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Prices and Price Dynamics

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by

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I. Introduction.

Simultaneous inflation and unemployment, which has led to the coinage of terms like "stagflation" and "slumpflation," does not seem to be a transitory phenomenon. It seems to be an attribute of today's capitalism in the sense that the processes set in motion by the behavior of individuals, firms and governments within decentralized markets that exist in today's institutional framework lead to the combination of chronic inflation and unimpressive employment and growth results that are evoked by the labels slumpflation and stagflation.[1] The argument that follows implies that the economic malaise of our times cannot be cured by simply correcting monetary and fiscal policies. Improvement will need to be preceded by changes in the market power of firms and labor. It is market power which lends an "institutional" life of its own to price formation.

In this paper, we examine output, wage, and price determination in a system which reflects characteristics of advanced capitalist economies. The structural forces that make stagflation a normal result are firm market power which leads to administered prices, negotiated wages, and big government. Administered prices reflect the market power of corporations derived from the need imposed by financing arrangements to sustain profits flows in an economy with expensive special purpose capital assets and complex liability structures. Negotiated, or even legislated, wages and wage changes reflect trade union power and the need for comparability of costs for "independent" units that share "market power." Big government in today's economy mainly operates by way of transfer payments and defense spending. Big government implies a need for high taxes. The combination of government spending and taxing schedules related to income means that the government deficits is sensitive to income variations. As will be shown below, "big government",

which may legislate market power is of particular importance in that it provides a mechanism that permits the price implication of firms and labor market power to be valid

History--the actual path of an economy--results from a combination of systemic and transitory factors. Many explanations of stagflation appeal to transitory and acidental phenomena: the Viet Nam War, the reaction of government economic policy to the social turbulence of 1968-69, the effective oil cartel, and policy errors by various monetary authorities. Such special events, which are part of the fullness of history, undoubtedly play a significant part in determining the details of what happens. However, there is a core of systemic economic and, because big government is part of the system, political relations that make for a persistence of inflation even as the performance of the economy as measured by unemployment and growth rates deteriorates.

As a result of today's structure, the shape of business cycles has changed. A full-fledged debt deflation followed by a deep and long depression cannot occur. This is so because the huge deficit that well-nigh automatically occurs when income turns down sustains prices and profits. This means that the ability of business to fulfill obligations is not compromised so that the value of debts and capital assets tend to be sustained.[1] This stabilizing effect of the big government, however, has destabilizing implications for wages and prices. ~~The failure of the conventional theory of the labor market, as embodied in the Phillips curve, to explain rising wages and prices in the face of chronic and worsening unemployment, is our starting point of our analysis. However, our objection goes behind its simple failure. More seriously, the Phillips curve violates the spirit and methodology of modern economic analysis in which interdependent markets determine system~~

results. The labor market cannot be held responsible in isolation for what happens to wages and prices.

The model that follows is open in that values for investment, tax schedules and endogenously determined parameters that set saving or consumption propensities of classes of income recipients are not discussed. The financial determinants of investment and the systemic interrelations among financial relations and investment which make a debt-deflation process possible have been dealt with by one of the authors in a series of papers. In a similar way in a number of places the other author has discussed the institutional features that lead to market power in labor markets. Our objective in this paper is to understand how the macroeconomics of price determination that follow from a post-Keynesian view of demand determination interacts with the obvious institutional relations in a labor and commodity market which makes the price level a function of past contractual commitments.

2. The Analytical Framework

There are two aspects to the price formation model we are examining. One aspect reflects the bargaining process between firms and labor that sets wages and the market power of firms that sets prices given the course of unit labor costs. The second aspect reflects the prices that are derived from aggregate demand and supply. Both the market power/bargaining and the aggregate views of price formation can be interpreted as asserting that prices are a mark-up in unit labor costs, but the substance of the mark-up is different in the two cases.

The bargaining power and market power formulation of price requires both a wage and a price equation. In a general form, they may be represented as:

simple failure. More seriously, the Phillips curve violates the spirit and methodology of modern economic analysis, in which interdependent markets determine system results.

On the other hand, it is possible to show how the monetarists tend to simplify the questions. In our model the influence of the monetary variables is indirect (which does not mean unimportant) and passes through the shifts of ceilings and floors through time.

Our impression is that the economic malaise of our times cannot be eased by simply correcting monetary and fiscal policies.

2. The analytical framework.

Let us first consider the bargaining and market power formation of prices. One requires both a wage and a price equation. In a general form, they may be represented as :

$$2.1 \quad P(t) = f(W(t), X(t)) + \alpha P^{e}(t)$$

$$2.2 \quad W(t) = g(Y(t)) + \beta P^{e}(t)$$

where P(t) and W(t) represent the price and the wage levels at time t; X(t) and Y(t) stand for a list of real variables (to be identified) and $P^{e}(t)$ reflects price expectations.

If we substitute 2.2 into 2.1 under particular ~~hypothesis and~~ specifications which are stated below, ~~we obtain~~ a second order difference equation of the type:

$$2.3 \quad P(t) - (C+D)\,P(t-1) + DP(t-2) = Z$$

~~which~~ looks like the reduced form of the accelerator-multiplier trade cycle model.[2] It is not necessary to constrain the values of the parameters C and D in order to obtain non-explosive results. It is sufficient to posit ~~transitory~~ limits to actual prices.

