Sweder van Wijnbergen

Credit Policy, Inflation, and Growth in a Financially Repressed Economy


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CREDIT POLICY, INFLATION AND GROWTH IN A FINANCIALLY REPRESSED ECONOMY

Sweder van WIJNBERGEN*
Massachusetts Institute of Technology, Cambridge, MA 02139, USA

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We analyse credit policy in an open economy macro-model incorporating stylized facts about the financial sector of LDC's (absence of security markets, existence of a curbmarket). These facts are incorporated in the financial sector part of a Keynes–Wicksell growth model. We focus on a transmission channel of monetary policy into the supply side of the economy via the cost of working capital. We show that ignoring this effect when analysing restrictive credit policy leads to underestimates of inflation and overestimation of output and current account improvements. It is shown that a credit crunch can be stagflationary in the short run. A cut in the real stock of credit is shown to lead to a lower steady-state capital stock.

1. Introduction

In short-run models of an open economy supply behaviour is typically either assumed to be totally elastic, which leads to Keynesian multiplier models [see for example Metzler (1942) or Mundell (1968)], or to be fixed exogenously, as in the models often used by adherents to the Monetary Approach to the Balance of Payments.

It seems to be generally accepted that the first assumption is inappropriate for an analysis of what is going on in most LDC's: tariff structures and sticky real wages cooperate in producing capital shortages and surplus labour at the same time. This has led to the widespread use of the assumption of fixed supply and therefore real income. If one adds to this a target path for future prices (to be reached by incomes policy) the future demand for monetary liabilities is predetermined. This in turn leaves only the composition of monetary assets (Net Foreign Assets and Domestic Credit), and not the level, as an instrument of monetary policy. An immediate conclusion is that domestic credit is an effective instrument to control the

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NFA position. This is, incidentally, the analytic framework behind IMF stabilization policies [cf. Polak (1957) or Robichek (1978)].

There is increasing evidence however, that these models fail to capture elements that are necessary to understand and predict the consequences of credit policy in LDC's. IMF reviews of their own stabilization attempts show that they have a persistently poor score on both real growth and inflation, overpredicting the first and underestimating the second [cf. Reichman and Stillson (1978)]. Specific country studies [Cavallo (1977), van Wijnbergen (1978, 1982); cf. Bruno (1979) for a theoretical contribution] point to certain features of the financial structure in a typical LDC as important left out factors. It is very important that securities markets and consumer credit are virtually absent in most LDC's. Bank credit is mainly used for business loans which are needed to finance working capital (and quite often fixed capital). This results in a direct link between credit and the supply side of the economy, thereby violating the assumption that real income is independent of the credit policy enacted.

A second issue stems from the observation that, if tight credit is used to reduce expenditure and so redress current account imbalances, investment often takes a large share of the adjustment burden. Is external balance bought at the expense of long-run growth prospects?

To analyse long-run aspects, we obviously have to construct an open economy growth model. Monetary growth models are virtually absent from the International Economics literature, and the few that exist [cf. for example Dornbusch (1975)] are really open economy extensions of the neoclassical models used in the money-growth debate of the late sixties and early seventies. While these models have desirable steady-state characteristics, their assumption of continuous market clearing and full employment 'assumes away a host of interesting short run problems', as Dornbusch notes in the introduction to his JME paper. In view of the fact that we want to analyse both short-run and long-run consequences of credit policy, these models are clearly inappropriate.

The assumption of a high speed of adjustment in asset markets is probably not unrealistic, certainly not in the presence of large unorganized money markets. However, there is substantial evidence that goods and labour markets adjust slowly (compared with asset markets). Accordingly, we will present a model that stresses differential adjustment speeds in goods and assets markets. In doing so, the model resembles the closed economy Keynes–Wicksell growth models that were briefly debated in the late sixties. Fischer (1972) shows that, if correctly specified, KW models have the same steady-state properties as comparable neoclassical models, but exhibit more realistic short-run behaviour.

To be able to analyse the first, 'short-run' issue discussed above, we will incorporate a financial sector that satisfies all the consistency conditions
outlined by Tobin (1975), but stresses the role commercial bank credit plays in financing working capital in most LDC's.

In section 2 the model is presented. In section 3 the short-run characteristics of the model are analyzed, and impact effects of a credit crunch are discussed. The conclusions emerging from a comparison with a fixed supply version of the model are that neglect of the direct credit-supply side link via the financing of working capital will lead to:

(1) underestimates of inflation,
(2) overestimation of real growth,
(3) overestimation of current account improvement.

The last point depends on the assumptions made on spill over effects from goods market disequilibrium.

In section 4 asset accumulation over time is introduced together with price dynamics to analyse the steady-state characteristics of the model and long-run consequences of tight credit policy. It is shown that this will reduce the long-run capital stock. In section 5 we show however that in the admittedly extreme case of perfectly elastic supply of foreign loans, domestic credit has no influence on the long-run capital stock and domestic product (it does influence national income: tight credit in this case leads to larger foreign indebtedness and therefore to a higher debt service burden).

