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FINANCIAL REPRESSION AND EXCHANGE RATE MANAGEMENT IN DEVELOPING COUNTRIES: THEORY AND EMPIRICAL SUPPORT FROM INDIA

KENNETH KLETZER
AND
RENU KOHLI

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INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS
Core-6A, 4th Floor, India Habitat Centre, Lodi Road, New Delhi-110 003

Contents

Foreword

Restrictions on domestic and international financial transactions have enabled governments to generate revenues through financial repression while restraining inflation. The fiscal implications of these revenues, i.e. seignorage and implicit taxation of financial intermediation, pose a challenge for financial reform and liberalization. This paper presents a theoretical model that incorporates the role of financial repression in fiscal policy and exchange rate management under capital controls. It demonstrates how a balance of payments crisis arises under an exchange rate peg without capital account convertibility in the model economy and how financial repression may be used for exchange rate management.

The model is compared to the experience of India, a country that exemplifies the fiscal importance of financial restrictions, in the last two decades. In particular, the paper discusses the dynamics leading up to the devaluation in 1991 and the role of required bank holding of government debt in exchange rate intervention afterwards.

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I have no doubt that the analysis in this paper will help contribute to a better understanding of the very complex issues addressed here and encourage further research in this area.

Isher Judge Ahluwalia
Director & Chief Executive
ICRIER

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1. Introduction

Most developing countries have used financial repression to generate revenues for financing public expenditures at one time or another. These policies impose implicit taxes on domestic financial activities that help the government to satisfy its intertemporal budget constraint, as emphasized by Fry [1988, 1997a, 1997b], Giovannini and de Melo [1993] and Nichols [1974]. The policy instruments of financial repression include high reserve requirements for commercial banks, requirements that financial intermediaries hold government debt issued at low rates of interest, interest rate ceilings and foreign exchange controls. Because financial repression essentially imposes discriminatory taxation on the financial system, it has long been identified as an important impediment to economic growth by Goldsmith [1969], Shaw [1973], McKinnon [1973], McKinnon and Mathieson [1981] and others.[1] The fiscal importance of the revenues derived from financial restrictions, however, can be a barrier to financial reform and create problems for successful liberalization. In particular, many Latin American and Asian countries experienced booms in public and private borrowing from abroad and subsequent financial crises after capital account liberalization. Liberalizing access to international markets erodes the capacity of the government to tax financial intermediation. The resulting financing gap is often filled by additional government borrowing at much higher rates of interest while fiscal reforms are postponed.

One of the reasons that governments use financially repressive policies is that they allow budget deficits to be financed through domestic credit creation at lower rates of inflation than would otherwise be possible. Restrictions on capital account convertibility also allow governments to both peg the nominal exchange rate and use monetary policy for meeting domestic objectives. When the capital account is liberalized, the government cannot use monetary policy to influence nominal rates of interest for domestic purposes and resist exchange rate movements indefinitely. The liberalization of the capital account of a financially repressed economy can be expected to lead to a rise in inflation if government deficits are not reduced. This can be postponed if the government instead borrows externally, but eventually it must either increase the primary surplus or monetize the deficits inclusive of accumulated interest. Each of these works against resisting a rise in the rate of nominal depreciation. Indeed, the combination of capital account liberalization of a previously financially repressed economy and a pegged exchange rate regime is a volatile one: the exchange rate regime eventually collapses in a speculative attack against the government's reserves that often coincides with a banking crisis and sudden output contraction.

Recent financial crises in emerging market economies have brought renewed attention to the management of international capital market integration and the choice of the exchange rate regime. One topic of attention concerns the revealed desire of governments to resist exchange rate fluctuations (Calvo and Reinhart [2000]) despite the susceptibility of pegged exchange regimes to crisis. The possibility of using capital controls to reduce the vulnerability of a country during domestic financial reforms has also received attention following the recent Chilean and Malaysian examples[2]. Diaz-Alejandro [1985] forcefully made the connection between capital account liberalization of a financially repressed economy and the boom-bust cycle of capital inflows to developing countries using the case of Chile in the early 1980s.

The importance of financial repression for fiscal policy and for maintaining a stable domestic currency poses a challenge for liberalization of both the current and capital accounts in developing countries. In this paper, we study the role of financial repression in a non-emerging market economy in its roles as an instrument of fiscal policy and as a means of maintaining lower rates of inflation despite high levels of domestic credit creation. In particular, we present a model based on optimizing behavior for households and firms that illustrates the consequences of financial repression for macroeconomic dynamics prior to capital account liberalization.[3] In the model economy, the currency is convertible for current account transactions but not for capital account transactions. This allows us to portray the consequences of current account liberalization and of fiscal policy expansions in a financially repressed economy. The model demonstrates the trade-offs between the use of different instruments of financial repression for revenue raising and exchange rate stabilization for aggregate output and consumption. The theoretical model is used to frame an overview of exchange rate and fiscal policy in India, a country that is a quintessential example of the fiscal importance of various means of financial repression and of resistance to exchange rate fluctuations. One application of the model is to show how an expansionary fiscal policy and financial repression may explain the macroeconomic crisis that followed early market reforms in India under an exchange rate peg in 1991. We use the model to illustrate a balance of payments crisis, in which a fiscal expansion eventually leads to a steady outflow of central bank reserves and sudden devaluation. In the case of a closed capital account, reserves change continuously with the current account balance and cannot suddenly drop as under an open capital account. The exchange rate, which varies continuously under an open capital account at the time of crisis, instead devalues suddenly in a crisis in this model. These devaluations are contractionary.

We choose India because it is an important developing country and financial repression in India is, in many ways, representative of policies pursued by a large number of developing countries over the last four decades. As emphasized by Fry [1997a, 1997b], financial restrictions are typically adopted for purposes other than revenue generation. In the 1960s, India adopted a number of policies to enable the government to allocate credit toward development programs. These included interest rate controls, high liquidity requirements, the establishment of state banks and ultimately nationalization of the largest commercial banks. While many developing countries have liberalized the capital account and undertaken significant domestic financial reforms over the last two decades, India began domestic economic reforms and initiated international liberalization only recently and only to a limited extent. The liberalization of current account transactions and relaxation of restrictions on foreign capital inflows to the private sector are both recent reforms.

Financial repression has played a significant role in the financing of public spending in India. During the 1980s, for example, the combination of implicit taxes imposed on financial intermediation and conventional seignorage revenues averaged about five percent of GDP.[4] Formal financial intermediation in India is dominated by commercial banks. By imposing high cash reserve requirements and additional liquidity requirements to hold government debt on commercial banks, fiscal authorities are able to borrow from the domestic financial sector at below-market rates of interest. Tight restrictions on currency convertibility and on the acquisition of foreign financial assets by residents allow authorities to keep domestic rates of interest low for savings while imposing a high rate of implicit taxation on domestic financial intermediation. At the same time, capital controls allow monetary authorities to generate significant seignorage revenues while keeping the rate of domestic inflation and nominal exchange rate depreciation low. For many years, the government of India has used capital account restrictions and the taxation of domestic financial activities for the dual purposes of closing the financing gap of the public sector and resisting nominal exchange rate movements.[5] After 1991, revenues from financial repression have decreased as a share of GDP with progressive reforms, and the government has pursued a managed float of the exchange rate.

We begin in the next section with our formal model of financial repression and exchange rate management. The model is used to illustrate how the dynamics of output, consumption, saving and the current account balance are determined by the way in which the government chooses to finance its deficits and manage the nominal exchange rate. This is followed by a selective overview of the Indian macroeconomy framed by the theoretical model. Our discussion focuses on the relationship between fiscal policy and exchange rate policy as a way of illustrating the challenges that financial repression poses for liberalization. Demetriades and Luintel [1996, 1997] also study financial repression in India. However, they examine the impact of financial repression on financial development and on economic growth for India.

2. The Model

The dynamics of exchange management and financial repression are analyzed in a stylized model of a national economy that takes the world interest rate on internationally-traded securities and world prices for commodities as given. To highlight the role of financial repression, private current account transactions are allowed but private capital account transactions are not. Trade taxes and quantitative restrictions on commodity trade have also played an important role in financially repressed economies and could be added to the model. These are left out to focus on the role of financial repression in an economy in which the current account has already been opened, but the capital account remains closed.

Consumption, saving and labor supply decisions are made by an infinitely-lived representative household. The household derives utility from the consumption of a single perishable good and leisure. Capital accumulation is left out for the sake of simplicity. Household savings can be held in the form of domestic bank deposits or domestic firm equity. Current account convertibility is allowed so that households can purchase foreign goods but not foreign assets; there is a single exchange rate. This means that the current account balance is endogenous to the determinants of household savings. The government has access to international capital markets. Domestic assets are denominated in units of domestic currency, and foreign assets in foreign currency. Since the foreign price level is constant in the theoretical model, it is simply set equal to unity so that international reserves and external public debt are indexed to the single good.

The government imposes requirements on banks that they hold cash reserves and government bonds in proportion to deposits. Because banks are required to hold liquidity reserves in government debt, the interest rate received on this instruments by the banks is a policy variable that can be set below the opportunity lending rate.[6] This optimizing model with a credit-in-advance constraint imposed on firms is very similar to that used by Lahiri and Vegh [2000] to study the interest rate defense of a fixed exchange rate with perfect international financial capital mobility. Our version emphasizes financial repression with strict controls on capital outflows.

2.1 Households

The household seeks to maximize lifetime utility given by

$$U_t = \int_t^\infty \frac{(c_t - \alpha \ell_t^\nu)^{1-\sigma} - 1}{1-\sigma} e^{-\rho(s-t)} ds, \qquad \sigma > 0, \qquad \nu > 1, \tag{1}$$

where c is household consumption of the single good, ℓ is household labor supply, $\nu - 1$ is the inverse of the elasticity of labor supply with respect to the real wage, ρ is the pure rate of time preference and σ is the inverse of the intertemporal elasticity of substitution. These preferences are drawn from Greenwood, Hercowitz and Huffman [1988] and have been widely used in the literature on real business cycles. Mendoza [1991], for example, shows that these preferences provide a realistic description of the dynamics of consumption and the trade balance for small open economies. They will be useful here for deriving the relationship between consumption, output and financial repression in a simple way.

The demand for money is introduced by assuming a transactions technology that requires real balances. The transactions cost of consuming c is given by $\varphi(c, h)$ where h is the level of real balances held by the household. For simplicity, the dependence on c is ignored without affecting the qualitative results. It is assumed that transactions costs are decreasing in h at a diminishing rate; that is,

$$\varphi(h) \geq 0, \qquad \varphi'(h) \leq 0, \qquad \varphi''(h) > 0.$$

It is also assumed that $\varphi'(\overline{h}) = \varphi(\overline{h}) = 0$ for some finite value, $\overline{h} > 0$, so that the Friedman rule can be implemented.

