Price Expectations and Policies for Internal-External Balance

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I. Introduction

In recent years, a rich literature on short-run stabilization policy under a regime of fixed exchange rates has concentrated on an appropriate mix of monetary and fiscal policy for the simultaneous attainment of full employment and balance of payments equilibrium. By employing a fixed targets approach much of the recent work on internal and external balance has shown a successful assignment of policy instruments oriented to the two targets on the basis of the Mundellian principle of effective market classification (EMC).

This literature, however, has significant limitations. First, it does not distinguish the real rate of interest (as well as other real variables) from the nominal rate of interest (as well as other nominal variables) by assuming a rigid L-shaped relationship between the price and employment levels of productive factors.(1) Secondly, it overlooks the fact that in the short-run, with given inputs of capital and labor available for current production, any stablization policy aimed to achieve full employment may result in a high rate of price increase simply by raising the capital-labor ratio beyond the economic region of input utilization. Finally, by pointing out that balance-of-payments equilibrium may be attained by changes in the capital account as the current account, numerous writers working in a Keynesian world of unemployment have not introduced the role of inflationary expectations into the flows of capital.(2)

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(1) It is obvious that the increasing level of employment and inflation are mutually exclusive under the L-shaped price-employment relationship.

(2) Lutz (1966) drew our attention to a neglected aspect of capital flows in a world in which countries have different rates of price change. However, he failed to introduce the role of price expectations into his model by simply identifying the actual rate of inflation to the anticipated rate of price change.

With a revival of the Fisherian proposition and the recent development of monetary growth theory, an increasing volume of theoretical, as well as empirical, research on the role of price expectations has been directed to the relationship between the nominal rate of interest and the expected rates of price change. In a closed economy, an increase in anticipated inflation drives the nominal rate of interest upward by the entire amount of the increase but it may take a long time for this adjustment to occur. In the meantime, the effects of the increase in expected inflation will influence other economic behavior and affect the rate of real investment, the level of national income, and price level.

In an open economy, however, any change in price expectations can also affect the balance of payments through its effect on the trade balance and capital movements. The degree of "openness" of the economy may therefore play a crucial role in this adjustment process of the nominal rate of interest to price expectations as well as affect the behavior of investment and the rate of factor utilization in the economy.[3]

The purpose of this paper is to extend the current static analysis of short-run stabilization policy so as to incorporate price adjustments and price expectations and thereby to integrate these two lines of literature developed in isolation in formulating a short-run macro-model of economic policy. This analysis can be viewed as an extension of Turnovsky's recent article (1974) to a small open economy in an "almost classical" world.[4] our model incorporates various arguments concerning the causes of inflation (demand-pull, cost-push, and structural) into the price adjustment process and recognizes the role of inflationary expectations in international capital movements, thereby enabling us to identify and trace the feedbacks to which each gives rise. This model thus provides a treatment of the problems of short-run stabilization policy within a unified framework.

Within such an integrated model it can be shown that policy assignments are independent of the degree of capital mobility and remain consistent with the Mundellian pairing of fiscal policy with internal balance and monetary policy with external balance as long as there are capital movements. In the absence of capital flows, the assignment problem of course ceases to exist

(3) The degree of "openness" of the economy can be measured by the marginal propensity to import.
(4) I borrowed this expression from Collery et. al. (1972)

since any policy pairings with targets are equally efficient. We also show that the effects of price expectations, through their influence on the nominal rate of interest on the behavior of the economy depend crucially on the degree of "openness" of the economy.

For the analytical purpose of policy assignment, we empoy a two-stage approach, which introduces a set of intermediate policy variables (the rate of input utilization and the nominal interest rates) between the targets (the actual rate of inflation and the state of the balance of payments) and the fundamental policy instruments (the supply of money and the level of government expenditures).(5) In analogy with the comparative advantage theory of trade (Ricardian model), there is complete specialization in the policy assignments in the light of the ratios of the effects of instruments on each target.(6)

II. The Basic Model

Starting from the traditional macroeconomic model, with a slight modification on the basis of the points indicated above, we shall employ several restrictive simplifying assumptions in the following analysis. In this short-run model, with given levels of productive resources, we are concerned with the rate of factor utilization and thus we wish to assume away any technological changes as well as growth in supplies of the factors of production. We shall also ignore time lags in the behavior of variables.