2. The model

2.1. The financial sector

The model presented here incorporates several stylized facts typical of financial markets in LDC's.

Markets for non-monetary government debt are largely non-existent. An unhappy consequence of this is that government deficits automatically feed into the money supply. Also non-existent are significant markets for equities and commercial paper. Intermediation between private wealthholders and the business sector takes place either via the banking system or the curb market. So firms have to finance their fixed capital stock (and its increment, investment) and the working capital they need (more on that in the next section) by short-term bank credit, retained earnings or loans from the Unofficial Money Market.

We will consider retained earning as a loan by the owner of the firm to the firm, and put the firm owner in the same category as money lenders at the Unorganized Money Market, the category 'Public'. In the model presented here we will represent all this by assuming that firms issue bonds to finance
their capital needs. These bonds are held by banks, owners of firms and money lenders at the UMM.\(^1\)

Commercial banks are assumed not to hold free reserves, not an unrealistic assumption for inflation-plagued LDC's. This makes reserve requirements and ceilings on the volume of bank loans mutually dependent instruments. In what follows we will assume that credit ceilings are used, but identical results can be obtained with the other assumption. On their liability side, banks do not have control over deposit rates, these are fixed by the monetary authorities (which, of course, is also the case in most developed countries). This implies that they are thrown off their supply curve and have to accept whatever amount the public wants to hold as deposits at the banking system [Tobin (1975)].

Private individuals, finally, can hold their wealth as money (cash or bank deposits\(^2\)) or they can acquire direct claims on firms by lending on the Unofficial Money Market.

A series of balance sheets, based on the financial structure whose outlines we just sketched, is presented below.

\[
\begin{array}{cccccc}
\text{CB} & \text{Commercial banks} & \text{Firms} & \text{The public (firmowners and others)} \\
NFA & C & R & DD & pK & pB, & M \\
NDC & R & pB, & pD_t & pB_p & & \\
\end{array}
\]

\[M = DD + C, \quad MB = NFA + NDC,\]

\[pW = M + pB_p = M + pK + pD_t - pB_p = MB + pK + pD_t.\]

For a list of symbols and their meaning, see the list of symbols in the appendix.

The behavioural equations transforming all this accounting into economics are as follows. The public has a Tobin-type demand for money,

\[M_d = m(i, y)pW, \quad (1)\]

\(^1\)Capital gains on the firm's assets create a problem in a model without equity on the liability side to 'absorb' the gains. The natural way of solving that is to introduce equity in this model. Although the introduction of a market in such claims would clearly reduce the realism of the model, stock markets do not play a significant role in LDC's. I have chosen not to introduce equity because of that reason. Instead I have made the simplifying but admittedly very artificial assumption that firms issue new debt simultaneously with the capital gain and distribute the cash so raised randomly among bond holders. The point that this transfer is distributed randomly is important because in this way the transfer does not become part of the rate of return on those bond holdings; \(i\) can therefore still be interpreted as the (nominal) rate of return on bond holdings.

\(^2\)For simplicity and without loss of generality, we assume that wealth holders maintain a fixed cash demand deposit ratio.
where $i$ represents the interest rate in the Unorganized Money Market (UMM from here on). This implies a supply of 'private loans' via the wealth constraint:

$$ pB_p = (1 - m(i, y))pW. \tag{2} $$

Further, firms can borrow from banks. Equity is assumed not to exist while retained earnings are modelled as if they were UMM loans (from the owner of the firm to the firm). As to the asset side of their balance sheet, they have a capital stock that is fixed in real terms at any moment in time. They also have to finance their working capital needs $D_f$ (in real terms; more on $D_f$ below). Their total demand for funds (in real terms, deflated by $p$, the price of the good they produce) becomes

$$ B_s = D_f + K. \tag{3} $$

Equality between demand–supply for funds at the curbmarket would require that the part of the business sector's demand for funds not covered by bankloans $(B_s - B_b)$\(^3\) is matched by the public's supply of curb-market loans, $B_p$ (all quantities are deflated by $p$):

$$ B_s - B_b = B_p, \quad \text{or} \quad D_f(w, y) + K = (1 - m(i, y)) W + B_p. \tag{4} $$

Demand for working capital $D_f(w, y)$ is derived in section 2.2.

Using the balance sheets constraints on banks and private individuals, it is easy to show that equilibrium in the curbmarket implies equilibrium in the money market.

