

RESEARCH ARTICLE

Keynsian Model with Remittances, Demand for Foreign Currency and Foreign Interest Rate

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Abstract

This is a Keynesian mathematical model that includes the demand for foreign currency and the interest rate abroad in the IS. Phenomena that sometimes is present in developing countries. As a result, we got an IS more vertical than the normal or Keynesian case, and in the LM curve the interest rate outside the country is a shift factor. In the balance of payments equation with flexible exchange rates, we estimated that the remittances sent from abroad cause a shift factor in the BP curve. We conclude that the demand for foreign currency, remittances and flexible exchange rates makes fiscal policy less effective than the standard model in changing the level of income, where there is some degree of capital mobility. Developing countries need to create their own models to apply economic policies specially monetary and fiscal policies to get better result in growth for the wellbeing of their people.

Keywords: *Keynsian model, Remittances, Foreign currency, Foreign interest rate, Balance of payment.*

Introduction

Macroeconomic models have been in use for the formulation of economic policy in almost every country in the world. These models not only provide an analytical framework to link the demand and supply sides and the resource allocation process in an economy but also may help in reducing fluctuations and enhancing the economic growth, which are two major aspects of any economy.

Classical, Keynesian, new classical and new Keynesian approaches have evolved over time to analyze fluctuations of output, employment and price level over years (Keynes [1], Hicks [2], Samuelson [3], Phillips [4], Friedman [5], Phelps [6], Tobin [7], Barro and Gordon [8], Sargent [9], Goodhart [10], Nickell [11], Lockwood Miller and Zhang [12], IMF [13]). The empirical validity of these models are tested using one of three models, macro-econometric simulations models, applied multisectoral general equilibrium models or by using stochastic dynamic general equilibrium models (Wallis [14], MPC [15], Pagan and Wickens [16], Kydland and Prescott [17]). There is considerable controversy about the causes, consequences and remedies for the

macroeconomic fluctuations in the short run in the literature.

New classical and new Keynesian models use rational expectation and market imperfections and frictions in the labor market. They also use or technological shocks to explain these fluctuations. There is less controversy in the literature about the economic events in the long run, despite plenty of work that has been done in the area of endogenous and exogenous growth models (Solow [18], Lucas [19], Romer [20], Mankiw, Romer and Weil [21], Parente and Prescott [22]).

Works using Keynesian models have been developed for developing countries There are some works for developed countries of Keynesian models. For example, Dancourt [23] in his paper discusses the macroeconomic impact that a boom (or a fall) in international prices of export commodities has on an small open economy operating in a context of free international capital mobility.

Mendoza [24] presents a Keynesian effective demand model that reproduces expansive or

contractive effects of an expansionary fiscal policy as a function of the initial conditions of the public finances.

In an economy with fiscal slack, when observed primary surplus is above the optimal fiscal surplus level, expansive fiscal policy raises the level of economic activity. However, when there is no fiscal slackness, when the observed surplus is below the optimal surplus, a fiscal expansion may contract the level of economic activity.

Chu and Silva [25] evaluate how a post Keynesian model of growth and wealth distribution in the line of Kaldor-Pasinetti can be extended using an infinitely lived representative agent of the type of Ramsey [26]. It is verified that the model permits the inclusion of leisure as a variable class distinctive, as well as permitting the government to choose optimal taxes on profits and on wages once the economic agents defined for this economy respond to fiscal policies. The results show that the Dual Theorem does not hold the marginal propensity to save of the capitalists is endogenous and, given the specificity for this economy, the tax on the gain from capital is zero in the long run equilibrium.

Mendoza [24] in Mendoza's model, monetary policy follows an inflation targeting scheme, using the interbank interest rate as the instrument of policy, while the money supply remains endogenous.

On the other hand, a limit for the fiscal deficit as a percentage of GDP is set as the rule for fiscal policy, with public expenditure remaining endogenous. In the monetary policy rule, the smoothing interest rate derives from the optimizing behavior of the central bank.

This model shows the macroeconomic dynamics that appear in two opposite scenarios: that of total credibility in the inflation target of the central bank, and that of no credibility whatsoever. It is found that:

- i) There can be convergence towards the stationary equilibrium, even when the Taylor Rule is not followed.
- ii) If there is total credibility in the central bank, a contractionary monetary policy can lead to inflation undershooting.

Carranco and Venegas-Martinez [28] in his study develops a model of a small, open economy, with

perfect capital mobility. This makes it possible to examine the actions of the government in the fiscal and monetary areas, which is compatible with optimal plans in the private sector. The proposed model considers a representative individual with perfect foresight. The key result is that fiscal and monetary policies consistent with the optimal plans of consumers and rational firms should not generate distortions.