On the real side of our basic model, aggregate demand is assumed to be satisfied at all times, but there may be substantial variations in the rate of input utilization, u, in the short-run to attain the equality between aggregate demand and supply. The resulting product market equilibrium condition. therefore, can be expressed in the following equation (1):

$$(1)\quad Y(K_0,N_0)\psi(u)=C\{Y(K_0,N_0)\psi(u)\}+I\{Y(K_0,N_0)\psi(u),\ i-\pi^*\}+G+T\{Y(K_0,N_0)\psi(u),\ \pi^*;\ e\}/P^{(7)}$$

(5) Jones(1968) used the analogous concept of two-stage approach. We assume here that government budget deficit is financed only through issuing new bonds.

(6) See Niehans (1968) and Ott and Ott (1963).

(7) Following conventional specification, we assume that $0<C'<1$, $I_1>0$, $I_2<0$, $T_1<0$, and $T_2<0$ where subscript numerals represent the first-order partial derivatives of the relevant function with respect to the independent variables in order. Recognition of the expected rate of price change, π^*, leads us to investment as a function of the real rate of interest as well as aggregate supply. Here u is an endogenous variable

where Y,C,I,G,T denote real income, consumption, investment, government expenditure, and domestic currency value of the trade balance, respectively; K_0 and N_0 represent respectively the given stocks of capital and the labor force that supply productive services; and e denotes the fixed (given) exchange rate, the price of foreign exchange in terms of domestic currency. $\phi(u)$ is the ratio of actual to capacity output ($\phi'(u)>0$, $\phi''(u)<0$); i denotes the nominal rate of interest; while π^* represents the expected rate of price change. P denotes the general price level and $P_t=P_{t-1}(1+\pi)$ where π is the actual rate of inflation.[8]

As to the behavior of price adjustment, we shall follow the assumption made by Stein (1970) and Fischer (1972) in their models of monetary growth theory to the effect that markets are organized by specialists who set prices on the basis of both the current state of excess demand and the specialists' expectations about the rate of inflation.[9] Therefore, the actual rate of inflation has two components: the expected rate of price change and the current excess demand in the commodity market.

(2) $\pi=\alpha\pi^*+\lambda\{\phi(u)-1\}$ $(0\leqq\alpha\leqq1$ and $0<\lambda<\infty)$

where λ is the adjustment coefficient of the commodity market to the excess demand and depends on the competitive market structure.[10]

Unlike the traditional demand-pull hypothesis of inflation in which the economy in question is in the neighborhood of the full employment level of output, the rate of input utilization, u, is defined as follows:[11][12]

u = maximum $(K_a/K_0,\ N_a/N_0)$ where K_a and N_a are respectively the actual levels of capital and labor employment.

u^* = maximum $(K_a/K_0,\ N_a/N_0)=1$ and $\phi(u^*)=1$

$\bar{u}$ = minimum $(K_a/K_0,\ N_a/N_0)=1$

Following Turnovsky (1974) and others, the money market equilibrium

(8) In a single time period model in which we are primarily concerned with the current rate of inflation rather than the price level, P_t is the current level of price and P_{t-1} the previous level.

(9) This specification of price adjustment is consistent with Turnovsky's (1974) derivation of the price adjustment equation.

(10) In an "almost classical" world, we assume that $\phi(u)-1\geqq0$, i.e., there is asymmetry in the behavior of price adjustment a la Keynesian downward rigidity of the price level.

(11) With Keynesian unemployment $u<u^*$, while $u>u^*$ incorporates cost-push and structural inflation in addition to "pure" demand-pull inflation.

