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NOTES

OPTIMAL MONETARY AND FISCAL POLICIES UNDER WAGE AND PRICE RIGIDITIES

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We study a structural dynamic monetary economy submitted to technological, monetary, and real demand shocks, and investigate the nature of optimal monetary and fiscal policies under Walrasian or preset wages and prices. If prices and wages are Walrasian, then the optimal policies are both nonactivist and derive directly from Milton Friedman's prescriptions. If prices or wages are preset, however, optimal policies, and, notably, the fiscal part, become activist and countercyclical.

Keywords: Activist Policies, Optimal Policy, Fiscal Policy, Monetary Policy, Nominal Rigidities

1. INTRODUCTION

This article studies optimal monetary and fiscal policies in a monetary cash-in-advance economy under price or wage rigidities. We shall be particularly interested in giving some answer to the long-standing debate on whether wage or price rigidities make a valid case for activist countercyclical policies. We begin our investigation by quickly reviewing the most salient features of this debate.

Until the early seventies, it was generally admitted, following Keynesian intuitions, that wage (or price) rigidities provided a strong case for countercyclical demand policy activism. Under such rigidities, unforecasted negative demand shocks create underemployment of resources and, it was thought, government can successfully fight such underemployment by adequate demand stimulation (and conversely for positive shocks).

This consensus exploded at the beginning of the seventies with the advent of rational expectations. Two lines of critique have been particularly harmful to the Keynesian view:

The first one stems from the seminal work by Lucas (1972), and is based on the fact that most models displaying policy effectiveness are not "structural," that is, not based on rigorous microfoundations. Indeed, it is the case that the results

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of many "nonstructural" models come from some ad hoc assumptions introduced in the equations of the model. So effectiveness must clearly be investigated in the framework of a fully structural model. A good recent example of such an investigation is found in Ireland (1996), who constructed a rigorous maximizing model of an economy characterized by price rigidities and submitted to technology and monetary shocks. He found that a nonactivist policy, directly inspired by Friedman's (1969) prescriptions, would allow one to reach the highest possible utility under monetary shocks. Using activist policies against such shocks would thus be counterproductive.

The second critique was put forward by Sargent and Wallace (1975, 1976). They show that effectiveness of policy in most traditional Keynesian models is essentially due to an "informational advantage" implicitly conferred to the government in such models. More precisely, the government is allowed to react to some "recent" shocks, whereas the private sector is locked into "old" wage or price contracts. Now if the government is not allowed to react to more shocks than the private sector, then government policies become "ineffective." This critique was particularly damaging, notably as most Keynesian models, even those constructed with rational expectations after Sargent–Wallace, were actually totally vulnerable to this critique [Fischer (1977) is a well-known example].[1]

Although the case for policy effectiveness might look extremely bleak at this stage, the purpose of this article is nevertheless to reexamine the issue in a full maximizing framework, and to show that a well-designed policy can be effective. We thus study a dynamic economy subjected to technological, monetary, and real demand shocks, and investigate the nature of optimal monetary and fiscal policies.[2] We shall see that, contrary to common wisdom, even though the model is structural and the Sargent–Wallace conditions are met, activist countercyclical fiscal policies will be part of the optimal policy package. More precisely, the results are the following:

- If prices and wages are Walrasian, then the optimal monetary policy is to have the nominal interest rate set to zero; the optimal fiscal policy is to have the stock of "outside money" grow at the rate β, where β is the discount rate. We thus find the two "Friedman rules" [Friedman (1969)], and these policies are, of course, nonactivist.
- If wages are preset, the optimal monetary policy is still to maintain the nominal interest rate at zero, but the optimal fiscal policy becomes activist and countercyclical, in the sense that the fiscal transfer is negatively related to past demand shocks.
- If prices are preset, then the optimal monetary policy remains the same. Fiscal policy reacts negatively to demand shocks, and positively to technology shocks.

The plan of the paper is the following: Section 2 describes the model and Section 3 studies Walrasian equilibria as a benchmark. Section 4 presents the optimality criterion and derives the optimal policy in the Walrasian case. Section 5 describes the preset wage equilibria and the associated optimal monetary and fiscal policies. Section 6 carries out the same investigation for preset prices. Section 7 concludes.