The critical question is of course, will this equality in fact obtain, does the curb-market rate move quickly enough to clear the market. The accepted wisdom seems to be that it does not [see for example Wai (1957) or McKinnon (1973)]. The argument is always the same, the persistence of wide interest differentials for similar loans is taken to be evidence of a segmented market in disequilibrium, a case of credit rationing (see the two authors mentioned above). The conclusion of disequilibrium however seems to me a non-sequitur. The point is that the different rates may be charged on similar loans (similar maturity etc.), but not to similar customers. In fact the most well known explanation of the persistence of credit rationing in highly developed but regulated financial systems such as the American one is

\(^3\)The implicit assumption made here is that firms try to obtain bank credit before going into the curb market. Bank credit is typically offered at below market clearing rates in most LDC's, so this is not an unrealistic assumption.
exactly the inability of banks to charge different rates to different customers for the same type of loans [Jaffee and Modigliani (1969)]. The fact that this is possible in curbmarkets, and the ensuing interest differentials on similar loans are thus an argument for equilibrium in this market, not for disequilibrium. For empirical evidence in support of this claim, see van Wijnbergen (1982).

2.2. The real sector

Production is subject to a production function assumed to be separable in capital $K$ and other factors $L^2$

$$y = f(K)h(L)^{1/a}, \quad a > 1.$$  \hspace{1cm} (5)

This can be described alternatively by the restricted cost function:

$$c = y^a f^{-a}g(w)$$  \hspace{1cm} (5')

with $w$ a vector of real (in terms of home goods) factor payments. (5') can be derived from (5) via simple cost minimization. We will assume that all payments to ‘other factors’ are financed by short-term credit, so the demand for working capital is

$$D_f = D_f(w, y),$$  \hspace{1cm} (6)

where both partial derivatives of $D_f$ are positive. We will assume $w$, the real wage in terms of domestic goods, to be parametrically determined, as mentioned in the introduction.

Firms will attempt to maximize profits $py - pc(1 + i - \bar{p})$. This leads to

$$1 = ay^{a-1}f^{-a}g(w)(1 + i - \bar{p})$$  \hspace{1cm} (7)

or price equals marginal costs [inclusive borrowing costs $(i - \bar{p})c$]. We take the real instead of the nominal rate to represent the marginal cost of borrowing, which is consistent with our assumption of a fixed real wage.$^6$

$^4$For a similar model of firm behaviour see Bruno (1979).

$^5$Although for any single firm $c = y^a f^{-a}g(w)$ is a flow variable, it is straightforward to show that aggregation over firms leads to a stock demand for credit $n\cdot c$ with the stock/flow conversion factor $n$ linearly dependent on the production delay. A discrete delay in production implies that output $y$ cannot change instantaneously to the new short-run equilibrium value after a disturbance, but can only do so after a time period equal to the duration of the production delay. This will be ignored in what follows.

$^6$This is covered in app. D (available on request).
Planned expenditure on domestic goods is

\[ A_d = C_d(q, y_d, W) + I + G + E(q) \]  

(8)

with \( q = \frac{p}{(ep^*)} \) and \( y_d = y - T - \beta^*MR \). Capital gains are included in the definition of disposable income to maintain consistency between the definition of private saving and private wealth (i.e., to be able to define wealth as accumulated savings).

The investment function is a conventional Keynes–Wicksell investment function:

\[ I = I(i - p^*, K). \]  

(9)

With \( i \) and \( y \) determined simultaneously by firms and money lenders, there is obviously no guarantee that demand for domestic goods \( A_d \) will equal the supply \( y \), assuming that prices cannot jump to clear the market. This comes down to assuming immediate adjustment to disturbances on the assets markets but slow (depending in \( \lambda \), see below) adjustment on goods markets.

If firms noticing the excess supply (demand) for their products react by trying to adjust their relative price, aggregation over firms leads to a price inflation equation:

\[ \hat{p} = \pi^* + \lambda(A_d - y). \]  

(10)

For a discussion of this equation see Barro (1972) or Fischer (1972).\(^7\)

Finally we have to specify our expectations hypothesis. While somewhat unusual for an analysis of a LDC type economy, we will assume Rational Expectations (RE). The fact of a less highly developed financial and industrial structure seems to me an insufficient argument for persistent suboptimal behaviour. Moreover, the RE assumption permits one to disentangle the consequences of exceptional errors from other phenomena under study. RE in this non-stochastic model comes down to perfect foresight:

\[ \pi^* = \pi. \]  

(11)

Noting that \( \pi = \gamma \hat{p} + (1 - \gamma)\pi^* \) with \( \pi^* \) the 'imported' foreign inflation rate, (10) can be rewritten to get

\[ \hat{p} = \pi^* + \frac{\lambda}{1 - \gamma}(A_d - y), \text{ or} \]  

(10')

\(^7\)Firms adjust their output price with respect to the prices of all other goods traded in the economy, including imports. Accordingly, expected general inflation \( \pi^* \) rather than expected domestic goods inflation appears at the right-hand side of eq. (10).
\[ A_d - y = \lambda^{-1}(\pi - \pi^*) \quad \text{with} \quad \lambda = \lambda(1 - \gamma)^{-1} \quad (10') \]

which will turn out to be convenient later on. It is maybe worthwhile to point out that the assumption of RE adds an immediate transmission channel between jumps in the foreign inflation rate and the domestic economy. While any well specified expectations mechanism should have this feature in the long run, under the RE assumption changes in the foreign inflation rate are incorporated without delay in the expectations formation process.

