}{1+i} [p_{n2} (Y_{n2} - g_2) + e_2 Y_{T2}] = W_0 .$$

Expression (16) states that the present value of private spending equals the present value of privately disposable domestic output.^{14/} This allows a very simple treatment of the household optimization problem, as shown by Helpman [1981]: maximization of (5) subject to (6)-(10) reduces to the problem of choosing a $\{C_{nt}, C_{Tt}\}$ sequence that maximizes (5) subject to (16). Once the equilibrium intertemporal profile of consumption is obtained, the household's "desired" demand for domestic and foreign monies can be determined recursively using (6) and (7) as shown in Appendix II. The household's commodity demand

functions, which appear in the equilibrium conditions below, are also derived there.

Nontradeable Sector

In the first period where p_{n1} and the wage rate are assumed to be inflexible, the level of output in the nontradeable sector is demand determined (denoted by a bar over Y_{n1}):

$$(17) \quad \bar{Y}_{n1} = C_{n1} + g_1 = \alpha \frac{1+\delta}{2+\delta} \frac{W_0}{P_{n1}} + g_1$$

In the second period (representing the long run), Walrasian equilibrium is assumed to prevail:

$$(18) \quad Y_{n2}(\rho_2) = C_{n2} + g_2 = \alpha \frac{1+i}{2+\delta} \frac{W_0}{P_{n2}} + g_2.$$

The wealth term W_0 in the household demand functions is defined in (16) above.

Domestic Money Market

Under the S-system, aggregate (world) demand for domestic money just equals the value of domestic output (see Appendix I). This reflects the quantity theory of money with the unitary velocity of circulation that is inherent in the cash-in-advance specification. Equating domestic money supply and money demand in each period yields the monetary equilibrium conditions:^{15/}

$$(19) \quad \bar{M}_0 + X_1 = M_1^H + M_1^G + M_1^F = p_{n1} Y_{n1} + e_1 Y_{T1}$$

$$(20) \quad \bar{M}_0 + X_1 + X_2 = M_2^H + M_2^G + M_2^F = p_{n2} Y_{n2} + e_2 Y_{T2}$$

Equations (1) and (16)-(20) determine six endogenous variables:

$i, e_1, e_2, p_{n2}, \bar{Y}_{n1},$ and W_0 for given levels of the exogenous variables: $i^*, p_{n1}, g_1, g_2, \bar{M}_0, X_1, X_2,$ and T_1 . (T_2 is endogenously determined so as to satisfy the government's intertemporal budget constraint).

The Balance of Trade

Recall that the domestic economy is assumed to be small in the world market for tradeable goods. Once the above-mentioned endogenous variables have been determined, therefore, the balance of trade^{16/} in periods 1 and 2 can be found using the standard definition:

$$(21) \quad BT_1 = Y_{T1} - C_{T1} = Y_{T1}(\rho_1) - (1 - \alpha) \frac{1 + \delta}{2 + \delta} \frac{W_0}{e_1}$$

$$(22) \quad BT_2 = Y_{T2} - C_{T2} = Y_{T2}(\rho_2) - (1 - \alpha) \frac{1 + i}{2 + \delta} \frac{W_0}{e_2}$$

It is easy to show that the equilibrium values of the trade balance in the two periods must have a present value of zero:

$$(23) \quad BT_1 + \frac{1}{1 + i^*} BT_2 = 0.$$

This is just the economy-wide intertemporal budget constraint.

Solving the Model

In order to understand the comparative static results that follow, it is helpful to have a simple way of characterizing the model's equilibrium. One tractable method that yields a neat geometric presentation is the following:

First, substitute (21) and (22) into (23) to obtain an expression for wealth:

$$(24) \quad W_0 = \frac{e_1}{1-\alpha} [Y_{T1}(\rho_1) + \frac{1}{1+i^*} Y_{T2}(\rho_2)].$$

This expression holds for equilibrium values of the relative prices ρ_1 and ρ_2 only (whereas the definition of W_0 in (15) holds for all relative prices).

The expression for wealth in (24) enables the nontradeables market equilibrium conditions for $t = 1$ and 2 to be rewritten in terms of the relative price of tradeables in terms of nontradeables in the two periods:

$$(25) \quad \bar{Y}_{n1} = \left(\frac{\alpha}{1-\alpha}\right) \left(\frac{1+\delta}{2+\delta}\right) \rho_1 [Y_{T1}(\rho_1) + \frac{1}{1+i^*} Y_{T2}(\rho_2)] + g_1$$

$$(26) \quad Y_{n2}(\rho_2) = \left(\frac{\alpha}{1-\alpha}\right) \left(\frac{1+i^*}{2+\delta}\right) \rho_2 [Y_{T1}(\rho_1) + \frac{1}{1+i^*} Y_{T2}(\rho_2)] + g_2.$$

From (26) we can obtain the implicit equilibrium relative price in the second period as a function of g_2 and conditional on ρ_1 :

$$(27) \quad \tilde{\rho}_2 = \tilde{\rho}_2(\rho_1, g_2).$$

where

$$\partial \tilde{\rho}_2 / \partial \rho_1 < 0 \quad \text{and} \quad \partial \tilde{\rho}_2 / \partial g_2 < 0.$$

