Macroeconomic Dynamics in a Financially Repressed Economy

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I. Introduction

The financial liberalization problem in less developed countries (LDCs) has been discussed in a number of studies since the simultaneous publications in 1973 by McKinnon and Shaw. Most studies are based on the so-called debt intermediation view of money; financial market can operate at optimum efficiency only if the monetary system is fully deployed as a financial intermediation between savers and investors. This is particularly valid in LDCs where commercial banks are the only organized capital market due to the lack of a significant open market for primary securities.

It has been argued that the real return on financial asset should be made attractive through an appropriate interest rate policy. Such interest policy is deemed desirable for two reasons. The first deals with the effect of a higher interest rate on saving. A higher interest rate increases saving by raising the price of present consumption. The second emphasizes the allocative efficiency of a high interest rate. Setting the real interest rate at market-clearing level increases the real cost of credit. Then only the most profitable investment would be taken.

The early experiments with full scale financial liberalization — the withdrawal of the massive state interventions typically found in the capital markets of LDCs (particularly, interest restrictions on both deposit and loans) — were successful in coun-

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tries such as Taiwan and Korea. However, unlike Taiwan which has a sustained financial deepening, Korean economy has regressed into a repressed state after achieving a phenomenal increase in the real size of banking sector for several years of the 1960's. A massive increase in export loan payments coupled with two supply shocks during the 1970's caused Korean inflation to soar, leaving the real interest rate on deposits near zero, if not negative. Consequently, the financial deepening has stopped and the Koreans have depended on foreign borrowings to finance their economic growth.

Then, an obvious question arises; can a monetary policy which raises the interest rate on both deposits and loans restore the financial deepening and reduce the dependence on foreign capital? To answer this, one needs to examine the relationship between interest rates and overall saving; how elastic is the total supply of saving to interest rates, and whether this elasticity varies with the size of financial intermediation.

Because open markets for primary securities do not exist, business investment is financed mainly by the corporate retained earnings — out of which the propensity to consume is low. The rest is channeled from the household sector through bank intermediation. This lack of financial integration makes household saving decisions independent of corporate saving. The true value of a firm is not registered in household asset portfolios. Therefore income redistribution from households to firms increases net saving in the economy.

A high interest rate induces households to increase saving. On the other hand, an increase in interest rate reduces corporation saving due to increased interest costs. Therefore, the overall effect of a rise in interest rates on total saving depends on the size of bank deposits (income redistribution effect) and the interest rate elasticity of household saving rate (substitution effect).

The purpose of this paper is to analyze the effects of alternative monetary policies in a closed LDC by explicitly incorporating the distribution of income between households and firms into monetary growth models. Here, the government not only imposes restrictions on bank interest rates but also finances a part of the private investments simply by printing money. It is contended that a high interest policy should be accompanied by a fiscal policy which offsets the income redistribution effect in lump sum in oder to achieve desirable effects on the output growth rate as well as inflation rate in an economy with a sizable banking sector.

In section II, we develop a Keynsian monetary growth model to discuss two sets of monetary policy — changes in bank interest rate and growth rate of money supply. The household saving rate is assumed to be fixed in the short run. In section III, a neoclassical monetary growth model is developed to investigate the long-run dynamics of the aforementioned policies. The household saving rates is assumed to be elastic to real interest rate, and the size of bank deposit *vis a vis* output is allowed to vary in the long run. Finally, section IV presents concluding remarks.

II. Short-run Dynamics

In this part, we develop a Keynsian monetary growth model to discuss short-run macroeconomic policies in an inflationary LDC which is also financially repressed.[1] This model emphasizes a short-run dynamics stemming from "forced saving" in the transition period when a policy is employed.

A. The Model

1. Monetary Sector

No taxation exists in this model. The government borrows from the central bank to finance loan payments to firms. The supply of money changes only through the changes in government loan payments. A characteristic feature of virtually all financially repressed economies is that an artificially low ceiling is imposed on bank interest rates. As the market for primary securities is insignificant, saving deposits in commercial banks are the only meaningful financial assets besides money. For simplicity, no reserve requirement is assumed to exist for a saving deposit. Commercial banks are regulated by the government so that they have no profit; this, together with no reserve requirment, assures that lending rate equals the deposit rate.

[1] See Stein and Fisher (1975) for different types of monetary growth model.

The public is assumed to desire to hold money balances which are strictly proportional to income. Considering high inflation and the liquidity of saving deposits, the public demands money (M1) for transaction motive only.[2]

$$(1) \quad M^d = kPy.$$

where M^d is a demand for money, P is a general price level and y is a real income. A fixed share, θ of total money stock is assumed to be held by the household sector while the rest of it is held by the firm sector.

2. *Inflation*

If there is an excess demand in the competitive market, there is some market bidding process that produces a rise in price. On the other hand, it is possible that firms have some power to set prices, or that market are organized by specialists who take the expected inflation rate into account in their prices. The actual rate of price change may be the sum of two elements; the specialist's expectation of price changes and the actual state of excess demand, as described by the following equation.[3]

$$(2) \quad \pi = f\left(\frac{y^d - y}{y}\right) + \pi^e,$$

where π is the inflation rate, π^e is the expected inflation rate and y^d is aggregate demand for goods and services.

By Walras' law, the excess demand for goods and services should equal the "flow" excess supply of money. Assuming that the speed of adjustment between the actual and the desired money holdings is a positive constant h, we can rewrite equation (2) as

2 Conlisk suggests that saving and time deposits be left out of the definition of money in LDCs.

3 This type of specification of inflation function is proposed by Stein, Hadjimichalakis, Goldman, and Fisher (1972).

$$(3)\ \pi = h(m-k) + \pi^e$$

where m is real money stock per unit of output.

