On the Possibility and Desirability of Stabilization Policy

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1. Introduction

Can fiscal policy be used to stabilize the economy? In this essay we address this question within the framework of an equilibrium theory of business fluctuations. We conclude that fiscal policy rules, namely those with effects upon relative prices, can and have had important effects upon the stability of the economy and upon the deadweight loss of financing governmental expenditures. The method of analysis is that of neoclassical public finance theory which has been applied to numerous problems involving important effects of government policies upon resource allocation[1]. We see no reason why that theory is not equally applicable to evaluate fiscal policy rules which affect the stability of the economy.

The policy problem considered is that of choosing from a set of fiscal policy rules for setting tax rates and levels of government spending. Principles are sought for the design of good policy rules for three reasons. First, policy which is best in the cost-benefit sense of modern public finance may be very complicated and not explainable to the public. The policy selection process in a democratic society is not well suited to making subtle second and third best distinctions. Second, the determination of optimal policy requires precise estimates of the parameters of preferences and technology that are not available and probably not obtainable. Finally, the optimal policy will be time inconsistent as the authors (1977) have previously shown[2].

At this point we emphasize that the choice is from a set of fiscal policy rules. Only if businesses and households have a basis for forming expectations of future policies do they have well-defined decision problems, a prerequisite for the application of modern public finance theory. Only then is the behavior of the economic agents economically predictable. This is just the point made by Lucas (1976) in his critique of current econometric policy evaluation and will not be dwelt upon here. We emphasize that the fixed-rule procedure we advocate does not necessarily imply constant values or constant growth rates of the policy instruments. Feedback rules with the tax parameters varying systematically with economic conditions are considered. A policy rule, however, is needed before one can predict what equilibrium process will govern the economy.

Two policy principles follow from the analysis: First, tax policies, such as the rule by which the investment tax credit rate is varied, should be stated so businesses have a basis for forming expectations. In selecting the "rules of the game", the government is making a contract with individuals and firms. For some realizations of events the government would like to modify the contract as is typically the case for any contract. If the contract is modified at the discretion of the policy maker, the government is constraining itself to self enforceable or time consistent contracts and this reduces obtainable social welfare.

The second principle that emerges is that tax and investment credit rates should not be varied in an effort to stabilize the economy. Varying these rates increases the deadweight loss of collecting the revenues needed to finance public expenditures. Temporary changes in government expenditures should be financed by changes in the government debt. Permanent changes, however, that reflect society's changing demand for public goods and amounts of income redistribution are best financed by <u>permanent</u> changes in tax rates. The reason that varying tax rates increase the deadweight loss of taxation follows from the result of Ramsey (1927) that the loss in consumer surplus per dollar collected from taxing a commodity is greater the more elastic is its demand.[3] Capital goods produced in different periods are close substitutes as is leisure consumed in different periods and the elasticity of demand for a product with close substitutes is high. If all goods in a class which are close substitutes among themselves but not with other goods are taxed at the same rate, deadweight loss will be small.

This analysis assumes a representative household and consequently the income distributional element of fiscal policy is not considered. Income distribution considerations are indeed important in the design of tax and welfare programs and should not be ignored in designing tax policies. We, however, found no quantitatively important reason why varying tax rates and expenditures over the business cycle is an efficient way to redistribute income.

The focus of this discussion is fiscal policy but monetary factors are not completely ignored. The American tax system is not neutral to inflation. Changes in the average rate of inflation have large effects upon the price of new capital relative to the price of consumption goods and leisure and therefore a sizeable effect upon the stationary capital stock. As is shown in section 2, a change in the average annual inflation rate from zero to seven percent more than offsets the effect of a ten percent investment tax credit. This occurs because the effect of a capital good purchase today upon future tax liabilities is fixed in nominal terms. The real present value of such claims, an offset to the purchase price of the capital good in much the same way as is an investment tax credit, declines more the higher is the (expected) average future inflation rate. There are other nonneutralities of inflation, such as the liquidity tax effect, that affect real allocations even if anticipated. The quantitative magnitude of these are not large and are ignored in this essay.