Finally there is the question of how to allocate output when \( A_d \neq y \). Obviously at this level of aggregation development of a theory of allocation under disequilibrium is not likely to be a fruitful exercise; instead we follow Fischer (1972) and assume that both investors and consumers will have to give in when \( A_d > y \). In particular, actual investment becomes:

\[ I = I - (1 - z)(A_d - y) = 1 - v(p - \pi^*) \quad \text{with} \quad \lambda = (1 - z)^{-1}. \]

\( (1 - z) \) is the fraction of the total amount of rationing falling on investment, \( z \) falls on domestic and foreign consumption of our goods (respectively \( C_d \) and \( E \)). The model is however not a proper Malinvaud-type dis-equilibrium model because output is assumed to be always supply determined, not just in excess demand situations.

Spillover effects due to frustrated demands for domestic goods obviously cannot cause disequilibrium in either money or loans (UMM) market: the spillover is the difference between two flows and therefore a flow itself and cannot instantaneously change any stock. However, spillover effects do influence the current account (another flow variable). This issue will be taken up later on.

3. Analysis of the model

At any moment in time \( K, MR \) and \( q \) are given, inherited from the past. Given these state variables, the ‘short-run’ model boils down to

\[ 1 = ay^{n-1}f^{-a}g(w)(1 + i - \bar{p}), \quad \text{supply,} \quad (13) \]

\[ \dot{\bar{p}} + K = (1 - m(i, y))W + B, \quad \text{equilibrium in the UMM,} \quad (14) \]

\[ \dot{\bar{p}} = \pi^* + \lambda (A_d - y). \quad (15) \]

Equilibrium in the assets markets together with supply behaviour gives us one relationship between the inflation rate \( \bar{p} \) and income \( y \). Differentiating (14), the assets markets equilibrium equation, gives
\[(mD_{ty} + m_y W)dy + m_W Wdi = dB.\]  \hspace{1cm} (16)

Eq. (13), supply behaviour, yields

\[\frac{(a-1)dy}{y} + \frac{di}{1+i-\hat{\rho}} - \frac{d\hat{\rho}}{1+i-\hat{\rho}} = 0.\]  \hspace{1cm} (17)

Substituting out \(di\) gives a positive relation between \(y\) and \(\hat{\rho}\):

\[\frac{d\hat{\rho}}{dy} \bigg|_{LM} = \frac{(a-1)}{y}(1+i-\hat{\rho}) - \frac{(mD_{ty} + m_y W)}{m_W} > 0.\]  \hspace{1cm} (18)

To see what is going on, consider an increase in \(\hat{\rho}\), the actual and expected rate of change of domestic goods prices. *Ceteris paribus*, this would lower real credit costs and therefore induce an additional supply of domestic goods. However, this also increases demand for money and thus reduces the supply of loans while it increases the demand for them, leading to an increase in the nominal rate \(i\). This partially (otherwise the expansion would not start to begin with) offsets the initial disturbance. Together this yields a positive relation between \(\hat{\rho}\) and \(y\) [eq. (18) and fig. 1].

This relation (labeled S in fig. 1) indicates what will be produced at various inflation rates, given a market clearing interest rate at all times, and might be called a 'pseudo-supply curve'.

Differentiating eq. (15) which links the change in domestic prices to foreign inflation and disequilibrium in the market for domestic goods, gives eq. (19):

\[(1 + \ddot{x}(c_y M_R + I_1))d\hat{\rho} = -\ddot{x}(1-c_y)dy + \ddot{x}I_1 di.\]  \hspace{1cm} (19)
The coefficient of $d\hat{p}$, $(1+\hat{k})(c_yMR+I_1)$, plays a crucial role in the stability analysis. If it is positive, all three necessary and sufficient conditions for stability of the stock equilibrium will be satisfied (cf. app. A.1). It turns out that the coefficient has a straightforward interpretation: $-\hat{k}(c_yMR+I_1)$ is the contribution of a 'blip' in inflationary expectations to the actual inflation rate $\hat{p}$. It is partly positive, because given everything else, it reduces the real rate and so increases investment demand, and partly negative $(-\hat{k}c_yMR)$, because higher expected inflation implies higher expected capital losses on nominal assets and so reduces disposable income $y-T-\hat{p}^*MR$. The condition

$$1+\hat{k}(c_yMR+I_1)>0.$$  

(20)

simply states that if the actual inflation rate changes because an increase in inflationary expectations disturbs goods market equilibrium, it should increase by less than the original disturbance.