The formation of inflationary expectation is given by the adaptive expectation which is originally introduced by Cagan and can be expressed in terms of the following differential equation.

$$(4)\ \dot{\pi}^e = \beta(\pi - \pi^e),$$

where $\dot{\pi}^e$ is the rate of changes in expected inflation rate and β is a constant greater than zero and less than one.

3. Saving, Investment, and Growth

The households save a fixed proportion, 1-c of their disposable income. A portion of the saving is held as money balance for a transaction purpose, while the rest is kept in a saving account. The real disposable income of the household sector can be written as

$$(5)\ y_d = w\alpha y + \frac{D}{P}(i-\pi^e) - \theta\frac{M}{P}\pi^e,$$

where y_d is disposable real income, w is institutionally determined real wage rate, α is a fixed labor-output coefficient, D is saving deposit and i is nominal interest rate fixed by the government.

The corporation saving (S_f) can be defined as

$$(6)\ S_f = y - w\alpha y - \frac{D}{P}(i-\pi^e) - (1-\theta)\frac{M}{P}\pi^e.$$

The total provision for investment is the sum of corporation saving, loan from commercial banks and government loan payment. Part of the investment is held as money balance by the firms for a transaction purpose while the rest is spent to finance the new investment for physical capital. By assuming no depreciation for capital, the investment demand for physical capital (I) can be defined as

$$(7)\quad I = [S_f - (1-\theta)\,(\frac{\dot{M}}{P})^d] + [(1-c)y_d - \theta\,(\frac{\dot{M}}{P})^d] + \mu\frac{M}{P}$$

where μ is a rate of change in money supply.

However, during inflationary periods, the total demand for output C + I exceeds the total supply of output y as long as the money market is not in equilibrium. Then, the question arises; how much of output will be allocated for physical capital formation. Clearly, both household and firms cannot be satisfied simultaneously during the period of excess aggregate demand. As Stein suggests, we assume that the actual rate of capital formation will be a linear combination of planned saving and planned investments. As in the inflation part, the excess demand for goods should equal the "flow" excess supply of money. Assuming the constant coefficient of speed between actual and desired money holding, we obtain

$$(8)\quad \dot{K} = y - c[w\alpha y + \frac{D}{P}(i-\pi^e) - \theta\frac{M}{P}\pi^e] + \lambda(\frac{M}{P} - \frac{M^d}{P}),$$

where $\dot{K}$ is a realized investment for physical capital and λ is a positive constant less than one.

The supply of labor is perfectly elastic because real wage rate is fixed above market clearing level by an institutional arrangement. The capital-output ratio is assumed to be a fixed constant, 6 by technical factors. Replacing $\dot{K}$ by $\sigma\dot{y}$ and dividing both sides of equation (7) by y, we obtain the following growth equation.

$$(9)\quad g = \frac{1}{\sigma}[\,1 - c[\alpha w - (i-\pi^e)d - \theta m\pi^e] + \lambda(m-k)\,],$$

where g is a output growth rate and d is a deposit-output ratio. Assuming that the deposit-output ratio does not change in the short run, the growth rate of output in this model is a function of real money stock per output, the expected inflation rate given policy variables — growth rate of money supply and nominal interest rate.

To see direct effects of π^e and m on g, differentiate equation (8) partially with respect to π^e and m:

$$(10) \qquad \frac{\partial g}{\partial \pi^e} = \frac{1}{\sigma} c(d+\theta m) > 0.$$

$$(11) \qquad \frac{\partial g}{\partial m} = \frac{1}{\sigma}(c\theta\pi^e + \tilde{\lambda}) > 0.$$

An increase in the inflation rate has a positive effect on the output growth rate by redistributing income from household sector to firm sector. An increase in real money stock per unit of output raises the output growth rate by increasing the inflation tax base as well as the forced saving.

B. Dynamic System

Along the equilibrium growth path, the expected inflation rate and real money stock per unit of output should not change. That is $\dot{\pi}^e = 0$ and $\dot{m} = 0$.

Differentiating the natural logarithm of both sides of the basic identity, $m = \frac{M}{Py}$, we obtain

$$(12) \qquad \dot{m} = \mu - \pi - g.$$

Substituting equations (3), (9) into (12) and (3) into (4), we obtain two basic differential equations of our model which describe the short-run time pathes of expected inflation rate and real money stock per unit of output.

$$(13) \qquad \dot{m} = \mu - [h(m-k) + \pi^e] - \frac{1}{\sigma}\Big[1 - c[w\alpha + (i-\pi^e)d - \theta m\pi^e]$$

$$+\lambda(m-k)\Big] = 0.$$

(14) $\dot{\pi}^e = \beta h(m-k) = 0.$

Equations (13) and (14) are represented by graphs in the phase diagram (see Figure 1).

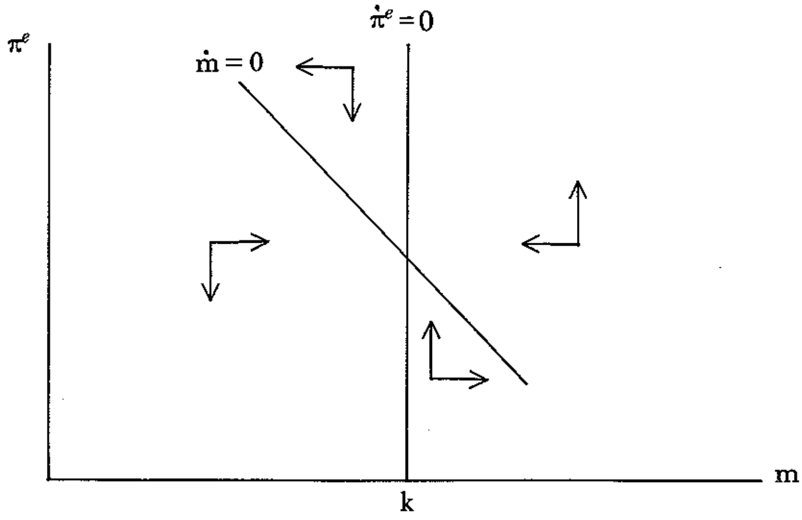
The stability condition is satisfied if the $\dot{m} = 0$ schedule has a negative slope (see Appendix 1). Otherwise the system is explosive outside the equilibrium locus.