2. Outline of a Theory of Fluctuations

A prerequisite for the application of neoclassical public finance is an equilibrium theory; that is, a specification of preferences and technology which rationalizes choices of the economic actors. The puzzle of the business cycle is why output does not vary smoothly over time but rather fluctuates about trend. In the postwar period these deviations from trend have been as large as five percent and have displayed considerable persistence. The rate of capital accumulation, in particular the production of producer and consumer durables, is highly correlated with output (both measured as percentage deviation from trend), with investment fluctuations displaying far greater amplitudes. Fluctuations in labor supplied are also positively and strongly correlated with output and have amplitudes comparable to those of real output. Can an equilibrium theory explain these well-known facts?

Lucas (1972) developed an equilibrium monetary shock theory that explained the negative correlation of output and the consumption of leisure. Monetary shocks confound relative price shifts resulting in correlated supply errors in a decentralized economy. Crucial to his theory is the intertemporal substitutibility of leisure which implies temporary changes in the real wage have large effects upon labor supplied while permanent changes have little and possibly negative effects. Later, Lucas (1975) introduced capital accumulation and information diffusion. This resulted in persistence of the effect of monetary shocks.

Even if Milton Freidman were made Chairman of the Fed monetary shocks would not be completely eliminated. There would continue to be shocks to the technology of exchange affecting the velocity of the chosen monetary aggregate in an unpredictable way. We, however, argue that shocks to the technology of production and fiscal policy parameter changes can and have had important effects upon relative prices and upon the resulting consumption of leisure and rate of capital accumulation. In section 2.1 we establish that changes in tax rates that have occurred in this postwar period have had large effects upon the stationary capital stock. Next we examine the persistence of deviations of output from trend and the momentum of the economy. We then argue that these facts are consistent with an equilibrium theory of fluctuations once it is recognized that considerable time elapses between the initiation of an investment project and its completion.

2.1 Quantitative effects of fiscal policy parameters upon the stationary capital stock

Policies which affect the relative price of capital goods, leisure, and consumption have important effects upon the stationary capital stock. Abstracting from growth, as our concern is with deviations from trend, the stationary capital stock k^s satisfies

$$(1 - \theta)\ f_k(k^s, n^s) = q(\delta + \rho)$$

where

- θ corporate tax rate
- f_k marginal product of capital
- n^s stationary labor supply
- q effective price of new capital
- δ exponential depreciation rate of capital
- ρ subjective time discount rate.

The effective price of capital is related to fiscal policy parameters and the inflation rate as follows:

$$q = 1 - \pi - \frac{\theta\ \psi}{\psi + \gamma + \rho}$$

where

- π is the investment tax credit rate
- ψ capital consumption allowance rate allowed for tax purposes
- γ inflation rate.

This is the standard rental price analysis of Jorgenson.

For purposes of obtaining order of magnitude estimates of effects of policy parameters upon stationary capital stock, we assume a Cobb-Douglas production function with capital's exponent being .25. Letting the time period be a year, the initially assumed values for the other parameters are

$\rho = .05$, $\psi = .10$, $\delta = .10$, $\pi = 0$, and $\gamma = 0$. We also assume that changes in the policy parameters have negligible effect upon the stationary labor supply. This is not an unreasonable approximation given the small change in labor supply over the last forty years associated with a very large change in the real wage.

With these assumptions the effect of a ten percent investment tax credit is to increase the stationary capital stock by twenty percent. If one-fifth of the adjustment to the steady state occurs in the first year and the capital-output ratio in the corporate sector is one, the effect upon investment in the initial year is four percent of GNP. As a ten percent investment tax credit was introduced in the early sixties and the depreciation schedule accelerated (ψ increased), the rapid rate of capital accumulation over much of that decade is no surprise.