(12) $\bar{u}$ is the upper bound of u in the sense that the economy shall incur intolerably high costs of production or the government may not allow for any production beyond $\bar{u}$ even if firms are willing to produce.

condition is described by the following equation.[13]

3　$f(i)\ H/P=L\{Y(K_0,\ N_0)\psi(u),\ i,\ \pi^*\}$

where $f(i)$ is the monetary multiplier and H is the quantity of high-powered money. Since H is treated as the fundamental policy instrument, the monetary effect of the balance of payments is assumed to be sterilized by means of open market operations.

In a pure flow model of international capital movements the balance of payments in terms of home currency is:

4　$B=T\{Y(K_0,N_0)\psi(u),\ \pi^*;e\}+F(i)$

where F is the net balance on capital account and $F'(i)>0$ in a world with different rates of inflation in different countries i.e., the net inflow of capital is assumed to be a function of the domestic nominal rate of interest, given the interest rate in the rest of the world.[14]

III. Assignment of Policy Instruments and the Role of Price Expectations

We are now in a position to investigate the relative efficacy of the policy instruments in the attainment of our two goals. Differentiating totally equations (1) and (3), we obtain

$$\begin{bmatrix}(1-C'-I_1-T_1/P)\psi' & -I_2\\ L_1\psi' & L_2-Hf'(i)/P\end{bmatrix}\begin{bmatrix}du\\ di\end{bmatrix}=\begin{bmatrix}dG-(I_2-T_2/P)d\pi^*\\ f(i)dH/P-L_3d\pi^*\end{bmatrix}$$

Solving simultaneously for the two intermediate policy instruments:

$$du=(1/\triangle)\ [\{L_2-Hf'(i)/P\}dG+I_2f(i)dH/P-\{(I_2-T_2/P)\ (L_2-Hf'(i)/P)+I_2L_3\}d\pi^*]$$

$$di=(1/\triangle)\ [\Omega f(i)dH/P-L_1\psi'dG+\{L_1(I_2-T_2/P)\psi'-L_3\Omega\}d\pi^*]$$

where $\triangle=(1-C'-I_1-T_1/P)\ \{(L_2-Hf'(i)/P)\psi'+I_2L_1\psi'$

$=\Omega(L_2-Hf'(i)/P)+I_2L_1\psi'<0$

and $\Omega=(1-C'-I_1-T_1/P)\psi'>0$

Therefore, we can have explicit functional relationships between the set of the intermediate policy variables and the set of the fundamental policy instruments.

5　$u=(G,H,\pi^*);\ u_1>0,\ u_2>0,\ u_3\gtreqless 0$

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(13) It is assumed that $L_1>0$, $L_2<0$, and $L_3<0$.

(14) $F'(i)>0$ was explicity introduced by Lutz (1966). For a small open economy the nominal rate of interest in the world capital market is regarded as given and thus the net inflow of capital is dependent on the nominal interest rates in home country.

(6) $i=(G,H.\pi^*)$; $i_1>0$, $i_2<0$, $i_3\gtreqless 0$

The sensitivity of the rate of domestic input utilization and the nominal rate of interest to price expectations depends crucially on the degree of "openness" of the economy, which could be represented partly by T_1 and T_2. The less open the economy is, the greater will be the expansionary effect of inflationary expectations on the rate of input utilization, i.e., $u_3>0$. Similarly, the less open the economy is (the smaller T_2), ceteris paribus. i_3 tends to be positive even if i_3 also depends on the other structural parameters such as L_1, L_3, I_2, and the marginal propensity to withdraw (Q).[15] However, we cannot rule out the possibility of $u_3\leqq 0$ and $i_3\leqq 0$.

The interpretation of $0<i_3<1$ in relation to the effect of price expectations on the commodity market, particularly on planned investment, can be found in Mundell (1963), Sargent (1972), and Turnovsky (1974). However, in our open model, where the degree of "openness" plays a crucial role, the interpretation of $0<i_3<1$ should be different from the above authors: in an open economy the expansionary or contractionary effect of price expectations on the commodity market is less than in a closed economy.