Combining the asset market equilibrium condition (16) with (19) gives a second relation between $\hat{p}$ and $y$, which might be called a 'pseudo-demand curve'. This relation gives the rate of (domestic) price inflation $\hat{p}$ generated by excess demand pressure in the goods market, again assuming a market clearing interest rate,

$$\frac{d\hat{p}}{dy}_{\mid D} = \frac{-\hat{k}[(1-c_y)+I_1(mD_f+y+m_yW)/(m_yW)]}{1+\hat{k}(c_yMR+L_1)} < 0.$$  

(21)

The curve slopes downward: an increase in output $y$ leads to an only partially offsetting increase in aggregate demand ($c_y<1$). It also increases money demand which, given the money supply, leads to higher interest rates and therefore less investment expenditure. Both factors slow down inflation.

Now we can analyse the short-run effects of a lowering of the ceiling on domestic credit to the private sector, $B_b$, (due to the assumption that the price level $p$ cannot jump, we may indeed consider the credit ceiling in real terms, $B_b$, as our policy variable).

The decrease in bank loans tightens credit conditions, thereby not permitting as high a production at the ongoing inflation rate as before: Working capital has become more expensive to finance (i.e., the S curve shifts to the left). Formally, this can be shown by solving eqs. (16) and (17) with $d\hat{p}=0$ to get eq. (22),

$$\frac{dy}{dB_b}_{\mid LM} = [mD_f+y+m_yW] - \frac{m_yW}{y}(a-1)(1+i-\hat{p}).$$  

(22)

*Appendices are available on request.
Demand however will also be effected. Tighter credit will push up the interest rate and lead to lower investment given the inflation rate: the $D$-curve shifts to the left too,

$$\frac{dy}{dB_t}_{c=\hat{b}} = \frac{I_1}{(1-c_y)m_{y}W + I_1(mD_{fy}+m_yW)} > 0 \quad \text{and} \quad dB_t < 0.$$

The net effect on inflation depends on whether the impact on the supply side via higher costs of working capital (the shift of the $S$-curve) dominates the traditional negative impact on demand via depressed investment. This case, with strong supply effects and/or weak interest sensitivity of investment, is depicted in fig. 2. The output goes down more than aggregate demand for our good, so that investors and consumers will have to be rationed. Inflation will increase from $\pi^*$, the world inflation rate from which we started by assumption to $\hat{p}_B$. It is worthwhile to point out that investment under this scenario is hit twice: first the real rate rises (see app. A.3), so intended investment $I$ goes down; second actual investment $\hat{I}$ falls short of the intended level due to the rationing. Our model thus tends to confirm the real world fact noted in the introduction, that investment takes a large share of the adjustment burden.

![Fig. 2](image-url)

Obviously even if we neglect asset accumulation over time, to which we will come back in section 4, this is not a sustainable equilibrium: the terms of trade will change and competitiveness will decline as long as $\hat{p} > \pi^*$ (and the exchange rate remains fixed). This will shift both foreign and domestic demand away from our goods, shifting the $D$-curve until domestic and foreign inflation rates have converged at point $C$ (fig. 2). This is not a particularly interesting dynamic exercise however, the assumption of constant asset stocks is highly unrealistic.
Without the supply effects or with very interest sensitive investment, the demand shift will dominate the supply shift and both production and inflation will go down after a credit crunch, a more familiar result (see fig. 3). In this case the drop in supply is demand induced and no rationing of consumer or investment expenditure occurs [if eq. (10') applies, and note that $\hat{p}_R < \pi^*$ now].

![Diagram](image)

The observation that inventories tend to be low in periods of tight credit, and the fact that IMF stabilization programs, which rely heavily on the use of credit ceilings, nearly always perform poorly on their inflation and real growth targets [see again Reichman and Stillson (1978)] might be explained therefore by the presence of strong supply effects due to the credit–supply link modelled above.

Before we finish the short-run analysis by looking at the current account, we will have to say something on spillover effects. The current account is the only place where they show up immediately. While it may be reasonable to assume spillover effects of frustrated consumer demand for domestic goods into the foreign goods market, this is not obvious for investment. At least in LDC's, domestic and foreign investment are more likely to be complementary than substitutes, the former mainly consisting of construction, the latter of machinery imports. Accordingly, we will assume spillover of consumer expenditure, but no spillover of frustrated investment goods demand into the foreign market. The issue is relevant because rationing in the domestic market without spillover into other expenditure categories will lead to an unplanned curtailment of expenditure given income and therefore to an improvement of the current account.