More surprising, at least to us, is the large effect that changes in the anticipated future inflation rates have upon the capital stock. A change in the average inflation rate from zero to seven percent, more than offsets the effect of a ten percent investment tax credit, at least for the assumed parameter values. The increase in the average inflation rate that occurred in the seventies may be the principal cause of the low rates of capital accumulation in recent years.

The purpose of these numerical examples was to show that fiscal policy can have quantitatively important effects upon the rate of capital accumulation. We emphasize that rest point analysis is not a substitute for an equilibrium theory of capital accumulation. If tax rates are changing over time and leisure is intertemporally substitutable, rates of capital accumulation will be very different than they would be if tax rates were constant. For some policy rules, the equilibrium process generating output will be more stable and for others less stable.

2.2 Evidence of Persistence of Shocks

In this section we shall outline some of the evidence that unanticipated shocks to the economy generally have persistent effects in terms of deviations of aggregate output or employment from trend. An indication of the persistence can be observed by regressing the detrended log of real output on itself lagged two periods. The estimated equation from quarterly data for the period 1947-77 can be written

$$y_t = 0.909y_{t-1} + 0.477\ (y_{t-1} - y_{t-2})$$

This second-order difference equation is stable, but the effects of onee-and-for-all shocks to the right-hand side build up and then subside fairly slowly. The first term is an indication of the persistence of effects, while the second term gives an idea of the momentum in the system. Barro (1977, 1978) found persistence as well as momentum in the effects of unanticipated monetary shocks in that these effects were aslarge or larger in the second year as in the first, that is, the effect on unemployment and output seemed to build up and then subside after the second year.

These persistent deviations have by many been taken as an argument against the use of equilibrium models with rational expectations to explain business cycle phenomena. Modigliani (1977), in his presidental address, states: "But the most glaring flaw of MREH (Macro rational expectations hypothesis) is its inconsistency with the evidence: if it were valid, deviations of unemployment from the natural rate would be small and transitory - in which case The General Theory would not have been written and neither would this paper."

We shall argue that the kinds of persistence mentioned above can be obtained within a not implausible equilibrium model if attention is paid to capital-type elements and their lags. The work by Jorgenson (1963, 1971) and recent estimates by Hall (1977) suggest that there are long lags (delivery lags, etc.) from the time when changes in its determinants call for an increase in the capital stock and until the new capital starts yielding services. It was pointed out above that we are dealing with changes in stocks that have orders of magnitude as large as the annual GNP. Thus, an important feature of our equilibrium framework are distributed lags in capital accumulation.

Supposing that the process of designing, ordering, and installing capital can be described by a fixed distribution of lags, with β_i being the fraction of capital that can be installed in i quarters, Hall (1977) found the <u>average</u> lag to be about two years. Evidence of a different kind is reported in Mayer (1960). On the basis of a survey he found that the average lag (weighted by the size of the project) between the decision to undertake an investment project and the completion of it was twenty-one months. To this must be added any lag that occurs between the arrival of information and the decision to carry out the investment. If anything, this estimate is likely to be an underestimate of the actual lag during a period of general capital expansion. If most firms decide to expand almost simultaneously, delivery lags are likely to be substantially longer than would be the case if investments were evenly spread out over time. Also, it should be noted that lags tend to be longer the larger the projects are.

Once a project gets started, the cost will be distributed over the period of time it takes for it to become productive. According to

Mayer, the construction period for a typical plant is fifteen months. During the time period of half a year or so before start of construction, plans are drawn, financing is arranged, and the first significant orders are placed before construction can begin. There was, of course, a lot of variation in lead times. For example, in his sample of complete plants, 20 percent required ten months or more from start of drawing of plans to start of construction. These findings, which are probably low estimates for periods of generally high capital accumulation, suggest that only a small fraction of additions to capital stock that are decided on in a given year show up as investment expenditures in the same year. Most of the expenditures will be incurred during the next year, with a not insignificant fraction being left over for the year after that.

2.3 Distributed Lags and Persistence in Equilibrium

In this section we shall briefly outline an equilibrium theory of how unanticipated shocks are propogated through the economy, showing the kinds of persistent deviations from trends that we observe. The most important feature of this theory is equilibrium distributed lags, but we shall also emphasize the intertemporal substitution of leisure.

