



**TARGETING NOMINAL INCOME:
A CLOSER LOOK**

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TARGETING NOMINAL INCOME: A CLOSER LOOK

by

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Abstract:

I derive conditions under which the monetary authority should target nominal spending. The relevant spending target is a weighted average of income and consumption. Despite "sticky" nominal wages, under optimal policy the economy behaves as if all markets clear.

* Finn Kydland and Mark Wynne offered helpful comments on an earlier version of this paper. Neither they, the Federal Reserve Bank of Dallas, nor the Federal Reserve System necessarily share the views expressed here.

There is little agreement on how the Federal Reserve ought to allow prices to respond to near-term changes in real economic activity. Some analysts would have the Federal Reserve maintain a constant price level (Barro 1986). Other analysts have advocated policy rules that mandate short-run departures from zero inflation in response to unusually slow or unusually rapid output growth, or in response to deviations of output away from trend (Hall 1984, McCallum 1984 and 1988, Taylor 1985).

Bean (1983) addresses the short-run stabilization issue in the context of an economy with a predetermined nominal wage. He demonstrates that output is too sensitive to aggregate productivity shocks in such an economy unless the monetary authority allows the price level to vary inversely with output. In the special case where the supply of labor is perfectly inelastic with respect to the real wage, the monetary authority can optimally stabilize output by targeting nominal income.

A key simplifying assumption in Bean's analysis is that the supply of labor is independent of household wealth. I show that relaxing this assumption has two important policy implications. First, a nominal spending target is no longer optimal when the supply of labor is perfectly inelastic. Instead, a nominal spending target is optimal in the much more realistic case in which the wealth and substitution effects of an aggregate productivity shock offset one another. Second, the monetary authority should target not nominal income but, rather, a geometric average of nominal income and nominal consumption.

Insofar as the monetary authority successfully implements the optimal rule, the economy will behave exactly as predicted by a standard real business cycle model. An implication is that the fraction of output variation that can be explained by aggregate productivity shocks may say less about the importance or effectiveness of monetary policy than it does about how well the Federal Reserve has been doing its job.

Aggregate Supply in a Market-Clearing Economy

The representative competitive firm will equate labor's marginal product

to the real wage. If output is produced according to

$$Y = \theta N^{1-\beta} / (1 - \beta), \quad (1)$$

where Y is real output, N is hours of work, $0 < \beta < 1$ is a fixed parameter, and θ is a random productivity shock, it follows that

$$\theta - \beta n = w - p, \quad (2)$$

where lower-case letters denote the logs of their upper-case counterparts.

Under perfect competition, the representative household will equate minus the marginal rate of substitution between labor and consumption to the real wage. If the representative household's utility function takes the form

$$U(C, N) = (C^{1-\alpha} - 1) / (1 - \alpha) - N^{1+\lambda} / (1 + \lambda),$$

where C is real consumption and $\alpha > 0$ and $\lambda > 0$ are fixed parameters, then

$$\lambda n + \alpha c = w - p. \quad (3)$$

The supply of labor is positively related to the real wage and inversely related to consumption.

Finally, take the logarithm of equation 1:

$$y = (1 - \beta)n + \theta - \ln(1 - \beta), \quad (1')$$

and let

$$g \equiv y - c \quad (4)$$

denote the fraction of output that is unavailable to households. For now, the

reader may wish to think of g as measuring the fraction of output consumed by the fiscal authority. In general, g will have a random component. Moreover, this component may be correlated with θ .

The market-clearing values of output, consumption, the real wage, and labor are obtained by simultaneously solving equations 1', 2, 3, and 4:

$$y^* = \left[\frac{1}{\alpha + \beta(1-\alpha) + \lambda} \right] [(1+\lambda)\theta + \alpha(1-\beta)g - (\beta+\lambda)\ln(1-\beta)] \quad (5)$$

$$c^* = \left[\frac{1}{\alpha + \beta(1-\alpha) + \lambda} \right] [(1+\lambda)\theta - (\beta+\lambda)g - (\beta+\lambda)\ln(1-\beta)] \quad (6)$$

$$(w - p)^* = \left[\frac{1}{\alpha + \beta(1-\alpha) + \lambda} \right] [(\alpha+\lambda)\theta - \alpha\beta g - \alpha\beta\ln(1-\beta)] \quad (7)$$

$$n^* = \left[\frac{1}{\alpha + \beta(1-\alpha) + \lambda} \right] [(1-\alpha)\theta + \alpha g + \alpha\ln(1-\beta)]. \quad (8)$$

A positive productivity shock will raise equilibrium output, equilibrium consumption, and the equilibrium real wage for any given value of g . The impact on equilibrium hours is ambiguous, due to opposing wealth and substitution effects. When $\alpha = 1$, equilibrium hours of work are independent of θ .

