FINANCIAL LIBERALISATION AND INFLATIONARY DYNAMICS IN THE CONTEXT OF A SMALL OPEN ECONOMY

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Abstract

This paper develops a short-term model of a small open financially repressed economy characterised by unorganised money markets, intermediate goods imports, capital mobility and flexible exchange rates. The analysis shows that financial liberalisation, in the form of increased rate of interest on deposits and tight monetary policy, causes deflation for an economy with a high degree of capital mobility. However, for economies with a low degree of capital mobility, the possibility of stagflation cannot be ruled out. These results suggest that financial liberalisation in the form of lower reserve requirements should be recommended for economies with restricted transactions in the capital account.

JEL E31, E44, E52, F41

1 Introduction

Using a modified Mundell-Fleming model that accounts for financial repression, this paper analyses the effects of financial liberalisation on inflation. Financial restriction consists of three elements: first, the banking system is favoured and protected because the government can finance the budget deficit at a low or zero cost by forcing the banks to hold government bonds and money through the imposition of "high" multiple reserve requirements; second, since government revenue cannot be extracted very easily from private securities, the development of private bond and equity markets are discouraged, and; finally, interest rate ceilings are imposed on the banking system to encourage low-cost investment and curtail competition with public sector fund-raising from the private sector. In this context, financial liberalisation is defined as relaxation of the interest-rate ceiling and lowering of reserve requirements.

Since the break-up of the old colonial empires, many developing economies have suffered from stagnant economic growth, persistent inflation and external imbalances under financial repression. To cope with these difficulties, McKinnon (1973) and Shaw (1973) advocate a high interest-rate policy to accelerate growth with lower inflation. Such policy prescriptions have come to be associated with the Liberal school, which in its analysis tends to assume that financial sector development is the precursor to economic growth. Influential analysis of financial liberalisation initiated by the Liberal school has been strongly criticised by a group of economists adhering to the New Structuralist school. These economists, including Van Wijnbergen (1982, 1983 & 1985), Buffie (1984), Kohsaka (1984) and Lim (1987) postulate that the financial markets of many developing countries are characterized by competitive and agile Unofficial Money Markets (UMMs), which absorb the excess demand for credit from the official banking system; this is an implication of the interest rate ceilings. The New Structuralists indicate that in such an environment an increase in the nominal interest rate on deposits will cause households to reallocate their portfolios towards bank deposits at the expense of UMM securities, which in turn will cause the total supply of credit to the business sector to decline as funds are

shifted out of the UMM into the banking system. The reallocation occurs because the banking system, in the presence of reserve requirements, provides partial intermediation whereas the UMM, with no reserve requirements, provides one-to-one intermediation. As a result, this reallocation reduces the total supply of credit, causing the UMM rate to go up to clear the credit market. The associated increase in the cost of funds to finance working capital shifts the aggregate supply to the left, and output falls while inflation rises. (See Karapatakis, 1992, for a comprehensive literature review on financial repression.)

The objective of this analysis is to show that the stagflationary outcome predicted by the New Structuralist school is not a certain result, when flexible exchange rates, import of intermediate inputs and capital mobility are allowed for. This argument is closely related to the recent theoretical work of Nag and Mukhopadhyay (1998), who show that the new structuralist claim of a tight monetary policy and interest rate deregulation, propagated by Van Wijnbergen (1982, 1983, 1985 and 1986), is radically altered when import penetration and a flexible exchange rate are considered.

The argument of this present study builds on the work of Nag and Mukhopadhyay (1998), firstly by incorporating capital account mobility, which they do not include in their study. Secondly, while they assume that the economy is characterised by perfect wage indexation, which is typically not the case in a small open financially repressed country, this paper develops a flexible model that allows varied levels of wage indexation to be considered, including both extremes of no and perfect wage indexation. Thirdly, Nag and Mukhopadhyay use a phase-diagram analysis to obtain their results, while this study draws its results from a more tractable IS-LM-BP(AD)-AS model, which allows solutions focused explicitly on the endogenous variables of a model. Using an IS-LM-BP(AD)-AS model also allows the endogenising of money supply, and, hence, the incorporation of the role of reserve requirements. Analysis of reserve requirements is important, since even though most economies around the world have deregulated interest rates, the financial sector continues to be repressed through high mandatory reserve requirements (see Gupta, 2005, for a detailed review). This study can thus be viewed as a complementary and extended version of that of Nag and Mukhopadhyay (1998), better adapted to reality.

With these modifications to the model, and allowing for the role of intermediate inputs in the production process, higher interest rates on deposits and tighter monetary policy can be shown to be likely to cause deflation in an economy with high capital mobility. Moreover, financial liberalisation in the form of lower reserve requirements can increase output and lower inflation, if the country is subjected to restricted capital account transactions.

This argument will now be set out in two sections: Section 2 sets out the economic environment and Section 3 solves the model and discusses the effects of financial liberalisation on the rate of inflation.

2
The model

For the sake of argument, let us consider a small open economy, operating under a floating exchange rate regime, with one type of domestically produced goods and two different types of imported goods (one consumption and one imported intermediate), used in the production of domestic output. The price of the domestic goods is endogenous, whilst the prices of the imported goods, both consumption and capital, are exogenous. The supply function of the importables is perfectly elastic at a foreign currency price of P^*. Since P^* is parametrically given to the economy, let us assume it is set at unity for the sake of simplicity. Notice that an implicit assumption is that the production transformation schedule is linear for the imported consumption goods and the intermediate goods, so that the same technology applies to both kinds of importables and they sell for the same price of P^*.

Repression is assumed to be severe enough to give rise to UMMs, popularly called the "curb" markets. A curb market is an informal

credit market in which money lenders and indigenous banks are intermediate between savers and borrowers and are outside the realm of the regulations of the monetary authority. Because of the absence of reserve requirements, the curb market is often viewed as a competitive and agile credit market providing more efficient intermediation than the official banking system. Moreover, since the banking system operates under interest rate regulations and high reserve requirements, the curb market can be viewed as a residual market that absorbs the excess demand for credit from the official banking system.