The household saves by accumulating deposits, h, that earn a nominal rate of interest, i^d. Households also hold all equity in domestic firms, v. This is a non-consequential simplification motivated by the small level of domestic market capitalization that is owned by foreigners in financially repressed economies. The real return to household assets in terms of the perishable good is given by $i^d - \pi$, where π will equal the rate of nominal depreciation of the domestic currency. The household receives a real wage, w, dividends equal to ϕ and net transfers from the consolidated public sector in the amount, τ. Dividend income can be received from either banks or firms, although we will assume that all bank profits are arbitraged away through competition to avoid unnecessary expressions. The household's intertemporal budget identity is given by

$$\dot{h} = \left(i^d - \pi\right) h + w\ell + \phi + \tau - \varphi(h) - c. \tag{2}$$

The intertemporal budget constraint for the household is given by

$$h_t + \int_t^\infty \left(w_s \ell_s + \phi_s + \tau_s - \varphi(h_s)\right) e^{-\int_t^s \left(i^d - \pi\right) du} ds = \int_t^\infty c_s e^{-\int_t^s \left(i^d - \pi\right) du} ds. \tag{3}$$

The asset arbitrage condition for domestic equities is given by

$$\dot{v} = \left(i^d - \pi\right) v - \phi. \tag{4}$$

The necessary conditions for an optimal savings, labor supply and consumption plan for the household include

$$\left(c_t - \alpha \ell_t^\nu\right)^{-\sigma} = q_t \tag{5}$$

$$\nu \alpha \ell_t^{\nu - 1} = w_t \tag{6}$$

and

$$\frac{\dot{q}_t}{q_t} = \rho - \left(i^d - \pi - \varphi'(h)\right), \tag{7}$$

where q_t is the costate variable associated with deposits and will be continuous across anticipated changes in variables exogenous to the household's decisions. The return to household savings is given by the real rate of interest, $i^d - \pi$, plus the marginal decrease of transactions costs with deposits, $-\varphi'(h)$.

2.2 Firms

Firms can produce the single tradable good using a technology displays either decreasing or constant returns to scale given by

$$y = \ell^{\eta}, \qquad 0 < \eta \leq 1. \tag{8}$$

To introduce demand for intermediation, we impose a "credit in advance" constraint on firms that requires that each firm holds a deposit against a share of its wage bill every period. This is an arbitrary but transparent way to generate a role for intermediation that allows us to study how financial repression affects production and the dynamics of the economy. Each firm must hold credit in the amount

$$b_t^f = \theta w_t \ell_t \tag{9}$$

for $0 < \theta < 1$. Firms must borrow from banks at the rate of interest, i, which will not equal i^d, as will be evident below, in general.

The equity value of a firm is found by maximizing

$$v_t = \int_t^{\infty} [y_s - w_s \ell_s - x_s]\, e^{-\int_t^s (i^d - \pi) du} ds \tag{10}$$

with respect to the firm's loan retirement rate, x, subject to the constraints

$$\dot{b}^f = (i - \pi)\, b^f - x \tag{11}$$

and

$$b^f \geq \theta w \ell. \tag{12}$$

The firm maximizes its value by choosing a production level that satisfies the necessary condition,

$$\eta \ell^{\eta-1} = w\left(1+\theta\left(i-i^{d}\right)\right). \tag{13}$$

This is the labor demand function for production sector. Each firm seeks to equate the marginal productivity of labor and the marginal cost of employment which is the sum of the wage rate and holding cost of credit in advance of the payroll.

2.3 Banks

Banks are competitive and are required to hold cash reserves and interest-bearing government debt against a percentage of household deposits. The level of real balance demand for the economy is given by

$$m = \delta^{m} h, \tag{14}$$

where $\delta^{m} \geq 0$ is the cash reserve requirement imposed on banks. These assets pay zero nominal interest. Reserves are required to be held in treasury debt in the amount

$$b^{g} = \delta^{g} h, \tag{15}$$

for $\delta^{g} > 0$. These pay nominal interest in the rate $i^{g} \geq 0$. For example, δ^{g} represents the Statutory Liquidity Ratio imposed on commercial banks in the case of India. The policy instruments of financial repression are δ^{m}, δ^{g} and $i^{g} \leq i$.

In equilibrium for banking sector, the following two conditions hold:

$$m + b^{g} + b^{f} = h \tag{16}$$

and

$$i^{d} = \left(1-\delta^{m}-\delta^{g}\right) i + \delta^{g} i^{g} < i. \tag{17}$$

This implies that the interest differential that will determine equilibrium employment and production is given by

$$i - i^d = \delta^m i + \delta^g (i - i^g) . \tag{18}$$

An increase in the real interest differential between bank lending to the private sector and bank credit to the government, $i - i^g$, or in the ratio of bank liabilities that must be covered by holdings of public debt, δ^g, raises this interest differential and shifts labor demand downward.

The requirement that commercial banks hold government debt paying interest below the opportunity lending rate for the banks could be met in different ways under alternative institutions. One is that the government auctions bonds to the market so that the banks can either purchase bonds at auction or from the secondary market. Asset market arbitrage would lead to equilibrium bond yields that equal the opportunity lending rate adjusted for the difference in risk between loans to enterprises and loans to the government. Another is that the government requires banks to purchase government debt paying interest $i^g < i$ at par up to the statutory requirement directly from the treasury or central bank. This second assumption best represents repression of financial intermediation in many developing countries, notably in India. Additional debt purchases could be made by banks on the secondary market at discounts that yield the opportunity risk-adjusted loan return.

2.4 Government

The budget constraints of the central bank and fiscal authority are consolidated as the single public sector budget constraint. The fiscal authority makes public expenditures (denoted by g) and transfers, imposes taxes and issues debt. The central bank issues high-powered money, chooses reserve requirements and the exchange rate regime.

Domestically held public debt is denominated in domestic currency units, while external public debt is denominated in foreign currency, for convenience sake. The budget identity for the government is given by

$$\dot{b} + \dot{b^g} + \dot{m} - \dot{R} = rb - r^* R + (i^g - \pi) b^g - \pi m + (\tau + g), \tag{19}$$

where b is external debt, R equals foreign reserve holdings, r is the real interest rate (denominated in foreign currency units) paid on external debt, r^* is the real interest rate paid to reserves and τ equals the net lump-sum transfer to the representative household. Note that all domestic government debt is held by banks. We also make the simplification that all external debt is public debt, but allow domestic government debt to pay a premium (which could be negative for debt contracted on very concessional terms) over foreign government debt. The intertemporal budget constraint is found by integrating the government budget identity and imposing the solvency condition,

$$\lim_{T \to \infty} (R_T - b_T) e^{-\int_t^T r^* du} \geq 0,$$

to obtain

$$R_t - b_t \geq \int_t^{\infty} \left[\tau + g - \left(\dot{b^g} - (i^g - \pi) b^g \right) - \left(\dot{m} + \pi m \right) + (r - r^*) b_s \right] e^{-\int_t^s r^* du} ds, \tag{20}$$

where the time derivatives should be interpreted as allowing discrete changes in m and b^g through devaluation or changes in reserve requirements. This is the conventional solvency criterion. It imposes a restriction on foreign borrowing by the government given fiscal and monetary policies when $r > r^*$; when the grant element on foreign loans exceeds a market risk premium, then an exogenous constraint on the extension of such loans is required. The quantities, πm and $(i^g - \pi) b^g$ represent inflation tax revenues.

The central bank chooses the exchange rate regime, reserve requirements for banks and the rate of expansion of domestic credit. The change in domestic credit extended by the central bank is given by $\dot{D}$=$\dot{m}$ $-$ $\dot{R}$. We assume that the central bank chooses the growth rate of nominal domestic credit,

$$\mu_t = \frac{\dot{D}_t}{D_t} = \frac{\dot{d}_t}{d_t} + \pi_t,$$

which can be time varying. Recalling that $m = \delta^m h$, we have that

$$\frac{M}{S} = \delta^m \frac{H}{S}.$$

The real money supply can decrease over time given the nominal (spot) exchange rate, S, as households reduce their nominal deposits, H, by dissaving. It can also be reduced through depreciation or devaluation, or through changes in required reserves. Without household or firm holdings of treasury debt, open market operations do not arise.

Monetary and fiscal policies are interdependent via inequality (20). Monetary policies and the taxation of financial intermediation through changes in reserve requirements or the interest differential for bank credit to the government can be chosen to accommodate the fiscal authority, or fiscal policies can adjust to maintain solvency given monetary policy. For simplicity, we will take government expenditures and net transfers to households as exogenous to the monetary authority. Our focus will be on the choice of policies across the instruments of monetary policy and financial repression to meet the net financing requirements of fiscal policy.

2.5 International capital mobility and trade

Private capital account convertibility is ruled out by policy. The current account is the difference between increases in foreign reserves and external public borrowing, $\dot{b}$ $-$ $\dot{R}$. The current account identity is given by

$$\dot{R} - \dot{b} = r^{*}R - rb + y - \varphi(h) - (c+g)\,. \tag{21}$$

Private equity and portfolio capital inflows subject to capital controls could be added separately to this framework. However, private capital inflows are included with public external borrowing in the variable, b, under the assumption that these are subject to binding restrictions. Current account convertibility allows households to reduce their real balances by consuming perishable imports.[7] The government can increase its foreign reserves by either borrowing reserves or cumulative current account surpluses; that is, the change in reserves equals the change in external public debt plus the current account balance.

Free trade is assumed, but all that is necessary is that trade taxes be levied at constant proportionate rates over time. Purchasing power parity is assumed also, so that the domestic price of goods equals the nominal exchange rate times the foreign price.

3. Market Equilibrium

To find the equilibrium for this economy, we begin with labor market equilibrium at each date. Combining equations (13) and (6) to take advantage of the additive separability of the utility function in leisure and tradable goods, we have the labor market equilibrium condition,

$$\nu\alpha\ell^{\nu-1} = \eta\ell^{\eta-1}\left(1+\theta\left(i-i^{d}\right)\right)^{-1}, \tag{22}$$

which leads to equilibrium employment as a function of the interest differential,

$$\ell = \left(\frac{\eta}{\nu\alpha\left(1+\theta\left(i-i^{d}\right)\right)}\right)^{\frac{1}{\nu-\eta}}. \tag{23}$$

Equilibrium output is then given as a function of $i - i^d$,

$$y = \ell^\eta = \left(\frac{\eta}{\nu\alpha\left(1+\theta\left(i-i^d\right)\right)}\right)^{\frac{\eta}{\nu-\eta}}. \tag{24}$$

The credit constraint facing firms implies that the supply of real balances determines the spot market interest rate differential and the nominal deposit and lending rates of interest from

$$\left(1-\delta^m-\delta^g\right)h = \theta w\ell = \theta\eta\ell^\eta\left(1+\theta\left(i-i^d\right)\right)^{-1} = \theta\left(1+\theta\left(i-i^d\right)\right)^{\frac{-\nu}{\nu-\eta}}\eta^{\frac{\nu}{\nu-\eta}}\left(\nu\alpha\right)^{\frac{-\eta}{\nu-\eta}}, \tag{25}$$

$$i^d = \left(\delta^m+\delta^g\right)^{-1}\left[\left(1-\delta^m-\delta^g\right)\left(i-i^d\right)+\delta^g i^g\right] \tag{26}$$

and

$$i = \left(\delta^m+\delta^g\right)^{-1}\left[\left(i-i^d\right)+\delta^g i^g\right], \tag{27}$$

given the policy parameters i^g, δ^m and δ^g. Both the deposit rate and lending rate increase with the interest differential and consequently with a decrease in real balances given i^g, δ^m and δ^g.