Substituting this perfect foresight function for \tilde{p}_2 into the period 1 equilibrium in (25), it is clear that nontradeables output depends on ρ_1 , $\tilde{p}_2(\rho_1, g_2)$ and g_1 :

$$(28) \quad \bar{Y}_{n1} = \bar{Y}_{n1}(\rho_1, \rho_2(\rho_1, g_2), g_1)$$

where it can be shown that

$$(29) \quad \frac{d\bar{Y}_{n1}}{d\rho_1} = \frac{\partial \bar{Y}_{n1}}{\partial \rho_1} + \frac{\partial \bar{Y}_{n1}}{\partial \rho_2} \frac{\partial \tilde{p}_2}{\partial \rho_1}$$

is unambiguously positive (See Appendix III). Thus the demand-determined level of nontradeables output in period 1 depends negatively on its price, even after accounting for the effects of the own-price change on expected future prices and their feedback effects into current demand. Consequently the goods market equilibrium locus relating \bar{Y}_{n1} and ρ_1 , after accounting for the endogenous response of second-period relative prices ρ_2 , is positively sloped.^{17/} This locus is shown as GG in Figure 1.

The effects of government spending in $t = 1$ and 2 on GG are easily determined from (28), or equivalently (25) and (27). An increase in government expenditure at $t = 1$ cause an equal rightward shift in GG:

$$(30) \quad \left. \frac{\partial \bar{Y}_{n1}}{\partial g_1} \right|_{GG} = 1.$$

Increases in future government spending on nontradeables, on the other hand, cause a fall in the future relative price of tradeables ρ_2 via (27). This, in turn, reduces aggregate demand for nontradeables--and hence output

\bar{Y}_{n1} --in period 1. Thus increases in g_2 shift the GG locus to the left:

$$(31) \quad \left. \frac{\partial \bar{Y}_{n1}}{\partial g_2} \right|_{GG} = \frac{\partial Y_{n1}}{\partial p_2} \frac{\partial \tilde{p}_2}{\partial g_2} < 0,$$

(+)

(-)

implying a lower nontradeables output \bar{Y}_{n1} at each current-period relative price p_1 . It is unclear whether $\partial \bar{Y}_{n1} / \partial g_2$ exceeds or falls short of unity (is $\partial \bar{Y}_{n1} / \partial g_2 \gtrless \partial \bar{Y}_{n1} / \partial g_1$).

In order to complete the determination of (p_1, \bar{Y}_{n1}) , the nontradeables market equilibrium must be accompanied by money market equilibrium. Rewriting current-period monetary equilibrium (19) in terms of p_1 yields:

$$(32) \quad \frac{\bar{M}_0 + X_1}{P_{n1}} = \bar{Y}_{n1} + p_1 Y_{T1}(p_1).$$

This equation indicates a negative relationship between nontradeables output \bar{Y}_{n1} and p_1 , shown as MM in Figure 1. That is, increases in \bar{Y}_{n1} (which raise money demand ceteris paribus) must be accompanied by reductions in p_1 (which reduce money demand), if money demand is to remain equal to the unchanged level of money supply.

Increases in the money supply cause rightward shifts of the MM curve equal to:

$$(33) \quad \left. \frac{\partial \bar{Y}_{n1}}{\partial X_1} \right|_{MM} = \frac{1}{P_{n1}}$$

This result is important for the discussion in Section 4 below. It implies that money-financed increases in g_1 will shift the GG and MM curves to the right by exactly the same amount.

The intersection of GG and MM in Figure 1 shows graphically the equilibrium values of \bar{Y}_{n1} and ρ_1 , which solve (17) and (19) after using (18) to solve out for the perfect foresight level of future relative prices (27). Parenthetically, it should be noted that future-period monetary equilibrium (20) has no effect on the equilibrium values of \bar{Y}_{n1} , ρ_1 or ρ_2 . It determines recursively the long-run price level p_{n2} along well-known classical dichotomy lines.

Once the equilibrium values (ρ_1, \bar{Y}_{n1}) are found, it is straightforward to find the trade balance at $t = 1$. It depends positively on ρ_1 and negatively on ρ_2 , as can be confirmed by substituting for W_0 in (21) using (24):

$$(34) \quad BT_1 = \left(\frac{1}{2+\delta}\right) Y_{T1}^+(\rho_1) - \left(\frac{1}{1+i^*}\right) \left(\frac{1+\delta}{2+\delta}\right) Y_{T2}^+(\rho_2).$$

Alternatively BT_1 can be expressed in terms of ρ_1 and g_2 by using $\tilde{\rho}_2(\rho_1, g_2)$ from (27) to eliminate ρ_2 in (34). Increases in ρ_1 improve BT_1 , both directly and via $\tilde{\rho}_2$. Increases in future government expenditure g_2 have a positive partial effect on BT_1 in (34), because they cause ρ_2 to fall.