To our knowledge, the first analysis of distributed lags within an equilibrium framework was done in Kydland and Prescott (1977). The typical firm in a competitive industry was assumed to make investment plans in period t on the basis of the state of the economy at that time, the investment tax credit, and expectations about future prices. Part of the expenditures were incurred in the same period and the rest in period t+1. The new capital stock was assumed to become productive in period t+2. Expectations were rational in the sense that, when aggregated across firms, the investment behavior did indeed lead to the distributions of future prices on which individual decisions were based. For this model the propagation of random demand shocks or changes in the tax rate was fairly slow. Within this framework one could easily consider more than one type of capital with different distributed lags.

Formally, the law of motion of the capital stock may be written

$$k_{t+1} = (1-\delta)\, k_t + x_{t-L},$$

where k_t is capital stock at the beginning of period t, x_t is the investment plan made in period t, and δ is the depreciation rate. Thus, additions to the capital stock planned in period t-L do not produce services before period t+1. The expenditures, however, may be distributed with a fraction φ_o in the planning period t-L, a fraction φ_1 in period t-L+1, and so on. Total investment expenditures in period t are then

$$z_t = \sum_{j=0}^{L} \varphi_j x_{t-j},$$

where $\sum_{j=0}^{L} \varphi_j = 1$. On the basis of the empirical evidence, it seems reasonable that L would be at least two years, that φ_o would be relatively small, and that φ_1 would be more that 0.5.

Lucas and Rapping (1969) and Ghez and Becker (1975) found ample evidence that leisure in different periods are good substibutes for one another. This suggests that intertemporal substitution is an important feature of people's preferences. This can be modeled by introducing a capital-like element in the utility function which measures how much workers have worked in the past, with relatively more weight on the most recent past, say, given by

$$a_{t+1} = (1-\delta_a) a_t + n_t,$$

where n_t is hours worked in period t, and δ_a is a depreciation rate. Both a_t and n_t would then typically enter the current-period utility function. The higher the value of a_t in a given period, the more utility is derived from leisure in that period. This model is consistent with the observation that labor supply is elastic with respect to transitory changes in the real wage rate, but inelastic with respect to permanent changes.

Some might question whether the real wage does move procyclically as is needed for the theory outlined. First, if the elasticity of real wage with respect to cyclical variations in the real supply is high, only small fluctuations in the real wage, say a percent or two, are needed to explain the observed fluctuations in labor supplied. Measurement errors could very well introduce a cyclical bias in the measurement error of the real wage of this magnitude. In particular we are concerned with measurement biases that move cyclically. Possibly in boom periods a given worker may be assigned to a job which is higher on the internal job ladder and has higher pay.[4] Being less experienced, the firm may be paying more per unit of effective labor service in the boom period. Another potential source of cyclical measurement bias is that, with the implicit employment contract, payments are not perfectly associated over time with labor services supplied. Thus, the fact that there is little evidence of procyclical movement of the real wage is not damaging to the outlined theory.

The theory outlined assumed a single capital good. Generalization to multiple capital goods with different time periods required for construction and different required distributed resource allocations is straightforward. Such generalizations were not attempted because, besides increasing significantly the costs of computing the fixed point problem that must be solved to determine the competitive equilibrium, they were not needed to explain persistence of shocks nor did policy conclusions appear sensative to the simplification.

2.4 Some Results

For our purpose it is useful to place the typical household in an economy which is subject to both real and monetary shocks. There is a large number of such households which are all alike except possibly for a taste parameter which is distributed randomly across individuals. The real shocks that affect technology will to some extent net out across firms. But there are clearly shocks affecting the production possibility set for private goods which do not net out. Examples are the oil boycott with the ensuing extraordinary jump in oil prices, wars accompanied by temporarily increased demand for public goods, and tax changes (including acceleration or deceleration of depreciation).