Output can be rewritten as an increasing function of real balances given by

$$y = \left(\frac{\eta}{\nu\alpha}\right)^{\frac{\eta}{\nu-\eta}}\left(1+\theta\left(i-i^d\right)\right)^{\frac{-\eta}{\nu-\eta}} = \left[\frac{1}{\theta\nu\alpha}\left(1-\delta^m-\delta^g\right)h\right]^{\frac{\eta}{\nu}}. \tag{28}$$

Equilibrium employment is given by

$$\ell = \left[\frac{1}{\theta\nu\alpha}\left(1-\delta^m-\delta^g\right)h\right]^{\frac{1}{\nu}}. \tag{29}$$

Real output is a decreasing function of the interest differential for this economy. The interest differential decreases with an increase in real balances, a decrease in $(i - i^g)$, an increase in i^g or a decrease in the total reserve requirements, $\delta^m + \delta^g$. For example, a devaluation lowers output on impact because nominal deposits cannot be exchanged for foreign assets instantaneously through purely financial transactions with a closed capital account.

The dynamics for household consumption and savings are given by the following three relationships where output, y, and labor supply, ℓ, are the above functions of h and the policy parameters:

$$\sigma\left(\frac{\dot{c}-\alpha\nu\ell^{\nu-1}\dot{\ell}}{c-\alpha\ell^{\nu}}\right)=i^{d}-\pi-\varphi'(h)-\rho$$

and

$$\dot{R}-\dot{b}=r^{*}R-rb+y-\varphi(h)-(c+g)\,,$$

where $\alpha\ell_t^{\nu}$ is the simple linear function of h,

$$\alpha\ell_t^{\nu}=\frac{1}{\theta\nu}\left(1-\delta^{m}-\delta^{g}\right)h,$$

and

$$\frac{\dot{\ell}}{\ell}=\frac{\dot{h}}{h}.$$

3.1 Floating exchange rate

The steady state is achieved for this economy under a pure floating exchange rate regime. Because we have abstracted away from additional sources of transitional dynamics such as capital accumulation with costly adjustment, there are no intrinsic dynamics for this economy. With a perfectly flexible exchange rate, the steady state is reached immediately. Dynamics will arise below as a consequence of exchange rate management in transition.

In the steady state, the rate of nominal domestic credit creation equals the rate of depreciation, $\pi=\mu$, so that there is no real domestic credit growth. Real deposits and the real base money are constant. In the steady state, we have

$$\dot{c}=\dot{\ell}=\dot{h}=\dot{y}=0 \tag{30}$$

and

$$\dot{b}=\dot{b}^{g}=\dot{m}=\dot{R}=0. \tag{31}$$

Therefore,

$$i^d = \mu + \varphi'(h) + \rho, \tag{32}$$

which along with equations (25) and (26) determines $i - i^d$ and h as follows:

$$i - i^d = (1 - \delta^m - \delta^g)^{-1} \left[-\delta^g i^g + (\delta^m + \delta^g) (\mu + \varphi'(h) + \rho) \right] \tag{33}$$

and

$$(1 - \delta^m - \delta^g) h = \theta \left(1 + \theta \left(i - i^d \right) \right)^{\frac{-\nu}{\nu - \eta}} \eta^{\frac{\nu}{\nu - \eta}} (\nu \alpha)^{\frac{-\eta}{\nu - \eta}} . \tag{34}$$

Steady-state equilibrium output is determined by h using equation (28). An increase in the steady-state rate of depreciation lowers steady-state output and steady-state household holdings of real balances, hence financial wealth. The nominal exchange rate, S_t, is determined by equating H_t/S_t to the steady-state level of h.

Balance on the current account in the steady state gives steady-state consumption as a function of h and g,

$$c = r^* R - rb + y - \varphi(h) - g. \tag{35}$$

Steady-state consumption is also lower with a higher steady-state rate of nominal depreciation in this model. The real effects of raising the rate of nominal depreciation are consequences of a failure of monetary superneutrality in this economy. This is due to the taxation of financial intermediation (as measured by i^g, δ^g and δ^m) in the presence of the credit-in-advance constraint on firms (which provides the demand for intermediation in the model).

The steady-state choices of i^g, δ^g and δ^m necessary to satisfy the consolidated government's budget constraint are given by

$$\left[(\mu - i^g) \delta^g + \mu \delta^m \right] h = rb - r^* R + \tau + g, \tag{36}$$

using public sector budget identity (19) in the steady state (conditions (31)). With net transfers and public expenditures chosen before monetary policy, the rate of domestic credit creation and levels of financial repression need to be chosen to satisfy equation (36) under a floating exchange rate. The total tax rate on intermediation is given by the expression,

$$\left(\mu - i^g\right)\delta^g + \mu\delta^m.$$

The burden on the monetary authority is to choose a combination of the rate of (nominal) domestic credit expansion, interest rate paid to public debt held by banks and each reserve requirement to achieve public sector solvency given the elasticities of deposit demand, h, to these variables.

3.2 Exchange rate peg

We next consider the dynamics of an exchange rate peg in this economy. The rate of depreciation of the exchange rate is set at a constant, ε, unequal to the rate of nominal domestic credit creation, μ_t. A speculative attack against the peg which induces an immediate loss of reserves is not possible under the strict controls on capital account convertibility imposed in this economy. However, this type of monetary policy will only be sustainable temporarily as it induces a continuous outflow of capital through current account imbalances.

As above, fiscal policies are chosen independently of monetary policies. We begin with the case in which foreign-currency government debt is constant ($\dot{b} = 0$). The reserve requirement ratios and interest rate paid to banks on their holdings of government debt will be held constant, as well. However, under an exchange rate peg, real money holdings can increase temporarily if the rate of domestic creation exceeds the chosen rate of nominal depreciation. Because the rate of increase of the monetary base and bank credit to the government are proportionate through the relationships,

$$\frac{1}{\delta^g}\dot{b}^g = \frac{1}{\delta^m}\dot{m} = \dot{h},$$

an increase in real balances consequent to domestic credit creation implies that bank lending to the government, b^g, also rises. An increase in real high-powered money balances yields additional seignorage revenues for the government plus additional revenue from government borrowing from financial intermediaries at subsidized rates of interest. Money demand is rising if the interest differential, $i - i^d$, is declining.

From the balance sheet for the central bank, an expansion of real domestic credit equals the increase in the (real) monetary base less reserve accumulations,

$$\dot{d} = \dot{m} - \dot{R} = (\mu - \varepsilon)(m - R), \tag{37}$$

where the rate of growth of nominal domestic credit, μ, could be time-varying, but is taken as constant here. Domestic credit growth is chosen to satisfy the government's intertemporal budget constraint given exogenous net transfers to households, public expenditures and net interest payments on foreign debt. Rearranging the budget identity,

$$\left(\dot{m} - \dot{R}\right) + \varepsilon m + r^* R - \left[(i^g - \varepsilon) b^g - \dot{b}^g\right] = rb + (\tau + g), \tag{38}$$

and substituting for constant rates of domestic credit expansion and currency depreciation, we have

$$\mu m + (r^* + \varepsilon - \mu) R - \left[(i^g - \varepsilon) b^g - \dot{b}^g\right] = rb + (\tau + g), \tag{39}$$

under the exchange rate peg. Again, net transfers and public spending are constant for simplicity.

In equilibrium under this exchange rate peg, reserves will decline until they reach a lower bound, taken to be zero. When reserves hit this lower bound, the exchange rate floats while the rate of domestic credit expansion remains equal to μ. At the instant of the float, the economy is in steady state, but the exchange rate can jump to achieve the steady state. Before demonstrating these dynamics of the equilibrium, we need to rule out the possibility that real money demand can grow without bound. If reserves are not eventually depleted, equation (37) implies that real money demand must grow exponentially in the limit given the exogenous rates of domestic credit creation and depreciation. By equation (34) derived from the credit-in-advance constraint on firms, real balance demand can only grow without bound if the economy's endowment of labor is unbounded. We rule out this possibility.

The equilibrium under the peg ends in a steady state with a floating exchange rate depreciating at the rate of domestic credit creation. After reserves are exhausted, the growth rate of domestic credit equals the constant rate μ that satisfies the steady-state public sector budget identity,

$$\mu m - \left(i^g - \mu\right) b^g = rb + (\tau + g) \,. \tag{40}$$

Steady-state consumption satisfies

$$c^* = y\left(h^*\right) - \varphi\left(h^*\right) - g - rb, \tag{41}$$

where stars indicate steady-state values. Real balances and interest rates are determined simultaneously by equations (33) and (34). The steady-state levels of h, m, b^g, i^d and i are all functions of the policy parameters: the rate of growth of domestic credit, the reserve requirements imposed on banks and the interest rate paid to public debt held by banks. Given the reserve requirements and interest rate paid by the government, i^g, the three equations, (40), (33) and (34), determine the rate of domestic credit creation required to close the public sector budget. Output, labor supply and steady-state consumption are functions of real balances, and so determined recursively.

At the moment the government abandons the pegged exchange rate regime, the nominal exchange rate can change by a discrete amount because the capital account is not open. Given optimization by households, marginal utility must be continuous before, after and during the change of regime. This means that

$$(c_T - \alpha \ell_T^{\nu})^{-\sigma} = (c^* - \alpha \ell^{*\nu})^{-\sigma},$$

where c_T and ℓ_T are consumption and labor supply just as reserves reach zero. Substituting for labor supply using equation (29), this requirement imposes a linear restriction on consumption and real deposits just before the exchange regime collapses:

$$\left(c_T - \left(\frac{1-\delta^m-\delta^g}{\theta\nu}\right) h_T\right) = \left(c^* - \left(\frac{1-\delta^m-\delta^g}{\theta\nu}\right) h^*\right). \tag{42}$$

The time of the collapse, T, is endogenous. Given the choice of the rate of depreciation under the peg, initial level of reserves and the rate of domestic credit expansion required by fiscal policy, two dynamic equations are needed to determine the behavior of the economy under the peg. These are the equation of motion for real deposits,

$$\dot{h} = \left(i^d - \varepsilon\right) h + (w\ell + \phi - \varphi(h)) + \tau - c,$$

and the Euler condition for household optimization,

$$\dot{q} = -q\left(i^d - \varepsilon - \varphi'(h) - \rho\right),$$

where

$$q_t = (c_t - \alpha \ell_t^{\nu})^{-\sigma} = \left(c_t - \left(\frac{1-\delta^m-\delta^g}{\theta\nu}\right) h_t\right)^{-\sigma}.$$

Wage payments plus dividends, $w\ell + \phi$, are increasing functions of real deposits in equilibrium, and the deposit rate of interest is a decreasing function of real deposits. These can be rewritten using the equilibrium relationships between interest rates and real deposits as a pair of equations in real deposits, h, and the variable,

$$\lambda_t \equiv c_t - \left(\frac{1-\delta^m-\delta^g}{\theta\nu}\right) h_t,$$

as

$$\dot{h} = \left(i^d - \varepsilon\right) h + (w\ell + \phi - \varphi) + \tau - \lambda - \left(\frac{1-\delta^m-\delta^g}{\theta\nu}\right) h, \tag{43}$$

and

$$\dot{\lambda} = \lambda \frac{1}{\sigma}\left(i^d(h) - \varepsilon - \varphi'(h) - \rho\right). \tag{44}$$

These two equations determine the dynamics of output, consumption, the current account and interest rates between dates 0 and T. At date 0, real deposits are predetermined because the nominal supply of money, M_0, and nominal exchange rate, S_0, are given. At date T, real deposits drop by a discrete amount when the exchange rate jumps with devaluation. The longevity of the peg, T, depends on the level of reserves at the beginning, R_0, and the difference between the rate of growth of domestic credit, μ, and the chosen rate of depreciation, ε. The current account identity, in this case given by

$$\dot{R} = r^* R - (rb + g) + y - \varphi(h) - c,$$

determines the rate at which reserves decline from the initial level, R_0, to zero along any potential equilibrium path. At date T, the variable λ must just reach its steady-state value. The terminal conditions for the path are equation (42) and $R_T = 0$. The initial level of consumption is forward-looking and satisfies the requirement that it initiates a path that reaches the terminal conditions just as reserves are exhausted.