4. Fiscal Policy and the Current Account

With the foregoing description of the model, a number of interesting policy exercises can be performed. Consider a temporary increase in government spending ($dg_1 > 0, dg_2 = 0$) financed by taxes.^{18/} From (28) it is clear that there is now an excess demand for nontradeables in the first period at the initial real exchange rate (ρ_1). Thus an increase in the production of first period nontradeables (a rightward shift in the GG locus in Figure 2)

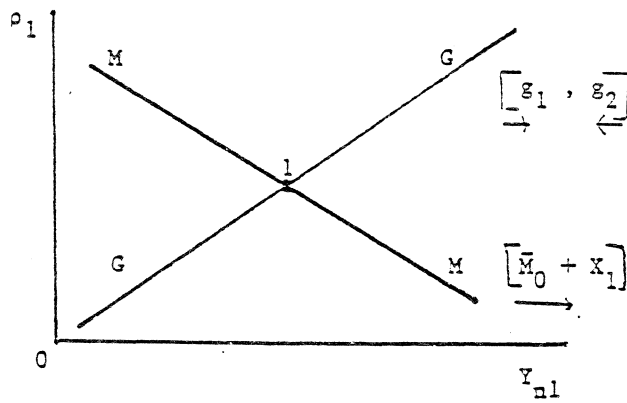


Figure 1. Perfect Foresight Equilibrium

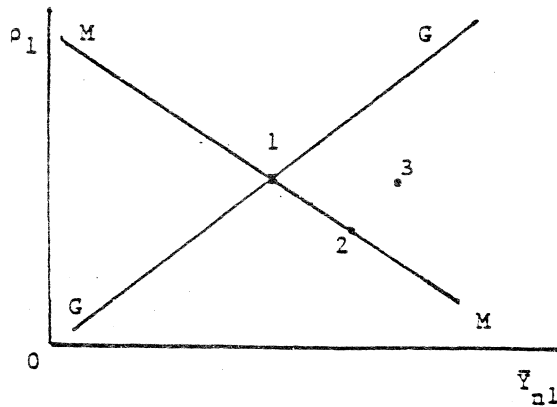


Figure 2. A Temporary Increase in Current Government Spending (s_1)

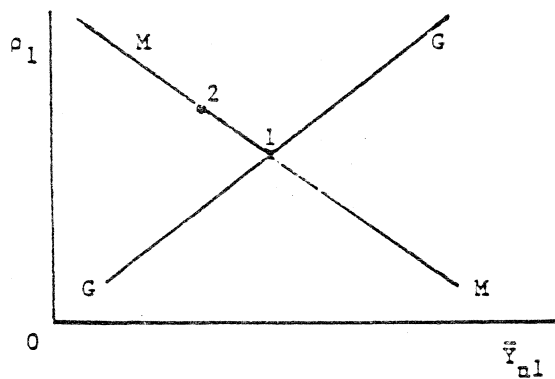


Figure 3. An Expected Increase in Future Government Spending (s_2)

is required to restore goods market equilibrium. The money market locus MM remains unchanged in the tax-finance case since the quantity of money is unaffected. Hence the rise in nontradeables output, which raises money demand in (32), must be accompanied by an exchange appreciation ($dp_1 < 0$) to maintain equilibrium in the goods and money markets. Even when second-period interactions through future price expectations p_2 are allowed, these effects still take place. Recall (27)-(28).

The new equilibrium after the increases in g_1 is at point 2 in Figure 2. First-period nontradeable output has increased and the real exchange rate has appreciated. This drop in the relative price of tradeables increases net domestic demand for tradeables. Hence the current account worsens in the first period (and improves correspondingly in the second period). See (34) to confirm this.

If the increase in first-period government spending is money financed, the same logic as before justifies the rightward shift of the GG locus. Now, however, the money market locus is also affected. The monetary financing creates an excess supply of money, necessitating an increase in nontradeables output (\bar{Y}_{n1}) to maintain monetary equilibrium at the initial real exchange rate. That is, the MM locus shifts to the right. The horizontal shifts in the GG and MM loci are of the same magnitude (equal to dg_1), as we emphasized in discussing (33) above. So the new equilibrium is at point 3 in Figure 2. in the money-finance case. Intuitively, the government provides enough liquidity to fully accommodate the increased demand for money it induces. Hence no exchange rate appreciation is required. This is a kind of "Haavelmo deficit multiplier" where the only effect of an increase in the budget deficit is an equal increase in first-period nontradeables output. 19/

The current account (34) is unaffected by the increase in g_1 since neither today's or tomorrow's real exchange rate is affected. This result obviously stands in stark contrast to the presumption that fiscal deficits will worsen the current account.

Next consider an expected increase in future government spending. This is expected to create a future excess demand for nontradeables, thereby requiring a drop in the second-period relative price of tradeables (p_2). Other things equal, this creates an excess supply of first-period nontradeables. Hence the increase in g_2 shifts the GG schedule leftwards as shown in Figure 3. Since the first-period monetary equilibrium locus MM is not altered, the current exchange rate p_1 must depreciate to restore equilibrium at point 2 in Figure 3.

At the new equilibrium, the first-period relative price of tradeables p_1 has increased. Both this effect and the reduction in the expected future exchange rate induced by the rise in g_2 (via (27)) contribute to an improvement in the current account (34).

It is noteworthy that in the case on an expected future increase in government spending ($dg_1 = 0, dg_2 > 0$), the economy's real variables are affected in exactly the same way regardless of whether the government spending is money or tax financed. This is so in our model because (1) taxes, being lump-sum, have no effect on households' labor-leisure choice and (2) the velocity of circulation is fixed at unity in the cash-in-advance specification of money demand. The inflation tax is in effect a lump-sum tax here. Interestingly enough, therefore, the Ricardian equivalence property extends to the monetized portion of the public debt during the Walrasian-equilibrium

period ($t=2$) where the classical dichotomy holds. Only the level of future government spending matters; its financing is irrelevant.

