BALANCE OF PAYMENTS CONSTRAINED GROWTH MODEL CONSIDERING FOREX AND CAPITAL FLOW

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Abstract: Economic Models on Balance of Payments Constrained Growth involving Capital Flows usually consider Capital flows from Forex Reserves as a part of Capital Flows, i.e. they make no difference between Capital inflow from investors and Capital flow from Forex reserves. I try to differentiate between Capital inflows from investors and capital flow accounted for by variation in foreign exchange reserves. I have divided the total foreign capital inflow into two parts, FDI (Foreign Direct Investment) and FPI (Foreign Portfolio Investment). Further, I have made different assumptions about their inflow, and have taken care to separate them from Foreign Exchange Reserves. In practical terms, Foreign Exchange reserves are quite different from FDI and FPI, since capital flow from Foreign Exchange Reserves does not bring any accompanying technology that FDI does. To that extent, this model tries to incorporate the difference between Forex reserves and foreign investment, and also tries to study the Balance of Payments Constrained Growth while accounting for this difference.

Keywords: Balanced of Payments Constrained Growth, Capital Flows, Forex Reserves.

Introduction: Economic Models on Balance of Payments Constrained Growth involving Capital Flows usually consider Capital flows from Foreign exchange (Forex) Reserves as a part of Capital Flows, i.e. they make no difference between Capital inflow from investors and Capital flow from Forex reserves. Thirlwall and Hussain (1982) [1] were the first to incorporate capital flows in Thirlwall's (1979) [2] model. However, they did not differentiate between FDI and FPI, neither did they take into account forex reserves of a country. Moreno-Brid (1998) [3] considers a debt creating foreign investment and makes a significant progress in Thirlwall's model, but doesn't recognize the role of forex reserves. Moreno-Brid also doesn't differentiate between FDI and FPI. Razmi (2013) [4], in his analysis includes capital flows while imposing a Balanced of Payments Constraint on Kaldorian model of Cumulative causation, but neglects forex reserves. Further analysis is done by Filho *et al.* (2011) [5], who differentiate Foreign Investment into FDI and FPI, but do not consider the role of forex reserves.

This paper aims to do two things, firstly, differentiate between FDI and FPI, and secondly, incorporate forex reserves while considering a balanced of payments constrained growth. FDI and FPI are fundamentally different insofar as a country's economy is concerned. FDI is more helpful compared to FPI and hence, they must be differentiated, so as to know their impact. Forex reserves are usually held by countries as a 'war-chest' to act as a buffer against external shocks. To that end, it becomes necessary to see what changes due to inclusion of forex reserves in the analysis of a balanced of payments constrained growth. Finally, doing all this, the paper aims to find out what other factors or policy decisions determine a Balanced of Payment Constrained Growth. I have not focussed on empirical studies and have developed a mathematical model, and I have also assumed that domestic sources of growth do not constrain the growth before Balance of Payment does.

Nomenclature:

P_d ➔ Price of Exports in Domestic Currency
P_f ➔ Price of Imports in Hard Currency
X ➔ Quantity of Exports
M ➔ Quantity of Imports
Z ➔ Income of the World
Y ➔ Domestic Income
Q ➔ Capital Inflow in the given year
Q_I ➔ Foreign Portfolio Investment in the given year
Q_D ➔ Foreign Direct Investment in the given year
F ➔ Forex Reserves
F_t ➔ Forex Reserves accumulated in the given year
V_X ➔ Value of Exports in Hard Currency
V_M ➔ Value of Imports in Hard Currency
S ➔ Structural Issues
E ➔ Exchange Rate
G ➔ Residual Structural Issues
r_d ➔ Domestic Rate of Return
r_f ➔ International Rate of Return
η ➔ Price Elasticity of Export Goods (Assumed Same for Both regions) <0
ψ ➔ Price Elasticity of Import Goods (Assumed Same for Both regions) <0
ε ➔ Income Elasticity of Export Goods >0
π ➔ Income Elasticity of Import Goods >0
α ➔ Foreign Capital Elasticity of Domestic Price Level >0
β ➔ Exchange Rate Elasticity of Domestic Price Level >0
γ ➔ International Price Level Elasticity of Domestic Price Level >0
δ ➔ Structural Factors Elasticity of Domestic Price Level >0