Model IS, LM curves

$$Y = F(K, N)$$

$$\frac{w}{p} = F_N$$

$$C = C(Y - T - \delta K, r - u)$$

$$I = I(q(K, N, r - u) - 1, r^*)$$

$$D = D(r^*, r - u)$$

$$Y = C + I + G + \delta K - D + NX$$

$$\frac{M}{P} = m(r, Y, D)$$

The first equation is the production function of the economy that depends on capital and labor or employment. In the second equation, the real wage equals the marginal productivity of labor. The third shows the consumption function that depends on income, taxes, depreciation of capital and the real interest rate. The fourth equation is for investment, which describes the aggregate demand for investment where people invest at a higher rate; the higher the marginal product of capital and the lower the real interest rate. The fifth equation refers to the demand for foreign exchange as a function of the interest rate abroad, domestic inflation, and the interest rate of the country.

The sixth refers to income that is equal to consumption plus investment, plus government spending and capital depreciation, minus demand for foreign currency. The seventh equation represents the money market as a function of interest rate, income and demand for foreign currency.

Thus we have seven equations in seven endogenous variables $Y, N, C, I, r, P,$ and D . The exogenous variables are $w, T, u, G, M,$ and r^* as well as the parameters determining the shapes of the various schedules. Totally differentiating the above equations, where $dK = d\delta = 0$ because are constants.

1. $dY = F_N dN$
2. $\frac{dw}{w} - \frac{dp}{p} = \frac{F_{NN}}{F_N} dN$
3. $dC = C_1 dY - C_1 dT + C_2 dr - C_2 du$
4. $dI = I' q_N dN + I' q_{r-u} dr - I' q_{r-u} du + I'_2 dr^*$
5. $dD = D_1 dr^* + D_2 du - D_2 dr$
6. $dY = dC + dI + dG - dD$
7. $\frac{dM}{p} - \frac{dP}{P} \frac{M}{P} = m_r dr + m_y dY + m_D dD$

I'_2 is negative means that there is foreign investment at home. That is, foreign investment depends only on the interest rate abroad, when the rate of interest at home and abroad are equal

$$C_1 dY - C_1 dT + C_2 dr - C_2 du + I' \frac{q_N}{F_N} dY + I' q_{r-u} dr - I' q_{r-u} du + dG - D_1 dr^* + I'_2 dr^* + D_2 du - D_2 dr = dY$$

Which is the total differential of the IS curve.

Rearranging yields

$$\left(1 - C_1 - I' \frac{q_N}{F_N}\right) = -C_1 dT + dG + (I'_2 - D_1) dr^* - (C_2 + I' q_{r-u} - D_2) du + (C_2 + I' q_{r-u} - D_2) dr$$

The slope of the IS curve is given by

$$\left. \frac{dr}{dY} \right|_{IS} = \frac{1 - C_1 - I' \frac{q_N}{F_N}}{C_2 + I' q_{r-u} - D_2}$$

The denominator of the right hand side is negative, while the numerator may be of either sign. It is positive if

$$1 - C_1 > I' \frac{q_N}{F_N}$$

Now $1 - C_1$ is the marginal propensity to save out of disposable income. The expression

$I' \frac{q_N}{F_N}$ represents the marginal propensity to invest

out of income. In this case the IS curve is steeper than the traditional model, because of term D_2 .

In the denominator of the slope all terms are negative, i.e., when the interest rate is high, and demand for foreign currency is low, the denominator will be negative as long as $C_2 + I' q_{r-u} > D_2$.

Only if the marginal propensity to consume via credit and the marginal propensity to invest are greater than the marginal propensity of demand for foreign currency. The term D will make the denominator smaller and the slope of the IS bigger.

The IS curve shifts upward when the parameters T, G and u change

to an increase in foreign interest rate decrease investments at home and vice versa. There is an inverse relationship between the interest rate abroad and foreign investment in the country.

On the other hand, D_2 is positive, D_1 negative, m_r negative, m_Y positive and m_D negative.