Table 1 summarizes the complete results of the above-mentioned policy experiments. The last two rows consider the case of an increase in current government spending that is expected to continue tomorrow ($dg_1 = dg_2 > 0$) under different forms of financing. Since it is a simple combination of the above mentioned experiments, it needs little additional explanation. The most interesting point here is that a permanent increase in government spending that is money financed in the first period^{20/} actually improves the first-period current account irrespective of the relationship between the time preference rate and the discount rate.

A very simple interpretation of these results can be based on the expression for domestic wealth in equilibrium in (24). Life-cycle theories of consumption tell us that individuals want to smooth out consumption over time. This implies savings fluctuations in response to shocks affecting the intertemporal profile of disposable income. In the case of our small open economy, we can think of $Y_{T1}(\rho_1)$ and $Y_{T2}(\rho_2)$ in expression (24) as representing the intertemporal profile of disposable income. The fifth and seventh columns of Table 1, indicate that:

- o a current increase in government spending on nontradeables which is tax financed increases future tradeables production and decreases it currently. Consequently, private disposable income is now relatively higher in the future, causing the economy to dissave today by running a current account deficit. In the money-finance case, on the other hand, the intertemporal disposable income profile is not changed so there is no current account effect.

TABLE I. Effects of Fiscal Policy

	dBt_1	$d\rho_1$	$d\rho_2$	dY_{n1}	dY_{T1}	dY_{n2}	dY_{T2}
$dg_1 = dT_1$	-	-	+	+	-	-	+
$dg_1 = dX_1$	0	0	0	1	0	0	0
$dg_2 = dT_2$	+	+	-	-	+	+	-
$dg_2 = dX_2$	+	+	-	-	+	+	-
$dg_1 = dT_1 = dg_2$?	?	?	?	?	?	?
$dg_1 = dX_1 = dg_2$	+	+	-	+	+	+	-

- o An expected future increase in government spending (money or tax financed) increases current tradeables production and reduces future tradeables production. Consequently, private disposable income is now relatively higher in the present. So the economy saves today, giving rise to a current account surplus.

5. Conclusions

On the basis of the analysis in this paper, it appears that in studying the effects of government spending on current account developments, one should carefully examine:

- a. how is it financed,
- b. whether it is perceived by the public as a short or long lasting event,
- c. whether it takes place in an economy characterized by full employment or not.

The specific results of our policy analyses, of course, depend at least to some extent on the key features that drive our model. These include: (i) the additive, time-separable utility function with log-linear instantaneous utility within each period. This eliminates a number of confounding cross-price effects that would complicate our comparative statics; (ii) the strong Ricardian equivalence implications that typify intertemporal optimization models of the type employed here; (iii) the perfect foresight assumption, although some relaxation of this assumption (along the lines suggested in footnote (17) leaves our results intact; and finally (iv) the assumption that wages and the price of nontradeables are sticky in the short run. This leads to a breakdown of the classical dichotomy in the short, but not the long, run.

At the theoretical level, our conclusions can be compared to those reached both by ad-hoc sticky-price rational expectations models and by the new intertemporal models of the current account. The ad-hoc sticky-price rational expectations models (described, e.g., in Branson and Buiter, 1983) predict that under flexible exchange rates a permanent tax-financed increase in government spending worsens the current account, while a money-financed budget deficit may worsen or improve the current account. Our model predicts just the opposite: a permanent tax-financed increase in government spending can improve or worsen the current account, while a money-financed deficit necessarily improves it.

The new intertemporal walrasian-equilibrium models (i.e., Sachs (1982), Frenkel and Razin (1984)) predict that tax financed transitory increases in government spending always worsen the current account. A permanent increase, on the other hand, has no clear-cut effect. Our model shows these conclusions remain valid when the intertemporal general equilibrium models are extended to allow for short-run Keynesian unemployment in a monetary framework. Furthermore in extending the modern approach to allow for monetization of the debt, we find that a transitory increase in government spending leaves the current account unaffected, while a permanent increase in government spending always improves it. In this respect our conclusions are also different from those obtained in nonmonetary intertemporal Keynesian unemployment models (van Wijnbergen (1984)).

Appendix I

Derivation of the Households Intertemporal
Budget Constraint in Equilibrium

Adding-up over time (using the equality form) expressions (6) and (10) separately, and setting them equal to each other yields:

$$\begin{aligned}
 (A1.1) \quad & p_{n1} C_{n1} + e_1 Y_{T1} - (1 - \lambda_1) e_1 (Y_{T1} - C_{T1}) - \lambda_1 e_1 (Y_{T1} - C_{T1}) \\
 & + \frac{1}{1+i} [p_{n2} C_{n2} + e_2 Y_{T2} - \lambda_1 e_2 (Y_{T2} - C_{T2}) - (1 - \lambda_1) e_2 (Y_{T2} - C_{T2})] \\
 & = W_0 = \bar{M}_0 + \frac{1}{1+i} (p_{n1} Y_{n1} + e_1 Y_{T1}) - (\pi_1 + \frac{1}{1+i} \pi_2)
 \end{aligned}$$

which simplifies to expression (15) in the text:

$$\begin{aligned}
 (A1.2) \quad & (p_{n1} C_{n1} + e_1 C_{T1}) + \frac{1}{1+i} (p_{n2} C_{n2} + e_2 C_{T2}) = W_0 \\
 & = \bar{M}_0 + \frac{1}{1+i} (p_{n1} Y_{n1} + e_1 Y_{T1}) - (\pi_1 + \frac{\pi_2}{1+i}) .
 \end{aligned}$$