In econometric models the values of the parameters of difference equations are constrained so as to avoid explosive results. The ~~assumptions~~ are necessary because the structure of the economy is kept constant through time. However, if structural changes are taken into account, the range of possible ~~behavior~~ patterns becomes wider. The hypothesis of ceilings and floors, ~~which~~ embody structural parameters ~~which~~ change, ~~in time allows the~~ incorporation ~~of~~ parameter values which generate explosive behavior, ~~that~~ cannot be extended in time because ~~of the structure of the economy. In fact,~~ it has been shown that otherwise explosive models can be bounded by floors and ceilings, ~~which~~, by imposing new initial conditions, lead to a realistic outcome from relations that would yield an unstable result. It follows that we have to identify:

i) a reasonable set of assumptions which allow us to derive, from equations 2.1 and 2.2, a second order difference equation such as 2.3;

ii) an economic justification for the presence of ceilings and floors and for their path in time;

iii) a model which can explain not so much the existence of stagflation as its likely pattern in a medium run perspective.

3. The Wage-Price Sub-Model

The price equation 2.1 as set by firms can be specified as follows:

$$3.1 \quad P(t) = \gamma \frac{W(t)}{a^{\circ}(t)} + \alpha P^{\circ}(t),$$

W(t) is the money wage rate, $a^{\circ}(t)$ is the entrepreneur expectation of normal labor productivity. $W(t)/a^{\circ}(t)$ can also be written as $C_L(t)$, the unit labor costs of output. The mark-up factor γ reflects a combination of market power, history and the cash payment requirements imposed by the liability structure. There is some minimum achieved mark-up on labor costs which must be achieved if a firm is to fulfill its various payment commitments because of debts.

Equation 3.1 can be rewritten as

$$3.11 \quad P_t = \gamma C_L(t) + \alpha P^{\circ}(t).$$

If expectation are extrapolative, we obtain:

$$3.2 \quad P(t) = \gamma \frac{W(t)}{a^{\circ}(t)} + \alpha\left[P(t-1) + \theta\left(P(t-1) - P(t-2)\right)\right] \text{ or}$$

$$3.21 \quad P(t) = \gamma C_L(t) + \alpha\left[P(t-1) + \theta\left(P(t-1) - P(t-2)\right)\right]$$

These price equations represent the market power of firms. P(t) is the index of offer prices which may or may not turn out to be the realized prices.

In much of recent literature the course of wages almost always conforms to a Phillips curve, i.e., an inverse relation between the rate of change of monye wages and the level of unemployment, perhaps adjusted to reflect recent ad/or anticipated rates of changes of prices. The adjustments have become more complicated and carry more of the econometric explanatory weight as

observations from the turbulent years since the middle 1960's gather weight. The Phillips curve of recent literature is a complex reflection of the original formulation. As far as the money wages are concerned,

We live in a world in which trade unions exist and money wages are affected by bargaining or negotiations. The wage function must take this into account. True, unemployment affects the wage bargains that are struck. However, as governments have assumed responsibility for maintaining employment and as catastrophic large and sustained unemployment has been avoided, the effect of today's unemployment rate on today's wage bargains has been attenuated. In this sense, today's unemployment rate may be dropped from the wage equation as an explicit variable, although chronic high unemployment can lead to a fall in the market power of unions.

We can write equation 2.2 as:

$$3.3 \quad W(t) = g(T_x, a^\circ_w) + \beta P^\circ(t)$$

where T_x represents taxation and a°_w stands for an improvement factor achieved by wage bargaining. In other words, we assume that money wages are the result of bargaining processes in which trade unions and employers agree on price adjusted after-tax wages. For the price component in the wage equation we posit the existence of explicit or implicit full or partial indexation. In that case, we obtain:

$$3.4 \quad W(t) = g(T_x, a^\circ_w)) + \lambda P(t-1)$$

Incomes policy and social contracts introduce limits to the parameters. The typical wage and price freeze or income policy requires workers forego attempts to recoup past losses in the purchasing power of wages in exchange for a promise that no further losses will take place and that henceforth the rise in money wages will exceed the rise in prices. Incomes policy has the effect of institutionalizing expected productivity increases.

Alternatively,

We may assume the presence of some kind of extrapolative expectations. In that case, we have:

$$3.5 \quad W(t) = g(T_x, a^\circ_w) + \beta\left[P(t-1) + \lambda\left(P(t-1) - P(t-2)\right)\right]$$

In the short run T_x and a°_w can be assumed to be constant. The same may be true for a° (the normal productivity according to entrepreneurs). If we normalize a° (i.e., we put it equal to 1) and if we insert equation 3.5 into equation 3.2, we get:

$$3.6 \quad P(t) - \left((\alpha+\gamma\beta) + (\beta\gamma\lambda+\alpha\theta)\right) P(t-1) + (\beta\gamma\lambda+\alpha\theta)\, P(t-2) = Z$$

where Z incorporates the productivity improvement and tax parameters that go into determining wages.

4. Ceilings and Floors: The Workings of an Explosive Second Order Dynamic Interaction

Equation 3.6 can be written in the following way:

$$4.1 \quad P(t) - (C+D)\, P(t-1) + D\, P(t-2) = Z$$

C being equal to $\alpha + \gamma\beta$ and D being equal to $\beta\gamma\lambda + \alpha\theta$.