Substituting equations 3, 4 and 5 in 6 yields

$$(I) dY = C_1 dY - C_1 dT + C_2 dr - C_2 du + I' q_N dN + I' q_{r-u} dr - I' q_{r-u} du + dG - D_1 dr^* + I'_2 dr^* + D_2 du - D_2 dr = dY$$

Solving 1 for dN and 2 and 1 for dP/P yields

$$dN = \frac{1}{F_N} dY, \quad \frac{dP}{P} = \frac{dw}{w} - \frac{F_{NN}}{(F_N)^2} dY$$

Substituting these two expressions into (I) yields

$$\left. \frac{\partial r}{\partial T} \right|_{IS} = \frac{C_1}{C_2 + I' q_{r-u} - D_2} < 0$$

$$\left. \frac{\partial r}{\partial G} \right|_{IS} = \frac{-1}{C_2 + I' q_{r-u} - D_2} > 0$$

$$\left. \frac{\partial r}{\partial u} \right|_{IS} = 1 \left. \frac{\partial r}{\partial r^*} \right|_{IS} = \frac{-(I' - D_2)}{C_2 + I' q_{r-u} - D_2} < 0$$

Then IS curve shifts upward when taxes decrease or government expenditures increase. When the rate of interest abroad decreases, the IS shifts upward; the anticipated inflation increases the IS upwards by the amount of increase in anticipated inflation.

The differential of the LM curve is derived by using (1) and (2) to eliminate dP from (7), thus

$$\frac{dP}{P} = \frac{dw}{w} - \frac{F_{NN}}{(F_N)^2} dY$$

Substituting the expression on the right for dP/P in (7) yields

$$\frac{dM}{P} - \frac{M dw}{Pw} + \frac{M F_{NN}}{P(F_N)^2} dY = m_r dr + m_y dY + m_D dD$$

Solving for dr yields

$$dr = \frac{1}{m_r} \left(\frac{dM}{P} - \frac{M}{P} \frac{dw}{w} + \left(\frac{F_{NN}}{(F_N)^2} \frac{M}{P} - m_y \right) dY - m_D dD \right)$$

$$\frac{\partial r}{\partial D} \Big|_{LM} = -m_D > 0$$

An increase in the demand for foreign currency diminishing the demand for real balances in domestic currency, so shifting the LM curve to the left.

The slope of the LM curve is thus given by

$$\frac{dr}{dY} \Big|_{LM} = \frac{1}{m_r} \left[\frac{F_{NN}}{(F_N)^2} \frac{M}{P} - m_y \right] > 0$$

As m_r approaches zero, the LM curve approaches a vertical position; while as $m_r \rightarrow -\infty$

As is in the case of the liquidity trap, the slope of the LM curve approaches zero. For a given level of income, if the money supply rises, the interest rate must fall (provided $m_r > -\infty$) in order to maintain equilibrium between the demand and supply for money. Similarly, when the demand for foreign currency rises, the interest must rise and the case is the same in the instance of a fall in money wage, where the interest rate also falls.

As summarized in this model, the LM curve is identical to the traditional Keynesian model, with the exception that the demand for foreign currency is a shift factor. The IS curve is more vertical than in the Keynesian model.

The stability condition is that the LM curve is steeper than the IS curve. This condition is automatically satisfied when the LM curve is upward sloping and the IS curve is downward sloping. It can still be satisfied if the IS curve is upward sloping, provided that the LM curve is more steeply sloped.

In this model we have a normal LM curve and the IS curve is more vertical or more steeply sloped than the standard Keynesian model, with the result that monetary policy is not adequate to achieve income increases, i.e., monetary policy is weak, and its income effects are negligible.

Balance of payment curve. The balance of payment is the sum of real net export, nx , and the net capital flows cf .

$$Bp = nx + cf$$

Net exports in nominal terms, NX , is the value of exports minus the value of imports, they are priced in terms of the domestic of the domestic price level P .

$$NX = Px - Pz$$

Where x is real exports and z is real imports. When S is defined as the spot exchange rate expressed as domestic currency per unit of foreign currency, and where P^* denotes the price level abroad, then

$$NX = Px - SP^*z$$

In real terms

$$\frac{NX}{P} = x - \left(\frac{SP^*}{P} \right) z \text{ or } nx = x - Rz \text{ where } R = SP^*/P$$

When real exports depend on income abroad and the real exchange rate (competitiveness), we assume a simple linear function.

$$x = x_0 + fR / f > 0$$

There is a positive relationship between real exports and the real exchange rate, assuming the Marshall-Lerner condition that states that, for a currency devaluation to have a positive impact on trade balance, the sum of price elasticity of exports and imports (in absolute value) must be greater than 1.

$z = z_0 + \mu y - gR$ $0 < \mu < 1, g > 0$ where μ is the marginal propensity to import.