The current account equals actual income minus actual expenditure (with the possibility of disequilibrium in the home goods market, it does not necessarily equal income minus planned expenditure):
actual income
\[ y = c_d + I + G + E(q) - \hat{x}^{-1}(\hat{\rho} - \pi^*), \] (23a)

actual expenditure
\[ A_T = c_d + c_m + I + G - (1 - z) \hat{x}^{-1}(\hat{\rho} - \pi^*), \] (23b)

\[ CA = E(q) - c_m(q, y_d, W) - z \hat{x}^{-1}(\hat{\rho} - \pi^*) = CA - z \hat{x}^{-1}(\hat{\rho} - \pi^*) \] (23c)

with
\[ CA = E(q) - c_m. \] (23d)

c_m (= c_T - c_d) is consumer demand for imports. CA is the ex ante current account surplus. The actual or ex post current account surplus CA equals CA minus the rationing term \( z \hat{x}^{-1}(\hat{\rho} - \pi^*) \).

Under both scenario's (supply or demand effects dominate the impact of tightening of credit, see figs. 2 and 3), the ex ante current account surplus CA improves [cf. (23d); in both cases disposable income \( y_d \) goes down while \( q \) and \( W \) do not change instantaneously]. If the credit squeeze is deflationary, the current account CA will improve even more [see (23c); in this case \( \hat{\rho} < \pi^* \)] unless all rationing falls on investment \( (z = 0) \).

However, if the impact of the credit squeeze is dominated by supply effects via higher costs of working capital, inflation will accelerate and the actual current account will improve less than the ex ante current account, and in fact may even deteriorate [now \( \hat{\rho} > \pi^* \), cf. again (23c)], as long as at least some of the rationing falls on domestic or foreign consumers of our goods \( (z > 0) \).

4. Dynamics

To be able to analyse long-run consequences of stabilization policies, we have to consider asset accumulation and the way it is influenced by the policy under study.

Capital accumulation equals investment \( I \) minus depreciation \( \delta K \), or, using eq. (21),
\[ \dot{K} = I - \delta K - v(\hat{\rho} - \pi^*) = I(i - \hat{\rho}, K) - \delta K - v(\hat{\rho} - \pi^*). \] (25)

Accumulation of real financial wealth equals domestic credit creation and net change in foreign assets (balance of payments deficits) minus inflationary erosion \( \hat{p}MR \):
\[ M\dot{R} = \frac{ND\overline{C}G}{p} + \frac{NB\overline{A}}{p} - \hat{p}MR, \] (26)
$N^CA$ equals the current account in the absence of capital flows, in that case $N^CA = Y - c_T - I - G$, income minus expenditure $NDC^CB$ can be substituted out using the government budget constraint $G = T + NDC^CB$. If we further assume zero taxes for simplicity ($T = 0$), all this leads to

$$MR = G + y - c_T - I - G - \bar{\rho}MR = y_d - c_T - I + v(\bar{\rho} - \pi^*).$$

(26')

Finally as long as $\bar{\rho} \neq \pi^*$, the terms of trade change, preventing equilibrium in the goods market. This is expressed in the final equation:

$$\dot{q} = \bar{\rho} - \pi^*.$$  

(27)

Long-run equilibrium will be characterized by unchanging terms of trade ($\dot{q} = 0$) and therefore convergence of foreign and domestic inflation rates, a constant capital stock (keep in mind we assumed zero population growth; generalization to positive growth is trivial and changes nothing essential) and gross private savings sufficient to cover replacement investment and to 'pay the inflation tax':

$$y - c_T = \delta K + \bar{\rho}MR.$$  

(28)

To actually solve this $3 \times 3$ system, the variables $i$, $\bar{\rho}$ and $y$ have to be expressed as functions of the state variables $K$, $MR$ and $q$:

$$y = y(K, MR, q; B_b, w, \pi^*, G),$$

(29)

$$\bar{\rho} = \bar{\rho}(K, MR, q; B_b, w, \pi^*, G),$$

(30)

$$i = i(K, MR, q; B_b, w, \pi^*, G),$$

(31)

$y_1$ is ambiguous: on the one hand, a higher $K$ increases capacity, which increases the supply of output, but on the other hand it depresses investment $I$, which, ceteris paribus, will lower $\bar{\rho}$, and it raises demand for loans, thus leading to higher $i$. Together this increases the real rate, which will lower the supply of output. In what follows we will assume that the capacity effect dominates. We will mention in footnotes places where relaxing this assumption would reverse the conclusions.

The ambiguity of $\dot{\rho}_4$, $d\bar{\rho}/dB_b$, has already been discussed in section 3 (cf. figs. 2, 3). The sign of $\dot{\rho}_2$ could not be determined uniquely from the
assumptions made. We assume it to be positive for reasons that will become clear in the stability analysis. The remainder is fairly self evident.