The weight of the various parameters may differ in the various countries and in the same country from time to time according to the political and economic situation. In periods of inflation they generally become bigger. If this happens, the mechanism transmiting inflation in the economy becomes stronger. So 3.2 and 3.5 are not the only specification which can give rise to a reduced form of the 4.1 kind.

The general solution to the second order difference equation is given by:

$$4.2 \quad P(t) = A_1 \mu_1^t + A_2 \mu_2^t + h_o$$

where the roots μ_1 and μ_2 depend upon the value of the parameters C and D of equation 4.1 while A_1 and A_2 are determined by initial conditions.

If we assume that the parameters are constant, so are μ_1 and μ_2. These parameters may assume values greater than one. In that case the model will tend to explode unless ceilings and floors force an oscillatory pattern, around the particular solution to the difference equation which is given by h_o.

The nature of the time path of the variable generated by the model depends upon whether the rate of growth of the ceiling is greater than, equal to, or less than the minor root of the solution equation. If one assumes that the larger root of the solution equation is greater than the rate of growth of the ceiling, so that in time the ceiling becomes effective, the problem then is to ascertain whether, once the ceiling becomes effective, the variable will bounce off the ceiling, yielding an upper turning point, or will continue to press against the ceiling, resulting in a state of steady inflation.

As is shown in the appendix, if the rate of growth of the ceiling (c) is equal to or greater than the minor root of the solution equation

$$\mu_1 > c > \mu_2 > 1$$

then the particular solution equation will continuously press against the ceiling so that a steady inflation will take place. If, on the contrary, the rate of growth of the ceiling is smaller than the minor root:

$$\mu_1 > \mu_2 > c > 1$$

then the variable will bounce off the ceiling and a turning point will be generated. A succession of such bounces between the ceiling and the floor generates a cycle.

In periods of inflation, the reaction by both firms and trade unions may be such to justify parameters greater than one. In this case, then, we have to look for a meaningful ceiling which at least for a time imposes a pattern of wages and prices other than those given by the market power and bargaining relations embodies in these wage and price equations.

Solution equations like 4.2 are summaries describing the time path of a recursive process such as is given by equations like 3.2. If the two most recent values of prices are given then an equation like 3.2 will generate a current price. If this current price becomes the t-1 price and the previous price becomes the t-2 price, a value of P(t+1) will be generated. This can be carried out through time and generate a time series of prices.

In a solution equation such as 4.2 the initial conditions determine the A_1 and A_2. The value for P(t), P(t-1), etc., obtained from the difference equation and that obtained from the solution equation are exactly the same.

If in the course of events a realized value differs from the value generated by the recursive formula or the solution equation then a new dynamic process is set in motion with new initial conditions. Thus, as long as the parameter values of the recursive equation are unchanged, the μ_1 and μ_2 are unchanged, but any time the realized differs from the computed value the dynamic process continues with a new set of values A_1 and A_2.

If the ratio of the initial conditions, η, is $\mu_1 > \eta > \mu_2$, then the two roots will be weighted by A_1 and A_2 so that the average equals η. However, because of the power of raising to a power the rate of increase of the computed value will increase to μ_1.

On the other hand, if $\mu_1 > \mu_2 > \eta$ and the average of μ_1 and μ_2 must equal η, then one of the coefficients in the averaging process must be negative: as η is closer to the smaller positive root, this is achieved by having a small

negative coefficient to the larger root. This means that the unconstrained motion set in process by these initial conditions in time will have the system more rapidly in the opposite direction from the thrust given by the initial conditions. If the initial condition were set by a ceiling then the free movement of the extrapolative market power pricing funds will fall away from a constant rate of growth ceiling. One exposure to a limitation of growth leads to a rapid dynamic movement away from a ceiling.

5. Macroeconomic Determinants of Prices

In equation 3.2 we posited that prices are set according to a mark-up convention, where the unit labor costs that are marked up reflect normal output and productivity; the price formula included a factor allowing for price anticipation.

Firms are not always successful in attaining their price, quantity and profit objectives. There are situations in which they cannot impose prices and achieve output or profit targets. It is the macroeconomic conditions that determine whether the aggregate firms achieve their price, output and profit objectives.

From Kalecki we know that aggregte profits for a closed economy are given by:

$$5.0 \quad \Pi = I + Df + C_{\Pi} - SW, \quad {}^{5}\ S_{w}$$

where Π = profits, I = investmetn, Df = the deficit, C_{Π} = consumption out of profits and SW = savings out of wages. Aggregate profits equals profits in consumption production, Π_c, and profits in investment production, Π_I. We therefore have:

$$5.1 \quad \Pi_c = W_I N_I + Df + C_{\Pi} - SW \quad \text{and}$$

$$5.11 \quad \Pi_I = \Pi_I.$$

Total revenues in the production of consumer goods equals total expenditure on

consumption goods. Total revenues in consumption goods production equals the expenditure financed by wage income in the products of consumer goods and the profits earned in consumer goods production.