These real shocks affect productivity, which in equilibrium determines the real wage. Our model has the typical worker's real wage being distributed randomly around some economy-wide mean which is subject to shocks. In addition, monetary shocks can be introduced by assuming that each individual can only observe his own nominal wage rate in period t (or the wage rate on his "island") before making his decisions for period t. From the observed nominal wage rate and knowledge of variances of shocks he will try and infer what his own real wage rate is, and also how it is related to the economy-wide wage, thus getting an idea of whether changes are transitory or not. Depending on relative prices his income will be divided between consumer nondurables and durable goods which will provide services in the future.

There appears to be general agreement that monetary shocks have important effects on real aggregates. Lucas (1975), in his equilibrium model of the business cycle with capital accumulation, found that the effects of once-and-for-all monetary shocks persisted over time, although they never accumulated. Our findings are similar for purely monetary shocks.

Real shocks, on the other hand, not only produced persistent effects on real output and employment, but the effects would often accumulate for up to three periods before subsiding. Most of these fluctuations would be due to fluctuation in durables, while nondurables showed relatively little procyclical function. These results are consistent with empirical observations.

As an example, consider an innovation to a parameter of the technology, say, from λ to $\lambda + \epsilon$ in period one, causing the equilibrium real wage rate to increase permanently. There are no monetary shocks nor any other reasons for imperfect information. Each worker knows his own real wage as well as the average economy-wide real wage. The equilibrium distributed lag for durables (see section 2.3) is such that $\varphi_0 = \varphi_1 = 0.3$ and $\varphi_2 = 0.4$. Figure 1 shows that the effect on labor supply and durables accumulates for three periods, and then the series approach the new steady state with some fluctuation. In the case of employment, the new steady state is essentially the same as the old one. The figure measures deviations from the new steady state. We have taken the new productivity to be one, so that output and employment are comparable, and output and durables have the same unit of measurement. We see that, although durables represent roughly one-third of total output, their fluctuation is comparable to that of total output.

In the next example we have incorporated imperfect information in the sense that each worker can observe his own nominal wage rate, but because of fluctuations in his wage rate about the economy-wide wage, and also because of monetary shocks, he has to infer what his own and the economy-wide real wage are from his observation and from knowledge of relative variances of the shocks. He does know last period's aggregate and own real wage rates. The distributed lag is the same as in the first example. We now consider a once-and-for-all shock to technology, say, from λ to $\lambda + \epsilon$ in period one, and then back to λ in period two. This simplification is made in order to be able to draw a meaningful figure. Obviously, by assumption there are simultaneously real and monetary shocks with certain relative variances, and ideally we have to look at the covariance structure of the state variables. Figure 2, however, isolates the effect of real shocks within this framework.

We see that the effect on employment in terms of deviation from the steady state (which in this example does not change) is larger in the third period than in the first. Then there is a movement well below the trend, reflecting partly a cutback in purchases of durables (again, the steady state has not changed), and partly the wish to work less after having temporarily reduced leisure in the previous periods.

In summary, both real and monetary shocks produced persistent effects within our equilibrium framework, an important feature of which were distributed lags of capital accumulation. It should be emphasized that these shocks had no serial correlation built into their structure. Looking at each type of shock alone, only the real shocks showed any momentum to their effects on real output. For not implausible examples, however, the covariances between current and lagged output movements suggested that, for given variances of real shocks, the momentum increased when the variance of monetary shocks increased.