Combining the results we can express real net export as

$$\begin{aligned} nx &= (x_0 + fR) - (z_0 + \mu y - gR) \\ &= (x_0 - z_0) + (f + g)R - \mu y \\ &= nx_0 + (f + g)R - \mu y \\ \text{where } nx_0 &= (x_0 - z_0) \end{aligned}$$

Turning now to real net capital flows

$$cf = v(r - r^*) + \gamma y \quad v > 0, 1 > \gamma > 0$$

Where γ marginal propensity of sending remittances and r and r^* are the nominal interest rate at home and abroad (which are equal to the real rates since we shall be holding prices at home and abroad constant).

Combining exports and the capital flow equation, we arrive to an expression for the balance of payment.

$$\begin{aligned} bp &= nx + cf \\ &= nx_0 + (f + g)R - (\mu - \gamma)y + v(r - r^*) \end{aligned}$$

Balance of payment equilibrium occurs when $bp = 0$, a deficit when $bp < 0$ and a surplus when $bp > 0$.

Under the assumption of fixed exchange rate, the BP curve denotes combinations of income and

interest rate for which the balance of payment is in equilibrium. Setting $bp=0$ and expressing the result as r a function of y , we have

$$r = \left[r^* - \frac{nx_0 + (f + g - \gamma)R}{v} \right] + \left(\frac{\mu - \gamma}{v} \right) y$$

Hence the BP curve is, in general positively, sloped because $\mu > \gamma$ and with the presence of γ the slope of BP curve is smaller, i.e., less steep. At the same level of interest rate the level of income will be higher, and if $bp < 0$ then

$$nx_0 + (f + g)R - (\mu - \gamma)y + v(r - r^*) < 0$$

i.e. $r < \left[r^* - \frac{nx_0 + (f + g)R}{v} \right] + \left(\frac{\mu - \gamma}{v} \right) y$

In other words, below the BP curve the balance of payment is in deficit, while above the BP curve it is in surplus.

We have to keep in mind that our model have small differences with respect to the standard model, we have an IS curve more vertical, greater constant in the LM and a BP curve more horizontal, i.e., closer to the perfect capital mobility, all this take us to a fiscal policy with less impact on the level of income.

Flexible exchange rates. With the spot exchange rate floating, S variable, and with fixed prices at home and abroad, P and P^* constant, then the real exchange rate R will vary directly with S . Whatever is happening in the economy, the exchange rate will assume instantaneous adjustment in the foreign exchange market and the money market. Then the full impact of any change in the economy will initially fall on interest rate and the exchange rate. Only over time will the economy adjust to the situation as income changes. In terms of the diagrammatic treatment, the BP curve will shift continuously so that it always passes through the intersection between the IS and LM curves, Shone [28].

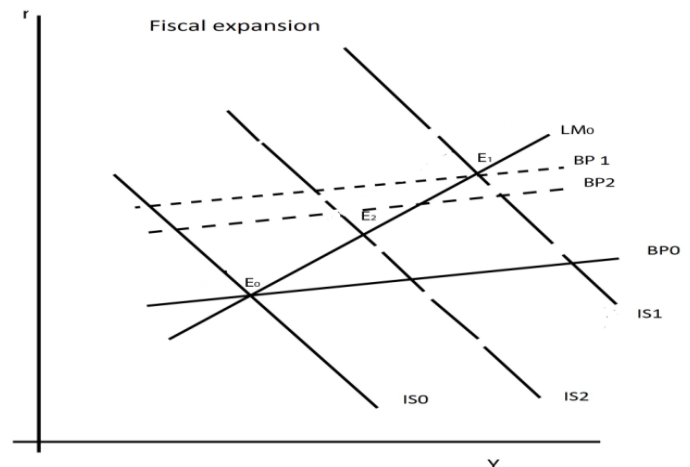
The initial impact of the fiscal expansion is to move the economy to a point E_1 , with a trajectory moving along LM_0 from E_0 to E_1 . Because of the resulting surplus, the exchange rate appreciates, shifting the BP curve to BP_1 . It should be noted that BP_1 passes to point E_1 , which it must do to eliminate any surplus on the balance of payments. The appreciation however, leads to an appreciation of the real exchange rate, a rise in R , which leads over time to a reduction in net exports. As net export declines, so too does income through the multiplier impact. However, this

reduction in income moves the inflow of remittances so that as income decreases, remittances increased, so the reduction in income is dampened a little bit by remittances. As income falls, so too does the demand for money and this leads to a fall in the interest rate, but by a smaller amount because of the presence of remittances from E_1 to E_2 .