The equilibrium dynamics for h and λ can be approximated by linearizing the pair of differential equations (43) and (44) around the steady state under the peg. We characterize the dynamics for important variables for the case in which the initial level of real balances exceeds the steady-state level under the peg in Figures 1 and 2. In this case, the nominal exchange rate is overvalued in the sense that an immediate change of regime to a pure float would result in a devaluation. Figure 1 shows the dynamics of real deposits, consumption, output, the current account and the nominal exchange rate (in logarithms) for a case in which the initial stock of reserves is relatively small. In this case, the duration of the pegged exchange rate regime is short. Figure 2 shows dynamics for the same variables when initial reserves are relatively large so that the peg is sustainable for a relatively long time. Real balances and output are monotone increasing under a short-lived peg, while consumption can be either rising or falling. For a long-lived peg, real balances, output and consumption all initially decrease as depicted in Figure 2.

When the pegged regime collapses, there is a devaluation, and consumption and output suddenly drop. Under the peg, consumption is higher than it would be under a sustainable peg. This leads to current account deficits that are continuously financed by an outflow of reserves. This consumption path could also be financed by rising foreign public debt. The reserve outflow, however, can only be avoided temporarily because foreign lenders will not hold more debt than the government will be able to service through monetization after the exchange rate peg collapses. Solvency implies an upper bound on the net foreign indebtedness of the government in this economy. Once this is reached, reserves begin to decline until the exchange rate regime collapses.

3.3 Policies to resist exchange rate movements

The government has alternatives available for maintaining solvency and a desired rate of nominal depreciation. Taking conventional taxes and the government's choices of public expenditures and transfers as given, these consist of increasing the reserve requirements, δ^m and δ^g, or the interest differential paid on bank credit to the government, $i - i^g$, while reducing the rate of domestic credit creation under a managed float. The consequences of these alternatives for output and consumption (therefore, welfare) can be illustrated in the steady state of this model.

The policy choices, μ, i^g, δ^g and δ^m, must be chosen to satisfy the consolidated government's budget constraint in the steady state, equation (36)

$$[(\mu - i^g)\,\delta^g + \mu\delta^m]\,h = rb - r^*R + \tau + g,$$

where real balances and the interest differential in equilibrium are given by the equations (33) and (34),

$$i - i^d = (1 - \delta^m - \delta^g)^{-1}\left[-\delta^g i^g + (\delta^m + \delta^g)\,(\mu + \varphi'(h) + \rho)\right]$$

and

$$(1 - \delta^m - \delta^g)\,h = \theta\left(1 + \theta\left(i - i^d\right)\right)^{\frac{-\nu}{\nu-\eta}}\eta^{\frac{\nu}{\nu-\eta}}\,(\nu\alpha)^{\frac{-\eta}{\nu-\eta}}\,.$$

Steady-state equilibrium output is determined from h by equation (28), and equilibrium consumption by equation (35),

$$c = r^*R - rb + y - \varphi(h) - g.$$

A decrease in the rate of depreciation can be achieved by reducing the rate of domestic credit creation, μ, but must be accompanied by an increase in δ^g or δ^m or by a decrease in i^g. The optimal choice of financial repression can be found for the case in which the discount rate equals the maximum of the real international rate of interest on government debt, r, and the real return to foreign reserves, r^*, by maximizing steady-state utility,

$$u(c) = \frac{(c - \alpha \ell^{\nu})^{1-\sigma}}{1-\sigma} = \frac{1}{1-\sigma}\left(c - \left(\frac{1-\delta^m - \delta^g}{\theta\nu}\right) h\right)^{1-\sigma},$$

subject to equations (36), (33), (34) and (35). In the optimum, banks will not be required to hold interest-bearing reserves (i^g or δ^g will be zero) and the rate of depreciation, μ, and reserve requirement maximize real balances subject to the revenue constraint,

$$\mu\left(\delta^m + \delta^g\right) h = rb - r^* R + \tau + g.$$

In the optimum, the government would also minimize its net debt servicing costs, $rb - r^*R$, by exchanging public debt for reserves or conversely.

The model implies that the government can resist exchange rate changes in response to temporary or permanent increases in the budget deficit by increasing the reserve requirements or increasing the interest subsidy it receives from financial intermediaries. Depreciation can be avoided in response to a temporary increase in rate of growth of domestic credit by increasing reserve requirements. Raising the reserve requirement raises real balances in equilibrium if the money demand is inelastic with respect to the interest differential, $i - i^d$. Real balance demand rises with reserve requirements for low levels of δ^m and δ^g under the parameter restriction,

$$1 > \frac{\nu}{\nu - \eta}\theta\left(\mu + \varphi'(h) + \rho\right), \tag{45}$$

but eventually falls as $\delta^m + \delta^g$ rises toward one. Similarly, this model implies that exogenous increases in output or other determinants of domestic money demand will be correlated with decreases in reserve requirements (or the interest subsidy to the public sector) if the government is seeking to reduce exchange rate fluctuations. For example, under a managed float, the government can lower the reserve requirements in response to an exogenous rise in productivity to avoid appreciation of the currency. The instruments of financial repression can also be used as tools of exchange rate intervention in the presence of capital inflows. Increases in the money supply can be offset by raising δ^g, in effect sterilizing a capital inflow. Similarly, the accumulation of reserves by the central bank can be financed by increased borrowing from financial intermediaries under a managed float. Therefore, exchange rate stabilization can lead to positive correlations between bank holdings of government debt and reserve inflows and between government revenues from reserve requirements and depreciation pressure.

4. Financial Repression, Fiscal Policy and Exchange Rate Management in India

For most of the past half century, India imposed very tight restrictions on international trade in goods, services and financial assets. International commodity and services trade were restricted by a wide variety of quantitative restrictions and tariff rates. International capital inflows and outflows were restricted by outright prohibition and administrative controls on the purchase of foreign assets by residents, direct investment by foreigners and private external borrowing. Domestic economic reforms and progressive liberalization of the trading regime began in the late 1980s. After 1991, the government gradually began to relax restrictions on capital inflows and direct investment. It also began to relax restrictions on the convertibility of the currency for current account transactions in 1992 and made the rupee fully convertible for current account transactions in August 1994 with Indian acceptance of the obligations of Article VIII of the Articles of Agreement of the International Monetary Fund. The government continues to maintain effective controls on the acquisition of foreign financial assets by the private sector and the currency is not convertible for capital account transactions for residents.

Foreign investment income is fully convertible, and limits of foreign equity participation were recently liberalized.[8] After 1991, the rate of tariff reduction and elimination of quantitative restrictions on imports increased. The average tariff rate fell from 125 percent in 1991 to 50 percent in 1995.[9]

4.1 Financial repression in India

The financial system of India was relatively unrestricted until the 1960s when the government began to impose controls for the purpose of allocating credit towards development programs. Interest rate controls were adopted and liquidity requirements on banks were raised progressively during the decade. The government also established state banks and nationalized the largest commercial banks (in 1969), allowing a greater degree of control over the allocation of credit by sector and enterprise. Throughout the 1970s and early 1980s, directed credit was a rising share of domestic lending and interest rate subsidies for individual sectors became common. The government began to reverse this process in 1985 with the partial deregulation of bank deposit rates. These controls were reinstated in 1988, but the government began to relax ceilings on lending rates the same year. By 1990, progressive reductions in controls on deposit rates and on lending rates and reductions in directed lending began. There was a gradual reduction of these instruments of financial repression throughout the 1990s. Demetriades and Luintel [1997] calculate an index of financial repression based on quantitative controls on financial intermediation which reveals an upward trend from 1969 through 1984 and the beginning of the downward trend in 1988. The tendency towards deficit financing of the public sector in India with the government resorting to seignorage and financial repression to generate revenues has been widely observed and documented. Recent papers include Cashin, Olekalns and Sahay [1998] and Srinivasan [2000].

Important means for the government to raise revenues through financial repression are the reserve requirements imposed on commercial banks. Two such requirements are imposed, the cash reserve ratio (CCR) and the statutory liquidity ratio (SLR). The first requires banks to hold cash assets in proportion to their liabilities, while the second imposes a lower bound on bank holdings of government interest-bearing (domestic-currency denominated) debt. These are held at below-market rates of interest. Both requirements vary significantly over time and are used as active instruments of monetary policy. Figure 3a shows how the reserve and liquidity requirements vary over time and reports ratios of commercial bank lending to the government. Two patterns are evident - the requirements vary within years, sometimes significantly, and they decrease over time the 1990s. Figure 3b shows the deposit, lending and real rates of interest for India over time. We also estimate the revenue realized by the government from these interest subsidies for the period 1981-1998 in Table 1 using the approach of Giovannini and de Melo [1993] for calculating the average interest subsidy on government debt.[10] This table reports the net interest subsidy realized by the government from domestic debt issues, which are overwhelmingly held by financial intermediaries, and from additional commercial bank credit to the government. These are ex post estimates of the net fiscal revenue generated by mandated private sector lending to the government and are calculated using the average opportunity interest rate for the government from borrowing abroad. Since this includes the interest on concessional loans from abroad, our estimates may be lower bounds for the transfer of resources from financial intermediation to the government. We also calculate conventional seignorage revenues as the change in reserve money in proportion to GDP. The average annual revenue from these forms of financial repression from 1981 to 1990 is 5.0 percent of GDP, while it falls to 2.6 percent after 1991. The large transfer of resources from the financial sector to the government in 1991 is the result of the depreciation of the rupee in July 1991 by over 17 percent.

The decrease in the implicit tax on financial intermediation implied by the decline of revenues generated by reserve and liquidity requirements for banks shown in Table 1 reflects financial liberalization in the 1990s. Traditional seignorage revenues do not show a downward trend as a share of GDP as these become a larger share of the diminishing revenues from taxes on financial activities. These trends do not reflect a decrease in the public sector's share of domestic credit from the financial sector. Table 2 reports domestic public debt and commercial bank credit to the government as shares of GDP. Increasing holdings of government debt by the banking sector correspond to a decreasing interest differential on public sector debt and relaxation of interest rate controls for loans and deposits in the 1990s.

For nearly the entire period from independence to September 1975, the rupee was tied to sterling. Until the Smithsonian agreement, a band width of one percent on either side was maintained with significant realignments of the parity in the second half of the 1960s. The band width was widened after the Smithsonian agreement to 2.25 percent on each side. In September 1975, the pound was abandoned as the peg currency and a basket of reference currencies based on commodity trade was adopted. The weights on individual currencies were left to the discretion of the Reserve Bank of India and the bandwidth was ultimately widened to five percent. Until 1991, movements in the rupee-dollar exchange rate were very limited; all for intents and purposes, the nominal exchange rate was pegged to the dollar except for infrequent realignments.