ω ➔ Structural Factors Elasticity of Foreign Direct Investment >0
θ ➔ Forex Reserve Elasticity of Structural Issues >0
σ ➔ Domestic Income growth rate Elasticity of Foreign Direct Investment >0
ρ ➔ World Income growth rate Elasticity of Foreign Direct Investment >0
τ ➔ Real Returns Elasticity of Foreign Portfolio Investment >0
λ ➔ World Income Elasticity of Foreign Portfolio Investment >0
A,B ➔ Constants

Assumptions :

- Full Capital Mobility (Full Capital Account Convertibility).
- Domestic constraints on growth do not apply before Balance of Payments Constraints apply.
- Domestic Price Level will depend upon: -
- Structural Issues
- Foreign Capital Base
- Exchange Rate
- Foreign Price Level

1. Structural Issues are decided by many factors including: -

- Monetary and Fiscal Policies
- Availability of infrastructure
- Global Risk factors
- Foreign Exchange Reserves and so on.

As such there is no concrete measurable index of Structural Issues, but segregating different components would make things very complicated, hence I've not done that. However, Structural issues can be expressed as: -

$$S = F^{\theta}h(G) \qquad (a)$$

2. Foreign Direct Investment depends upon: -

- Domestic Income Growth Rate
- World Income Growth Rate
- Structural Issues

3. Foreign Portfolio Investment depends upon: -

- Rate of return in International Market
- Rate of return in Domestic Market
- Rate of Depreciation
- Rate of growth of World Income

The Model : Basic Equation for Balance of Payments can be written as: -

$$\frac{P_d X}{E} - P_f M + Q = F_t \qquad (1)$$

This equation represents BoP in terms of Hard Currency.

Writing this equation in terms of change (By differentiating equation (1)), we get

$$\frac{P_d X}{E}(p_d + x - e) - P_f M(p_f + m) + Qq = dF_t \qquad (2)$$

dF_t represents the additional forex accumulated in the time period where all the quantities have changed

$\frac{dF_t}{F_t}$ represents rate change of annual forex addition = f'

$$dF_t = f'fF \qquad (3)$$

According to Kaldor,

$$x = \eta(p_d - p_f - e) + \varepsilon z \qquad (4)$$

$$m = \eta(p_f - p_d + e) + \pi y \qquad (5)$$

Further,

$$\frac{P_d X}{E} = V_X \qquad (6)$$

$$P_f M = V_M \qquad (7)$$

Using equations (2), (3), (4), (5) and (6), we get,

$$V_X(p_d - e + \eta p_d - \eta p_f - \eta e + \varepsilon z) - V_M(p_f + \psi e + \psi p_f - \psi p_d + \pi y) + Qq = Fff' \qquad (8)$$

Using the assumptions made above with regard to domestic price level: -

$$P_d = S^{\delta}Q^{\alpha}E^{\beta}P_f^{\gamma} \qquad (9)$$

Thus,

$$p_d = \alpha q + \beta e + \gamma p_f + \delta s \qquad (10)$$

Here, s represents change in Structural issues throughout the year. This may be due to change in Forex Reserves, Monetary, Fiscal Policies, or Due to level of infrastructure or World Investor sentiment and a host of other factors. Using Equation *(a)* we can easily see that

$$s = \frac{\theta f}{h(G)} + \frac{\delta h}{\delta G}\frac{dG}{h(G)} \qquad (11)$$

Using these equations, we get,

$$\begin{aligned} V_X\varepsilon z + e(\beta - 1)\{V_X(1+\eta) + \psi V_M\} \\ + p_f[V_X\{1 + (1+\eta)(\gamma - 1)\} \\ + V_M\{(1+\psi)(\gamma - 1) - \gamma\}] \\ + s\delta\{V_X(1+\eta) + V_M\psi\} - Fff' \\ + q\alpha\{V_X(1+\eta) + V_M\psi\} + qQ \\ = V_M\pi y \end{aligned} \qquad (12)$$

Foreign Investment Inflow (Capital Inflow) is divided into 2 types: -

- Foreign Portfolio Investment
- Foreign Direct Investment

$$Q = Q_I + Q_D \qquad (13)$$

Also,

$$Q = DQ_D;\ Q = IQ_I \qquad (14)$$

Thus,

$$qQ = q_I Q_I + q_D Q_D \qquad (15)$$

Further, from the assumptions regarding FDI,

$$Q_D = AS^{\omega}y^{\sigma}z^{\rho} \qquad (16)$$

Thus,

$$q_D = \omega s + \sigma\frac{dy}{y} + \rho\frac{dz}{z} \qquad (17)$$

$\frac{dy}{y}$ represents rate of change of annual growth rate of domestic income