The effect of the fundamental policy variables on the intermediate instruments is clear: an increase in the rate of input utilization must always necessitate a raising of aggregate expenditures. An increase in government expenditures tends to raise the nominal rate of interest through its income effect while a monetary expansion results in lowering the nominal interest rate since it has a smaller income effect and thereby gives more liquidity.

These results are simple, but what do they imply about the appropriate assignment of monetary and fiscal policy to the targets? In order to derive the effect of these fundamental policy instruments on the targets we have to use the relationship between (u,i) and (G,H) spelled out in equations (2′) and (4′):

(2′) $\pi=\alpha\pi^*+\lambda[\psi\{u(G,\ H,\ \pi^*)\}-1]$

(4′) $B=T[Y(K_0,N_0)\psi\{(u(G,H,\pi^*)\},\pi^*;\ e]+F\{i(G,H,\pi^*)\}$

Consider small changes in the fundamental variables and trace through the impact on the targets, π and B.

(7) $d\pi=\lambda\psi' u_1 dG+\lambda\psi' u_2 dH+(\alpha+\lambda\psi' u_3)d\pi^*$

(15) When $(I_2-T_2'P)\leqq 0$, then $0<i_3<1$ since $-L_3<-\{L_2-Hf'(i)'P'\}$.

(8) $dB=(T_1\psi'u_1+F'i_1)dG+(T_1\psi'u_2+F'i_2)\ dH+(T_1\psi'u_3+T_2+F'i_3)d\pi^*$

From the pair of the above equations of change, we obtain the following derivatives:

π_1 $d\pi/dG=\lambda\psi'u_1=\lambda\psi'[L_2-Hf'(\iota)]/\triangle>0$

π_2 $d\pi/dH=\lambda\psi'u_2=\lambda\psi'[I_2f(\iota)/P]/\triangle>0$

B_1 $dB/dG=T_1\psi'u_1+F'i_1\gtreqless 0$

B_2 $dB/dH=T_1\psi'u_2+F'i_2<0$

The comparative advantage of (G,H) in accordance with the criterion of the effective market classification may be expressed as a ratio of pairs of these derivatives:

$$\begin{vmatrix} dB/dG & d\pi/dG \\ dB/dH & d\pi/dH \end{vmatrix} = \left| \frac{u_2(T_1\psi'u_1+F'i_1)}{u_1(T_1\psi'u_2+F'i_2)} \right| = \left| \frac{T_1\psi'u_1u_2+F'i_1u_2}{T_1\psi'u_1u_2+F'i_2u_1} \right| <1$$

Thus, the criterion for directing G to the internal objective and H to the external objective is satisfied. Despite the fact that fiscal expansion has an ambiguous effect on the balance of payments, pairing monetary policy with the balance of payments and fiscal policy with price stability is in fact the correct assignment. Monetary policy has a comparative advantage in the attainment of external balance and fiscal policy has a relative advantage in the attainment of internal balance, independent of the degree or capital mobility, as long as capital is mobile between countries.(16)

Looking at our basic model, we can see that inflationary expectations affect the economy via four channels:

(a) the investment demand function (I)

(b) the net export function (T);

(c) the price adjustment process (π); and

(d) the demand for money function (L).

Each of these direct effects generates further repercussions and feedbacks.

(16) This result is in sharp contrast to the results obtained in Levin (1972) and others. In the world of no capital movements, i.e, $F'(\iota)=0$, we no longer have an assignment problem since the comparative advantage of fundamental policy instruments in the attainment of respective targets disappears. That is,

$\left| \frac{dB}{dG} \Big/ \frac{d\pi}{dG} \Big/ \frac{dB}{dH} \Big/ \frac{d\pi}{dH} \right|=1$. When $F'(\iota)=0$, $(dH/dG)_{dB=0}=(dH/dG)_{d\pi=0}=-u_1/u_2$

and this is the case in which Turnovsky (1971) worked to show the effect of monetary and fiscal policy on the rate of inflation and the level of employment in the context of a closed economy.