On July 1 and 3 of 1991, the rupee was devalued by 17.38 percent cumulatively in the midst of a balance of payments crisis. The rupee was repegged to the dollar, but the exchange regime was significantly liberalized during the early 1990s and India switched to a managed float in the second half of the 1990s. As shown in Table 3 and Figure 4, exchange rate fluctuations have been very modest for India although the variation of the rupee-dollar rate has increased under the managed float.

4.2 Fiscal deficits, foreign borrowing and reserves

Throughout the 1980s, the consolidated public sector of India ran large and increasing deficits as shown in Figure 5. The current account balance, external public debt and international reserves are shown in Figures 6, 7 and 8, respectively. We argue that the maintained hypothesis of our theoretical model that monetary policies accommodate fiscal policies fits the stylized facts of Indian fiscal policy making well. From the mid-1970s to the late 1980s, the primary deficit of the public sector grew steadily as a share of GDP. The current account balance and external public debt grew throughout the decade of the 1980s until 1991. The growth of external debt slows considerably after 1989, while reserve outflows rise. Throughout this period, the exchange rate is essentially a crawling peg against the dollar. We can also note that the cash reserve ratio rises as external borrowing slows by fifty percent between July 1988 and July 1989 to level off at 15 percent. The rise in bank credit to the government over the previous decade also levels off by the middle of 1989.

The events shown in the figures leading up to the balance of payments crisis in the early summer of 1991, culminating in the devaluation in the first few days of July, are consistent with our model's explanation of a balance of payments crisis under a pegged exchange rate regime. Consider the public sector as having reached an upper bound on external credit (whether externally-imposed or self-imposed) resorting to increased monetization of large interest-inclusive public sector budget deficits. The rise in the creation of domestic credit is met by an increase in the reserve ratios (the CRR, δ^m, and the SLR, δ^g) to a combined level of 53.5 percent of bank assets and of credit from the banking sector to the government of over 25 percent of GDP. These increases the rates of taxation of financial intermediation correspond to a rise in public sector revenues from financial repression (as seen in the estimates of Table 1). This increase in rates of financial repression allows the government to sustain large fiscal deficits under the exchange rate peg, but as the rise in reserve ratios and revenues stops, we see that the reserve outflow accelerates as predicted by our model. Essentially, after reaching the upper limit on external borrowing and on revenues from financial repression, the exchange rate peg was unsustainable given the required rate of domestic credit creation to finance the public sector budget deficit. The continued growth of the current account deficit with the reduction in the primary deficit after 1988 is also consistent with the dynamics of the model under an unsustainable peg. The growth rate of real GDP dropped to an annual rate of 1.25 percent in 1991 from an average annual rate of 6.8 percent for the previous ten years confirming the contractionary impact of the devaluation. The growth rate returned to trend, averaging about 7.5 percent for the remainder of the 1990s. That the growth rate falls but remains positive is not a contradiction of our model, because our model is written in levels with an underlying real growth equal to zero for convenience only. It is straightforward to add endogenous or exogenous growth the model.

The performance of the Indian economy after the devaluation is also consistent with our model, but not with the simple example of a collapsing exchange rate peg with strict controls on private capital outflows. The example assumes that the primary fiscal deficit is a constant fraction of output so that inflation rises after the exchange rate peg collapses by the difference between the rate of domestic credit creation (less the growth rate of real output) and the pegged rate of depreciation. Figure 5 illustrates the impact of significant fiscal reforms that followed the devaluation on the primary deficit of the consolidated public sector. The primary deficit fell from over six percent to less than two percent of GDP.

A fiscal effect of the devaluation is the reduction in the real value of rupee-valued government debt. A large share of the growth in public debt was financed by credit extended by the domestic financial system to the government, and this was deflated by over 17 percent in July 1991. This reduction appears in Table 1 as a combined jump in public revenues from domestic government debt and bank credit to the government from its trend of about 4.3 percent of GDP to 32.3 percent of GDP. This fiscal benefit of the devaluation is implicitly included in the equilibrium of the model under a collapsing exchange rate peg because it assumes perfect foresight.[11] We also assumed for simplicity of illustration that the rate of domestic credit creation was the same before and after devaluation. Equations (39) and (40) can also be satisfied by allowing different rates of domestic credit creation before and after the crisis and choosing a different constraint on monetary policy. For example, we could choose the rate of monetary growth before the collapse to assure that real balances remained constant as a share of output. With a positive real rate of interest (still less than the opportunity real rate of interest) on government debt held by banks ($i^g - \pi$), the reduction in government debt consequent to devaluation allows a drop in the rate of monetization required to maintain solvency. This is reflected in the easing of the public sector financing gap after 1991 and subsequent low rate of depreciation post-devaluation in the Indian case.

A different explanation for the 1991 macroeconomic crisis in India is suggested by Cerra and Chaman [2000]. They argue that the rupee was increasingly overvalued under the peg. Overvaluation can be consistent with the reserve outflow and real money growth generated in the equilibrium of our model under the exchange rate peg and domestic credit expansion with capital controls. In our model the real exchange rate is constant as purchasing power parity holds throughout, but the model could be extended easily to allow non-traded goods and an endogenous real exchange rate. With such an extension, however, real appreciation is a symptom of the underlying unsustainability of both the exchange rate regime and combination of monetary and fiscal policies. The hypothesis that relative purchasing power parity holds in the long run tests surprisingly well for India after 1993, and the deviation of the real exchange from the nominal exchange rate is modest in international comparison.[12]

4.3 Exchange rate management and financial repression

Financial repression continued to play a role in exchange rate management in India throughout the 1990s under the managed float. The consolidated public sector primary deficit declined in trend until 1997 consequent to the fiscal reforms adopted after the devaluation.[13] Combined with the transition to full convertibility of the rupee for current account transactions between 1992 and 1994 and the gradual relaxation of controls on inward capital inflows over the decade, these reforms helped to generate a rising trend in foreign exchange reserves. Despite increasing private capital inflows, public external debt reduction led to a reduction in aggregate external debt from its peak of nearly 35 percent in 1993 to 21 percent of GNP in 1999. The current account deficit fell to follow a trend of about one percent of GDP after 1991. Private portfolio capital inflows and foreign direct investment rose sharply in percentage terms over the decade, although starting from very low levels in international comparison as documented in Kohli [2001].

During this period of reserve inflows, the Reserve Bank of India has used a number of measures to reduce exchange rate movements. Forward intervention is used by the RBI to reduce short-term fluctuations and is reported routinely. However, the cash reserve and liquidity ratios, interest rate controls and other direct measures have been used actively to counter exchange rate movements. Table 4 gives an example, listing measures adopted by the RBI between 1994 and 1998. Figure 9 provides a traditional picture of possible exchange rate intervention by the RBI plotting monthly percentage exchange rate changes against percentage changes in official reserves. After the devaluation in July 1991, the rupee was once again pegged to the US dollar and devalued another 19.2 percent in March 1993. The formal exchange rate arrangement then switched to a managed float. However, it evident from the data that the rupee was pegged, *de facto*, to the dollar until the end of August 1995. Since August 1995, the rupee has depreciated against the dollar at an average annual rate (using monthly average rates) of 7.3 percent while the money supply has grown at an average annual rate of 14.9 percent and real GDP has grown at approximately 8.4 percent on average.[14]

An interesting relationship is seen in the monthly time series of reserves and bank credit to the government shown in Figure 10 where both variables are denominated in dollars (bank credit to the government has been converted to dollars at the contemporaneous exchange rate).

The correlation between the monthly increases in commercial bank credit to the government and reserve inflows for the previous month from August 1995 through December 2000 is 0.48, and the correlation between contemporaneous changes is 0.29. This suggests that the reserve bank has been sterilizing reserve inflows, at least partially, by increasing the government debt held by financial intermediaries. A conclusion is that the liquidity requirements imposed on commercial banks plus the willingness of state banks to hold government debt in excess of statutory requirements are actively used to sterilize capital inflows for the purpose of managing the rate of depreciation of the exchange rate.

The theoretical model shows how these instruments of fiscal policy can be used for the dual purpose of exchange rate management and meeting the intertemporal budget constraint of the public sector. Our estimates of the revenue from the implicit taxation of financial intermediation reveal that the fiscal importance of financial repression is declining as interest rate and other reforms were adopted in the 1990s. However, a very large percentage of commercial bank credit continues to go to the public sector, and government borrowing from the domestic financial sector plays a key role in managing the exchange rate in the presence of rising capital inflows.

5. Conclusion

As observed by Maxwell Fry [1997] and others, financial repressive policies in developing countries typically originate as restrictions on financial activities adopted in the interest of a variety of development and social objectives. Eventually, the primary role of policies that require financial intermediaries to hold large percentages of their assets in government debt, usually at below-market rates of interest, that control domestic rates of interest and that restrict residents' access to international financial markets is fiscal. Governments seek to finance the gap between public spending and conventional tax revenues plus seignorage by borrowing at subsidized rates from commercial banks. Under such policies, governments absorb relatively large shares of domestic credit and use restrictions on international capital flows to collect large inflation tax revenues at lower rates of inflation than would otherwise be possible. India provides a premier example of how financial restrictions initially imposed for the purpose of directing investment resources toward development projects became important instruments of fiscal policy.

Our theoretical model links financial repression and its role in fiscal policy to exchange rate management as the government seeks to satisfy its intertemporal budget constraint and repress inflation. The model demonstrates how financial liberalization without fiscal policy reforms can lead to a balance of payments crisis in an economy without capital account convertibility as India experienced in 1991. The theoretical model, based on optimizing behavior of households and firms in a monetary economy, articulates the relationship between exchange rate regimes, fiscal policies and balance of payments problems in developing countries traditionally discussed without the benefit of optimizing behavior by agents in a dynamic economy. The model also shows how the policy instruments of financial repression can become tools for resisting exchange rate fluctuations and managing financial capital inflows with partial liberalization even as the fiscal importance of financial repression diminishes with reform. Our comparison of the model to Indian experience during the 1990s, a period of increasing liberalization and financial reform, suggests that these instruments are used as tools of exchange rate intervention under a managed float.

The model also demonstrates the importance of fiscal reforms and financial reforms for capital account liberalization. International financial integration erodes the capacity of the government to tax financial intermediation for the purpose of generating resources for the government or to maintain an exchange rate peg inconsistent with rates of domestic credit creation. Capital account and financial liberalization in such an economy can lead to financial crisis in the absence of fiscal reforms just as described by Carlos Diaz-Alejandro [1985] is his remarkable paper.

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Endnotes

[1]Recent empirical and theoretical work on the relationship between financial repression and economic growth includes King and Levine [1993a and 1993b] and Bencivenga and Smith [1992]. Roubini and Sala-i-Martin [1995] restrict their study of financial repression and growth to the relationship between inflation taxation and growth.

[2]See for example, Eichengreen [2000] and Kletzer and Mody [2000].

[3]Our model differs from earlier work, for example, McKinnon and Mathieson [1981], in the incorporation of explicit optimizing behavior in a contemporary macroeconomic model. Brock [1989] studies the correlation between inflation taxation and reserve requirements in an optimizing framework. We emphasize the relationship between financial repression and exchange rate regimes in the open economy. More recently, Gupta and Lensink [1997] use a simulation model to study the effect of taxation of the financial sector on domestic capital formation.