Firms unable to obtain low cost funds from the banking system at the regulated lending rate turn to the UMM to satisfy their borrowing needs to finance intermediate input and physical capital requirements. The freely determined rate in the curb market is much higher than the deposit and loan rates in the official banking system, and reflects true marginal cost of production. Hence, the UMM rate of interest appears as an argument in both the aggregate demand and aggregate supply side of the model.[2]

Our model of a small open financially repressed economy is a modified version of the standard Mundell-Fleming model as outlined in Argy (1994). The basic structure of the economy can be laid out by considering four interrelated markets, namely, the labour, commodity, money and foreign exchange markets. We begin with the labour market. Unlike the standard Mundell-Fleming model, the aggregate supply curve in our economy is not perfectly elastic but is upward sloping under reasonable assumptions about wage-price flexibility. Since this is a short-run model, the aggregate supply, Q^s, is determined by the conditions prevailing in the labour market and the imported intermediate goods requirement, as shown in equation 1:

$$1\text{n } Q^s = \beta_1[(\text{In}W - \text{In}P_d)] - \beta_2[\text{In}e - \text{In}P_d) + r_c] \quad (1)$$

where W = nominal wage, P_d = domestic price level, e = nominal exchange level and r_c = real interest rate of the curb market, respectively, and $\beta_i > 0, i = 1.\ 2,$

Equation (1) states that the quantity supplied is negatively related to the marginal cost of hiring one additional unit of labour and the intermediate imported input. Note that the wage cost is assumed to be financed through retained earnings of the firms, while the intermediate input is purchased through loans from both the banks and the UMM. This is merely a simplification and, assuming that labour costs are also loan-financed, does not change the final results while simplifying the equation's coefficients. It is also assumed that firms do not want to tie up their retained earnings in dealings with foreign suppliers; many foreign suppliers require advance payment, hence the firms' reliance on loans. Thus, the interest rate of the curb market, which reflects the true marginal cost of production, enters as an argument into the aggregate supply curve, besides the real exchange rate.

Nominal wage is assumed to be indexed to the consumer price index (P), i.e., $W = \beta_3 P$, where β_3 reflects the degree of wage indexation, and the consumer price index (CPI) is the weighted average of the price of home good (P_d) and the price of imported good (eP^*). Since P^* is unity, movements in the price of imported goods are completely determined by variations in the nominal exchange rate, e. So the CPI is given by equation 2:

$$1\text{n P} = \beta_4 1\text{n } P_d + (1 - \beta_4)\ 1\text{n } e \quad (2)$$

Note, β_3 lies in the closed interval of 0 to 1. We will derive a general expression for the aggregate supply curve and mainly consider the case of no-wage indexation ($\beta_3 = 0$), which corresponds to a more realistic situation in the labour markets of the developing world. However, as a corollary we will observe what happens when there is perfect wage indexation ($\beta_3 = 1$). Assuming $\beta_3 = 0$ implies that the nominal wage is fixed and normalised to 1. We can then treat the nominal wage as parametric in the model, implying that employment is demand-determined. This is not an irrelevant assumption, especially in the short term when in the face of continuous unemployment, labour supply is rendered perfectly elastic. Moreover, though they state wages and working contracts in great detail, most union contracts ensure that

the right to adjust employment in response to changes in economic conditions is mostly reserved for the hiring firm (Addison & Siebert, 1979).

Substituting (2) into (1) and introducing time, the aggregate supply equation becomes equation 3:

$$1n\,Q_t^s = [\beta_2 + \beta_1\beta_3(1 - \beta_3\beta_4)1n\,P_{dt} - [\beta_2 + \beta_1\beta_3\,(1 - \beta_4)1ne_t - \beta_2 r_{ct} \quad (3)$$

Next, we turn our attention to the commodity market. The aggregate demand is positively related to the level of government expenditure G, exogenous foreign output Y_f and the real exchange rate ($\ln e$-$\ln P_d$). The real interest rate in the curb market r_c negatively influences the domestic investment demand and hence the aggregate demand. We postulate an IS curve given by equation 4:

$$1n\,Q_t^d = \alpha_1(1ne_t - 1nP_{dt}) + \alpha_2\,1nG_t - \alpha_3 r_{ct} + \alpha_4\,1nY_{ft} \quad (4)$$

where $\alpha_i > 0$, $i = 1, 2, 3, 4$.

Before we look into the money market, it is worthwhile discussing the structure of the banking sector. The central bank sits at the apex of all monetary activities, and maintains stability by controlling the base money and credit availability in the economy. For this purpose, the central bank imposes reserve ratio requirements on commercial bank deposits and interest rate regulations on loans and deposits. The UMM, operating outside the realm of the central bank, is subjected to neither interest rate control nor reserve requirements. The freely determined interest rate of the curb market helps in clearing the money market.

To incorporate the role of reserve requirements, we must endogenise the supply of money. The money demand equation is designed to follow the New Structuralist paradigm, and so the nominal demand for money is given in equation 5:

$$\text{In}\;\; M_t^d = 1nP_{dt} + \delta_1\,1nY_t + \delta_2\,\bar{i}_{dt} - \delta_3 i_{ct} \quad (5)$$

where M_t^d = nominal money demand, Y_t = real gross domestic product, $\bar{i}_d$ = nominal interest rate on deposits and i_{ct} = nominal interest rate on the curb market loans. Note, $\delta_1 > 0$, $i = 1, 2, 3$. Note that, following the New Structuralist argument, we assume that a rise in the bank deposit rate (UMM rate of interest) causes a reallocation in households' portfolios toward bank deposits (UMM securities) at the expense of UMM securities (bank deposits) and not cash, thus causing money demand to increase (decrease). This is not an irrational assumption for a developing world, where most goods are cash goods, so that the demand for currency is pretty inelastic in relation to changes in the opportunity cost variables. See Van Wijnbergen (1982, 1983 and 1985), Buffie (1984), Kohsaka (1984), Lim (1987), Nag and Mukhopadhyay (1998), and Nag (2000) for theoretical validation of this formulation of money demand in a financially repressed economy, and Van Wijnbergen (1982 and 1985) and Lim (1987) for empirical support of the same.