5.2 $P_C Q_C = W_C N_C + \Pi_C$

5.21 $P_C Q_C = W_C N_C + W_I N_I + Df + C\Pi - SW$

We therefore have

5.3 $P_C Q_C = W_C N_C \left(1 + \frac{W_I N_I + Df + C\Pi - SW}{W_C N_C} \right)$

Inasmuch as the ~~biggest~~ lagged price level is a factor affecting wages, the relevant price level for wage dynamics is that of consumer goods. The demand or realized price level of investment goods is quite different in its conception than the pricelevel of investment goods. If $W_I N_I$ are the wage costs in the production of investment goods and ρ is the interest rate or costs imposed by eternal financing terms and the producer's margin of safety we have that

$$P_I Q_I = W_I N_I (1+\rho).$$

Q_I of investment will take place at price P_I only as long as business people and their bankers can come up with $W_I N_I (1+\rho)$ of take out financing either from internal funds (gross retainment profits) or from new issues of appropriate debts or equities. The wage rate in investment output is determined by the same considerations as the wage rate in consumption output.

The aggregate price level at any period is compounded out the determinants of the movement of consumer goods prices and investment goods prices.

The realized price level for consumer goods becomes

5.4 $P_C = \frac{W_C N_C}{Q_C} \left(1 + \frac{W_I N_I + Df + C\Pi + SW}{W_C N_C} \right)$

The price level for investment goods is

$$P_I = \frac{W_I N_I}{Q_I} (1+\varphi)$$

where P reflects financing terms and $W_I N_I$ reflects the financing that must be obtained.

Let us write Q_C° for the normal output consumer goods and Q_C for the actual output; the ratio of actual to normal output is

$$k_C = Q_C / Q_C^\circ$$

If we write $a_C^\circ = Q_C^\circ / N_C$ as the normal productivity of labor in the production of consumer goods then 5.4 becomes

$$5.51 \quad P_C = \frac{W_C N_C}{W_C} \cdot \frac{Q_C}{Q_C^\circ} \left(1 + \frac{W_I N_I + Df + C\Pi + SW_C}{W_C N_C} \right)$$

$$5.52 \quad P_C = \frac{W_L}{a_C^\circ} \cdot \frac{Q_C^\circ}{Q_C} \left(1 + \frac{W_I N_I + Df + C\Pi + SW_C}{W_C N_C} \right)$$

$$5.53 \quad P_C = \frac{W_C}{a_C^\circ} \cdot \frac{1}{k_C} \left(1 + \frac{W_I N_I + Df + C\Pi + SW_C}{W_C N_C} \right)$$

Equation 5.53 can be written as

$$5.54 \quad P_C = \frac{C_L}{k} \cdot (1+M)$$

for $\frac{W_L}{a_L^\circ}$ is the unit labor costs C_L, k is the ratio of output to target output and M is the ratio of demand for consumer goods financed by other than the wage bill in consumer goods to the wage bill in consumer goods. Equations 5.51 through 5.54 are macroeconomic price equations. This is not quite a precise statement of M for SW represents savings out of wage income. We assume that prices are as in the market power and bargaining equations as long

5. Macroeconomic determinants of prices.

In equation 3.2 we posited that prices are set according to a mark-up convention, where the unit labour costs that are marked up reflect normal output and productivity; the price formula included a factor allowing for price anticipations.

Firms are not always successful in attaining their price, quantity and profits objectives. There are situations in which they cannot impose prices and achieve output or profit targets. It is the macroeconomic conditions that determine whether in the aggregate firms achieve their objectives.

From Kalecky we know that aggregate profits for a closed economy are given by : (6)

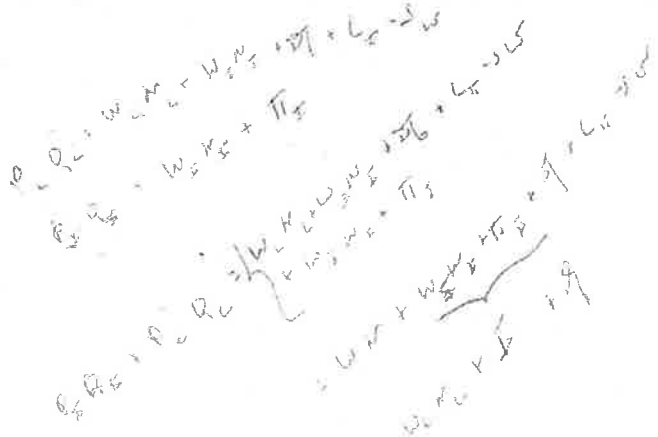
$$5.1 \qquad \Pi = I + Df + C_{\Pi} - S_w$$

where Π are profits, I investment, Df deficit, C_{Π} consumption out of profits and S_w, savings out of wages.

Under reasonable assumptions, we may write for a closed ~~and integrated~~ economy :

$$5.2 \qquad P\,Q = WN + I + Df + C_{\Pi} - S_w$$

since we have defined profits as the difference between the value of output (PQ) and the wage bill (WN), N being the amount of employment.