From equations (7) and (8) we can obtain:

$\pi_3=\partial\pi/\partial\pi^*=\alpha+\lambda\phi' u_3 \gtreqless 0$, depending on $u_3 \gtreqless 0$

$B_3=\partial B/\partial\pi^*=T_1\phi' u_3+T_2+F' i_3 \gtreqless 0$, depending on $u_3 \gtreqless 0$, $i_3 \gtreqless 0$, and the value of λ.

The key element in determining the signs of π_3 and B_3 is the sensitivity of the rate of demestic input utilization and the nominal rate of interest to inflationary expectations. As is shown above, the sensitivity of the rate of domestic input utilization and the nominal rate of interest to price expectations depends crucially on the degree of "openness" of the economy. Therefore, π_3 and B_3 depend on the degree of "openness" of the economy.

These results have several interesting implications in our short-run model of stabilization policy. Changes in price expectations will have an influence on the behavior of target variables. The less (more) open the economy is to international trade, the stronger (weaker) influence do inflationary expectations tend to exert on the actual rate of inflation through their indirect effect on the rate of input utilization, u_3. The balance on capital account is also affected significantly by price expectations through their effect on the nominal rate of interest, i_3. The less (more) open the economy is, the more (less) favorable effect do the inflationary expectations tend to have on the capital account balance.[17] The effect of price expections on the balance of payments depends crucially on the degree of "openness" of the economy.

IV. Stability Analysis

Turning to the stability problem of the above model of policy assignment, we want to show first the graphic analysis. Invoking the implicit function rule of differentiation we obtain:

$(dH/dG)_{d\pi=0}=-u_1/u_2<0$

$(dH/dG)_{dB=0}=-(T_1\phi' u_1+F' i_1)/(T_1\phi' u_2+F' i_2) \gtreqless 0$, depending upon $T_1\phi' u_1+F' i_1 \gtreqless 0$

The $\bar{\pi}$ schedules (which should be interpreted as the internal balance schedules or as the $d\pi=0$) in Figures 1 and 2 show the set of fundamental policy instruments (G,H) for which the rate of price change remains

(17) This is because i_3 tends to be positive, ceteris paribus, if the economy is less open to international trade.

constant. Since $u_1>0$ and $u_2>0$, when there is an increase in government spending we have to decrease the money supply in order to preserve the internal balance. This is because the $\bar{\pi}$ schedules slope downward $(dH/dG)_{\bar{\pi}=0}<0$. For any given value of H, above (below) the $\bar{\pi}$ schedule the actual government expenditures are greater (smaller) than the required amount to maintain the internal balance. Government spending, therefore, must decrease (increase) and horizontal vectors in Figures 1 and 2 indicate this phenomenon.

It is clearly important to consider the degree of capital mobility. The slope of the B schedules along which the set of (G.H) gives the sustainable