The model can be analyzed using fig. 4. Using eq. (27) to eliminate \( q \), we are left with two equations describing equilibrium values of \( K \) and \( MR \). The \( K \)-locus gives a set of points in \( K-MR \) space at which net additions to the capital stock are zero. An increment in \( MR \) will lower \( i \) and therefore \( i-n^* \), the real rate (note that in equilibrium \( \dot{p} = \pi^* \)). This will raise investment until a new equilibrium is reached at a higher \( K(I_2<0) \). So the curve is upward sloping:

\[
\frac{dK}{dMR}_{K\text{-locus}} = \frac{-(I_1i_2-I_1i_3\hat{p}_2\hat{p}_3^{-1})}{(I_1i_1+I_2-I_1i_3\hat{p}_1\hat{p}_3^{-1})} > 0.
\]

The \( MR \) locus gives those combinations that lead to zero net additions to financial wealth (in real terms). An increase in \( MR \) will reduce net private saving, which can be offset by a higher \( K \); this will increase income and therefore saving, and reduce net investment in capital goods, which, together, will increase net financial wealth accumulation. The \( MR \) locus, therefore, slopes upward too:

\[
\frac{dK}{dMR}_{MR\text{-locus}} = \frac{-(1-c_{T,y})y_2-\pi^*-I_1i_2-((1-c_{T,y})y_3-I_1i_3\hat{p}_2\hat{p}_3^{-1})}{((1-c_{T,y})y_1-(I_1i_1+I_2)-((1-c_{T,y})y_3-I_1i_3\hat{p}_1\hat{p}_3^{-1})} > 0.
\]

It follows from one of the stability conditions that the \( MR \) locus is steeper.

---

Fig. 4
than the $K$-locus:

$$\left| \frac{dK}{dMR} \right|_{MR-locus} > \left| \frac{dK}{dMR} \right|_{K-locus}$$ (34)

Now consider again the credit crunch from section 3, a reduction in the ceiling (in real terms) on the volume of bank loans outstanding. As in the analysis of the impact effects, the results depend crucially on whether the credit has an impact on supply or not. In section 3 it was shown that supply effects could actually reverse the sign of $\hat{p}_4$, making it negative. Consider first the case of $\hat{p}_4 < 0$.

Given $MR$, a lower level of credit will tighten credit conditions, raise interest rates and reduce net investment, till a lower $K$ has offset the disturbance, so the $K$-line shifts downwards (cf. figs. 5, 6). Further, a credit crunch will reduce disposable income and therefore saving, leading to a necessary offsetting reduction in $MR$: the $MR$-locus shifts to the left (fig. 5). The final result in this case (fig. 5) will be a lower capital stock and lower financial wealth (in real terms) due to the tight credit conditions. This obviously implies a lower production of domestic goods and lower income.

The picture will be less clear cut if we look at the other case, $\hat{p}_4 > 0$. While the $K$-locus will shift down as before, what happens to the $MR$ locus is ambiguous. It can be shown that the long-run result will still be a lower capital stock, but financial wealth may either increase or decrease (fig. 6 illustrates the first possibility).

A reduction in long-run financial wealth does not necessarily result in a reduction in NFA. What happens to Net Foreign Assets depends obviously on what the government does with net domestic credit. The government budget constraint tells us that
If the government aims at a zero current account deficit, all nominal financial asset accumulation $\pi^*MR$ will have to be provided by domestic credit expansion:

$$G = \pi^*MR = (ND\dot{C}/p) + \pi^*(NDC/p), \quad \text{or} \quad (ND\dot{C}/p) = \pi^*(NFA/p). \quad (36')$$

In this way the government exactly offsets private net saving, with a zero current account deficit as a result. Now if we assume the government was actually hitting a zero current account target before the credit crunch (i.e., $G = \pi^*MR_0$), it is obvious that in the new long-run equilibrium

$$G = \pi^*MR_0 > \pi^*MR_1, \quad (37)$$

in the case analyzed in fig. 5, or an unchanged government deficit will in the new equilibrium lead to a current account deficit. Endogenous tax receipts $T = T(y)$ clearly would make things worse. A resulting cut back in government expenditure to get the current account in line will lead to further contractionary effects.

5. Foreign lending

In this section we will relax the assumption that firms have access to domestic sources of funds only. In fact we will go to the other extreme and assume that they face an infinitely elastic supply at a fixed foreign interest rate $i^*$. This implies that firms arbitrage between foreign and domestic assets markets, thereby fixing $i$ at $i^*$, the foreign rate (expected exchange rate $J.D.E.-C$).
changes are zero, we are in a fixed exchange rate regime). As will be obvious, a decrease in $B_b$ will induce an equal amount of foreign lending, without further impact effects.$^9$ The $NFA$ position is influenced in two ways.$^{10}$

(1) A stock change (corresponding to an infinite inflow) equal to minus the change in $B_b$: $dB_f = -dB_b$.

(2) A deterioration of the current account because of the change in the debt service burden with $i^*dB_r$. See fig. 7 and app. A.3.