Or we may write :

$$5.3 \qquad PQ = WN \left(1 + \frac{I + Df + C_{\pi} - S_w}{WN} \right)$$

Therealized price level becomes :

$$5.4 \qquad P = \frac{WN}{Q} \left(1 + \frac{I + Df + C_{\pi} - S_w}{WN} \right)$$

Let us write Q° for normal output and Q for actual output. The ratio between the second and the first one becomes: (7)

$$k = \frac{Q}{Q^\circ}$$

If we define $a^\circ = Q^\circ / N$

as the normal productivity of labour, then 5.4 becomes (8):

$$5.5.1 \qquad P = \frac{WN}{Q} \frac{Q^\circ}{Q^\circ} \left(1 + \frac{I + Df + C_{\pi} - S_w}{WN} \right)$$

or

$$5.5.2 \qquad P = \frac{W}{a^\circ} \frac{Q^\circ}{Q} \left(1 + \frac{I + Df + C_{\pi} - S_w}{WN} \right)$$

$$5.5.3 \qquad P = \frac{W}{a^\circ} \frac{1}{k} \left(1 + \frac{I + Df + C_{\pi} - S_w}{WN} \right)$$

Equation 5.5.3 can be written as :

$$5.5.4 \qquad P = \frac{c_L}{k}(1 + M)$$

where c_L is W/a° i.e. the normalized labour cost ,k is the ratio of output to target output and M is the mark up,given by the ratio of exogenous expenditure to the wage bill:

$$5.6 \qquad M = \frac{I + Df + C_\Pi - S_w}{WN}$$

Given the exogenous variables,the equations 3.2,3.5, 5.5.4 and 5.6 determine P(t),W(t),k and M.

Equations 5.5 are macroeconomic price equations.We assume that prices are as in the market power and bargaining equations as long as the macroeconomic price equation can equal that level for a given mark up by adjusting k, the ratio of employed to employable resources

as the macroeconomic price equation can equal that level for a given mark-up by adjusting k, the ratio of employed to employable results.

6. The Path of Prices

There are two price level equations and they represent different aspects of the workings of the economy. One price equation represents the market power of firms and the bargaining process in wages. This equation can be interpreted as yielding the supply price. The second price equation represents the aggregate demand conditions. In this second price equation the mark-up on unit costs is determined by the ratio to the wage bill in consumption goods of investment, the government deficit, the balance of trade and the consumption propensities of wage earners and profit receivers.

In both equations prices are mark-ups on unit labor costs which is the ratio of money wages to the productivity of labor. The course of money wages reflects bargaining and political processes.

The market power/bargaining power price equation becomes a second order difference equation

$$3.6 \quad P(t) - \left((2+\gamma\beta) + (\beta\gamma\lambda+\alpha\theta)\right) P(t-1) + (\beta\gamma\lambda+\alpha\theta)) P(t-2) = Z$$

or

$$3.21 \quad P(t) = \gamma C_L(t) + \alpha\left[P(t-1) + \theta\left(P(t-1) - P(t-2)\right)\right]$$

The macroeconomic price equation is:

$$5.53 \quad P_m(t) = \frac{C_L(t)}{k(t)} \left(1+M_c\right)$$

The actual path of prices depends upon the interaction between the market power price equation and the aggregate demand price equation. We need a reconciliation process, which means we need parameters that will adjust when the prices determined by the two equations differ. One parameter of reconciliation is the level of output relative to normal output, k, which can

just as well be interpreted as the unemployment rate.

If the unit labor costs in the two formulas are the same, then the reconciliation of the two price levels can be considered to take place by way of output and employment. If

$$(\ ) \qquad \frac{C_L(t)}{k(t)}(1+M_t) \neq \gamma C_L(t) + \alpha(P_{t-1}) + \alpha\theta(P_{t-1} - P_{t-2})$$

then k changes so that equality is achieved. This means that if the aggregate demand price equation for a given k is higher than the market power price equation, then k(t) will increase (unemployment will decrease). Similarly, if the aggregate demand price equation yields a lower price level than the bargaining power market power price equation output will fall, unemployment will increase. That is, if

$$\frac{C_L(t)}{k(t)}(1+M_t) < \gamma C_L(t) + \alpha P_{t-1} + \alpha\theta(k_{t-1} - P_{t-2})$$

then k_t falls, output falls and unemployment rises.

If prices as set by market power are too great for demand then aggregate output falls. Too great a rise in prices by the exercises of market power implies unemployment. Stagflation is no mystery. It results from an inconsistency of prices as set by market power and prices as determined by spending patterns of the economy. This inconsistency can be reconciled by paying the prices as set by market power but purchasing less. The adjustment comes through unemployment.

If $\frac{C_L(t)}{k(t)}(1+M_t) > \gamma C_L(t) + \alpha P_{t-1} + \alpha\theta(P_{t-1} - P_{t-2})$, then k_t will rise. Thus prices will be as the market power dynamics would indicate unless k_t cannot change.

In both cases equality of the market power and macroeconomic price formulas is achieved by adjustment of the ratio of output to target output.

~~Employment and output adjust.~~ Price moderation by units that have market power is good for employment whereas price aggressiveness is bad. ~~We have achieved the inverse of the Phillips curve.~~ ~~Inasmuch as~~ rising unemployment and sluggish expansion of output is ~~one~~ repercussion of increases ~~in prices~~ beyond that which can be sustained by macroeconomic ~~determinants~~, the ~~result~~ can properly be labeled stagflation.

However, ~~we can posit that~~ the output adjustment process has ~~a~~ limits ~~that is~~, there is a k_{min} and a k_{max} beyond which k is not allowed to move:

$$k_{min} \leq k^{K}(t) \leq k_{max} .$$

~~k_{min} is~~ the lowest level of employment policy can tolerate and k_{max} is some full employment level of output.[9]

If, with employment at a maximum, prices as determined by aggregate demand, exceed prices as given by market power, ~~the~~ output shortages will ~~make~~ actual prices exceed ~~the~~ prices as determined by ~~the~~ market dynamics as ~~given in~~ equation 3.2. This is a case of pure demand inflation ~~and might be likened to~~ the inflation that accompanied the escalated entry into Viet Nam.