The money supply function can be formulated as follows. Money supply is the sum of currency in circulation (C), and supply of bank deposits (D), whereas base or high-powered money (H) is the sum of currency and reserves (R). Thus

$$(M^s)/H = ((C/D)+1)/(C/D+RR/D+ER/D) \quad (6)$$

where RR = required reserve, ER = excess reserves, and M^s is the nominal supply of money. Alternatively,

$$M^s = ((1+cu)/(cu+q+ex))H \quad (7)$$

where cu = currency deposit ratio, q = required reserve ratio and ex = excess reserves to deposit ratio.

Simple intuition suggests that the currency deposit ratio and the excess reserve to deposit can be postulated as a negative function of Y, and $\bar{i}_{dt}$ and a positive function of i_c. The rationale for the sign of the currency-deposit ratio with respect to the interest rates is obvious, given that the currency demand is pretty inelastic with respect to interest rate movements. However, as Y increases, both C and D rise, but since with the growth of banking habits more payments are settled through banks, deposits increase at a faster rate than currency. Hence, the currency-deposit ratio can be postulated to be a negatively correlated with the level of

income. On the other hand, as income rates in the curb market increase, *ex* falls, and as interest rates in the curb markets increase, *ex* rises. As the interest rate on deposits rises, deposits rise and excess reserve holdings fall, since the interest rate on loans in the official banking sector is also increased to maintain profitability, causing *ex* to fall.

Taking these arguments into account, and realising that increases in *cu* and *ex* reduce the money multiplier, the money supply function in log-terms can be constructed as follows:

$$1\mathrm{n}\, M_t^s = \eta_1 1\mathrm{n}Y_t + \eta_2 \bar{i}_{dt} + \eta_3 \bar{i}_{ct} + 1\mathrm{n}H_t - q_t \quad (8)$$

where, $\eta_1 > 0$, $i = 1, 2, 3$. Thus if we combine (5) and (8) and realise that the nominal interest rate is a sum of the real component and the expected rate of inflation, treated as exogenous, we have the following equation from the money market equilibrium:

$$1\mathrm{n}H_t = 1\mathrm{n}\, \mathrm{P}_{dt} + 1\mathrm{n}q_t - \alpha_5 n^e + \alpha_6 1\mathrm{n}Y_t - \alpha_7 r_{ct} + \alpha_8 \bar{i}_{dt} \quad (9)$$

where, $\alpha_i > 0$, $i = 6, 7, 8$, and $\alpha_5 = \alpha_7$, $\alpha_6 = -\eta_1 + \delta_1$, $\alpha_7 = \eta_3 + \delta_3$, $\alpha_8 = -\eta_2 + \delta_2$.

Note that we are assuming that the money demand function is more elastic with respect to real income than the money supply. This assumption is required to ensure that the aggregate demand curve is negatively sloped. Moreover, given that the New Structuralists assume that an increase in the nominal interest rate on deposits will result in higher interest rates in the curb market to clear the money market, we have to assume that the elasticity of the money demand function with respect to the nominal interest rate on deposits is higher than the elasticity of the money supply function with respect to the same.

Choosing the appropriate exchange rate regime is surely a controversial issue. But as Nag and Mukhopadhyay (1998) and Nag (2000) point out, with developing countries depending to a significant extent on imports of intermediate inputs and lack of growth of exports due to structural bottlenecks, it is difficult to maintain a fixed exchange rate regime. The tremendous pressure on the balance of payments in an open economic environment inevitably leads to adoption of flexible policies of exchange rates. In this paper, we assume that the monetary authority allows the exchange rate to float freely. Accordingly, the equilibrium in the foreign exchange market is given by equation[3] 10:

$$B_t/X_0 = \alpha_9 (1\mathrm{n}e_t - 1\mathrm{n}P_{dt}) - 1\mathrm{n}Y_t + 1\mathrm{n}\mathrm{Y}_{ft} + \alpha_{10} (r_{ct} - r_t^*) \quad (10)$$

where r_t^* is the world rate of interest, $\alpha_i > 0$, $i = 9$ and 10, with $\alpha_9 > \alpha_1$. As in Argy (1994), we assume that the trade balance is likely to be more responsive to the real exchange rate than the aggregate demand. Note that α_{10} captures the degree of capital mobility, which can range from 0 to infinity, indicating no and perfect capital mobility, respectively. Any positive intermediate value reflects imperfect capital mobility. Equation (10) defines the overall balance of payments given initial exports (X_0), where the first four terms determine the current account balance. The last term gives us the capital account balance. Equilibrium in the foreign exchange market would imply the balance of payments *(BP)* = 0.

3
Solution and financial liberalisation

This section discusses first the solution of the model and then analyses the effects of interest rate deregulation and lower reserve requirements on inflation and output. Equations (4), (9) and (10) constitute the IS, LM and the BP curves, and, along with (3), can be solved for Y, r_c, P_d and e, realising that $Q^d = Q^s = Y$.

Using (4), (9) and (10) we derive equation 11 for the aggregate demand (AD) curve:

$$1\mathrm{n}\, Q_t^d = \Omega_1\, 1\mathrm{n}P_{dt} + \Omega 2\, 1\mathrm{n}Y_{ft} + \Omega_3\, \bar{i}_{dt} + \Omega_4 r_t^* + \Omega_5 \pi_t^e + \Omega_6 q_t + \Omega_7 1\mathrm{n}\mathrm{H}_t + \Omega_8\, 1\mathrm{n}G_t \quad (11)$$

where

$\Omega_1 = -[\alpha_3\alpha_9 + \alpha_1\alpha_{10}]/\Theta < 0$
$\Omega_2 = [\alpha_7(\alpha_4\alpha_9 - \alpha_1]/\Theta ?$
$\Omega_3 = -\alpha_8[\alpha_3\alpha_9 + \alpha_1\alpha_{10}]/\Theta < 0$
$\Omega_4 = [\alpha_1\alpha_7\alpha_{10}]/\Theta > 0$
$\Omega_5 = \alpha_5[\alpha_3\alpha_9 + \alpha_1\alpha_{10}]/\Theta > 0$
$\Omega_6 = -[\alpha_3\alpha_9 + \alpha_1\alpha_{10}]/\Theta < 0$

$\Omega_7 = [\alpha_3\alpha_9 + \alpha_1\alpha_{10}]/\Theta > 0$
$\Omega_8 = \alpha_7\alpha_2\alpha_9/\Theta > 0$
$Q_8 = [\alpha_3\alpha_6\alpha_9 + \alpha_7(\alpha_9 - \alpha_1) + \alpha_1\alpha_6\alpha_{10}]/ > 0$

Note that, since $\alpha_9 > \alpha_1$, the signs of the coefficient can be shown to be such that the slope and the shifts of the aggregate demand curve confirm intuition.