[4]Estimates of revenues generated by financial repression for a wide range of developing countries are given by Giovannini and de Melo [1993] and Fry, Goodhart and Almeida [1996] among many others for specific countries. Financial repression is comparatively important for public finance for India, but not unusually so.

[5]A frequent justification for capital controls in India, as elsewhere, has been to insulate the economy from external shocks. After the Asian financial crises in 1997, capital controls were credited with protecting India from contagion by a wide variety of commentators. Towe [2001] studies the factors that might have protected India from the Asian crisis.

[6]Brock [1989], Courakis [1984] and Sussman [1991] each emphasize the importance of reserve requirements and the taxation of interest income on liquidity requirements in financial repression in developing countries. Brock [1989], in particular, uses a monetary model based on optimizing behavior to show the role of reserve requirements in inflation taxation.

[7]In the application of this model below, imports of consumer goods should be interpreted as inclusive of consumer durables. Also, certain restrictions on portfolio and equity capital inflows have been relaxed recently, but private capital account transactions are widely curtailed.

[8]For a comprehensive review of economic reforms and macroeconomic performance in India, see Joshi and Little [1994, 1996].

[9]See Krueger and Chinoy [2000].

[10]The effective interest rate on dollar denominated foreign debt is the ratio of the sum of interest payments and interest arrears to the two-year moving average of debt outstanding. The effective domestic interest rate is the ratio of rupee interest payments to the two-year average of domestic rupee debt outstanding. Actual currency depreciation is used to complete the calculation.

[11]Burnside, Eichenbaum and Rebelo [2001] calculate the fiscal costs of financial crises for Mexico (1994) and Korea (1997) including the benefits of devaluation for domestic currency-denominated public sector liabilities, implicitly without allowing perfect foresight.

[12]Cointegration tests confirm purchasing power parity between India and the United States using producer price indices and monthly data for the period, 1993-1999.

[13]The primary deficit has grown considerably since 1997. Reynolds [2001] uses a simple growth model to argue that India has taken advantage of a low difference between real interest rates and rates of growth to sustain the renewed accumulation of public debt but that another fiscal crisis could appear. This point is also argued by Srinivasan [2000].

[14]All figures are calculated from the IMF, **International Financial Statistics**. Monetary growth is calculated by summing lines 34 and 35.

Table 1

Revenue from Central Government Debt, Consolidated Debt and Bank Credit to Government, 1981-98 (percent of GDP)

Year	Revenue from central government debt	Revenue from consolidated public debt	Revenue from bank credit to governmentt	Seigniorage
1980	-	-	-	2.00
1981	3.82	4.42	2.10	0.92
1982	1.11	1.25	0.55	1.12
1983	2.58	2.93	1.31	2.68
1984	6.95	7.96	3.61	2.53
1985	-2.08	-2.35	-1.02	1.06
1986	2.66	2.99	1.31	2.13
1987	-2.44	-2.74	-1.20	2.45
1988	6.28	7.04	2.97	2.25
1989	5.63	6.33	2.75	3.01
1990	1.70	1.92	0.84	1.79
1991	19.72	22.39	9.82	1.79
1992	-2.28	-2.60	-1.12	1.51
1993	6.64	7.54	3.14	3.25
1994	-3.13	-3.58	-1.43	3.02
1995	2.66	3.06	1.24	2.12
1996	-2.25	-2.60	-1.04	0.40
1997	1.35	1.56	0.62	1.74
1998	0.64	0.75	0.30	1.87
1999	-	-	-	1.07

Calculations follow Giovannini and De Melo (1993) as explained in text. The opportunity interest rate is calculated using data for external debt outstanding, interest payments and interest arrears from Global Development Finance, Country Tables, The World Bank, 2000. Domestic debt and interest payments are from the Handbook of Statistics, Reserve Bank of India, 2000. Seignorage revenues are calculated as the ratio of the change in reserve money to GDP (data from the Handbook of Statistics, Reserve Bank of India, 2000).

Table 2

Domestic Public Debt and Bank Credit to Government, 1980/98
(ratio to GDP)

Year	Domestic Public debt	Bank Credit to Govt.
1980	-	-
1981	0.40	0.19
1982	0.45	0.20
1983	0.44	0.20
1984	0.48	0.22
1985	0.52	0.22
1986	0.56	0.25
1987	0.58	0.25
1988	0.58	0.24
1989	0.59	0.26
1990	0.60	0.26
1991	0.58	0.26
1992	0.58	0.25
1993	0.56	0.23
1994	0.54	0.21
1995	0.52	0.21
1996	0.51	0.20
1997	0.53	0.21
1998	0.54	0.21

Source: Handbook of Statistics, RBI, 2000 and World Bank, Global Development Finance (Various Issues).

Table 3

Standard deviations and Variance of Nominal Exchange Rate
(monthly averages)

Years	Standard deviation	Variance
1961-70	0.023	0.0325
1971-80	0.089	0.0152
1981-90	0.103	0.019
1991-2000	0.259	0.356

Table 4

Monetary Measures used by RBI to Counter Exchange Rate Movements: 1994-98

	Cash Reserve/Statutory Liquidity Ratio Changes	Interest Rate changes	Other Direct Measures
Oct. 1995	**Increases in Non-resident accounts (NRER, NR(NR)RD) over their outstanding levels on Oct. 27, 1995 exempted from CRR requirements.**	**Rise in interest rate on NRER deposits; interest surcharge on import finance; reduction in interest rate concessions on export finance between 3-6 months.**	
Jan-Feb 1996	**CRR requirements for all FCNR(B) and NR(NR) deposits relaxed; average CRR on NRER liabilities reduced from 14 to 12 per cent.**	**Interest rate surcharge on import finance raised from 15 to 25 per cent; interest rates on post-shipment export credit freed to expedite exports payments into the country.**	
Apr 1996	**NRER deposits exempted from CRR requirements; SLR on NRER reduced from 30 to 25%.**	**Interest rates on NRER term deposits over two years freed.**	
Nov-Dec 1997	**CRR increased by 0.5%; incremental CRR of 10 % on NR(E)RA and NR(NR) removed.**	**Interest rate on post-shipment export credit increased from 13 to 15 %; interest on fixed rate repurchase agreements increased by 0.5 %.**	
Jan. 1998	**Bank rate raised from 9 to 11%; CRR raised from 10 to 10.5%; general refinance limit reduced from 1 to 0.25% of fortnightly average outstanding aggregate deposits; export refinance limit reduced from 100 to 50% of the increase in outstanding export credit eligible for such refinance over the level of such credit as on Jan 16, 1996.**	**Interest on fixed rate repurchase agreements increased from 7 to 9%.**	**Banks barred from offering forward contracts based on past performance; declaration of exposure suspended.**

Table 4 (continued)

June 1998		**Lowering of interest rate on export credit on 'incremental exports' over the base year level of exports in 1997-98.**	**Foreign institutional investors (FII) allowed to undertake foreign exchange cover on their 'incremental' equity investment from June 12, 1998; merchants advised to monitor credit utilization to meet genuine foreign exchange demand but not unanticipated import requirements beyond a reasonable period to discourage inventory build-up; domestic financial intermediaries to buy back their won debt or other Indian paper from the international market; banks acting on behalf of FII allowed to but foreign exchange directly from the RBI at the prevailing market rate.**
Aug 1998	**CRR maintained by banks raised from 10 to 11 %;** **Notes: CRR denotes the cash reserve ratio;** **NRER, NR(NR)RD, NR(E)RA, NR(NR) and FCNR(B) are all various categories of Non-resident accounts.**	**Interest rate on fixed rate repurchase agreements increased from 5 to 8%.**	**Authorized dealers allowed to offer forward cover directly to FII up to 15% of their investment as on June 11, 1998; facility of rebooking of cancelled import contracts withdrawn; facility for splitting forward and spot leg for a commitment withdrawn; extension of time limit for realization of export payments allowed only in exceptional circumstances; authorized dealers advised to report their peak intra-day positions.**

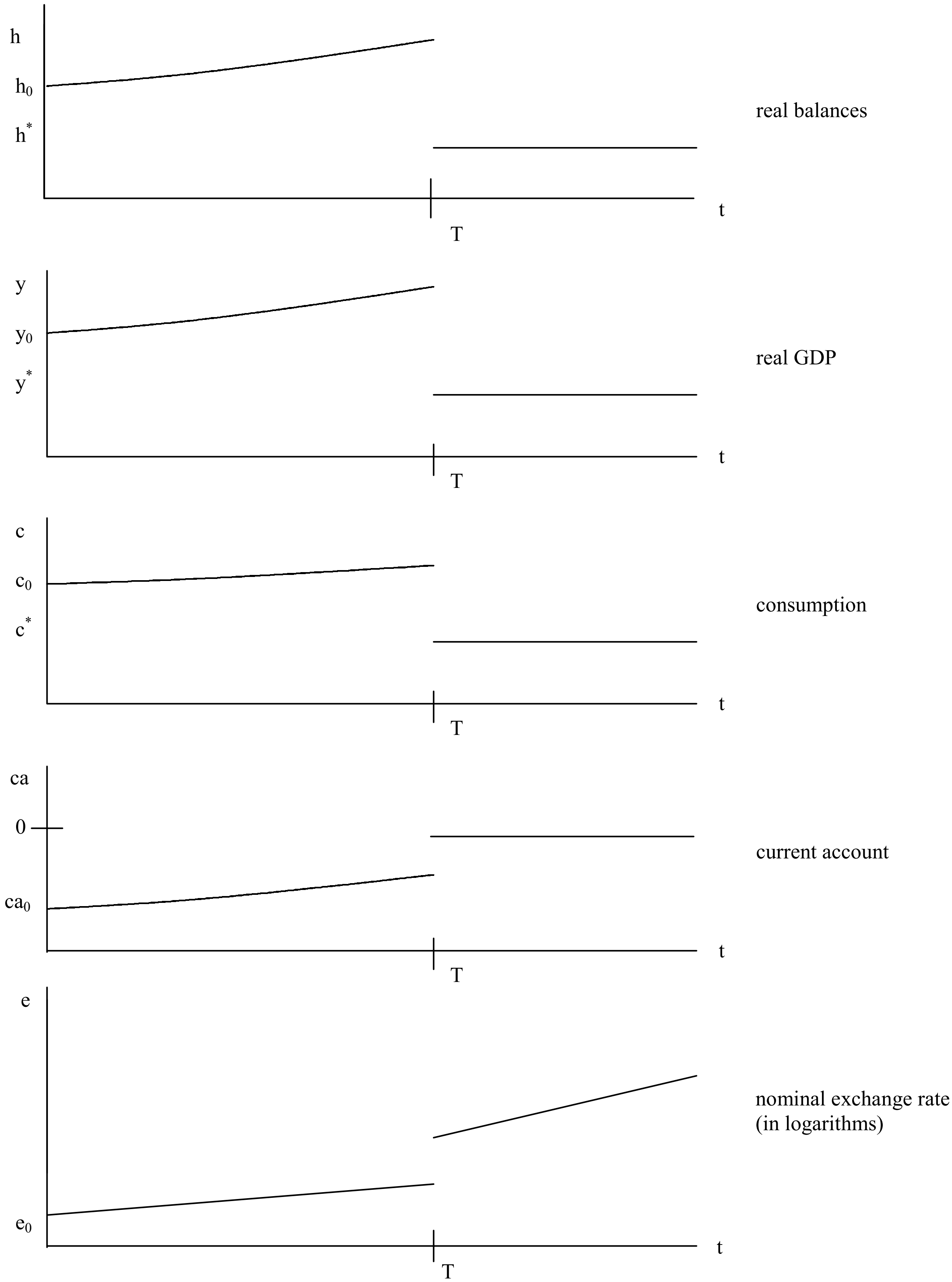


Figure 1: Dynamics of Aggregate Variables (for low initial reserves)