2. THE MODEL

We consider a monetary overlapping generations model [Samuelson (1958)] with production. The economy includes representative firms, households, and the government.

All generations have the same number of agents. Households of generation t live for two periods. They work L_t and consume C_t in period t, consume C'_{t+1} in period $t+1$. They maximize the expected value of their utility U_t:

$$U_t = \alpha_t \operatorname{Log} C_t + \operatorname{Log} C'_{t+1} - (1+\alpha_t)L_t, \tag{1}$$

where α_t is a positive stochastic variable. The coefficient $1+\alpha_t$ in the disutility of labor yields a constant Walrasian labor supply in the absence of government intervention (Section 3), so that variations in α_t are essentially "real demand shocks."

Households are submitted in each period of their life to a cash-in-advance constraint. These are written for the household born in period t:

$$m_t \geq \theta_t P_t C_t \qquad m'_{t+1} \geq \theta_{t+1} P_{t+1} C'_{t+1}, \tag{2}$$

where θ_t, the inverse of the "velocity of money," is a stochastic shock. The total quantity of money is simply $M_t = m_t + m'_t$. We see that at least the young household, which starts life without any financial asset, will need to borrow money to satisfy this cash-in-advance constraint. It can do so at the interest rate i_t set by the government.

The representative firm in period t has the production function

$$Y_t = Z_t L_t, \tag{3}$$

where Y_t is output, L_t is labor input, and Z_t is a technology shock common to all firms. The firms belong to the young households, to which they distribute their profits.

To make the exposition simpler, we assume that the three shocks, α_t, θ_t, and Z_t are stochastic i.i.d. variables.

Government has two policy instruments: It sets the interest rate i_t (or any other variable representing its open-market policy). It can also increase or decrease households' financial holdings through lump-sum monetary transfers T_t to the old households.

In each period, events occur in three steps:

(i) Government sets its two policy variables, the interest rate i_t and the "fiscal" transfer T_t, to the old. We assume that i_t and T_t are functions only of macroeconomic variables up to $t-1$ included (and therefore *not* of any variable or shock revealed in period t).

(ii) In a second step the wage (or price) is set by the private sector at its expected market-clearing value, without knowing the values of period t shocks α_t, θ_t, and Z_t.

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(iii) Finally, the shocks become known to the private sector and transactions are carried out.

We note that our framework clearly satisfies the Sargent–Wallace (1975) criterion since (a) wage contracts are signed after policy is announced and (b) government policy in time t is based on information up to $t-1$, which the private sector already knows.

3. WALRASIAN EQUILIBRIUM

To contrast the results with the preset wage (or price) economy, we study first the Walrasian equilibria of this economy.

3.1. Computing the Equilibrium

Call P_t and W_t the price and nominal wage. The real wage is equal to the marginal productivity of labor:

$$\frac{W_t}{P_t} = Z_t. \tag{4}$$

Let us now consider the problem of the old household in period t. Denote as Ω_t the financial wealth that it has at the beginning of period t, *including* the governmental transfer T_t. If the old household consumes C_t', it has to keep $\theta_t P_t C_t'$ under the form of money, will lend $\Omega_t - \theta_t P_t C_t'$ at the rate i_t, and will pay $(1-\theta_t) P_t C_t'$ at the end of the period, so that the household will be left with a financial wealth equal to

$$(1+i_t)\Omega_t - (1+\theta_t i_t) P_t C_t'. \tag{5}$$

Of course the old household wants to end up with zero wealth, so that the second-period consumption is given by

$$P_t C_t' = \frac{1+i_t}{1+\theta_t i_t}\Omega_t. \tag{6}$$

Now let us write the maximization program of the young household born in t. It receives profits $\Pi_t = P_t Y_t - W_t L_t$ when young, and a lump-sum monetary transfer T_{t+1} from the government when old. If it consumes C_t in the first period of its life, it will end up in the second period with a financial wealth

$$\Omega_{t+1} = (W_t L_t + \Pi_t + T_{t+1}) - (1+\theta_t i_t) P_t C_t. \tag{7}$$