(15) $$\frac{\partial \dot{m}}{\partial \pi^e} = -1 - \frac{\partial g}{\partial \pi^e} < 0.$$

(16) $$\frac{\partial \dot{m}}{\partial m} = -h - \frac{\partial g}{\partial m} < 0.$$

Figure 1

SHORT-RUN DYNAMIC SYSTEM



The $\dot{m}=0$ schedule has a negative slope as both π^e and m affect $\dot{m}$ in the same direction.

The points to the left of the $\dot{\pi}^e=0$ schedule are points where there is an excess demand for money and inflation rate tends to decline; the same thing happens to the expected inflation rate. The points to the right of the $\dot{\pi}^e=0$ schedule are the points where there is an excess supply of money and inflationary pressure is increasing. The points down to the left of the $\dot{m}=0$ schedule are the points where the sum of inflation rate and growth rate is lower than the growth rate of money supply so that the real money stock per unit of output is increasing. The opposite happens to the points down to the right of the $\dot{m}=0$ schedule.

C. Stabilization Policies

We can now employ the apparatus just developed to examine short-run implications of alternative stabilization policies.

1. A Reduction in Growth Rate of Money Supply

In terms of our model, a discrete reduction in rate of monetary expansion shifts the $\dot{m}=0$ schedule downward to the left while it has no effect on the $\dot{\pi}^e=0$ schedule (see Figure 2). The transition to the new steady-state equilibrium E_1 is depicted in Figure 2. The inflation rate is lower at the new equilibrium while the real money stock per unit of output remains unchanged.

What happens to m, π, and g during the transition period? A sudden reduction in monetary expansion initially decreases the real money stock per output. That is because the inflation rate does not fall enough to offset the reduction in monetary expansion due to the expectations carried over from the past. As people perceive somewhat later that inflation is slowing down, m start to increase. However, as m rises beyond k, the expected inflation rate bounces to increase, and so does the actual inflation rate until it reaches the equilibrium rate which is lower than the previous one.

Turning to the output growth rate, it is reduced rather sharply for the first stage of reduction in the growth rate money supply as loan payments to firms by the government are reduced suddenly. This problem is further complicated by the fact that as the inflation rate slows down, the firm's real interest cost increases,

Figure 2

DYNAMIC EFFECT OF A REDUCTION IN μ

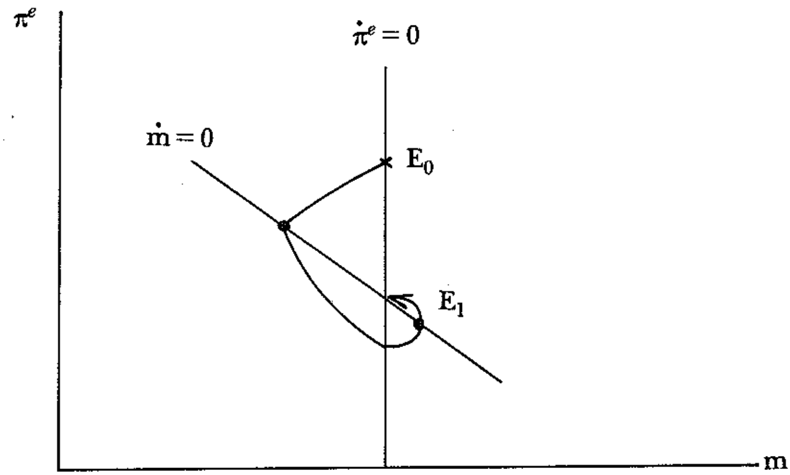
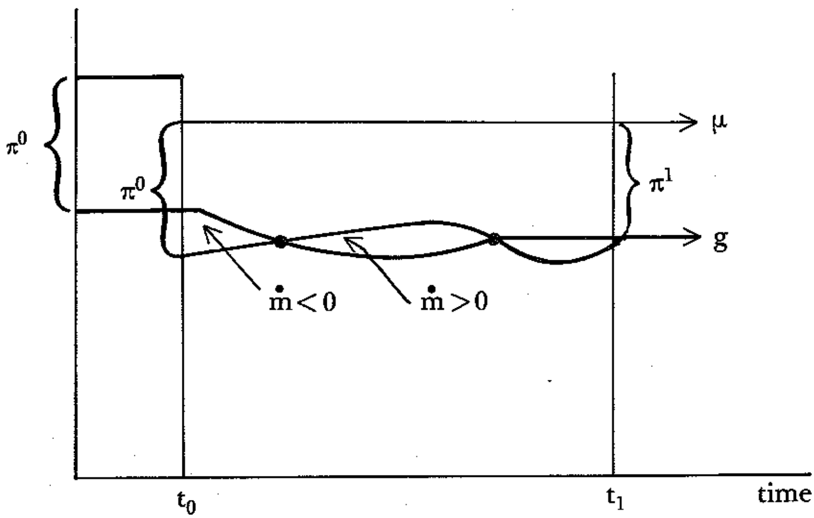


Figure 3

MOVEMENT OVER TIME IN π AND g



thereby reducing the amount of corporation saving. However, as the inflation rate and the real money stock per unit of output bounce to increase in the second phase, the output growth rate rises to its new equilibrium rate. The new output growth rate is definitely lower than the previous one because π has been reduced.

2. *An Increase in Nominal Interest Rate*

In terms of our model, a discrete increase in the nominal interest rate shifts $\dot{m}=0$ schedule upward to the right while the $\dot{\pi}^e=0$ schedule remains unchanged (see Figure 4). An increase in i raises $\dot{m}$ because it raises the interest costs of the firm sector, reducing g by $\frac{cd}{6}$. The inflation rate is higher at the new equilibrium, but the real money stock per unit of output remains unchanged. Therefore, the new equilibrium output growth rate is lower because the growth rate of money supply has not changed.