$\frac{dz}{z}$ represents rate of change of annual growth rate of world income

From assumption regarding FPI,

$$Q_I = B(r_d - r_f - e)^{\tau}z^{\lambda} \qquad (18)$$

$$q_I = \tau\frac{d(r_d - r_f - e)}{(r_d - r_f - e)} + \lambda\frac{dz}{z} \qquad (19)$$

For Simplicity the term $V_X(1+\eta) + \psi V_M$ can be written as V_Z. It can be seen that V_Z is negative. This is so because for a country running trade deficit, and exporting primary goods and importing secondary

and tertiary goods will have higher V_M compared to V_X and since both η and ψ are negative, the overall term can safely be assumed to be negative.

Using these equations, it can be seen that:-

$$V_X \varepsilon z + e(\beta - 1)V_Z + p_f[V_X\{1 + (1 + \eta)(\gamma - 1)\} + V_M\{(1 + \psi)(\gamma - 1) - \gamma\}] + \delta V_Z \frac{\delta h}{\delta G}\frac{dG}{h(G)} + \delta V_Z \frac{\theta f}{h(G)} - Fff' + (q_D D + q_I I)(Q + \alpha V_Z) = V_M \pi y \quad (20)$$

Equation *(20)* can be rearranged to be written as:-

$$V_M \pi y = V_X \varepsilon z + e(\beta - 1)V_Z + p_f[V_X\{1 + (1 + \eta)(\gamma - 1)\} + V_M\{(1 + \psi)(\gamma - 1) - \gamma\}] + \delta V_Z \frac{\delta h}{\delta G}\frac{dG}{h(G)} + \delta V_Z \frac{\theta f}{h(G)} - Fff' + \{\omega(\frac{\theta f}{h(G)} + \frac{\delta h}{\delta G}\frac{dG}{h(G)}) + \sigma\frac{dy}{y} + \rho\frac{dz}{z}\}D(Q + \alpha V_Z) + \{\tau\frac{d(r_d - r_f - e)}{(r_d - r_f - e)} + \lambda\frac{dz}{z}\}I(Q + \alpha V_Z) \quad (21)$$

$(Q + \alpha V_Z)$ will be positive because α will be very less. This is so because α would represent the Foreign Capital Elasticity of Domestic Price Level. At any point, foreign Capital would form a very small part of Money Base of the economy. Thus, since domestic price level depends on Money Supply, it would respond very less to Foreign Capital, i.e. Domestic Price Level would be quite inelastic to Foreign Capital. Thus, while α will be positive, it would be very small. Therefore, $(Q + \alpha V_Z)$ would be positive.

Conclusion:

- Given that coefficient of annual rate of accumulation of forex reserves is $[\omega\frac{\theta}{h(G)}D(Q + \alpha V_Z) + \delta V_Z\frac{\theta}{h(G)} - Ff']$, the balance of payments constrained growth will initially be boosted as forex reserves accumulate, but will gradually taper off as Forex reserves reach a specified level. Beyond this level, to further contribution of forex reserves to growth will be positive only if rate of acceleration of annual forex accumulation (f') becomes negative.
- For the same amount of FDI and FPI, (D = I = 0.5), FDI has a much stronger impact on balanced of payments constrained growth compared to FPI, given that coefficient of D is $\omega(\frac{\theta f}{h(G)} + \frac{\delta h}{\delta G}\frac{dG}{h(G)}) + \sigma\frac{dy}{y} + \rho\frac{dz}{z}$, while coefficient of FPI is $\tau\frac{d(r_d - r_f - e)}{(r_d - r_f - e)} + \lambda\frac{dz}{z}$. Thus FDI is always more helpful in raising balance of payments constrained growth.
- There will not be any convergence between growth rate or final income of different economies. However, an accelerating world economy will benefit all the countries which have a balance of payments constrained growth.
- Continual depreciation will hamper growth by discouraging both FPI and also because coefficient of e, $(\beta - 1)V_Z$, is negative.
- Despite a seemingly positive role that a higher rate of domestic interest (assumed as a proxy for Domestic rate of return in case of debt instruments of FPI) plays in growth, too high of the domestic rate of interest would lead to a reduced domestic investment demand and dual gap analysis would come into play, hampering growth.

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