In view of (6), the expected value of $\operatorname{Log} C_{t+1}'$ is, up to an unimportant constant, equal to $\operatorname{Log} \Omega_{t+1}$, so that the household in the first period of its life solves the following program:

$$\text{Maximize } \alpha_t \operatorname{Log} C_t + \operatorname{Log} \Omega_{t+1} - (1+\alpha_t) L_t \qquad \text{s.t.}$$
$$\Omega_{t+1} = (W_t L_t + \Pi_t + T_{t+1}) - (1+\theta_t i_t) P_t C_t.$$

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Note that, since T_{t+1} is a function of variables up to period t, it is known to the household when deciding on quantities supplied and demanded, so that the above program is deterministic. The first-order conditions for this program yield

$$P_t C_t = \frac{\alpha_t}{1+\alpha_t} \frac{W_t L_t + \Pi_t + T_{t+1}}{1+\theta_t i_t} = \frac{\alpha_t}{1+\alpha_t} \frac{P_t Y_t + T_{t+1}}{1+\theta_t i_t}, \tag{8}$$

$$L_t^s = \frac{W_t - \Pi_t - T_{t+1}}{W_t}. \tag{9}$$

Equation (8) is the usual consumption function, while equation (9) gives the Walrasian supply of labor. The equilibrium condition on the goods market is

$$C_t + C_t' = Y_t = Z_t L_t. \tag{10}$$

Equations (4), (6), (8), (9), and (10) determine all equilibrium values. We can combine them to compute

$$P_t^* = \frac{(1+\alpha_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t + \alpha_t \theta_t i_t) Z_t}, \tag{11}$$

$$W_t^* = \frac{(1+\alpha_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{1+\theta_t i_t + \alpha_t \theta_t i_t}, \tag{12}$$

$$C_t = \frac{\alpha_t Z_t}{(1+\alpha_t)(1+\theta_t i_t)}, \tag{13}$$

$$C_t' = \frac{(1+i_t)(1+\theta_t i_t + \alpha_t \theta_t i_t)\Omega_t Z_t}{(1+\alpha_t)(1+\theta_t i_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}, \tag{14}$$

$$L_t = \frac{(1+\alpha_t)(1+i_t)\Omega_t + \alpha_t T_{t+1}}{(1+\alpha_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}, \tag{15}$$

where P_t^* and W_t^* are the Walrasian price and wage. We see from equation (15) that, as we indicated in Section 2 above, if there are no transfers, i.e., if $T_{t+1} = 0$, then the Walrasian quantity of labor is constant and equal to one.

4. OPTIMALITY

To assess the optimality properties of government policies, both in the Walrasian and the non Walrasian case, we need a welfare criterion. We shall use a criterion proposed by Samuelson himself for the overlapping generations model (Samuelson, 1967, 1968, Abel, 1987). After describing it, we shall show that it yields in the Walrasian case the same prescriptions as those obtained in the traditional models with infinitely lived consumers.

4.1. The Criterion

In period t, the government maximizes the function V_t, which is a discounted sum of the utilities of all generations:

$$V_t = E_t \sum_{s=t-1}^{\infty} \beta^{s-t} U_s. \tag{16}$$

The sum starts at $s = t - 1$ because the household born in $t - 1$ is still alive in t. The limit case $\beta = 1$ corresponds to maximizing the representative household's expected utility. It will turn out that β plays the same role here as the household's discount rate in traditional models.