Figure 1

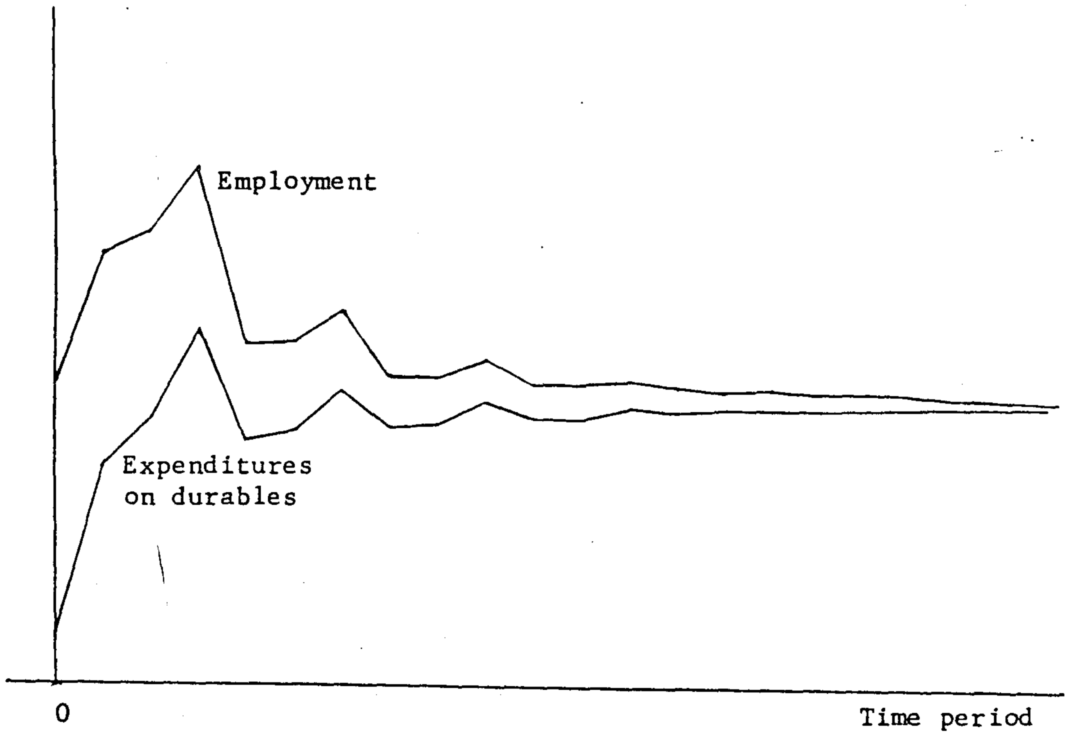
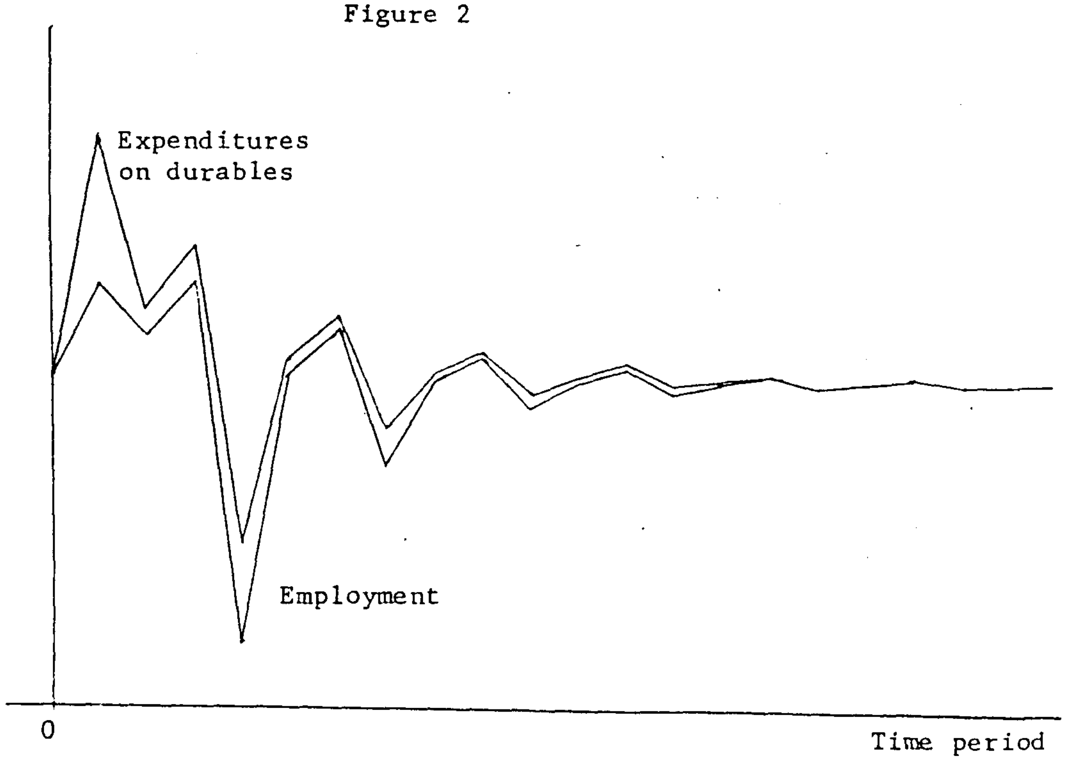