Let us examine the time pathes of m, π, and g. A sudden increase in i raises the interest costs of the firm sector, reducing corporation saving. This increased interest payments in turn raises household sector's disposable income by the same amount. However, since the household saving rate is less than 1, the overall saving rate drops; so does g. This in turn causes an excess demand for goods and services, raising π. The rising π lowers the real interest rate, partly reducing the interest burden of the firm sector. As g declines, m increases, raising π further. However, m starts to decrease in some time as g continues falling. As m falls below k, the excess demand for money develops and π starts to decrease. Thereafter, π and m converge cyclically to the new equilibrium rates and g also converges cyclically to the new equilibrium rate.

To sum up, an increase in the nominal interest rate has unfavorable effects on both the inflation and the output growth rate in the short run. One reason is that we treat the saving rate insensitive to the interest rate in the short run. The other reason is that we recognize the income redistribution effect of interest rate by incorporating the deposit-output ratio in the model. A change in the interest rate has a direct effect on the investment through redistribution of income from the firm sector to the household sector whose saving rate is less than the firm sector's. The saving rate is of course affected by the real interest rate and the deposit-

Figure 4

DYNAMIC EFFECT OF AN INCREASE IN i

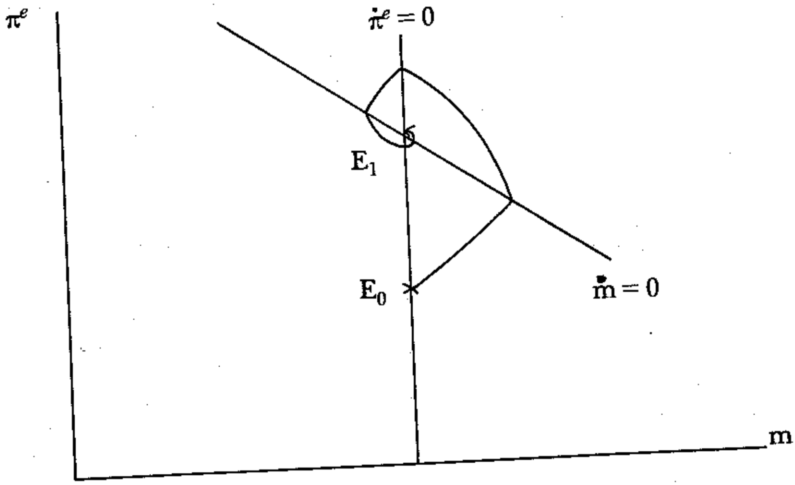
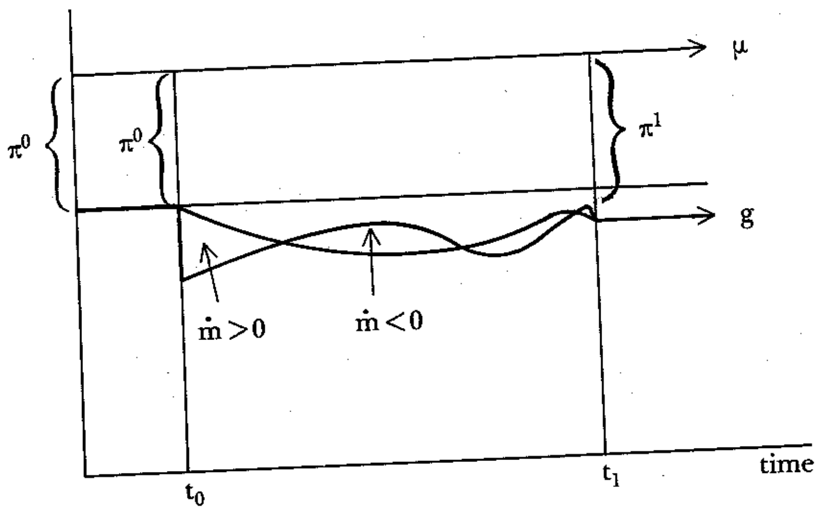


Figure 5

MOVEMENT OVER TIME IN π AND g



output ratio changes in the long run. Then, are the results we obtained in the short-run analysis invalid in the long run? This is the task we examine in the subsequent section.

III. Long-run Dynamics

In this part, we develop a neoclassical monetary growth model in discussing long-run stabilization policies in an inflationary LDC. The deposit-output ratio which reflects the firm's debt position will be recognized as an important factor in determining the long-run output growth rate.

A. The Model

The following modifications are made to the model in the previous section.

First, as household realize the real interest has changed in the long run, they take the expected real interest rates into the consideration of saving decision; i.e., the saving rate, 1-c is no longer a fixed constant but is a function of the expected real interest rate, $i\text{-}\pi^e$.[4] The household sector is assumed to increase its saving when the expected real interest rate rises.

Second, the deposit-output ratio changes in the long run. As long as the demand for money is strictly proportional to the nominal output, the deposit-output ratio also represents the degree of the firm's debt position. Therefore, the financial condition of a firm becomes more sensitive to changes in real interest rate as the deposit-output ratio gets larger.

Third, in the tradition of the neoclassical approach, we assume that the money market is in equilibrium in each moment of time.[5]

[4] Instead of using a "flow" saving function based on utility maximization, most authors in the financial liberalization literature use a "stock" demand function for real money stock (M2). For example, McKinnon (1973) derives a "flow" saving function from the "stock" demand function for real money stock. Therefore, the propensity to save is a function of the output growth rate as well as the real return on holding money.