Rearranging the terms in the infinite sum (16), we find that, up to a constant, V_t can be rewritten under the more convenient form

$$V_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} \Delta_s, \tag{17}$$

$$\Delta_t = \alpha_t \operatorname{Log} C_t + \frac{\operatorname{Log} C_t'}{\beta} - (1 + \alpha_t) L_t. \tag{18}$$

4.2. A Characterization of Optimal States

The resource constraint in each period is

$$C_t + C_t' = Z_t L_t. \tag{19}$$

To find the optimal allocation, one should maximize in each period the quantity Δ_t [formula (18)] subject to the resource constraint (19). One obtains immediately the "first-best" allocation characterized by

$$C_t = \frac{\alpha_t Z_t}{1 + \alpha_t}, \qquad C_t' = \frac{Z_t}{\beta(1 + \alpha_t)}, \tag{20}$$

$$L_t = \frac{1}{1 + \alpha_t} \left(\alpha_t + \frac{1}{\beta} \right). \tag{21}$$

4.3. Optimal Policies in the Walrasian Case

For later comparison with the results under nominal rigidities, we now compute, as a benchmark, optimal policies in the Walrasian case. They are characterized by the following proposition.[3]

PROPOSITION 1. *Under Walrasian wages and prices, the optimal monetary and fiscal policies are given by*

$$i_t = 0, \tag{22}$$

$$\frac{\Omega_t + T_{t+1}}{\Omega_t} = \beta. \tag{23}$$

Proof. Our intuition tells us that, under the optimal policies, the Walrasian equilibrium will be a first best. We can thus find the optimal policy by equating the first best values of C_t and C'_t [equation (20)] and those obtained at the Walrasian equilibrium [equations (13) and (14)]. We therefore obtain the two conditions,

$$C_t = \frac{\alpha_t Z_t}{(1+\alpha_t)(1+\theta_t i_t)} = \frac{\alpha_t Z_t}{1+\alpha_t}, \tag{24}$$

$$C'_t = \frac{(1+i_t)(1+\theta_t i_t + \alpha_t \theta_t i_t)\Omega_t Z_t}{(1+\alpha_t)(1+\theta_t i_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]} = \frac{Z_t}{\beta(1+\alpha_t)}. \tag{25}$$

Simplifying equations (24) and (25), we obtain the two conditions (22) and (23). ■

We recognize in formulas (22) and (23) the two famous "Friedman rules," which originate in Friedman's (1969) "optimal quantity of money" article: Set the nominal interest rate at zero and have a monetary aggregate grow at a rate equal to the discount factor β.

The fundamental thing to note, in view of our interest in the "activism versus nonactivism" debate, is that rules (22) and (23) are totally nonactivist because they do not depend in any way on any event, past or present.

We shall now see that the introduction of preset wages or prices changes things quite substantially.

5. PRESET WAGES

We shall start with preset wages, and assume that the preset wage is equal to the expected value of the Walrasian wage,[4] that is,

$$W_t = E_{t-1} W_t^*, \tag{26}$$

where the expression of W_t^* is given in formula (12).

5.1. The Equilibrium

Because the wage is preset, equation (9) representing households' labor supply does not hold anymore, but the other equilibrium equations—(4), (6), (8), and (10)—are still valid. Combining them, we find that the preset wage equilibrium quantities C_t, C'_t, and L_t are given by

$$C_t = \frac{\alpha_t[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t)(1+\theta_t i_t + \alpha_t \theta_t i_t)} \frac{Z_t}{W_t}, \tag{27}$$

$$C'_t = \frac{(1+i_t)\Omega_t Z_t}{(1+\theta_t i_t)W_t}, \tag{28}$$

$$L_t = \frac{(1+\alpha_t)(1+i_t)\Omega_t + \alpha_t T_{t+1}}{(1+\theta_t i_t + \alpha_t \theta_t i_t)W_t}. \tag{29}$$

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5.2. Optimal Policies

We shall now characterize the optimal fiscal and monetary policies through the following proposition:

PROPOSITION 2. *Under preset wages, the optimal monetary and fiscal policies are given by*

$$i_t = 0, \tag{30}$$

$$\frac{\Omega_t + T_{t+1}}{\Omega_t} = \frac{\beta(1+\alpha_a)}{1+\alpha_t}, \tag{31}$$

where

$$\alpha_a = E(\alpha_t). \tag{32}$$

Proof. To find the optimal policy in a simple manner, we use a slightly roundabout method, which uses essentially the fact that the value of C'_t in (28) is independant of the demand shock α_t. Thus, we proceed in two steps:

(i) We compute the best possible situation attainable under the constraint that C'_t is independant of α_t.
(ii) We show that the policy defined by (30) and (31) actually leads to this best situation, so that it is indeed the optimal policy.