Next, aggregate money demand (M_t^D) in each period can be written as the sum of the domestic private (M_t^H) and public (M_t^S) demands for domestic money plus the foreign demand for domestic money (M_t^F):

$$\begin{aligned}
 (A1.3) \quad & M_t^D = M_t^H + M_t^S + M_t^F = p_{nt} C_{nt} + e_t Y_{Tt} - (1 - \lambda_t) e_t (Y_{Tt} - C_{Tt}) + \\
 & + p_{nt} S_t + (1 - \lambda_t) e_t (Y_{Tt} - C_{Tt}) \quad ; \quad t=1,2
 \end{aligned}$$

In equilibrium, money supply equals aggregate money demand:

$$(A1.4) \quad M_t = \bar{M}_0 + \sum_{j=1}^t X_j = M_t^D = p_{nt}(C_{nt} + \varepsilon_t) + e_t^Y Y_{Tt} = p_{nt} Y_{nt} + e_t^Y Y_{Tt} ;$$

where M_t is money supply in period t .

The right-hand side of expression (A1.2) can be rewritten, following Helpman (1981) as:

$$(A1.5) \quad \bar{W}_0 = \bar{M}_0 - (T_1 + \frac{T_2}{1+i}) + (p_{n1} Y_{n1} + e_1^Y Y_{T1}) + \frac{1}{1+i} (p_{n2} Y_{n2} + e_2^Y Y_{T2}) \\ + (\frac{1}{1+i} - 1) (p_{n1} Y_{n1} + e_1^Y Y_{T1}) - \frac{1}{1+i} (p_{n2} Y_{n2} + e_2^Y Y_{T2})$$

Using expression (A1.4) for each period yields:

$$(A1.6) \quad (\frac{1}{1+i} - 1) (p_{n1} Y_{n1} + e_1^Y Y_{T1}) = (\frac{1}{1+i} - 1) (\bar{M}_0 + X_1)$$

$$(A1.7) \quad -\frac{1}{1+i} (p_{n2} Y_{n2} + e_2^Y Y_{T2}) = -\frac{1}{1+i} (\bar{M}_0 + X_1 + X_2)$$

Therefore:

$$(A1.8) \quad (\frac{1}{1+i} - 1) (\bar{M}_0 + X_1) - \frac{1}{1+i} (\bar{M}_0 + X_1 + X_2) : \\ = -(\bar{M}_0 + X_1 + \frac{X_2}{1+i})$$

Using now the government intertemporal budget constraint (13) yields:

$$(A1.9) \quad -(\bar{M}_0 + X_1 + \frac{X_2}{1+i}) = -(\bar{M}_0 + p_{n1} \varepsilon_1 + \frac{p_{n2} \varepsilon_2}{1+i}) + (T_1 + \frac{T_2}{1+i})$$

Substituting into (A1.5) yields

$$(A1.10) \quad W_0 = [p_{n1}(y_{n1} - s_1) + e_1 y_{T1}] + \frac{1}{1+i} [p_{n2}(y_{n2} - s_2) + e_2 y_{T2}]$$

which is the right-hand side of expression (16) in the text.

Substituting into expression (A1.2) yields expression (16) in the text.



Appendix II

The Household Optimization Problem:
The Demand for Goods and Money

The time-separability property of the intertemporal utility function coupled with the cash-in-advance specification allows the solution of the household intertemporal optimization problem to proceed in the following stages:

1. In stage one, the household determines the optimum allocation of expenditure across the two periods.
2. In stage two, the household allocates the each period's expenditure between tradeables and nontradeables.
3. The household then determines how much domestic and foreign money is necessary at the beginning of the current period in order to buy the chosen quantities of tradeables and nontradeables at prevailing prices.

As shown in Appendix I, in equilibrium, the household optimization problem reduces to:

$$(A2.1) \quad \max V = [\alpha \ln C_{n1} + (1 - \alpha) \ln C_{n2}] + \frac{1}{1 + \delta} [\alpha \ln C_{n2} + (1 - \alpha)$$

subject to:

$$(A2.2) \quad (p_{n1}C_{n1} + e_1C_{T1}) + \frac{1}{1+i} (p_{n2}C_{n2} + e_2C_{T2}) = W_0$$

where W_0 is as defined in expression (16) of the text.

Maximizing the Lagrangean and rearranging the first-order condition yields the following expressions for the optimal domestic expenditure levels (in domestic currency) for periods 1 and 2:

$$(A2.3) \quad Z_1 = \frac{1+\delta}{2+\delta} W_0 \quad .$$

$$(A2.4) \quad Z_2 = \frac{1+i}{2+\delta} W_0 \quad .$$

In turn, the log-linear shape of each period's utility function yields:

$$(A2.5) \quad p_{n1} C_{n1} = \alpha Z_1$$

$$(A2.6) \quad e_1 C_{T1} = (1 - \alpha)Z_1$$

$$(A2.7) \quad p_{n2} C_{n2} = \alpha Z_2$$

$$(A2.8) \quad e_2 C_{T2} = (1 - \alpha)Z_2$$

Combining (A2.3) with (A2.5) and (A2.7), and (A2.9) with (A2.6) and (A2.8) yields the following system of goods demand functions:

$$(A2.9) \quad C_{n1} = \alpha \frac{1+\delta}{2+\delta} \frac{W_0}{p_{n1}}$$

$$(A2.10) \quad C_{T1} = (1 - \alpha) \frac{1+\delta}{2+\delta} \frac{W_0}{e_1}$$

$$(A2.11) \quad C_{n2} = \alpha \frac{1+i}{2+\delta} \frac{W_0}{P_{n2}}$$

$$(A2.12) \quad C_{T2} = (1-\alpha) \frac{1+i}{2+\delta} \frac{W_0}{e_2}$$

In a perfect foresight equilibrium, the corresponding money demand functions by households are readily obtained by using the above expressions (A2.9)-(A2.12) and expressions (6) to (9) in the text for both periods.