Using (9) and (10) we solve for ln e_t and replacing the resulting solution in (3) we have the aggregate supply (AS) curve given by equation 12:

$$1n\ Q_t^s = \Psi_1\ 1nP_{dt} + \Psi_2 1nY_{ft} + \Psi_3\ \bar{i}_{dt} + \Psi_4 r_t^* + \Psi_5 \pi_t^e + \Psi_6 q_t + \Psi_7 1nH_t + \Psi_8\ 1nG_t \qquad (12)$$

where

$\Psi_1 = (1 - \beta_3)\{[\alpha_3\alpha_6\alpha_9 + \beta_1(\alpha_1\alpha_{10}\alpha_6 + (\alpha_9 - \alpha_1)\alpha_7)] + (\alpha_3 + \alpha_{10})[\beta_3\beta_1(1 - \beta_4)] + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))\}/\Theta$
$\Psi_2 = [\alpha_6(\alpha_1 - \alpha_4\alpha_9)\beta_2 + \beta_3\beta_1(1 - \beta_4) + \beta_2](\alpha_6\alpha_3 + \alpha_4\alpha_6\alpha_{10} + (1 - \alpha_4)\}\alpha_7)\}]/\Theta$
$\Psi_3 = \alpha_8[(\alpha_3 + \alpha_{10})\{\beta_3\beta_1(1 - \beta_4)\} + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta$
$\Psi_4 = -\alpha_{10}[(\alpha_3\alpha_6 + \alpha_7)[\beta_3\beta_1(1 - \beta_4) + \beta_2] + \alpha_1\alpha_6\beta_2)]/\Theta$
$\Psi_5 = -\alpha_5[(\alpha_3 + \alpha_{10})[\beta_3\beta_1(1 - \beta_4)\} + \beta_2](\alpha_3 + \alpha_{10} - (\alpha_9 + \alpha_1))]/\Theta$
$\Psi_6 = [(\alpha_3 + \alpha_{10})\{\beta_3\beta_1(1 - \beta_4)\} + \beta_2](\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta$
$\Psi_7 = -[(\alpha_3 + \alpha_{10})\{\beta_3\beta_1(1 - \beta_4)\} + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 + \alpha_1))]/\Theta$
$\Psi_8 = \alpha_2[(\alpha_6\alpha_{10} - \alpha_7)\{\beta_3\beta_1(1 - \beta_4) + \beta_2) - \beta_2\alpha_6\alpha_9]/\Theta$

As suggested in the introduciton, we will focus on the case of no wage indexation, so we impose $\beta_3 = 0$, and sign the coefficients of the aggregate supply curve. From the above equations, using the fact that there is no wage indexation, the AS curve and the coefficients of the same are given by equation 13:

$$1n\,Q_{tnw}^s = \Psi_{1nw} 1nP_{dt} + \Psi_{2nw} 1nY_{ft} + \Psi_{3nw}\ \bar{i}_{dt} + \Psi_{4nw} r_t^* + \Psi_{5nw} \pi_t^e \Psi_{6nw} q_t + \Psi_{7nw} 1nH_t + \Psi_{8nw} 1nG_t \qquad (13)$$

where

$\Psi_{1nw} = \{[\alpha_3\alpha_6\alpha_9 + \beta_1(\alpha_1\alpha_{10}\alpha_6 + (\alpha_9 - \alpha_1)\alpha_7)] + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))\}/\Theta$
$\Psi_{2nw} = \beta_2\{[\alpha_6(\alpha_1 - \alpha_4\alpha_9) + \{\alpha_6\alpha_3 + \alpha_4\alpha_6\alpha_{10} + (1 - \alpha_4)\alpha_7)]/\Theta?$
$\Psi_{3nw} = \alpha_8\beta_2[(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]\Theta?$
$\Psi_{4nw} = -\alpha_{10}\beta_2[(\alpha_3 + \alpha_1)\alpha_6]/\Theta < 0$
$\Psi_{5nw} = -\alpha_5\beta_2[(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1)]/\Theta?$
$\Psi_{6nw} = \beta_2[(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta?$
$\Psi_{7nw} = -\beta_2[(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta?$
$\Psi_{8nw} = \alpha_2\beta_2[\alpha_6(\alpha_{10} - \alpha_9) - \alpha_7]/\Theta?$

Given that Θ is positive, we impose the following condition to ensure that the AS curve is positively sloped, yielding equation 14:

$$\{[\alpha_3\alpha_6\alpha_9 + \beta_1[\alpha_1\alpha_{10}\alpha_6 + (\alpha_9 - \alpha_1)\alpha_7)] + \beta_2[\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))\} > 0 \qquad (14)$$

However, (14) does not allow us to sign the coefficients corresponding to the two main variables of interest, the nominal interest rate on deposits and the reserve requirements. A sufficient condition for the AS curve to be positively sloped would be to impose: $(\alpha_3 + \alpha_{10} + \alpha_1 - \alpha_9) > 0$, which suggests that the sum of the interest elasticity of the domestic output and the trade balance is high enough to outweigh the difference between the real exchange rate elasticity of the IS and the BP curves. This condition is likely to hold for a higher degree of capital mobility, given by α_{10}, and is obvious when α_{10} tends to infinity. The sufficient condition also helps us sign Ψ_{inw}, $i = 3, 5, 6$ and 7. However, Ψ_{inw}, i = 2,8 is ambiguous in sign.