Let us now carry out step (i). For that, we maximize the expected value of the "period t utility," Δ_t:

$$\Delta_t = \alpha_t \operatorname{Log} C_t + \frac{1}{\beta} \operatorname{Log} C'_t - (1+\alpha_t) L_t \tag{33}$$

subject to the feasibility constraint $C_t + C'_t = Z_t L_t$ and the condition that C'_t be independent of α_t. Let us first insert the feasibility constraint into (33). The maximand becomes

$$\alpha_t \operatorname{Log} C_t + \frac{1}{\beta} \operatorname{Log} C'_t - (1+\alpha_t) \frac{C_t + C'_t}{Z_t}. \tag{34}$$

Since there is no constraint on C_t, we immediately find

$$C_t = \frac{\alpha_t Z_t}{1+\alpha_t}. \tag{35}$$

Now taking out constant terms, we have to maximize the expected value of

$$\frac{1}{\beta} \operatorname{Log} C'_t - (1+\alpha_t) \frac{C'_t}{Z_t} \tag{36}$$

under the only constraint that C'_t is independent of α_t. This amounts to maximizing, for every value of the shock Z_t, the following quantity:

$$\frac{1}{\beta} \operatorname{Log} C'_t - (1+\alpha_a) \frac{C'_t}{Z_t}, \tag{37}$$

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which yields

$$C_t' = \frac{Z_t}{\beta(1+\alpha_a)}. \tag{38}$$

We now move to step (ii) and show that policies (30) and (31) indeed allow us to reach the allocation defined by (35) and (38). To show that, we equalize the values in (27) and (28) to those we just found [(35) and (38)]:

$$C_t = \frac{\alpha_t[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t)(1+\theta_t i_t + \alpha_t \theta_t i_t)} \frac{Z_t}{W_t} = \frac{\alpha_t Z_t}{1+\alpha_t}, \tag{39}$$

$$C_t' = \frac{(1+i_t)\Omega_t Z_t}{(1+\theta_t i_t)W_t} = \frac{Z_t}{\beta(1+\alpha_a)}. \tag{40}$$

First using equation (39), and comparing it with the value of the Walrasian wage W_t^* [equation (12)], we obtain

$$W_t = \frac{(1+\alpha_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t)(1+\theta_t i_t + \alpha_t \theta_t i_t)} = \frac{W_t^*}{1+\theta_t i_t}. \tag{41}$$

Given that $W_t = E_{t-1} W_t^*$, the only way to make these consistent is to have $i_t = 0$ [equation (30)]. Now, inserting the value $i_t = 0$ into equations (39) and (40), we obtain

$$\Omega_t + T_{t+1} = \frac{W_t}{1+\alpha_t}, \tag{42}$$

$$W_t = \beta(1+\alpha_a)\Omega_t. \tag{43}$$

Combining (42) and (43), we finally obtain the optimal fiscal policy [equation (31)]. ■

The optimal monetary-fiscal policy consists of equations (30) and (31). The open-market rule is the same as in the Walrasian case ($i_t = 0$), but the optimal fiscal policy (31) is now an activist countercyclical one: A negative demand shock today (low α_t) triggers a monetary expansion tomorrow (high T_{t+1}) and conversely for a positive demand shock.

Let us note that since $i_t = 0$, equation (41) is rewritten as

$$W_t = W_t^*. \tag{44}$$

This means that, whatever the value of the shocks, the labor market will be cleared at all times inspite of the preset wages!

At this stage, it may be useful to give here a simple intuition as to why the countercyclical policy (31) so effectively stabilizes the economy: from equation (27) an unexpected negative shock α_t depresses consumption, and thus output and employment. However, in view of (31), households will therefore know that T_{t+1} will be high, and this, again from (27), will *a contrario* tend to increase consumption, output, and employment. Under policies (30) and (31), these two antagonistic effects exactly balance, so that the labor market remains cleared.