[5] See Sidrauski.

$$(17) \qquad (\frac{M}{P})^s = (\frac{M}{P})^d = ky.$$

$$(17') \qquad (\mu-\pi)\frac{M}{P} = (\frac{\dot{M}}{P})^d.$$

After substituting equation (17) into (8), the actual investment for physical capital can be defined as

$$(18) \qquad \dot{K} = y - c[w\alpha y + \frac{D}{P}(i-\pi^e) - \theta\frac{M}{P}\pi^e].$$

Assuming that the capital-output coefficient is a fixed constant σ, we obtain the following growth equation.

$$(19) \qquad g = \frac{1}{\sigma}\left[1 - c[w\alpha + d(i-\pi^e) - \theta k\pi^e]\right],$$

where c is a function of $i-\pi^e$. Now the output growth rate, g is a function of the expected inflation rate and the deposit-output ratio, given policy variables — the growth rate of money supply and the nominal interest rate.

To see the direct effects of π^e and d on g, differentiate equation (19) partially with respect to π^e and d:

$$(20) \qquad \frac{\partial g}{\partial \pi^e} = \frac{1}{\sigma}\left[-(1-c)'\,[w\alpha + d(i-\pi^e) - \theta k\pi^e] + c(d+\theta k)\right],$$

$$(21) \qquad \frac{\partial g}{\partial d} = -\frac{1}{\sigma}c(i-\pi^e) < 0,$$

where $(1-c)' = \frac{\partial(1-c)}{\partial(i-\pi^e)}$ represents the sensitivity of the household saving rate with respect to the expected real interest rate. The sign of $\frac{\partial g}{\partial d}$ is negative as long as the real interest rate is positive. However, the sign of $\frac{\partial g}{\partial \pi^e}$ depends on $(1-c)'$ and d. For the economy with a high deposit-output ratio and an inelastic household saving rate with respect to the expected real interest rate, the direct effect of an increase in π^e on the output growth rate can be positive. The opposite happens to the economy with a low deposit-output ratio and an elastic household saving rate with respect to the expected real interest rate.

B. Dynamic System

Along the long-run equilibrium growth path, the expected inflation rate should equal the actual inflation rate: $\dot{\pi}^e = 0$. On the other hand, the deposit-output ratio should not change: $\dot{d} = 0$.

Differentiating both sides of the natural logarithm of equation (17) with respect to time, we obtain

$$(22) \quad \pi = \mu - g.$$

As was the case before, the expectation of inflation rate is assumed to be formed adaptively. Substituting equation (22) into (4), we obtain

$$(23) \quad \dot{\pi}^e = \beta(\pi - \pi^e) = \beta(\mu - g - \pi^e).$$

Replacing g in equation (23) with equation (19), the following differential equation is obtained:

$$(24) \qquad \dot{\pi}^e = \beta\left[\, \mu - \frac{1}{6}\left\{1 - c[w\alpha + dk(i - \pi^e) - \theta k\pi^e]\right\} - \pi^e \,\right] = 0.$$

Equation (24) describes a long-run time path of the expected rate of inflation.

Differentiating the identity $d = \frac{D}{Py}$ with respect to time, we get

$$(25) \qquad \dot{d} = (\frac{\dot{D}}{P})\frac{1}{y} - dg.$$

By definition,

$$(26) \qquad (\frac{\dot{D}}{P}) = (1-c)\,[w\alpha y + (i-\pi^e)\frac{D}{P} - \theta\pi^e\frac{M}{P}] - \theta\frac{\dot{M}^d}{P}\,.$$

Substituting equation (26) into (25), we obtain

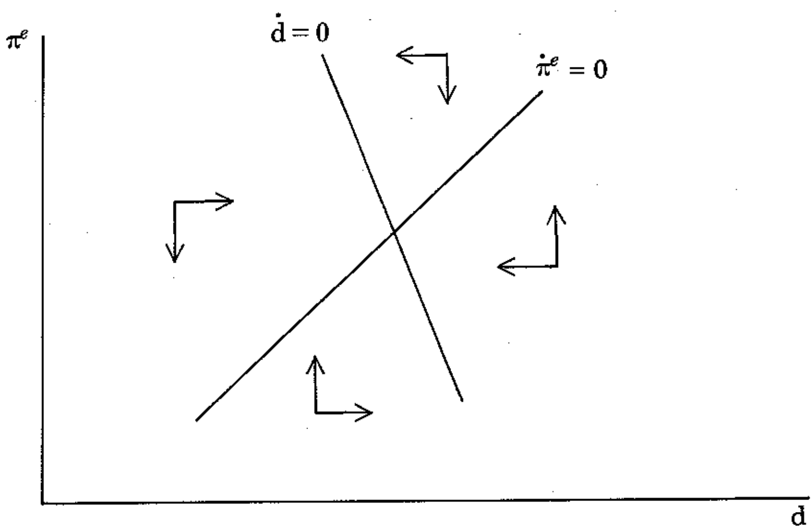
$$(27) \quad \dot{d} = (1-c)[w\alpha + d(i-\pi^e) - \theta\pi^e k] - g(\theta k + d) = 0.$$

Equation (27) describes a long-run time path of the deposit-output ratio.

The two dynamic equation, (24) and (27) are represented by the graphs in the phase diagram (see Figure 6).

Figure 6

LONG-RUN DYNAMIC SYSTEM



The stability condition is satisfied if the $\dot{\pi}^e = 0$ schedule has a positive slope and the $\dot{d} = 0$ schedule has a negative slope (see Appendix 2). To see the slope of the $\dot{\pi}^e = 0$ schedule, differentiate equation (24) with respect to π^e and d:

$$\frac{\partial \dot{\pi}^e}{\partial \pi^e} = -\frac{\partial g}{\partial \pi^e} - 1 < 0. \tag{28}$$

$$\frac{\partial \dot{\pi}^e}{\partial d} = -\frac{\partial g}{\partial d} > 0. \tag{29}$$

As $\frac{\partial g}{\partial \pi^e}$ cannot be less than -1 given the usual size of 6, the sign of $\frac{\partial \dot{\pi}^e}{\partial \pi^e}$ is negative.[6] This together with $\frac{\partial \dot{\pi}^e}{\partial d} > 0$ ensure that the $\dot{\pi}^e = 0$ schedule has a positive slope. An increase in π^e has a negative effect on $\dot{\pi}^e$ by increasing π^e while an increase in d has a positive effect on $\dot{\pi}^e$ by reducing g.