Using equations (11), (13) and (14), we derive the reduced-form solutions and the coefficients for the output and the price level given in equations 15 and 16 :

$$1nY_{tnw} = \Xi_{1nw} 1nY_{ft} + \Xi_{2nw}\ \bar{i}_{dt} + \Xi_{3nw} r_t^* + \Xi_{4nw}\ \pi_t^e + \Xi_{5nw}\ q_t + \Xi_{6nw} 1nH_t + \Xi_{7nw}\ 1nG_t \qquad (15)$$

$$1nP_{dtnw} = \Lambda_{1nw} 1nY_{ft} + \Lambda_{2nw}\ \bar{i}_{dt} + \Lambda_{3nw} r_t^* + \Lambda_{4nw}\ \pi_t^e + \Lambda_{5nw}\ q_t + \Lambda_{6nw}\ 1nH_t + \Lambda_{7nw}\ 1nG_t \qquad (16)$$

where

$\Xi_{1nw} = (\Omega_2\Psi_{1nw} - \Psi_{2nw}\Omega_1)/(\Psi_{1nw} - \Omega_1)?(?)$,
$\Xi_{2nw} = (\Omega_3\Psi_{1nw} - \Psi_{3nw}\Omega_1)/(\Psi_{1nw} - \Omega_1) > 0$ (< 0),

$\Xi_{3nw} = (\Omega_4\Psi_{1nw} - \Psi_4\Omega_1)/(\Psi_{1nw} - \Omega_1)?(?)$, $\Xi_{4nw} = (\Omega_5\Psi_{1nw} - \Psi_{5nw}\Omega_1)/(\Psi_{1nw} - \Omega_1) > 0 (< 0)$,

$\Xi_{5nw} = (\Omega_6\Psi_{1nw} - \Psi_{6nw}\Omega_1)/(\Psi_{1nw} - \Omega_1) > 0$ (< 0), $\Xi_{6nw} = (\Omega_7\Psi_{1nw} - \Psi_{7nw}\Omega_1)/(\Psi_{1nw} - \Omega_1) < 0 (> 0)$,

$\Xi_{7nw} = (\Omega_8\Psi_{1nw} - \Psi_{8nw}\Omega_1)/(\Psi_{1nw} - \Omega_1)?(?)$

and
$\Lambda_{1nw} = (\Omega_2\Psi_{2nw})/(\Psi_{1nw} - \Omega_1)?(?)$, $\Lambda_{2nw} = (\Omega_3 - \Psi_{3nw})/(\Psi_{1nw} - \Omega_1) < 0 (> 0)$,
$\Lambda_{3nw} = (\Omega_4\Psi_{4nw})/(\Psi_{1nw} - \Omega_1) > 0 (> 0)$, $\Lambda_{4nw} = (\Omega_5 - \Psi_{5nw})/(\Psi_{1nw} - \Omega_1) < 0 (> 0)$,
$\Lambda_{5nw} = (\Omega_6 - \Psi_{6nw})/(\Psi_{1nw} - \Omega_1) < 0 (> 0)$, $\Lambda_{6nw} = (\Omega_7 - \Psi_{7nw})/(\Psi_{1nw} - \Omega_1) < 0 (> 0)$,
$\Lambda_{7nw} = (\Omega_8 - \Psi_{8nw})/(\Psi_{1nw} - \Omega_1)?(?)$

The first signs of the coefficients corresponding to the nominal interest rate on deposits, the inflation expectations, the required reserve ratio and the required reserve in the solution of the price level correspond to the case where the sufficiency condition holds. The sign of the same set of variables in the brackets corresponds to the case when the sufficiency condition does not hold. In the case of the output solution, we supplement the sufficiency condition with the Cavallo effect. (See Karapatakis, 1992, Nag and Mukhopadhyay, 1998 and Nag, 2000, for details regarding the Cavallo effect.) According to Cavallo, the supply-side effect of changes in monetary variables tends to dominate the demand side effect of the same. So the first set of signs on the coefficients of the output correspond to the case when both the sufficiency condition and the Cavallo effect hold, while, the signs in the bracket corresponding to the coefficient of a particular variable refer to the case when only the Cavallo effect holds, but not the sufficiency condition.

Moreover, given that $\Psi_{inw}, i = 2.8$ and Ω_2 are uncertain in sign, foreign output and government expenditure have ambiguous impacts on domestic output and price level. Note that an increase in the foreign rate of interest increases domestic price level, but has uncertain impact on output. Finally, if the sufficiency condition holds, an increase in inflation expectations is inflationary.

Let us now intuitively analyse the effects of financial liberalisation on domestic inflation ($\dot{P}_{dtnw}$). In the context of our model, financial liberalisation implies at least one of the following: (i) deregulation of the interest rate ceiling on deposits, that is, an increase in $\bar{i}_{dt}$, or; (ii) lower reserve requirements (q_t).

We start off by deriving the reduced form equation for the rate of inflation by first differentiating equation (16). A "dot" over the variable indicates the growth rate, while a Δ preceding the variable, indicates a change in the variable concerned. This differentiating yields the reduced form equation for that domestic rate of inflation given by equation (17):

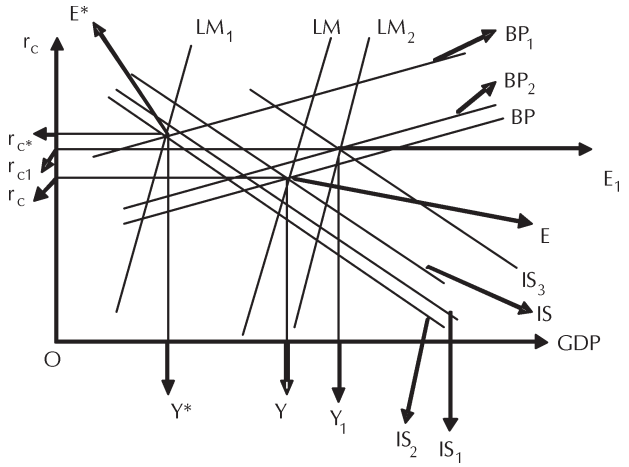
$$(\dot{P}_{dtnw}) = \Lambda_{1nw}(\dot{Y}_{ft}) + \Lambda_{2nw}\Delta\bar{i}_{dt} + \Lambda_{3nw}\Delta r_t^* + \Lambda_{4nw}\Delta\pi_t^e + \Lambda_{5nw}\Delta q_t + \Lambda_{6nw}(\dot{H}_t) + \Lambda_{7nw}(\dot{G}_t) \quad (17)$$

If the sufficiency condition holds, we can make the following observations from this equation:

(i) Interest rate deregulation unambiguously reduces inflation, and

(ii) A lower reserve requirement policy is inflationary.