Appendix III

Technical Details

A. Derivation of exact expression for (27) in the main text: Second-period equilibrium in the nontradeables good market is given by expression (26) in the text. Totally differentiating yields:

$$(A3.1) \quad \frac{\partial Y_{n2}}{\partial \rho_2} d\rho_2 = \frac{\alpha}{1-\alpha} \frac{1+i^*}{2+\delta} \{ [Y_{T1}(\rho_1) + \frac{1}{1+i^*} Y_{T2}(\rho_2)] d\rho_2 + \rho_2 \left[\frac{\partial Y_{T1}}{\partial \rho_1} d\rho_1 + \frac{1}{1+i^*} \frac{\partial Y_{T2}}{\partial \rho_2} \right] \} + d\epsilon_2$$

Rearranging:

$$(A3.2) \quad \left(\frac{\partial Y_{n2}}{\partial \rho_2} - \left(\frac{\alpha}{1-\alpha} \right) \left(\frac{1+i^*}{2+\delta} \right) \left[Y_{T1}(\rho_2) + \frac{1}{1+i^*} Y_{T2}(\rho_2) + \rho_2 \frac{1}{1+i^*} \frac{\partial Y_{T2}}{\partial \rho_2} \right] \right) d\rho_2 = \left(\frac{\alpha}{1-\alpha} \right) \left(\frac{1+i^*}{2+\delta} \right) \rho_2 \frac{\partial Y_{T1}}{\partial \rho_1} d\rho_1 + d\epsilon_2$$

(A3.2) can also be expressed as:

$$(A3.3) \quad d\rho_2 = \frac{1}{\Delta} \left[\left(\frac{\alpha}{1-\alpha} \right) \left(\frac{1+i^*}{2+\delta} \right) \rho_2 \frac{\partial Y_{T1}}{\partial \rho_1} d\rho_1 + d\epsilon_2 \right]$$

where $\Delta \equiv \frac{\partial Y_{n2}}{\partial \rho_2} - \left(\frac{\alpha}{1-\alpha} \right) \left(\frac{1+i^*}{2+\delta} \right) \left[Y_{T1}(\rho_1) + \frac{1}{1+i^*} Y_{T2}(\rho_2) + \rho_2 \frac{1}{1+i^*} \frac{\partial Y_{T2}}{\partial \rho_2} \right] <$

This is the exact representation of (the total differential of) expression (27) in the text.

3. Showing that expression (29) in the text is unambiguously positive. By looking at expression (25), it is clear that all we have to show is that the term in squared brackets depends positively on ρ_1 .

Taking the total differential of $\{Y_{T1}(\rho_1) + \frac{1}{1+i^*} Y_{T2}(\rho_2)\}$ we get:

$$(A3.4) \quad \frac{\partial Y_{T1}}{\partial \rho_1} d\rho_1 + \frac{1}{1+i^*} \frac{\partial Y_{T2}}{\partial \rho_2} d\rho_2$$

Substituting expression (A3.3) for $d\rho_2$ into (A3.4) and omitting the ds_2 component yields:

$$(A3.5) \quad \frac{\partial Y_{T1}}{\partial \rho_1} d\rho_1 + \frac{1}{1+i^*} \frac{\partial Y_{T2}}{\partial \rho_2} \frac{1}{\Delta} \left(\frac{\alpha}{1-\alpha} \right) \left(\frac{1+i^*}{2+\delta} \right) \rho_2 \frac{\partial Y_{T1}}{\partial \rho_1} d\rho_1$$

or

$$(A3.6) \quad \frac{\partial Y_{T1}}{\partial \rho_1} \left[1 + \frac{\partial Y_{T2}}{\partial \rho_2} \frac{1}{\Delta} \left(\frac{\alpha}{1-\alpha} \right) \left(\frac{1}{2+\delta} \right) \rho_2 \right] d\rho_1$$

(+)

To check whether the collection of terms accompanying $d\rho_1$ in expression (A3.6) is positive or negative, we multiply all its components by Δ (Notice that since $\Delta < 0$, this changes the sign of the expression).

$$(A3.7) \quad \frac{\partial Y_{T1}}{\partial \rho_1} \left[\Delta + \frac{\partial Y_{T2}}{\partial \rho_2} \frac{\alpha}{1-\alpha} \left(\frac{1}{2+\delta} \right) \rho_2 \right]$$