6. PRESET PRICES

Let us now assume that, instead of wages, it is the prices that are preset according to the formula

$$P_t = E_{t-1} P_t^*, \tag{45}$$

where P_t^* is given in equation (11).

6.1. Computing the Equilibrium

Now, equation (4), representing the firms' goods supply behavior, does not hold anymore since the price is preset. The other equilibrium equations—(6), (8), (9), and (10)—are still valid. Combining them, we obtain the values of the preset price equilibrium quantities:

$$C_t = \frac{\alpha_t[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t)(1+\theta_t i_t + \alpha_t \theta_t i_t)P_t}, \tag{46}$$

$$C_t' = \frac{(1+i_t)\Omega_t}{(1+\theta_t i_t)P_t}, \tag{47}$$

$$L_t = \frac{(1+\alpha_t)(1+i_t)\Omega_t + \alpha_t T_{t+1}}{(1+\theta_t i_t + \alpha_t \theta_t i_t)P_t Z_t}. \tag{48}$$

6.2. Optimal Policies

We characterize the optimal fiscal and monetary policies through the following proposition.

PROPOSITION 3. *Under preset prices, the optimal monetary and fiscal policies are given by*

$$i_t = 0, \tag{49}$$

$$\frac{\Omega_t + T_{t+1}}{\Omega_t} = \frac{\beta(1+\alpha_a)Z_t}{(1+\alpha_t)Z_a}, \tag{50}$$

where

$$\alpha_a = E(\alpha_t), \qquad \frac{1}{Z_a} = E\left(\frac{1}{Z_t}\right). \tag{51}$$

Proof. Following the same method as in Section 5, we note that the value of C_t' in (47) is independant of both the demand shock α_t and the productivity shock Z_t. We thus maximize again the expected value of Δ_t:

$$\Delta_t = \alpha_t \operatorname{Log} C_t + \frac{1}{\beta} \operatorname{Log} C_t' - (1+\alpha_t)L_t, \tag{52}$$

subject this time to the feasibility constraint $C_t + C_t' = Z_t L_t$ and the condition that C_t' be independent of both α_t and Z_t. Using the same reasoning as in the proof of Proposition 2, we obtain

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$$C_t = \frac{\alpha_t Z_t}{1+\alpha_t}, \qquad C_t' = \frac{Z_a}{\beta(1+\alpha_a)}. \tag{53}$$

Now if a set of policies allows to reach these values, it will be the optimal one. We thus equalize the values in (46) and (47) to those we just found (53):

$$C_t = \frac{\alpha_t[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t)(1+\theta_t i_t + \alpha_t\theta_t i_t)P_t} = \frac{\alpha_t Z_t}{1+\alpha_t}, \tag{54}$$

$$C_t' = \frac{(1+i_t)\Omega_t}{(1+\theta_t i_t)P_t} = \frac{Z_a}{\beta(1+\alpha_a)}. \tag{55}$$

First using equation (54), and comparing it with the value of the Walrasian price P_t^* [equation (11)], we obtain

$$P_t = \frac{(1+\alpha_t)[(1+i_t)\Omega_t + (1+\theta_t i_t)T_{t+1}]}{(1+\theta_t i_t)(1+\theta_t i_t + \alpha_t\theta_t i_t)Z_t} = \frac{P_t^*}{1+\theta_t i_t}. \tag{56}$$

Since $P_t = E_{t-1}P_t^*$, the only way to make these consistent is to have $i_t = 0$ [equation (49)]. Inserting $i_t = 0$ into equations (54) and (55), we obtain

$$\Omega_t + T_{t+1} = \frac{P_t Z_t}{1+\alpha_t}, \tag{57}$$

$$P_t = \frac{\beta(1+\alpha_a)\Omega_t}{Z_a}. \tag{58}$$

Combining (57) and (58), we obtain the optimal fiscal policy [equation (50)]. ■

The open-market rule is again the same as in the Walrasian situation ($i_t = 0$). Optimal fiscal policy (50), as in the preset wages case, reacts countercyclically to demand shocks α_t. Moreover, it now reacts positively to productivity shocks Z_t. This might look like an element of "procyclical" policy, but actually it is not if we look at the labor market: Under rigid prices, a positive productivity shock creates a *negative* shock on labor market demand. It is natural in such a case to want to engineer a demand expansion so as to bring market balance in the labor market, and this policy is countercyclical from the point of view of the labor market.