To see the slope of the $\dot{d} = 0$ schedule, differentiate equation (27) with respect to $\dot{\pi}^e$ and d:

$$\frac{\partial \dot{d}}{\partial \pi^e} = -\frac{\sigma - 1}{\sigma}(1-c)' \, [w\alpha + d(i - \pi^e) - \theta \pi^e k] - [1 - c\frac{(\sigma - 1)}{\sigma}] \, (d + \theta k) < 0. \tag{30}$$

$$\frac{\partial \dot{d}}{\partial d} = \left[1 - c \, [1 - \frac{1}{\sigma}(\theta k + d)] \right] (i - \pi^e) - g < 0. \tag{31}$$

Since the real interest rate is small, the sign of $\frac{\partial \dot{d}}{\partial d}$ can be assumed to be negative. This together with $\frac{\partial \dot{d}}{\partial \pi^e} < 0$ ensure that the $\dot{d} = 0$ schedule has a negative slope. An increase in d has a negative effect on $\dot{d}$ while an increase in π^e has a negative effect on $\dot{d}$ by reducing the deposit.

6 As long as σ is greater than 1, $\frac{\partial g}{\partial \pi^e}$ is greater than -1.

The points up to the left of the $\dot{\pi}^e = 0$ schedule are the ones where there is an excess demand for money and inflation tends to decline. The points down to the right of the $\dot{\pi}^e = 0$ schedule are the ones where there is an excess supply of money and inflationary pressure is increasing. The points down to the left of the $\dot{d} = 0$ schedule are the ones where the deposit is growing faster than the money supply. The opposite happens to the points up to the right of the $\dot{d} = 0$ schedule.

C. Stabilization Policies

1. A Reduction in Growth Rate of Money Supply

In terms of our model, a discrete reduction in the rate of monetary expansion shifts the $\dot{\pi}^e = 0$ schedule downward to the left, but the $\dot{d} = 0$ schedule remains unchanged (see Figure 7). The inflation rate is lower, but the deposit-output ratio is higher at the new equilibrium. Therefore, the new equilibrium growth rate depends on the interest elasticity of household saving rate and the deposit-output ratio. The new equilibrium growth rate of output is likely to be higher if the household saving response to the increased real interest rate is large enough to offset the increased burden of interest payments due to the higher d.

2. An Increase in Nominal Interest Rate

In terms of our model, a discrete increase in the nominal interest rate shifts the $\dot{d} = 0$ schedule upward to the right. The direction of the movement in the $\dot{\pi}^e = 0$ schedule depends on the interest elasticity of household saving rate and the deposit-output ratio.

Let us suppose an economy where the interest elasticity of household saving rate is so high that an increase in household saving outweighs the increase in corporation interest payments due to a higher interest rate. Then the $\dot{\pi}^e = 0$ schedule shifts downward to the right (see Figure 9). Initially, an increase in the nominal interest rate raises the household saving rate as well as the disposal income. Therefore, there is a substantial increase in saving deposit. This increases the deposit-output ratio. An increase in the bank deposit is large enough to offset the increase in interest costs of the firm sector. The growth rate of output goes up due to

Figure 7

DYNAMIC EFFECT OF A REDUCTION IN μ

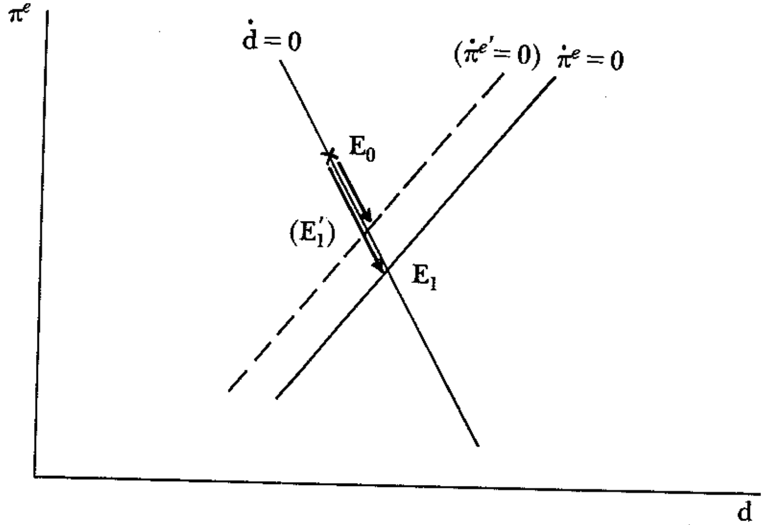


Figure 8

MOVEMENT OVER TIME IN π AND g

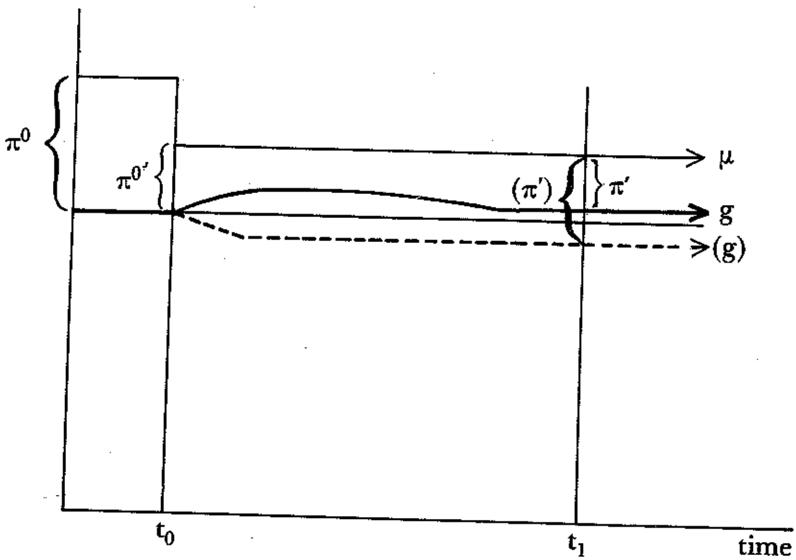


Figure 9

DYNAMIC EFFECT OF AN INCREASE IN i (CASE 1)