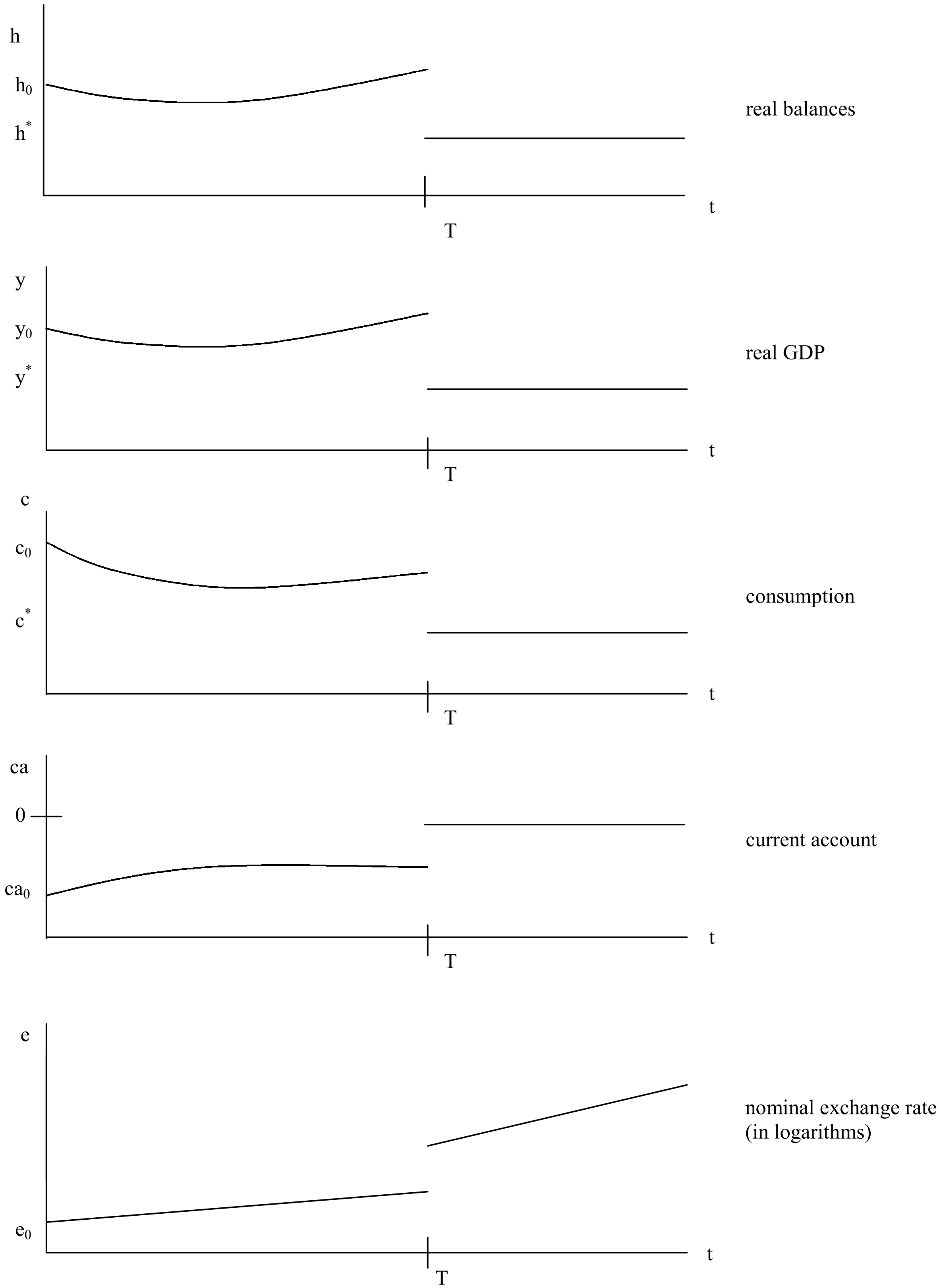


Figure 2: Dynamics of Aggregate Variables (for high initial reserves)

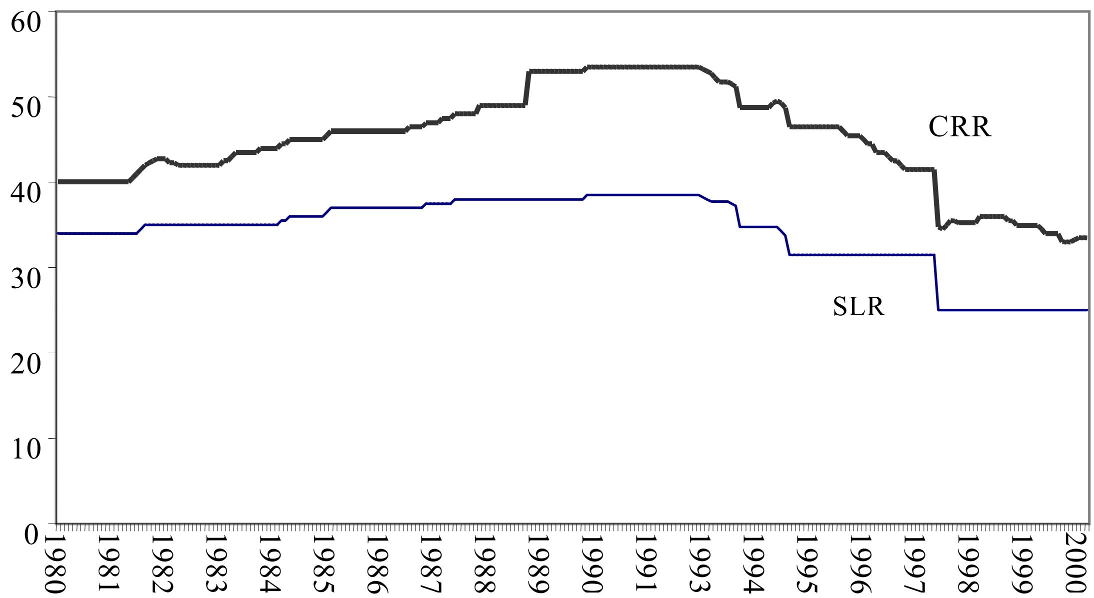


Figure 3a: Commercial Bank Reserve Requirements for India -
Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR)

Source: Handbook of Statistics, Reserve Bank of India, 2000.

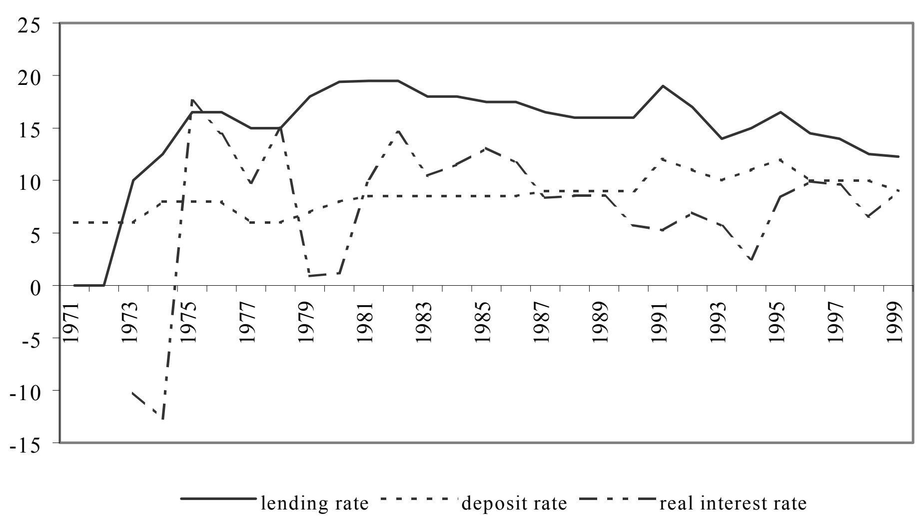


Figure 3b: Rates of Interest, India

Source: Handbook of Statistics, Reserve Bank of India, 2000.

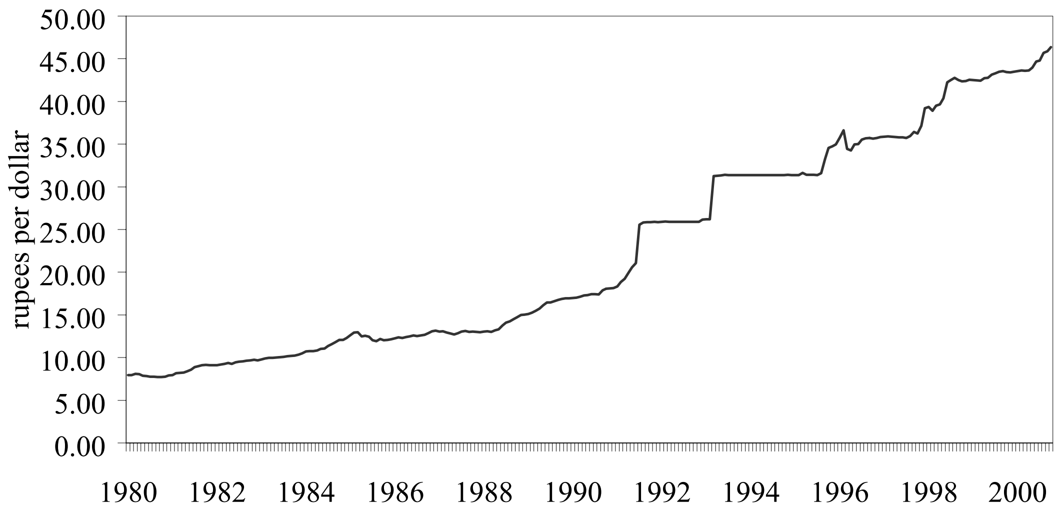
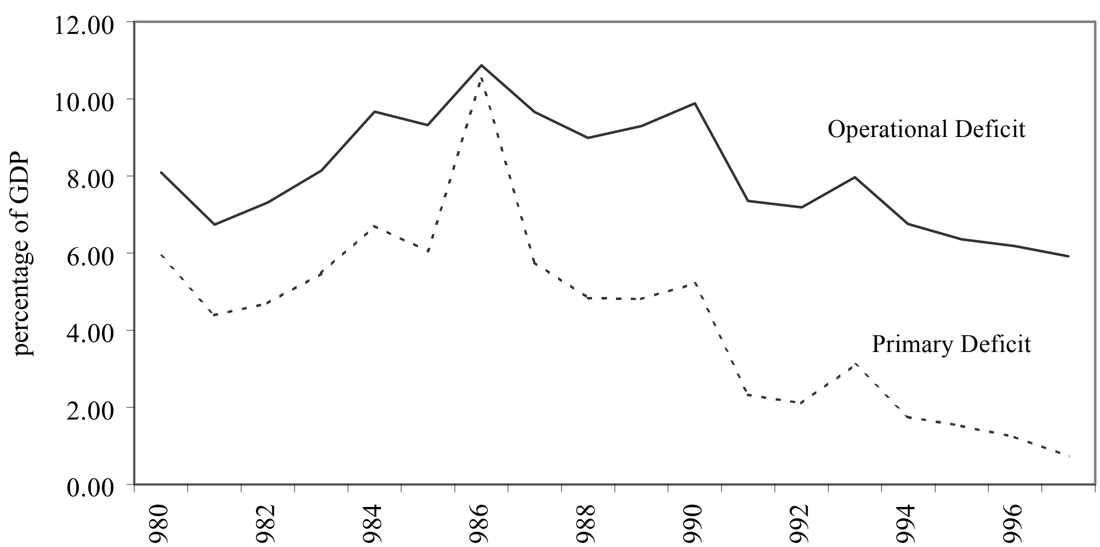


Figure 4: Nominal Exchange Rate – Indian rupees per US dollar



Source: International Monetary Fund, International Financial Statistics, 2000.