The long-run analysis is quite straightforward: as credit policy will be offset immediately by capital in or outflows, it cannot influence credit market conditions and therefore has no long-run effects on the level of production $y$. In the long run both $i$ and $\hat{p}$ are fixed at their 'foreign' levels, so it becomes obvious from eqs. (25) and (13) that $K$ and $y$ will be unaffected in the long run. In terms of the graphical apparatus of section 4, the $K$-locus is flat in this case [cf fig. 8 and eq. (32). Note that all the partial derivatives of $i$ are zero now]. What does change is disposable income. The increased debtservice actually decreases $y_d$: in conventional accounting terms, domestic product remains unaffected but national income falls. This reduces private saving and, in the long run, private financial wealth $MR$. So even with the extreme assumption of perfect capital mobility the traditional Monetary Approach tenet of long-run neutrality of credit policy does not survive. While the capital stock and domestic production will remain unaffected by a credit crunch, real financial wealth and disposable (national) income will be reduced because of the increased burden of servicing the foreign debt. A quantitative ceiling on foreign lending (imposed by the rest of the world?) or foreign interest rates that rise as total indebtedness increases, would reintroduce the stagflationary effects discussed in sections 3 and 4.

$^9$This is not entirely correct. Changes in foreign indebtedness result in changes in the debt service $i^*B_f$, which in turn changes disposable income. So not all transmission channels are cut off by the perfect capital mobility assumption. This is taken into account in app. C and in the long-run analysis in this section.

$^{10}$Note that the introduction of international capital flows and foreign debt leads to some modification of the definitions of the current account and disposable income, both now include (with a minus sign) interest payments on foreign debt.
6. Conclusions

In this paper we have attempted to give a theoretically rigorous but realistic (at least for LDC's) analysis of the short- and long-run consequences of credit policy for inflation, income, growth and external balance in a small open economy setting.

The model stresses differential speeds of adjustment in assets and goods markets, contrary to most money and growth models, which typically use the neoclassical assumption of continuous equilibrium in all markets. This does not affect the long-run properties of the model, but provides it with more realistic short-run behaviour.

Another feature of the analysis is the attention paid to the use that is actually made of commercial bank credit. It is an institutional fact in most LDC's that commercial bank credit is used almost exclusively for business loans to finance working (and, quite often, fixed capital) capital requirements of firms. This results in a direct transmission mechanism between domestic credit and production.

We show that this gives a possibly strong stagflationary bias to credit policy. Under conditions that are likely to be fulfilled in most LDC's, tight credit may actually increase inflation initially, will always slow down production, but will probably improve the current account. If it does so, however, it is shown that the crucial expenditure adjustment comes from a reduction in investment.

This brings us to the long-run consequences: a sustained policy of tight credit is shown to reduce the long-run capital stock, and, under the same conditions under which it leads to an increase in inflation in the short run, to reduce the long-run stock of financial wealth (in real terms) as well. If the government does not adjust its deficit in that case, this will result in a deterioration of the current account in the long run. If it does adjust its deficit via a cutback in expenditure (the only possibility in most LDC's), the contractionary effects will be exacerbated.
Finally it is shown that a perfectly elastic supply of foreign loans (perfect capital mobility) cures most but not all problems: obviously the stagflationary effects will disappear, as there is no need to induce the private sector to hold less money and supply more loans via higher interest rates, or for firms to cut back on production for lack of credit. It does however lead to an increased debt service burden and an accompanying decline in disposable income.

Appendix: List of the symbols used

- \(A_d\) real planned expenditure on domestic goods,
- \(A_T\) real planned total expenditure,
- \(B_b\) real ceiling on bank credit to the private sector,
- \(B_t\) real stock of loans from abroad,
- \(B_p\) real stock of loans from domestic non-bank sources (UMM),
- \(B_s\) real stock of loans from domestic bank sources,
- \(c_d\) real private consumption of domestic goods,
- \(c_m\) real private consumption of imported goods,
- \(c_T\) real total private consumption,
- \(D_t\) real demand for working capital by firms,
- \(I\) real planned investment,
- \(i, i^*\) domestic (foreign) nominal interest rate,
- \(K\) real fixed capital stock,
- \(m\) fraction of wealth held as money,
- \(M\) nominal money stock;
- \(MB\) monetary base (nominal),
- \(MR\) monetary base (real),
- \(NDC_{CB}\) net domestic credit from the central bank to the government (nominal),
- \(NFA\) net foreign assets (nominal),
- \(p, p^*\) price of domestic (foreign) goods,
- \(q\) terms of trade, \(q = p/(e p^*)\),
- \(y\) real production of domestic goods,
- \(W\) real private wealth,
- \(w\) real wage rate,
- \(z\) fraction of total rationing that falls on foreign and domestic consumers of domestic goods (so \(1 - z\) falls on investment,
- \(\pi^*\) foreign inflation rate,
- \(\pi, \pi^*\) actual (expected) inflation rate.

Hats (\(^\)\) indicate percentage changes. Real variables are obtained by deflating the relevant nominal variables with the price index of domestic goods, \(p\).
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