Figure 2



3. Financing Fluctuating Government Expenditures

Assume now that the government, rather than using tax policies strictly for stabilization purposes, also has to finance expenditures on public goods which affect consumers' utility function. People's taste for public goods may change exogenously over time, for example related to wars or other major but temporary projects. The preferences of the representative household is represented by a utility function:

$$\sum_{t=0}^{\infty} \beta^t u\,(c_t, n_t, a_t, g_t, g_t^*),\ 0 < \beta < 1,$$

where c_t is consumption in period t, n_t is labor supply, a_t is a stock of work experience as in section 2.2, g_t is government expenditures, and g_t^* is an exogenous variable expressing consumers' relative desire for public goods in period t. This last variable g_t^* may be subject to a stochastic process, either with independent fluctuations over time, or possibly with serial correlations. The dependence upon n_t and a_t can be made such that the response to the after-tax real wage rate is highly elastic in the short run, but with little, perhaps even negative, response to permanent changes in the wage rate.

There is no capital, and the output is proportional to labor input. Without loss of generality, the proportionality coefficient is taken to be one. In equilibrium, the real wage rate before taxes is equal to one.

The government finances its expenditures and past debt obligations through a proportional tax on labor income and the issuance of real-purchasing-power bills which come due next period. Letting b_t be the debt coming due in period t, τ_t the proportional tax rate, and p_t the price of a real bill coming due next period, the budget constraint of the typical household is

$$c_t + p_t b_{t+1} = (1 - \tau_t) n_t + b_t,$$

and the government budget constraint is

$$p_t b_{t+1} + \tau_t n_t = g_t + b_t \ .$$

The policy instruments are the tax rate, government expenditures, and the amount of bills issued. From the above constraint we see that only two of the instruments can be independently manipulated, which in period t we take to be τ_t and b_{t+1}.

The objective of the government is to maximize the welfare of the representative household subject to its budget constraint and the equilibrium behavior of consumers, given the government policy rule. We assume that policy in period t depends only upon debt coming due in that period, the accumulated aggregate work experience, and the desirability of government expenditures in period t, that is, $\tau_t = \tau(a_t, b_t, g_t^*)$, $b_{t+1} = b(a_t, b_t, g_t^*)$, and $g_t = g(a_t, b_t, g_t^*)$. Thus, the triple (a_t, b_t, g_t^*) describes the position of the economy at time t.

The decision problem of the household is not well defined unless a sequence of state contingent future government policies is assumed. This sequence of policies along with the expected aggregate behavior of all households determine expectations of distributions of the price of debt. When aggregated over all households, their behavior is given by decision rules $c_t = c(a_t, b_t, g_t^*, p_t)$, $n_t = n(a_t, b_t, g_t^*, p_t)$, and $b_{t+1} = B(a_t, b_t, g_t^*, p_t)$. In equilibrium, p_t is the price that yields equality between the debt demanded and supplied. The price can be written as a function of the state, $p_t = p(a_t, b_t, g_t^*)$, which in equilibrium is the process on which agents' expectations were based.