With actual p(t) greater than ~~anticipated~~ p(t), new initial conditions ~~determining a new A_1 and A_2 for the solution equation are set in motion~~. This new equation will make for a more rapid rate of growth of the market power/bargaining ~~wage rate.~~

When ~~the~~ market power price equation leads to prices that are greater than the macroeconomic price formula allows, then output falls, unemployment rises even as prices rise. This process continues until the minimum accepted employment level is achieved. At that point two routes to policy are open. Fiscal policy can increase the deficit ~~along some path~~, thus increasing the mark-up on labor costs that aggregate demand can sustain. This path would lead to rising prices at a faster rate than earlier.

Alternatively, a fight inflation program can be adopted which constrains the rise in the components of the mark-up. If the prices implicit in this program fall very fast then the reaction through the unemployment level may not be appreciable, prices achieved will fall below the market power relation.

If prices are not as the market power equation indicates, the new initial conditions become the basis for a new ruling dynamical equation that lowers the weight of the dominant root--it may even be negative so that a rapid price deflation begins.

The economy is not a mechanical interaction among price determining equations: the economy's actual price path reflects market processes. A break in the price path that market power and bargaining would determine indicates that there has been a change in the effective market power of firms. If there was no firm market power then prices would be as the aggregate demand equation indicates with the k parameter set at some approximatioon to full employment.

If stagflation is the result of firms' market power, the bargaining process, and accomodating monetary/fiscal policies, along with a policy commitment to investment combined with an unwillingness of the authorities to tolerate unemployment above some threshhold, then stagflation can be eliminated only if market power, bargaining or the commitment to investment are reduced. Allowing unemployment to increase--forcing a serious depression--is one way to decrease market power and the impact of bargaining.

The alternative to a deep depression is to eliminate the impact of market power and bargaining upon prices: to lower the major root of the solution equation for the market power price equation. This can be done in two ways: legislation that truly forces competitive labor and product markets or an

incomes policy which effectively constrains the ability of units with market power to affect prices and wages.

The market and bargaining powers that force the hand of macroeconomic policy to validate inflation are themselves the product of the success of macroeconomic demand management in maintaining a close approximation to full employment over an extended period of time. ~~The~~ successful macroeconomic policies reduced the potential penalty for exercising market power by assuring that profit flows will be sustained. Assured profits meant that the use of resources to gain market power by firms along with an acquiescence by firms in the exercise of limited ~~market~~ power by unions led to the development of an institutional structure which gave price and wage determination an "uncontrolled" dynamic of its own. ~~An effective incomes policy must be based upon recognition that the basic cause of the~~ transformation of macroeconomic stabilization policy into an engine of inflation was the growth in market power and an increase in the willingness of those with market power to use their power. For incomes policy to enjoy more than a transitory success it must be joined to industrial and labor market policies that aim at constraining and reducing market power. Demand management ~~is successful as~~ output and employment ~~management~~ as ~~it works within a~~ structure of ~~competitive~~ markets in which market power is limited.

~~It is not surprising that~~ incomes policy, in the sense of policies that actively impose the results that would rule in competitive markets where competitive do not exist, is a necessary adjunct to successful monetary and fiscal policy.

7. Final Remarks

The success of the Phillips curve in explaining wage and price behavior in the sixties led to the diffusion of a trade-off philosophy: more unemployment

is necessary if there is to be less inflation. In fact, in the years that followed, increases in unemployment have been tolerated because less inflation was to result. In the seventies, even as the trade-off view dominated policy, we have had more inflation with more unemployment.

An implication of the present work is that unemployment and inflation are both results of the processes by which prices are set and then "determined" by the structure of income. Unemployment is not a variable that checks inflation as long as the tolerable range of unemployment is slight. The success of the Phillips curve explaining prices and wages in the sixties was more the result of the underlying pattern of the economy than the result of how prices are formed in the labor market.

To understand the new reality of stagflation, one has:

a) to have a suitable analytical framework;

b) to identify the main historical changes.

We presented a first target. Two are the elements essential to the working of the model: the parameters of the reduced form of the system that sets ex ante prices are such as to generate an explosive inflation, while the presence of a ceiling to prices due to the limit on the mark-up that can be realized tends to generate unemployment, k falls when $p_{ex\ ante} > p_{ex\ post}$. When $p_{ex\ ante}$ has to adjust to $p_{ex\ post}$, the new initial condition is the $p_{ex\ ante}$ determining relation can lead to a downturn in prices. The model does not belong to either the cost push or to the monetarist variant of neo-classocal thinking. The aspects typically characterising cost push models of inflation are incorporated in to the reduced form, while monetary or financial factors influence the ceiling by affecting financial investment.

The model is open not only because it does not explain the behavior of important variables (for instance, investment or productivity), but also

because it does not pretend to explain the inflation process in its historical experience.