Substituting the exact expression for Δ in (A3.7) yields:

$$(A3.8) \quad \frac{\partial y_{T1}}{\partial \rho_1} \left\{ \frac{\partial y_{n2}}{\partial \rho_2} - \frac{\alpha}{1-\alpha} \left(\frac{1+i^*}{2+\delta} \right) [y_{T1}(\rho_1) + \frac{1}{1+i^*} y_{T2}(\rho_2)] \right. \\ \left. + \rho_2 \frac{1}{1+i^*} \frac{\partial y_{T2}}{\partial \rho_2} + \frac{\partial y_{T2}}{\partial \rho_2} \frac{\alpha}{1-\alpha} \frac{1}{2+\delta} \rho_2 \right\}$$

This can be simplified to:

$$(A3.9) \quad \frac{\partial y_{T1}}{\partial \rho_1} \left\{ \frac{\partial y_{n2}}{\partial \rho_2} - \frac{\alpha}{1-\alpha} \left(\frac{1+i^*}{2+\delta} \right) [y_{T1}(\rho_1) + \frac{1}{1+i^*} y_{T2}(\rho_2)] \right\} < 0$$

(+)
(-)
(+)

Therefore, since $\Delta < 0$, this proves that expression (A3.6) is positive. Consequently, expression (29) in the text is unambiguously positive also.



Footnotes

- */ Helpful comments from participants in the Stanford University International Macro Workshop are gratefully acknowledged.
- 1/ See especially the pronouncements of the Cambridge Economic Policy Group in British context. Cripps and Godley (1976).
- 2/ See Vinals and Cuddington (1984a) (1984b) for some evidence.
- 3/ Other disequilibrium regimes considered in the literature (c.f. Cuddington-Johansson-Lofgren, 1984) are not discussed here so as to avoid being unduly taxanomic.
- 4/ What is important is not the currency of invoice but the ultimate currency in which the suppliers want to receive payment. Furthermore, in what follows it does not matter whether it is the buyer or seller that enters the foreign exchange market in order to meet this demand for the specific currency required by the seller.
- 5/ An alternative specification is the "B-system" where the sellers require that all transactions be paid for using the buyer's home currency. See Helpman and Razin (1981) for a comparison.
- 6/ Implicitly, labor market transactions are credit transactions, which do not require cash-in-advance.
- 7/ The careful reader will note here that the length of one payment cycle in the cash-in-advance specification is presumably much shorter than the length of the periods defined earlier as the "short run and the long run" on the basis of whether wage-price flexibility does or does not prevail. It would be more precise, but would leave our conclusions unaffected, to assume that a large but fixed number of payment cycles occurred in each of the two periods, the short run and the long run. The short run would then contain a number of identical fix-price equilibrium payment cycles. The long run would contain a number of identical Walrasian equilibrium payment cycles.
- 8/ For simplicity, the same wage applies in both sectors. This is unimportant for what follows.
- 9/ See Barro and King [1982] on the restrictions implied by time-separable utility functions. Note that neither government spending nor leisure enters the utility function of the representative consumer in our model.
- 10/ See Obstfeld [1981] for a discussion of the convenience of having a constant or a variable time preference rate.

- 11/ See Svensson [1983b] and Helpman and Razin [1982] for the implications of varying the timing of transactions. Recent developments to provide a "precautionary" and "store of value" demand for money in intertemporal closed and open economy models include: Grossman and Weiss [1982], Helpman and Razin [1982], Rotemberg [1983], Aizenman [1983] and Svensson [1983b].
- 12/ As Persson (1982 fn.8) notes, "The careful reader might wonder why the household would work at all in the second and last period when there is no opportunity of spending the income. This problem is a consequence of the simplified two-period structure; it disappears in an infinite horizon framework."
- 13/ It is assumed that the government does not issue foreign-currency debt.
- 14/ Comparing expressions (15) and (16), it should be noted that initial money holdings disappear and the second period income appears for the first time in (16). Intuitively, in a cash-in-advance economy, money is only useful as a means of effecting transactions. Per se, it does not change the overall consumption possibility set of the economy over time. However, initial net holdings of foreign assets if we had allowed them to be nonzero would affect consumption choices, since debts have to be paid off.
- 15/ Domestic demand for foreign money is recursively determined because the domestic economy is small in that market. Hence it can be ignored here.
- 16/ Because the economy's initial holdings of foreign assets equal zero, the balance of trade and the current account are the same in the first period.
- 17/ With static (ρ_2 constant) or regressive expectations ($0 < \partial \rho_2 / \partial \rho_1 < 1$) rather than the perfect foresight assumption in (27), the GG locus would be flatter. That is, the derivative in (29) would have a larger positive value.
- 18/ Due to the fact that Ricardian equivalence holds in our model, it does not matter whether the taxes are levied today or instead the government borrows today and repays the debt (with interest) in the long run by taxing the private sector.
- 19/ Interestingly, van Wijnbergen (1983) obtains a multiplier of one for the tax/bond finance case in a non-monetary model. In our monetary model, the multiplier in the tax finance case is less than one due to the endogenous adjustment of the exchange rate. The money-finance case yields the unity multiplier.
- 20/ Recall that the financing method in the second period is irrelevant.