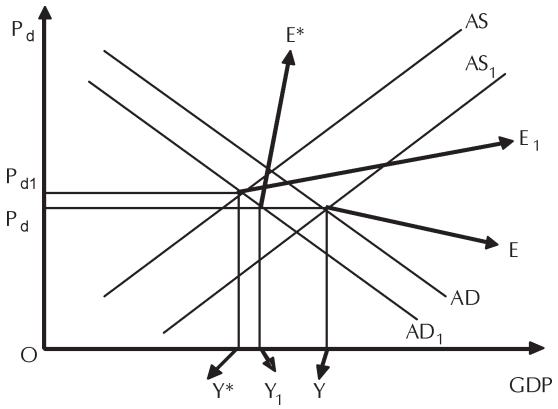
Figure 1
Demand-side effects of interest rate deregulation or tight monetary policy (when sufficiency condition holds)



Economic arguments from intuition for points (i) and (ii) can be outlined as follows. An increase in the controlled rate of interest on deposits increases the demand for money, and, hence, the rate of interest in the curb market has to increase to clear the money market, causing the LM curve to move to LM_1. This enhances the cost of domestic investment and shifts the IS curve leftwards, reducing real gross domestic product and also the import of the consumption good. In terms of Figure 1, this implies that starting from an initial equilibrium at E, the IS curve shifts to IS_1. At the same time, the increase in the UMM rate causes capital inflow. The resulting surplus will cause the nominal exchange rate to fall, the IS_1 curve to shift further to the left to IS_2 and the BP curve to move upwards to BP_1, reducing output further. The new equilibrium in the goods, money and balance of payments at E* ensures that the aggregate demand curve shifts to the left at a given price level. The resulting movement of the aggregate demand curve is shown in Figure 2.

On the supply side, the increase in the UMM rate of interest tends to shift the AS curve upwards due to the cost-push effect, but the decline in the nominal exchange rate tends to reduce the marginal cost of production, by making per unit import of the intermediate goods cheaper. The sufficiency condition ensures that the positive effect on the aggregate supply curve due to the exchange rate appreciation tends to outweigh the negative effect due to the increase in the UMM rate of interest, causing the aggregate supply curve to shift rightwards to AS_1. The leftward shift of the AD curve and the rightward shift of the AS curve ensure a deflation, as can be seen from Figure 2.

Figure 2
Effect of interest rate deregulation or a tight monetary policy
(when sufficiency conditon holds)



However, unless we assume the Cavallo effect holds, interest rate deregulation tends to have an ambiguous effect on the domestic output. Assuming that the Cavallo effect holds, we move to a point E_1 in Figure 2. From Figure 1, the fall in the price level causes the real exchange rate to increase, and shifts the IS_2 and BP_1 curves rightwards, with the LM_2 curve also shifting rightwards, due to the increase in the real money supply, until we reach E_1. Note that when there is perfect capital mobility (a_{10} tends to infinity), interest rate deregulation is deflationary, irrespective of whether the sufficiency condition holds or not, and expands output if $\beta_2 > \alpha_{10}$.

On the other hand, a reduction in the reserve requirement implies a loose monetary policy, so the curb market rate of interest has to fall to ensure the money market equilibrium. Henceforth, the analysis is exactly opposite to that discussed above corresponding to an increase in the controlled interest rate on

deposits. The aggregate demand curve shifts rightward while the aggregate supply curve shifts leftward, causing stagflation, if the Cavallo effect is in operation.

However, when the sufficiency condition does not hold, an increase in the nominal interest rate on deposits, given the Cavallo effect, would be stagflationary. Since the cost-push effect on the AS curve, due to a rise in the interest rate of the curb market, dominates the effect of the exchange rate appreciation, import of the intermediate goods will be cheaper.

This is the standard New Structuralist critique of financial liberalisation, in the presence of UMMs, and is indicated in Figures 3 and 4. So, once we allow for capital mobility, the New Structuralist result is not obvious, and is completely altered if we have high degrees of the same. Interestingly, when the sufficiency condition does not hold, a lower reserve requirement policy will shift the AD and AS curves rightwards and improve domestic output and reduce inflation, if the Cavallo effect holds.

Figure 3
Demand-side effects of interest rate deregulation or a tight monetary policy (when sufficiency condition does not hold)

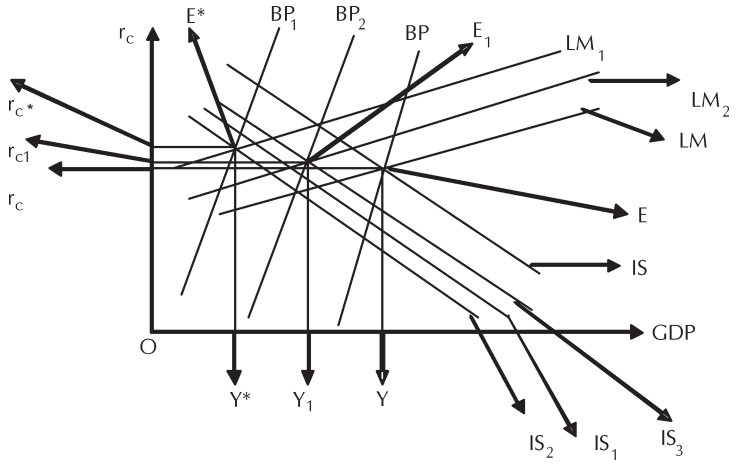
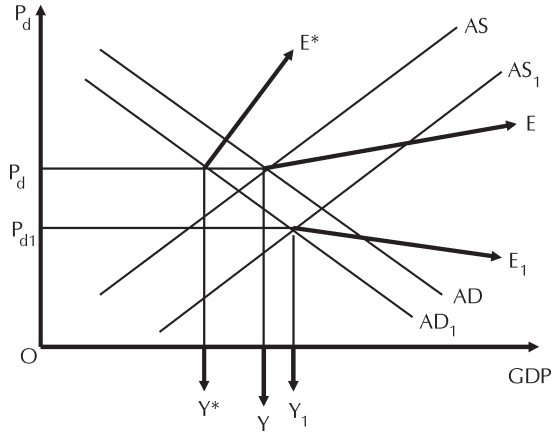


Figure 4
Effect of interest rate deregulation or a tight monetary policy (when sufficiency condition does not hold)



In summary, the following can be noted:

(i) Deregulation of the interest rate on deposits and a tight monetary policy (a rise in q or a fall in H) are unambiguously deflationary for high degrees of capital mobility;

(ii) The corresponding effect on GDP is positive, if the Cavallo effect holds; and

(iii) For low degrees of capital mobility, a lower reserve requirement policy will unambiguously increase output and reduce inflation, if the Cavallo effect is ensured. Nominal interest rate deregulation, in this case, however, will be stagflationary.