However, as has been pointed out, it is just this openness that makes it more useful for research on a concrete historical experience. The fact that the parameters have changed in such a way as to produce an accelerating inflation is not an explanation of inflation but it is rather an expression of it. ~~The same holds true for the shifts of the ceiling in time.~~

The only way to face a crisis in the process of accumulation and to prevent a deep and lasting depression is to increase the government deficit. This stimulates profits even if it is not sufficient to check unemployment. The inflation of the years since the middle '60's in the United States is a side effect of this medicine (not only huge deficits but also effective lender of last resort intervention which has not been pursued in the present paper). It has taken place in spite of rising unemployment and a weakened labor movement. Other reasons why the ceiling has shifted come from the international links of each economy.

Not only can the present model incorporate the main shocks that have occurred at an international level, but it can be reshaped in such a way as to deal with the inflation explosion in reference to the international system itself.

7. Final remarks.

To understand the new reality of stagflation ,one has :

a)to identify the main historical changes;

b)to have a suitable analytical framework.

We tried to reach the second target.Although many factors contribute to history,we have looked for some systemic factors that makes stagflation a possible result.

Two ~~are the~~ elments essential to the working of the model : i) the parameters of the reduced form of the system that express what we called as the market power /bargaining process and 2) the macro-economic conditions that set a limit to the mark up that can be realized.

The ~~working of the~~ model ~~can~~ produce a variety of results that cannot be found in those models insisting exclusively either on cost-push aspects or on monetary factors.

The fact that the parameters can change in such a way as to produce an accelerating inflation which does not necessarily explode thanks to the working of a ceiling is not an explanation of inflation but it is rather an expression of it.The same holds true for the shifts of the ceiling in time.

As has been said,a positive aspect of the present model is that it is open to many extensions.For instance,not only the present model can incorporate the main shocks that have occurred at an international level, but it can be reshaped in such away as to deal with the inflation explosion referred tc the international system itself.

Notes

[1]For these aspects, see Minsky (1980).

[2]See Minsky (1959).In this aggregate model we shall not consider the structure of prices and hence we shall make the assumption that wages depend on prices in general.

[3]For a discussion on this point, see Ferri (1978).

[5]μ_1 and μ_2 are the roots of the characteristic equation:

$$f(x) = x^2 - (C+D)x + D$$

to the second order equation. The roots are determined by setting $f(x) = 0$. From elementary algebra, it turns out that if:

$(C+D)^2 - 4D > 0$; $C+D > 2$ and $D < 1$, then we have that μ_1 and $\mu_2 > 1$. The particular solution is equal to $h_o = \frac{Z}{1-C}$, where $1-C > 0$.

[6]See Kalecki (1971).

(3)For a discussion on the meaning of expectations and a criticism to the rational expecattions theory ,see Tobin (1980).It is worth stressing that in our model the expectations are not fixed once for all but may be changed according to the macroeconomic conditions.See paragraph 6.

(4)In the literature,the nature of wages almost always conforms to a Phillips curve,i.e. an inverse relation between the rate of change of money wages and the level of unemployment,perhaps adjusted to reflect recent and/or anticipated rates of changes of prices.The adjustments have become more complicated and carry more of the econometric explanatory weight as observations from the turbulent years since the middle 1960's gather weight.Phillips curve of recent literature is a complex reflection of the original formulation. A discussion on the origin,the meaning,the changes and the implications of the Phillips

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is beyond the scope of the present work.For an analysis,see Ferri(1978). Suffice it to stress some points.

i)The relationbetween wages and unemployment ,that was initially stated by Phelps Brown and Phillips,was taken to be an aggregate law of price formulation,i.e; that the rate of change of the price of a product is an increasing function of the excess demand in its own market.

ii)Afterwards,the researches have taken two routes.On one hand,many authors have tried to find a theoretical paradigm capable of generating the results.Neo-classical frameworks of the various kinds (Walrasian, Pigouvian or the so-called micro-foundations) have been the favourite choice above all in the Anglo-Saxon world.The roots in the Ricardo-Marx tradition has been stressed in the Italian tradition:see,for instance, Sylos Labini.(1988) On the other hand,estimates have been carry out in order to quantify the importance of the independent variables and ,primarily, the role of the prices which was negligible in the pioniering works.The importance of these studies lies in the attempt to draw economic policy conclusions:if the parameters of the prices is equal to one no trade-off between unemployment and prices is possible.

Three kinds of observations are worth stressing.

First of all,it is important to say that the success of the Phillips curve in the sixties was more the result of the underlying pattern of the economy than the result of how prices are formed in the labour market.

In the second place,it is true ,as the rational expectationists claim (but according to Tobin(1980),pag.29 this is not controversial),that Phillips curves did not survive when economic policy attempted ,whether purposefully or not,to purchase lower unemployment with the predicted increment of inflation.

Finally,it is not true ,as Friedman claims,that the differences among economists are of empirical nature about the value of the parameters. On the contrary there are important theoretical questions at issue.For instance,how are expectations formed outside a steady-state world?Which are the peculiarities of the labour market?(The developing theory of contracts tries,for instance ,to unveil the forces governing institutional arrangements even if with many ambiguities),while the marxists stress the relation between wages and the nature of the process of production in a capitalistic world.)Finally,one should ask in which sense the literature on the Phillips curve concieved as a trade-off instrument violates the methodological principle according to which interdependent markets determine system results.