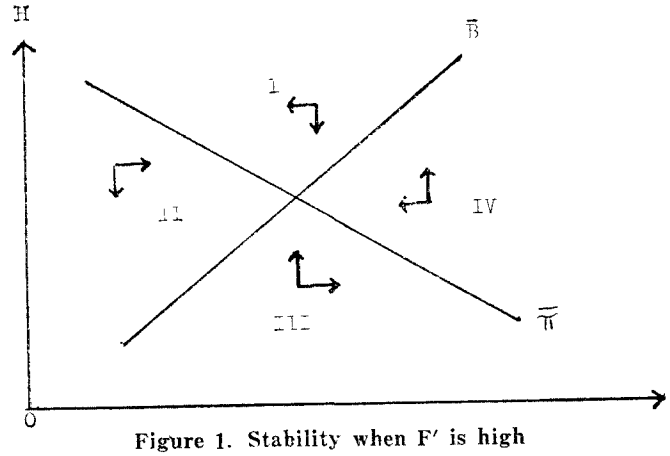

Figure 1. Stability when F′ is high

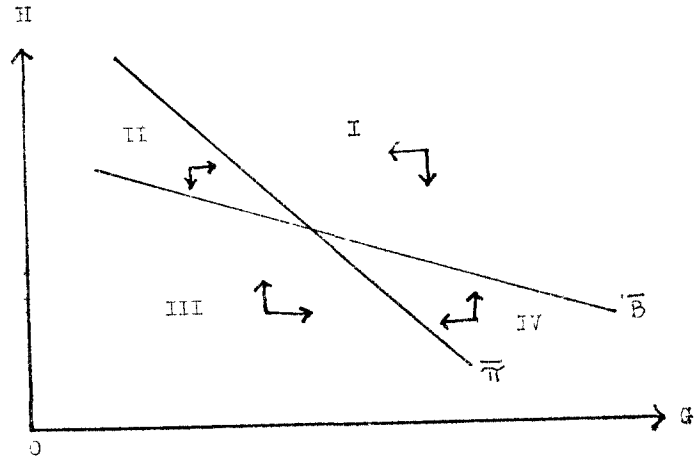

Figure 2. Stability when F′ is low

The four quadrants in the above two figures represent

I Inflation, deficit　II. Recession, deficit　III. Recession, surplus　IV Inflation, surplus

balance of payments position in both figures depends on the value of F'. If the response of capital flows to changes in the nominal rate of interest is sufficiently high that $F' > -T_1\phi' u_1/i_1$ an increase in government spending would improve the balance of payments. To restore the original value of B would require an offsetting increase in the money supply. This gives the positively sloping external balance schedule in Figure 1. On the other hand, if capital mobility is sufficiently low that $F' < -T_1\phi' u_1/i_1$, the $\bar{B}$ curve must be negatively sloping as is shown in Figure 2.[18] An increase in G would deteriorate the balance of payments and thus the monetary authorities must decrease the money supply in order to correct a deficit in the international payments accounts. Above (below) the $\bar{B}$ curve, for any given value of G. the actual stock of money is greater (less) than the required amount to preserve the sustainable B, and the resulting balance of payments deficit (surplus) would require H to decrease (increase). Vertical vectors in Figures 1 and 2 represent this fact.

Mathematically the stability of our basic model can be easily shown as follows: if the fiscal and monetary policy variables are adjusted to the discrepancies of the current rate of inflation and the balance of payments from their respective target values, the policy system is described by

(9) $dG/dt = a_{11}\pi(G,H;\ \pi^*) + a_{12}B(G,H;\ \pi^*)$

(10) $dH/dt = a_{21}\pi(G,H;\ \pi^*) + a_{22}B(G,H;\ \pi^*)$

where t represents time and the a's are speeds of adjustment of the fundamental policy variables to the discrepancies. By taking Taylor linear approximation of the above two differential equations, we obtain:

$$\begin{bmatrix} (a_{11}\pi_1 + a_{12}B_1) & (a_{11}\pi_2 + a_{12}B_2) \\ (a_{21}\pi_1 + a_{22}B_1) & (a_{21}\pi_2 + a_{22}B_2) \end{bmatrix} \begin{bmatrix} (G - G_0) \\ (H - H_0) \end{bmatrix} = \begin{bmatrix} dG/dt \\ dH/dt \end{bmatrix}$$

where G_0 and H_0 are respectively the unknown levels of G and H associated with the target values of π and B.

The necessary and sufficient conditions for local stability are:

(i) the trace of the above coefficient matrix must be negative, that is,
$(a_{11}\pi_1 + a_{12}B_1) + (a_{21}\pi_2 + a_{22}B_2) < 0$

(ii) the determinant of the above matrix be positive, namely,
$(a_{11}\pi_1 + a_{12}B_1)(a_{21}\pi_2 + a_{22}B_2) - (a_{11}\pi_2 + a_{12}B_2)(a_{21}\pi_1 + a_{22}B_1) > 0$

(18) The slope of the $\bar{B}$ curve is flatter than the slope of the $\bar{\pi}$ curve since monetary policy has a comparative advantage in the attainment of the external balance.