Figure 5: Deficit of the Consolidated Public Sector, India

Source: Indian Public Finance Statistics, Ministry of Finance, Department of Economic Affairs, Economic Division, Government of India.

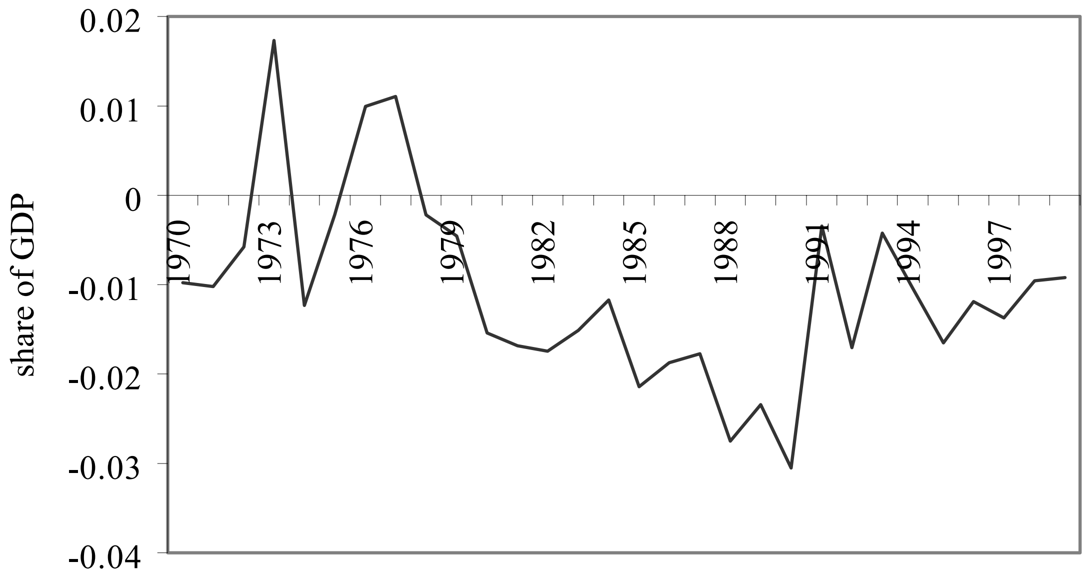


Figure 6: Current Account Balance, India

Source: Handbook of Statistics, Reserve Bank of India, 2000.

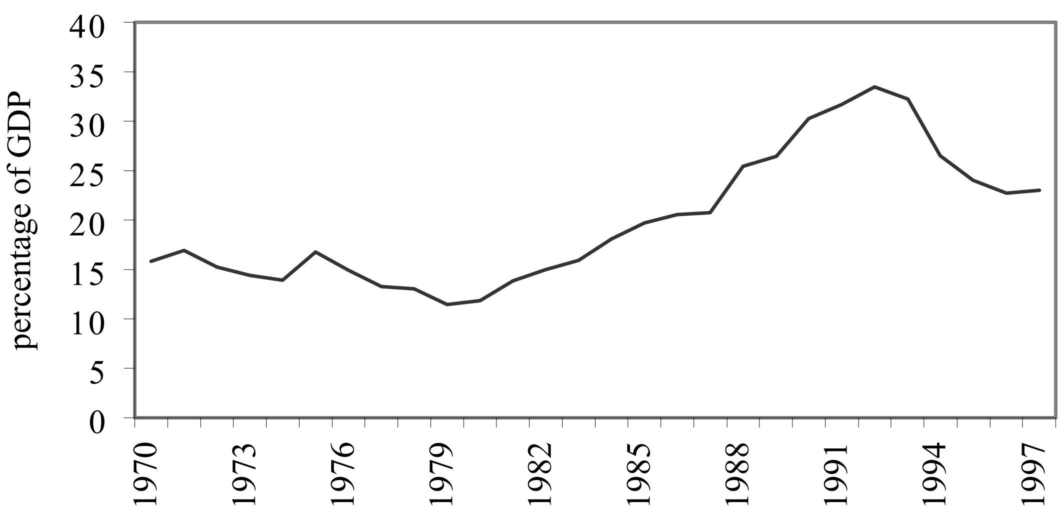


Figure 7: External Debt as Share of GDP, India

Source: World Development Indicators, World Bank.

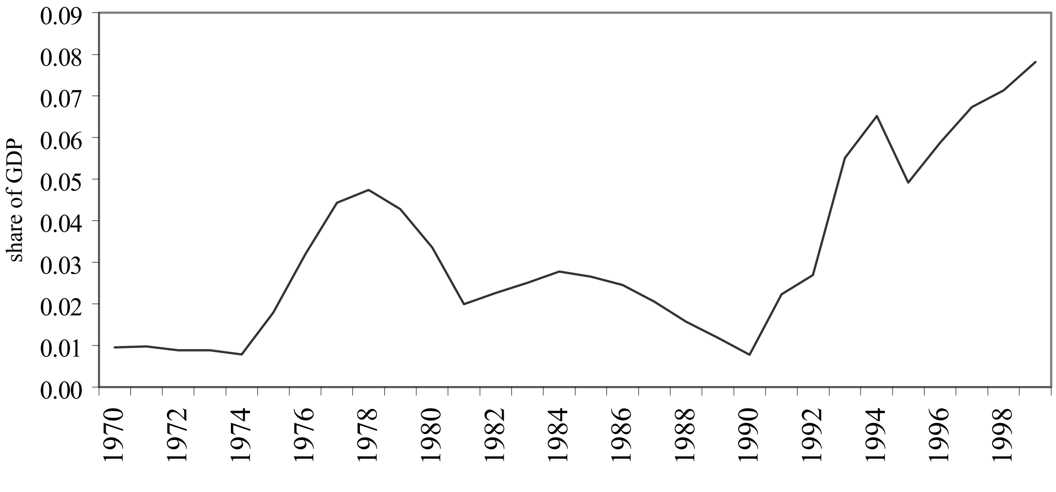


Figure 8: International Reserves, India

Source: Handbook of Statistics, Reserve Bank of India, 2000.

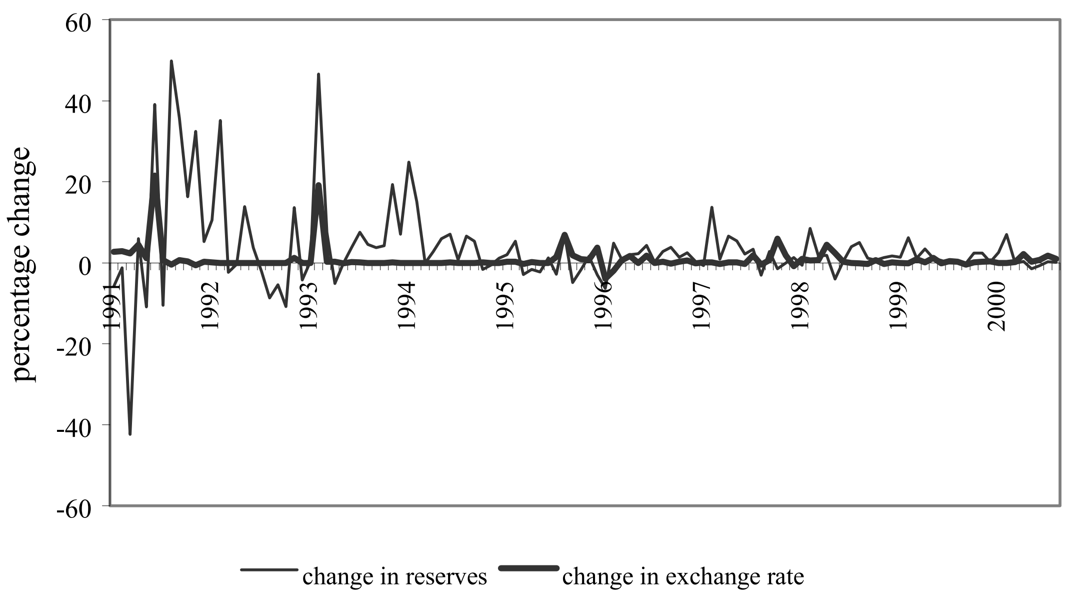


Figure 9: Change in Reserves and Nominal Exchange Rate, India

Source: Handbook of Statistics, RBI, 2000.

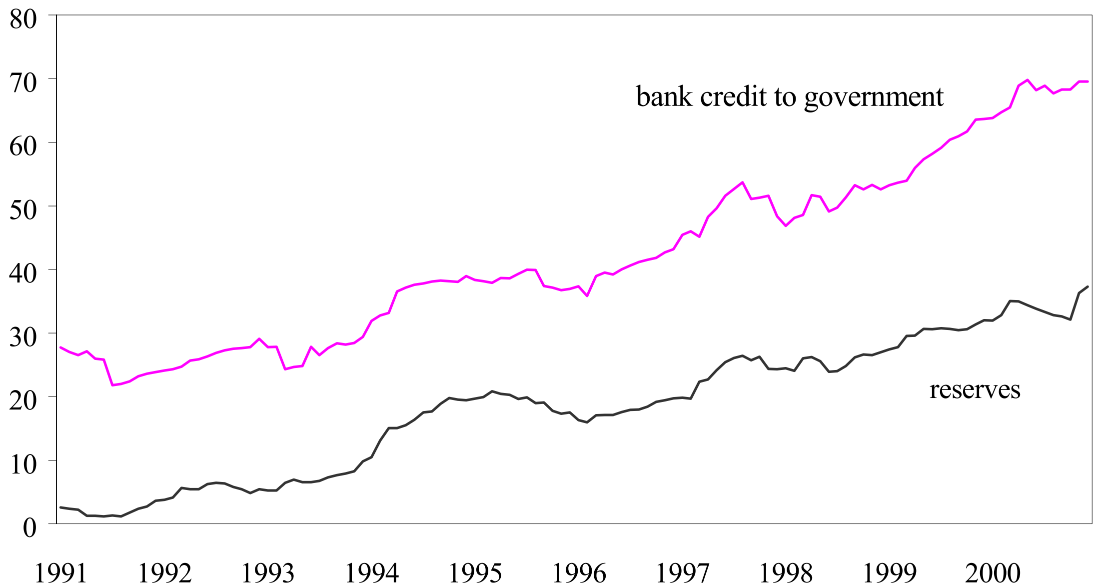


Figure 10: Reserves and Bank Credit to the Government
(billions of US dollars)

Source: International Financial Statistics, IMF.