Further, our policy has the same remarkable feature as in the preset wage case. Indeed, with $i_t = 0$, equation (56) becomes

$$P_t = P_t^*. \tag{59}$$

Even though the price is preset before the shocks are revealed, the goods market is always cleared under our optimal policy! Note, however, comparing (20) and (53), that this optimal policy does not allow us to reach the first best optimum (the same was true under preset wages), so that nominal rigidities still result in some residual efficiency cost, however attenuated by our optimal policy.

7. CONCLUSIONS

We constructed a simple but rigorous model of a dynamic economy submitted to three types of shocks (technological, monetary, and real demand shocks) and studied the optimal fiscal and monetary policies under the three regimes of market clearing, preset wages, and preset prices.

An important question that motivated this investigation was whether wage or price rigidities make a valid case for policy activism. The answer is clearly yes, since we found the optimal policies to be activist in the cases of preset wages or prices. Our results are not subject to the usual critiques since (a) the model is microfounded and (b) it satisfies the informational restrictions (adequately) prescribed by Sargent and Wallace (1975). We also note that this optimality of activism was not an a priori obvious property of the model since, in the Walrasian version, it is optimal to follow the two (nonactivist) Friedman rules.

Now we qualify our results a little more since not any combination of shocks and rigidities is conducive to policy activism.

First, we note that there is a clearcut difference between fiscal and monetary policy: Optimal monetary policy is always used to maintain the nominal interest rate at zero, so that this part of the policy remains nonactivist. On the other hand optimal fiscal policy will respond in a countercyclical manner to real demand shocks α_t, whether wages or prices are rigid.

Second, it was often the case in models of Keynesian inspiration that government should respond countercyclically to all demand shocks. Here we must clearly differentiate between the different types of demand shocks: money velocity shocks θ_t and real demand shocks α_t. As it turns out, only the existence of real demand shocks α_t makes it necessary to run an activist fiscal policy. As for the velocity shocks θ_t, a zero nominal interest rate is sufficient to take care of them in all cases (rigid wages or prices). This result explains why Ireland (1996), working with a similar maximizing model, concluded that activist policies were useless against demand shocks: The only demand shocks he considered were velocity shocks. So, his conclusion that the Friedman rule was enough against demand shocks was due to the limited range of shocks considered.

Finally, we note that optimal reaction to a particular shock may depend very much on the underlying rigidity. We saw, for example, that, in this model, fiscal policy should not react to technology shocks if wages were rigid, but should react positively if prices were rigid.

So, although activist policies are superior in the case of nominal rigidities, it is clear that a very detailed knowledge of the economy, notably the rigidities and shocks that it is subject to, is necessary before embarking on such policies.

NOTES

1. There are, however, a few contributions that survive the Sargent–Wallace critique, such as those of Turnovsky (1980), Weiss (1980), King (1982), and Andersen (1986), but that are not set in a full maximizing framework.

2. Monetary policy consists of open-market policy. Fiscal policy takes the form of lump-sum money transfers.

3. Of course, this proposition will not surprise the reader since the basic intuitions were given by Friedman (1969). The policy rules were derived rigorously in models with infinitely lived agents by Dornbusch and Frenkel (1973), Grandmont and Younès (1973), and Brock (1975), and in OLG models by Abel (1987) and Crettez et al. (1999).

4. We thus take a "traditional" form of nominal wage rigidity, which has the advantage of introducing no distorsion other than the nominal rigidity itself. It is possible to carry out the same investigation when wages are set by imperfectly competitive utility-maximizing trade unions. Although similar results are obtained, the computations become much clumsier. The corresponding version is available from the author upon request.

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