(8)On this point see also Badhuri-Robinson (1980)

(8)We could define normal productivity theratio between normal output Q^o and optimum employment N^o, i.e $a^{o\prime} = Q^o/N^o$. In this case the equation 5.5.3' would become:

$$5.5.3'\quad P(t) = \frac{W}{a^{o\prime}} \cdot \frac{N}{N^o} \cdot \frac{1}{k} \left(1 + \frac{I + Df + C_{\pi} - Sw_w}{WN} \right)$$

(9) If one wants to emphasize the employment aspects, one should consider the equation 5.5.3' of ~~paragraph~~ footnote 8 and not the equation 5.5.3. In such a case one should consider N as a variable and one needs one more equation: Q = F(N) could be a candidate. In such a case the working of the model becames a little more complicated (N influences the denominator of M).

Appendix.

In order to understand the functioning of the model, one must distinguish between actual prices $(P^{(a)}(t))$, prices generated by a particular solution equation $(P(t))$, ceiling $(P^{(c)}(t))$ and floor $(P^{(f)}(t))$ price levels, identified by superscripts. [1]

Since in the present model ceilings will be interpreted as imposing new initial conditions, we take account of these intermettendly imposed initial conditions in our notation by writing the date of the initial conditions in paranthesis after $P(t)$, A_1 and A_2 and subtracting the date of the first initial conditions from the solution equation.

In these sections, it will be mathematically convenient to measure the variables P as deviation from h_o. A lower case p will be used when the level of prices is so measured.

Let us start from the determination od A_1 and A_2 .

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(1) A detailed description of these demonstrations are contained in Minsky(1959)

Determination of A_1 and A_2

To determine A_1 and A_2 it is necessary to know the actual level of prices of two dates, $P^{(a)}(o)$ and $P^{(a)}(1)$. We have:

$$p(o) = P^{(a)}(o) - h_o = A_1(0,1) + A_2(0,1)$$

$$p(1) = P^{(a)}(1) - h_o = -A_1(o,1)\mu_1 + A_2(o,1)\mu_2$$

Assuming h_o is known and that $p(1) = \bar{\mu}\, p^{(a)}(o)$ we have

A.1 $$A_1(o,1) = \frac{\bar{\mu} - \mu_2}{\mu_1 - \mu_2}\, p^{(a)}(o)$$

A.2 $$A_2(o,1) = \frac{\mu_1 - \bar{\mu}}{\mu_1 - \mu_2}\, p^{(a)}(o)$$

If $p(1) > p(o) > 0$

and $\mu_1 > \bar{\mu} > \mu_2$

then $A_1(o,1)$ and $A_2(o,1)$ are both positive and the price changes generated by this particular solution equation will be positive and the rate of growth of prices will increase, approaching μ_1 as a limit. On the other hand, if $\mu_2 > \bar{\mu}$, $A_1(o,1)$ is negative. THerefore if

$p(1) > p(o)$ but $p(1) < \mu_2\, p(o)$

$A_1(o,1)$, the coefficient of the dominant root will be negative.

This particular equation, with roots large enough to generate an explosive time series, will in fact have one upper turning point. If instead of $\bar{w}$ we introduce c, the rate of growth of the ceiling, we obtain the results previously stated.

The ceiling to prices

In time, say at the n th date, the rate of growth of prices generated by the particular solution equation will become greater than the ceiling

$$p(n) = A_1(o,1)\mu_1^n + A_2(0,1)\mu_2^n > c^n \; p(o)^{(c)}$$

where c is a constant rate of growth of the ceiling.

Whenever a particular solution equation tends to generate a price rate of change inconsistent with the constraint, the actual rate of, change will be equal to the ceiling rate of change. And whenever actual rate of change of prices is determined by a constraint, it will be interpreted as imposing new initial conditions.

As $\dot{p}(n)^{(a)}$ and $p(n+1)^{(a)}$ are both ceiling rate of change,

$$\frac{p(n+1)^{(a)}}{p(n)^{(a)}} = c$$

so that a negative $A_1(n,n+1)$ coefficient will be determined. As long as

$\mu_1 > \mu_2 > c$

this new particular solution equation

$$p(t;n,n+1) = A_1(n;n+1)\mu_1^{t-n} + A_2(n,n+1)\mu_2^{t-n}$$

will generate future rates of change of prices smaller than the ceiling

rates of the respective dates.

Therefore the ceiling will no longer be an effective constraint. The variable will bounce off the ceiling and ,unless constrained by a floor, the solution equation will in time generate an income that approaches $-\infty$ at a rate determined by μ_1. (2)

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(2) Mutatis mutandis,we can apply the same kind of technique in the presence of a floor which can be represented by a price equation incorporating some minimum level of mark up. However, as Hicks pointed out "it is harder to demonstrate the necessity of a floor than to demonstrate the necessity of a ceiling". See Hicks(1949)

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On the other hand, if $\mu_1 > 0, \mu_2 > 1$ a steady solution will be generated. In fact, let us suppose that the nth and (n+1) st date are ceiling level of prices. A particular solution equation determined by using these dates' prices as initial conditions will have positive A_1 and A_2 (see A_1 and A_2). This particular equation will yield only positive and increasing prices and $p(n+2)$ generated by this equation will be greater than $p^{(c)}(n+2)$. As a result of $p(n+2)$ being determined by a ceiling constraint rather than by the solution equation, new initial conditions are effective. This will be repeated as long as the ceiling level of prices is the effective determinant. A steady solution will be generated .