With the assignment of G to π and H to B, i.e., $a_{12}=a_{21}=0$, in accordance with the Mundellian EMC principle, the stability conditions will be reduced to (i') $a_{11}\pi_1+a_{22}B_2<0$ and (ii') $a_{11}a_{22}(\pi_1B_2-\pi_2B_1)>0$. If $F'>-T_1\psi'u_1/i_1$ so that $B_1>0$, the system will be stable provided $a_{11}\pi_1+a_{22}B_2<0$ and $a_{11}a_{22}<0$. These conditions are satisfied by $a_{11}<0$ and $a_{22}>0$, which is the case shown in Figure 1. (19)

If capital mobility is so low that $F'<-T_1\psi'u_1/i_1$ and thus $B_1<0$, in order for the system to be stable, i.e., $\pi_1B_2-\pi_2B_1<0$ in the second stability condition of the reduced form, $a_{11}<0$ and $a_{22}>0$ are also required again. This is the case shown in Figure 2. (20)

Without any information on the values of the system's parameters and on the degree of capital mobility, the authorities can have proper pairings of policy instruments and goals to achieve both internal and external balance. The stability of these pairings and thus the adjustment process depends crucially on the degree of capital mobility.

V. Concluding Remarks

In this paper we have attempted to develop a model of stabilization policy to achieve both external and internal balance. When the rate of input utilization, u, is below the full capacity level, u^*, we can raise the rate of factor utilization without impairing the stability of price level, while under $u>u^*$ our first concern goes to curbing inflation.

Thus we avoid the problem of policy conflict between unemployment and inflation even without the restrictive Keynesian assumption of a L-shaped price-output relationship. Special attention has been given to the role of price expectations in capital movements as well as in the analysis of the effects of monetary and fiscal policy.

Unlike most of the static analyses of short-run stabilization policy, in

(19) That is, if G is increased (decreased) when π is below (above) its target value such that $u>$ (<) u^* while H is increased (decreased) when the balance of payments is in surplus (deficit), the system will be stable.

(20) If $B_1<0$ and $\pi_1B_2-\pi_2B_1>0$, then $a_{11}\pi_1+a_{22}B_2<0$ and and $a_{11}a_{22}>0$ are required for the stability of the system. However, since $a_{11}a_{22}>0$ necessitates that both a_{11} and a_{22} have the same algebraic sign, the first satbility condition of $a_{11}\pi_1+a_{22}B_2<0$ cannot be assured. Nonetheless, this case in which $B_1<0$ and $\pi_1B_2-\pi_2B_1>0$ is ruled out by our policy assignment that is based on $\pi_1>0$ and $B_2<0$ G to π and H to B.

this model the successful assignment of fundamental policy instruments to targets does not depend on the degree of capital mobility that plays a role in the stability and the adjustment process of the system. The Fisherian proposition that the nominal rate of interest adjusts exactly to the anticipated rate of inflation should be modified in an open economy: In a relatively open economy, changes in inflationary expectations have less effect on the actual rate of price change and on the balance of the capital account.

It should be emphasized that our analysis is based on a single period model. Because of the continuous adjustment of price expectations to the forecasting errors of inflation as well as the dynamic nature of the price-adjustment process, any changes in the fundamental policy instruments lead to further effects in subsequent periods.(21) As has been done in most short-run stabilization policy models, we have ignored the capacity generating effect of investment. Since this effect takes time, it is unlikely to influence our results in any significant way.

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(21) In continuous time analysis we may introduce the adaptive price expectations in which $d\pi/dt = \beta(\pi(G,H,\pi^*) - \pi^*)$ where β is an adjustment coefficient and $0 < \beta < \infty$.

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