If the interest rate is deregulated and reserve requirements are lowered simultaneously, given that $\Omega_2 = \alpha_8\Omega_6$, $\Psi_{2nw} = \alpha_8\Psi_{6nw}$ and $\alpha_8 < 1$, the effect of the reserve requirements will always outweigh the effect of the interest rate deregulation.

Though it is unlikely that wages will be completely indexed in a small open developing economy, analysis of the case below yields interesting results and policy implications.

Imposing $\beta_3 = 1$ in (10), we have the aggregate supply (AS) curve given by equation 18:

$$\ln Q_t^s = \Psi_{1nw}\ln P_{dt} + \Psi_{2nw}\ln Y_{ft} + \Psi_{3nw}\bar{i}_{dt} + \Psi_{4nw}r_t^* + \Psi_{5nw}\pi_t^e + \Psi_{6nw}q_t + \Psi_{7w}\ln H_t$$

where

$$\Psi_{1w} = (\alpha_3 + \alpha_{10})[\beta_1(1-\beta_4)] + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))\}/\Theta > 0$$

$$\Psi_{2w} = [\alpha_6(\alpha_1 - \alpha_4\alpha_9)\beta_2 + [\beta_1(1-\beta_4) + \beta_2]\{\alpha_6\alpha_3 + \alpha_4\alpha_6\alpha_{10} + (1-\alpha_4)\alpha_7)\}/\Theta ?$$

and

$$\Psi_{4w} = -\alpha_{10}[(\alpha_3\alpha_6 + \alpha_7)[\beta_1(1-\beta_4) + \beta_2] + \alpha_1\alpha_6\beta_2)]/\Theta < 0$$

$$\Psi_{5w} = -\alpha_5[(\alpha_3 + \alpha_{10})\{\beta_1(1-\beta_4)\} + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta < 0$$

$$\Psi_{6w} = [(\alpha_3 + \alpha_{10})\{\beta_1(1-\beta_4)\} + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta > 0$$

$$\Psi_{7w} = -[(\alpha_3 + \alpha_{10})\{\beta_1(1-\beta_4)\} + \beta_2(\alpha_3 + \alpha_{10} - (\alpha_9 - \alpha_1))]/\Theta < 0$$

$$\Psi_{8w} = \alpha_2[\{\alpha_6\alpha_{10} - \alpha_7\}(\beta_1(1-\beta_4) + \beta_2) - \beta_2\alpha_6\alpha_9]/\Theta ?$$

Note that, by assuming that the supply curve is positively sloped, we can sign, Ψ_i, $i = 3, 5, 6$ and 7.

Using equations (11) and (18), we derive the solutions for output and the price level as follows:

$$\ln Y_{tw} = \Xi_{1w}\ln Y_{ft} + \Xi_{2w}r_t^* + \Xi_{3w}\ln G_t \quad (19)$$

$$\ln P_{dtw} = \Lambda_{1w}\ln Y_{ft} + \Lambda_{2w}\bar{i}_{dt} + \Lambda_{3w}r_t^* + \Lambda_{4w}\pi_t^e + \Lambda_{5w}q_t + \Lambda_{6w}\ln H_t + \Lambda_{7w}\ln G_t \quad (20)$$

where

$\Xi_{1w} = (\Omega_2\Psi_{1w} - \Psi_{2w}\Omega_1)/(\Psi_{1w} - \Omega_1)?$, $\Xi_{2w} = (\Omega_4\Psi_{1w} - \Psi_{4w}\Omega_1)/(\Psi_{1w} - \Omega_1)?$, $\Xi_{3w} = (\Omega_8\Psi_{1w} - \Psi_{8w}\Omega_1)/(\Psi_{1w} - \Omega_1)?$

and

$\Lambda_{1w} = (\Omega_2 - \Psi_{2w})/(\Psi_{1w} - \Omega_1)?$, $\Lambda_{2w} = (\Omega_3 - \Psi_{3w})/(\Psi_{1w} - \Omega_1) = -\alpha_8 < 0$,

$\Lambda_{3w} = (\Omega_4 - \Psi_{4w})/(\Psi_{1w} - \Omega_1) > 0$, $\Lambda_{4w} = (\Omega_5 - \Psi_{5w})/(\Psi_{1w} - \Omega_1) = -\alpha_5 > 0$,

$\Lambda_{5w} = (\Omega_6 - \Psi_{6w})/(\Psi_{1w} - \Omega_1) = -1 < 0$, $\Lambda_{6w} = (\Omega_7 - \Psi_{7w})/(\Psi_{1w} - \Omega_1) = 1 > 0$,

$\Lambda_{7w} = (\Omega_8 - \Psi_{8w})/(\Psi_{1w} - \Omega_1)?$

$\Lambda_{1w} = (\Omega_2 - \Psi_{2w})/(\Psi_{1w} - \Omega_1)?$, $\Lambda_{2w} = (\Omega_3 - \Psi_{3w})/(\Psi_{1w} - \Omega_1) - \alpha_8 < 0$

$\Lambda_{3w} = (\Omega_4 - \Psi_{4w})/(\Psi_{1w} - \Omega_1) > 0$, $\Lambda_{4w} = (\Omega_5 - \Psi_{5w})/(\Psi_{1w} - \Omega_1) = \alpha_5 > 0$,

$\Lambda_{5w} = (\Omega_6 - \Psi_{6w})/(\Psi_{1w} - \Omega_1) = -1 < 0$, $\Lambda_{6w} = (\Omega_7 - \Psi_{7w})/(\Psi_{1w} - \Omega_1) = 1 > 0$,

$\Lambda_{7w} = (\Omega_8 - \Psi_{8w})/(\Psi_{1w} - \Omega_1)?$

Perfect wage indexation ensures that the solution of the output is independent of the monetary policy parameter and inflation expectations. However, just as in the case with no wage indexation, the effect on output corresponding to a fiscal policy change is ambiguous, since the effect on the aggregate supply curve is uncertain.