The equilibrium behavioral relations of consumers could be indexed by the policies of the government, that is, these relations would change if government policy changes. The public finance problem is therefore to maximize the utility of the representative household subject to the behavioral relations of the competitive economy for alternative given sequences of policies. As the authors have shown (1977), the optimal policy within this kind of framework is not time consistent. Without further restrictions on policies, there would therefore be a question of whether an optimal policy would be implemented and followed. It is still of interest to determine the properties of the optimal policy, but we only determine the nature of policies with good operating characteristics. One can, for instance, imagine large costs associated with changing the policies.

In order to make this model computable, we approximate locally the utility function by a quadratic function. We assume that fluctuations are not too large, and if the approximation is made around the steady state, it is a good approximation in the region of interest. We assume that only the difference, $g_t - g_t^*$, between actual and desired government expenditures matters in people's preferences, and we also, with little loss in generality, assume that the current-period utility function is separable in $g_t - g_t^*$ and the other variables. We select the parameters of the utility function so that long run labor supply is very inelastic.

Of special interest are the coefficients of g_t^* in the government policy rules for τ_t and b_{t+1}. We found that for policies with good operating characteristics, the coefficient is relatively small for τ_t, that is, temporary changes in desired government expenditures should be financed primarily by changes in the government debt, and not by temporary income tax changes. In view of the optimal taxation literature, this is not surprising, since the labor supply is very elastic with respect to temporary changes in the after-tax wage rate. This result does not appear to be sensitive to the coefficients in the quadratic approximation of the utility function.

The model can be modified to investigate the effects of permanent changes in g_t^* as well. Not surprisingly, permanent changes should be financed by permanent changes in the tax rate.

4. Concluding Comments

The principles for fiscal policy that emerge from this exercise in neoclassical public finance is that tax rates should not respond, at least not much, to aggregate economic fluctuations. Permanent changes in the demands for public goods and income redistributions should be financed by permanent changes in tax rates. Tax rates should not respond to temporary changes in public expenditures and the budget should be balanced on average[5]. These are just the principles laid down by Friedman (1947) thirty years ago. His conclusions, however, were based in large part upon ignorance of timing and magnitude of effects of various policy action. With our analysis, these conclusions follow even if the structure of the economy is well understood and the consequences of alternative stabilization policy rules econometrically predictable. We did not determine the rule with best operating characteristics for a particular estimated structure such as was done by Taylor (1978). This was unnecessary because we found the conclusion insensitive to assumed parameter values.

The issue was addressed within an equilibrium framework which requires maximizing behavior and market clearing. Part of the maximizing assumption is the efficient use of information or equivalently, rational expectations. Equilibrium also requires that the set of markets assumed be sufficiently rich that it is not in the mutual interests of economic agents to organize additional markets. We argued that the persistence of deviations of output from trend can be explained within the equilibrium framework by requiring multiple periods to build new capital goods. Considerable persistence of the effects of monetary, fiscal and technological shocks and momentum characterize the equilibrium behavior of our models which incorporate this factor as part of the technology.

The implication of this equilibrium analysis is that the economy like a single commodity market can be stabilized but that, like the commodity market, the costs of stabilization exceeds the benefits. This is not to say the employment rate is best. Indeed, with the public finance solution, there is an oversubstitution of nonmarket produced goods for market produced goods because of the tax on income and if people would supply more labor services than is in their private interests everyone might benefit.[6] Our conclusion is that there are no important market failures such as an externality or public good phenomena that warrant cyclical manipulation of tax rates to stabilize the economy.

FOOTNOTES

[1]See for example Feldstein's (1974) analysis of the effects of the Social Security System upon capital accumulation.

[2]Calvo (1979) independently developed the same result when analyzing monetary policy.

[3]We found Sandmo's (1976) survey a good introduction to the optimal taxation literature. Articles of Diamond and McFadden (1974), Diamond and Mirrlees (1971) and Harberger (1964) were also useful.

[4]See Reder (1962) for a further discussion.

[5]In an interesting paper, Barro (1978) has applied optimal taxation to develop a positive theory of the size of government debt.

[6]Phelps (1973) has a good discussion of this issue.

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