References

- Aizenman, Joshua (1983), "A Theory of Current Account and Exchange Rate Determination," NBER Working Paper No. 1177, August.
- Barro, Robert J. and Robert G. King (1982), "Time-Separable Preferences and Intertemporal-Substitution Models of Business Cycles," NBER Working Paper No. 888.
- Branson, William H. and Willem H. Buiter (1983), "Monetary and Fiscal Policy under Flexible Exchange Rates," in Jagdeep S. Bhandari and Bluford H. Putnam (eds.) Economic Interdependence and Flexible Exchange Rates, MIT Press.
- Cripps, F. and W. Godley (1976), "A Formal Analysis of the Cambridge Economic Policy Group Model," Economica, November.
- Cuddington, John T., Per O. Johnsson and Karl G. Lofgren (1984), Disequilibrium Macroeconomics in Open Economies, Oxford: Basil Blackwell.
- Cuddington, John T. and Jose M. Viñals. 1984. "Budget Deficits and The Current Account in the Presence of Classical Unemployment," Stanford University, mimeo, May.
- Frenkel, Jacob A. and Assaf Razin (1984), "Fiscal Policies, Debt and International Economic Independence," NBER Working Paper No. 1266.
- Greenwood, Jeremy (1983), "Expectations, The Exchange Rate, and the Current Account," Journal of Monetary Economics, 12, pp. 543-569.
- Grossman, Sanford J. and Lawrence Weiss, (1983), "A Transactions-Based Model of the Monetary Transmission Mechanism," American Economic Review, 73, 5, December, pp. 871-880.
- Helpman, Elhanan (1981), "An Exploration in the Theory of Exchange-Rate Regimes," Journal of Political Economy, Vol. 89, No. 5, pp. 865-890.
- _____ and Assaf Razin (1979), "Towards a Consistent Comparison of Alternative Exchange Rate Systems," Canadian Journal of Economics 12, August, pp. 394-409.
- _____ (1981), "The Role of Saving and Investment in Exchange Rate Determination Under Alternative Monetary Mechanisms," Institute for International Economic Studies, Seminar Paper No. 181, October.
- _____ (1982), "Dynamics of a Floating Exchange Rate Regime," Journal of Political Economy, Vol. 10, No. 4, pp. 728-754.

- _____ (1982), "A Comparison of Exchange Rate Regimes in the Presence of Imperfect Capital Markets," International Economic Review, Vol. 23 (2), June, pp. 365-388.
- Hodrick, Robert J. (1982), "On the Effects of Macroeconomic Policy in a Maximizing Model of a Small Open Economy," Journal of Macroeconomics, 4, pp. 195-213.
- Lucas, Robert E. (1980), "Equilibrium in a Pure Currency Economy," Economic Inquiry 18, pp. 203-220.
- _____ (1982), "Interest Rates and Currency Prices in a Two-Country World," Journal of Monetary Economics, 10, pp. 335-359.
- _____ and Nancy L. Stokey (1983), "Optimal Fiscal and Monetary Policy in an Economy Without Capital," Journal of Monetary Economics, 12, pp. 55-93.
- Neary, J. Peter and Joseph E. Stiglitz (1983), "Towards a Reconstruction of Keynesian Economics: Expectations and Constrained Equilibria", Quarterly Journal of Economics 98 (Supplement), pp. 199-228.
- Obstfeld, Maurice (1983), "Intertemporal Price Speculation and the Optimal Current-Account Deficit," Journal of International Money and Finance, 2,2, (August), 135-146.
- _____ and Alan C. Stockman (1983), "Exchange-Rate Dynamics," NBER Working Paper No. 1230, November.
- Penati, Alessandro (1983), "Expansionary Fiscal Policy and the Exchange Rate", IMF Staff Papers, October pp. 542-569.
- Persson, Torsten (1982), "Global Effects of National Stabilization Policies Under Fixed and Floating Exchange Rates," Scandinavian Journal of Economics, 84 (2), pp. 165-192.
- Persson, Torsten and Lars E.O. Svensson. 1983. "Is Optimism Good in a Keynesian Economy?" Economica 50 (August), 291-300.
- Rotemberg, Julio, J. (1984), "A Monetary Equilibrium Model with Transactions Costs," Journal of Political Economy, 91, 1, February, pp. 40-58.
- Sachs, Jeffrey, D. (1982), "Current Account in the Macroeconomic Adjustment Process" Scandinavian Journal of Economics, pp. 147-159.
- _____ (1981), "The Current Account and Macroeconomic Adjustment in the 1970s," Brookings Papers on Economic Activity, 1, pp. 201-282.
- Svensson, Lars E. O. and Assaf Razin (1983), "The Terms of Trade and the Current Account: The Harberger-Laursen-Metzler Effect," Journal of Political Economy, 91, 1, pp. 97-125.

- _____ (1982), "Oil Prices, Welfare and the Trade Balance: An Intertemporal Approach," NBER Working Paper No. 991, September.
- _____ (1983-a), "Money and Asset Prices in a Cash-in-Advance Economy," Institute for International Economic Studies, Seminar Paper No. 267, December.
- _____ (1983-b), "Currency Prices, Terms of Trade, and Interest Rates: A General Equilibrium Asset Pricing Cash-in-Advance Approach," Institute for International Economic Studies, Seminar Paper No. 269, December.
- Van Wijnbergen, Sveder (1983), "Oil Price Shocks, Unemployment, Investment and the Current Account: An Intertemporal General Equilibrium Analysis," Mimeo, Development Research Department, World Bank.
- Viñals, Jose M. and John T. Cuddington, (1984a), "Some International Evidence on Fiscal Policy and the Current Account," Stanford University, Mimeo, April.
- _____ (1984b), "Budget Deficits and the Current Account in the United States: Is there a Connection?," Stanford University, Mimeo, April.

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