However, as the interest rate falls, the amount of net capital inflow declines, but in smaller amounts because of remittances, therefore the exchange rate must depreciate. This shifts the BP curve down from BP_1 to BP_2 which occurs as the IS curve shifts from IS_1 to IS_2 . In other words, in the (y,r) -plane, the economy gradually moves down LM_0 from E_1 to E_2 , establishing itself as the final equilibrium point E_2 . The most likely trajectory, therefore, is a movement along LM_0 from E_0 to E_2 as all these forces take effect.

Remittances help to slow the income movements, so that the exchange rate does not depreciate too much and that fiscal policy should be a bit more effectively achieving a higher income growth, and acting as a cushion of dynamic movements.

Remittances gives more stability to the economy. So in our case, we end up with an E_3 with lower income and higher interest rate instead of E_2 , that represents the standard model fig. 1.



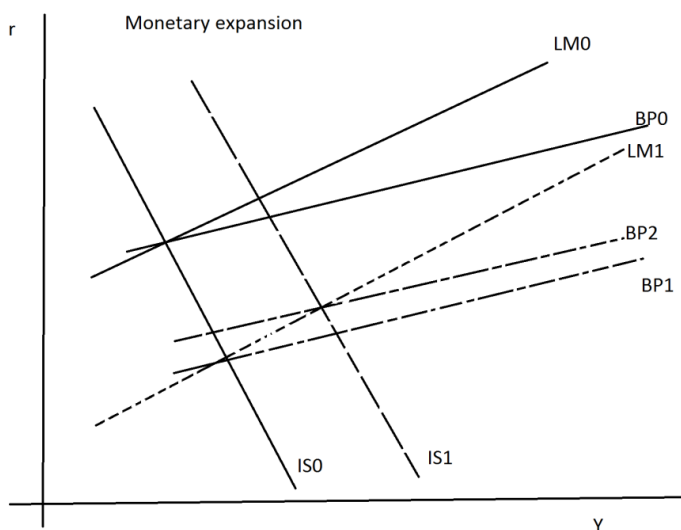
The Mundell-Fleming result under flexible exchange rates, fiscal policy Young and Darity [29] is effective in changing the level of income where there is some degree of capital mobility, but totally ineffective where there is a perfect capital mobility.

Dornbusch overshooting under flexible exchange rates, fiscal expansion leads to an overshooting of interest rates and an overshooting of the exchange rate. This result holds with some degree of capital mobility, or with perfect capital mobility [30].

Different slopes in IS and BP curves and an upward movement of the LM curve from LM0 to LM1, lead us to a higher interest rate and lower

income, i.e., point E3, compared with the normal model that ends up in point E2 in fig. 1.

A rise in the money supply shifts the LM curve right to LM1 and moves the economy from E0 to E1, at E1 the BP is in deficit, thus the exchange rate adjusts instantaneously under flexible exchange rate, it will depreciate shifting BP0 to BP1 in the intersection of IS and LM curve in point E1. The depreciation leads to a rise in the real exchange rate and hence to a stimulus to net exports. This leads to shift right in the IS curve to IS1, and the resulting rise in the rate of interest leads to an appreciation of the exchange rate, but not enough to swamp the original depreciation of the exchange rate, the economy accordingly ends in point E2 in fig.2.



Conclusion

The demand for foreign currency, remittances and flexible exchange rates makes fiscal policy less effective than monetary policy in changing the level of income where there is some degree of capital mobility. The design and implementation of fiscal and monetary policy is of paramount

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importance, all to ensure that they do not create distortions of the decisions of individuals and in economies and in the wellbeing of people.

A Keynesian model with modifications like this is useful for analyzing foreign investment and the demand for foreign currency, recurring phenomena in countries in the process of development. Here we show that the models generated in developed countries are not directly applicable to developing countries and that some changes may be useful.

In this model, fiscal policy is weak and therefore does not have a positive effect on consumption and investment and can lead to an increase in demand for foreign currency. Therefore the policy does not create an increase in income. Moreover, monetary policy is strong and most suitable to achieve increases in income, but also carries the risk of increasing external dependence. So a cautious combination of both, with an emphasis on fiscal policy, is necessary.

More complex models are needed in the future to take into account several variables such as taxes, income distribution, trade and so on, to have a more complete, fully informed picture of underdeveloped economies models.

In this model, we end up with less income and a higher interest rate than in the normal case, as this situation is a vicious circle of underdevelopment. Therefore, the demand for foreign currency and foreign interest rate makes growth for developing countries more difficult by making an IS curve steeper and shifting the LM to the left. But remittances make the BP curve less steep, acting as a regulator of the movements of the IS and LM curves. However, it is not enough to crowd them out completely.

Developing countries need to create their own models to apply economic policies specially monetary and fiscal policies to get better result in growth for the wellbeing of their people.

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