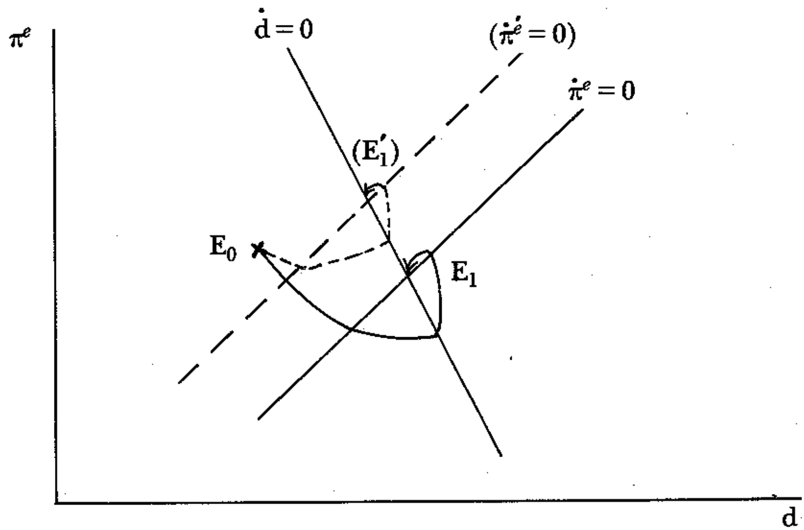
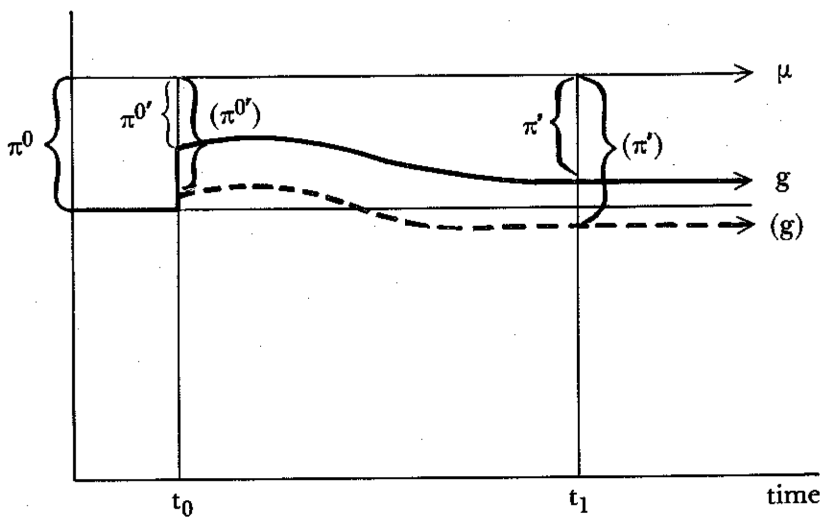


Figure 10

MOVEMENT OVER TIME IN π AND g (CASE 1)



higher investment. As the output growth rate increases, the declining inflation rate further improves the output growth rate through an increase in the household saving. However, as the deposit-output ratio continues to increase, the aggregate saving ceases to increase due to the increased burden of interest costs of the firm sector. Then, the output growth rate drops and the inflation rate bounces to rise. Therefore, the inflation rate, deposit output ratio, and output growth rate move cyclically to new equilibrium rates.

The final equilibrium inflation rate as well as the output growth rate depend on the interest elasticity of household saving rate and the deposit-output ratio.

Turning to the economy with a low interest elasticity of household saving rate and a high deposit-output ratio, an increase in the nominal interest rate shifts the $\dot{\pi}^e = 0$ schedule upward to the left (see Figure 11). An increase in the nominal interest rate initially lowers the aggregate saving because the increase in interest costs of the firm sector outweighs the increase in household saving. As the output growth rate goes down as a result of lower investment, the excess demand for goods raises the inflation rate. The deposit-output ratio increases until a higher inflation rate offsets the favorable effect of the increased nominal interest rate on the household saving rate. After that, the deposit-output ratio declines. As the deposit-output ratio goes down and the inflation rate goes up, the corporate saving improves and the aggregate saving increases in some time. As the output growth rate increases, the inflation rate drops. Thereafter, the inflation rate, deposit-output ratio, and output growth rate converge cyclically to new equilibrium rates.

At the new equilibrium, the inflation rate is higher than the previous one. Since the new equilibrium real interest rate is higher than the previous one, the new equilibrium output growth rate is lower. A lower growth rate means a higher inflation rate since the growth rate of money supply has not changed.