Differentiating (20) once yields the reduced form equation for the domestic rate of inflation, given by equation (21).

$$(\dot{P}_{dtw}) = \Lambda_{1w}(\dot{Y}_{ft}) + \Lambda_{2w}\Delta\bar{i}_{dt} + \Lambda_{3w}\Delta r_t^* + \Lambda_{4w}\Delta\pi_t^e + \Lambda_{5w}\Delta q_t + \Lambda_{6w}(\dot{H}_t) + \Lambda_{7w}(\dot{G}_t) \quad (21)$$

Figure 5
Demand-side effects of interest rate deregulation or a tight monetary policy (with perfect wage indexation)

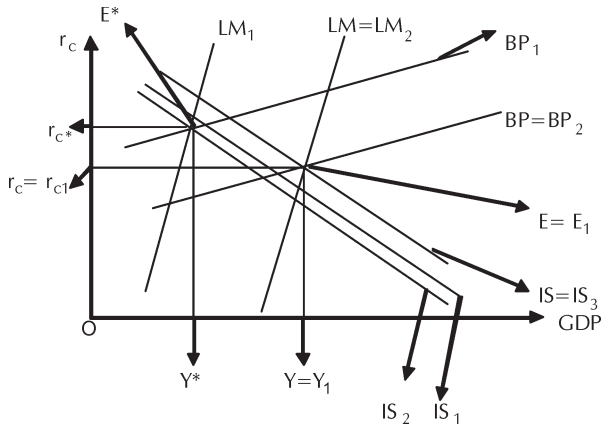
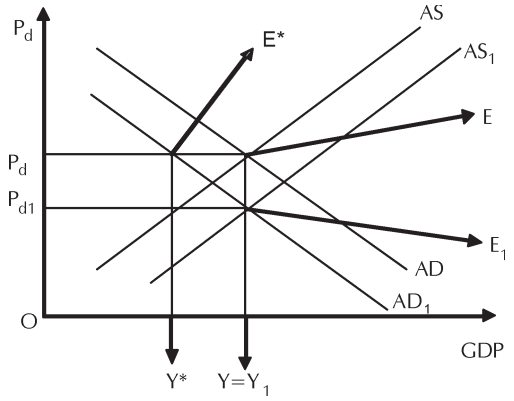


Figure 6
Effect of the interest rate deregulation or a tight monetary policy (with perfect wage indexation)



So, from the above equation and figures 5 and 6 we can make the following observations:

(i) Deregulation of the interest rate on deposits and a tight monetary policy (a rise in q or a fall in H) are unambiguously and unconditionally deflationary; and

(ii) The corresponding effect on the GDP is, however, neutral.

Note that in this case the fall in the price level corresponding to deregulation of the nominal interest rate on deposits or tighter monetary policy causes the IS, BP and the LM curves to return to their original position, ensuring the effect on output is neutral, with real exchange rates and real interest rate remaining unchanged as well.

4
Conclusion and suggestions for further research

This paper modifies the standard Mundell-Fleming model and analyses the effects of financial liberalisation on domestic inflation and GDP. Considering a small open financially repressed economy characterised by a UMM, no wage indexation, intermediate goods imports, and capital mobility, we have seen that

interest rate deregulation is inflation reducing for economies with higher degree of capital mobility. The effect on output is, however, uncertain, and will only increase if the Cavallo effect is in operation. For economies with lower degrees of capital mobility, financial liberalisation in the form of lower reserve requirements will enhance output and, if the Cavallo effect holds, lower inflation. The stagflationary outcome of interest rate deregulation, as claimed by the New Structuralists, is not an obvious outcome in economies characterised by curb markets. This discussion shows that stagflation is possibly a result of limited capital mobility in a flexible exchange rate regime, and not the mere presence of a competitive and agile curb market.

To put the analysis differently, the policy prescriptions of this paper can be summarised as follows: The analysis shows that if reducing inflation is a priority, the government may ensure high capital mobility, and deregulate the domestic rate of interest. On the other hand, if the government values increase in output and employment generation relatively more in their loss function, financial liberalisation should be in the form of lower reserve requirements with capital controls. Moreover, in an economy characterised by perfect wage indexation, the government can always ensure lower levels of inflation by deregulating the interest rate and pursuing a tight monetary policy. However, the only prerequisite for such a policy choice is the establishment of a flexible exchange rate regime; degree of capital mobility is irrelevant. An extension of the current analysis would be to make endogenous the process of expectation formulation along the lines of rational expectations, and analyse whether such a change affects our existing results. Further, since the current model is without any microfoundations, it would be interesting to analyse the long-term effects of financial liberalisation on growth and inflation in a dynamic general equilibrium model.

Endnotes

1 This paper was written as a part of my coursework in Monetary Theory and Policy at the University of Connecticut. I am particularly grateful to Professor Stephen M. Miller, Professor Steven F. Koch, and the two anonymous referees for many helpful comments.

2 The firms receive fixed loan amounts from the banking sector at an administered rate. The shares of bank loans for fixed capital formation and the intermediate input are assumed to be exogenous, as Karapatakis (1992) suggests. With no differences in the lending rate between the two types of credit, it can be assumed that these shares depend exclusively on the discretion of the commercial banks. The remaining part of the firms' demand for loans (for the two purposes) is financed by the curb market at the market clearing rate.

3 Since the curb market rate of interest is the true opportunity cost of the asset market, its movement relative to the world rate of interest determines the direction of capital flows (see Nag (2000)). Moreover, the expected rate of exchange rate depreciation has been assumed to be zero, just as a simplification, simply because in our model expectations are exogenous (see Argy (1994) for details).

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