The negative effects of an increase in interest rates on the long-run output growth rate as well as the inflation rate are more than a remote possibility; it is even possible when the substitution effect dominates the income redistribution effect so that the aggregate saving resulting from a higher interest rate is positive. In

Figure 11

DYNAMIC EFFECT OF AN INCREASE IN i (CASE 2)

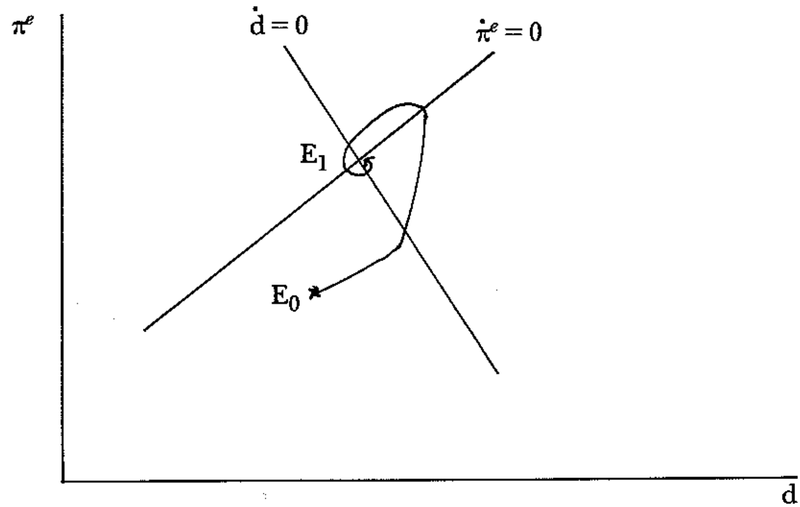
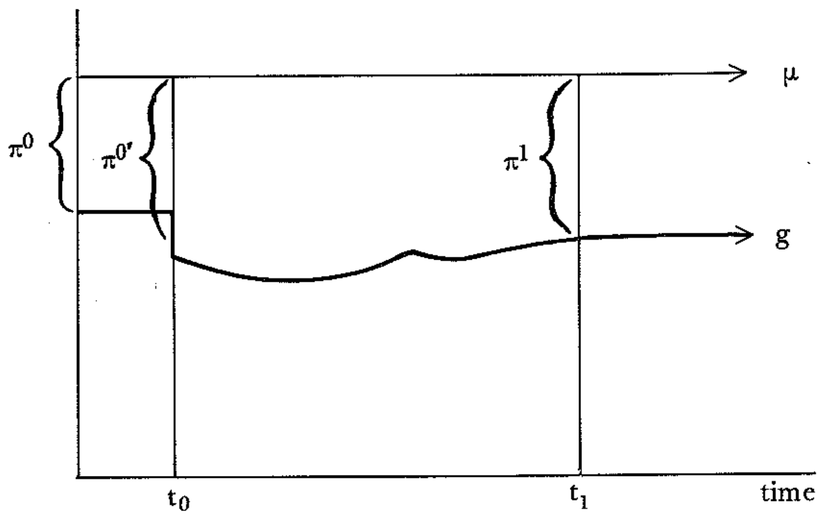


Figure 12

MOVEMENT OVER TIME IN π AND g (CASE 2)



order for a high interest policy to be successful in an economy with a sizable real money stock (M2), it should be mixed with a fiscal policy offsetting the income redistribution effect — an increase in personal income tax plus a reduction in business profit tax.

IV. Concluding Remarks

The purpose of this paper was to analyze various effects of alternative monetary policies on a closed economy which is also financially repressed by constructing simple monetary growth models. These policy effects are separately analyzed both in the short run and in the long run. The basic behavioral difference in constructing a short-run model and a long-run model is the real interest rate sensitivity of household saving rate.

Given the formation of the saving function, a stabilization policy through a reduction in monetary expansion could achieve a lower inflation rate both in the short run and in the long run. However, while its short-run impact on the output growth rate is negative, its long-run impact is ambiguous. An increase in the nominal interest rate has negative effect on both the inflation rate and the output growth rate in the short run whereas its long-run effects are ambiguous depending on the parameters.

As more capital is accumulated through the banking system, the deposit-output ratio becomes higher and the interest rate sensitivity of household saving rate becomes lower due to a wealth effect. A high interest policy to increase the domestic saving may have undesirable effects on both output growth rate and inflation rate unless a fiscal policy to negate the income redistribution effect is accompanied in an economy with a sizable bank intermediation.

Finally, the analysis is confined to monetary policies. The model can be modified to investigate the effects of fiscal policies; taxes affect household saving decision as well as money supply.

Appendix 1

STABILITY OF THE SHORT-RUN DYNAMICS

Linearizing equations (13) and (14) around the equilibrium locus, the resulting matrix is:

$$\mathbf{A} = \begin{bmatrix} \dfrac{\partial \dot{m}}{\partial m} & \dfrac{\partial \dot{m}}{\partial \pi^e} \\ & \\ \dfrac{\partial \dot{\pi}^e}{\partial m} & 0 \end{bmatrix}$$

A necessary and sufficient condition for the local stability requires that the trace of the above matrix be negative and its determinant positive, where both of them are evaluated at the equilibrium point.

From equations (15) and (16),

$$\text{tr}\,(A) = \frac{\partial \dot{m}}{\partial m} < 0.$$

$$D(A) = -\,\frac{\partial \dot{m}}{\partial \pi^e}\,\frac{\partial \dot{\pi}^e}{\partial m} > 0.$$

Appendix 2

STABILITY OF THE LONG-RUN DYNAMICS

Linearizing equations (24) and (27) around the equilibrium locus, the resulting matrix is:

$$B = \begin{bmatrix} \dfrac{\partial \dot{d}}{\partial d} & \dfrac{\partial \dot{d}}{\partial \pi^e} \\[2ex] \dfrac{\partial \dot{\pi}^e}{\partial d} & \dfrac{\partial \dot{\pi}^e}{\partial \pi^e} \end{bmatrix}$$

From equations (28), (29), (30) and (32),

$$\operatorname{tr}(B) = \frac{\partial \dot{d}}{\partial d} + \frac{\partial \dot{\pi}^e}{\partial \pi^e} < 0.$$

$$D\,(B) = -\frac{\partial \dot{d}}{\partial d}\,\frac{\partial \dot{\pi}^e}{\partial \pi^e} - \frac{\partial \dot{d}}{\partial \pi^e}\,\frac{\partial \dot{\pi}^e}{\partial d} > 0.$$

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