If the fraction, g , of output that is denied to consumers rises, the representative household, feeling worse off, will cut back on both consumption and leisure. Households' increased willingness to work is reflected in a lower equilibrium real wage and increased equilibrium output.

Aggregate Supply with a Pre-Determined Money Wage

If relocation costs are negligible when workers switch jobs one period in advance and prohibitive otherwise, then the labor market will be competitive *ex ante* and monopsonistic *ex post*. Workers will insist that some of the terms of their employment be spelled out in advance. In practice, it is often the money wage that is predetermined. Flexibility is preserved by giving firms control of hours. For supporting empirical evidence, see Card

(1990), Cho and Cooley (1992), Cho (1993), and McLaughlin (1994).

Assume that the money wage is specified one period in advance. Moreover, consistent with the existing literature, assume the wage is fixed at its expected market-clearing level. Equations 1', 2, and 4 then imply

$$y - y^* = \left[\frac{1-\beta}{\beta} \right] (p - p^e) + \left[\frac{1-\beta}{\alpha + \beta(1-\alpha) + \lambda} \right] \left[\left(\frac{\alpha + \lambda}{\beta} \right) (\theta - \theta^e) - \alpha (g - g^e) \right], \quad (9)$$

where an "e" superscript indicates an expected value conditional upon information available in the immediately preceding period. Intuitively, firms respond to unanticipated shocks as if the labor supply schedule is horizontal at the predetermined wage. As a result, employment and output respond too strongly to unanticipated shifts in labor demand (due to unanticipated changes in p or θ), and do not respond strongly enough to unanticipated shifts in labor supply (due to unanticipated changes in g).

Optimal Policy

Since competitive equilibria are efficient, the monetary authority should seek a policy that achieves a competitive allocation. I claim that the sticky-wage economy will achieve exactly the same allocation as the market-clearing economy provided that the monetary authority implements a policy rule of the form $p_t + Ac_t + By_t = T_t$, where T_t is an arbitrary pre-announced target and A and B are fixed parameters.¹ If $\alpha = 1$, then $A + B = 1$ and the policy rule can be rewritten as $A(p + c)_t + (1 - A)(p + y)_t = T_t$. That is, if $\alpha = 1$ the monetary authority should target a geometric weighted average of nominal consumption and nominal income.

To see that the proposed rule is optimal, begin by noting that the rule implies that $p_t - Ag_t + (A + B)y_t = T_t$. Since the target, T_t , is announced at least one period in advance, it follows that $(p - p^e)_t = A(g - g^e)_t - (A + B)(y - y^e)_t$ or, equivalently, that $(p - p^e)_t = A(g - g^e)_t - (A + B)[(y - y^*)_t + (y^* - y^e)_t]$. Using the latter expression to eliminate $(p - p^e)_t$ from equation 9:

$$y - y^* = \left[\frac{1-\beta}{\beta + (A+B)(1-\beta)} \right] \left[\frac{1}{\alpha + \beta(1-\alpha) + \lambda} \right] \left[[(\alpha + \lambda) - (1 + \lambda)(A+B)] (\theta - \theta^e) \right. \\ \left. + [A(\alpha + \beta(1-\alpha) + \lambda) - \alpha\beta - (A+B)(1-\beta)\alpha] (g - g^e) \right]. \quad (10)$$

To ensure that $y - y^* = 0$ for arbitrary values of $g - g^e$ and $\theta - \theta^e$, it is necessary and sufficient that $A = \alpha/(1 + \lambda)$ and $B = \lambda/(1 + \lambda)$. Note that $A + B = 1$ when $\alpha = 1$ --i.e., when the wealth and substitution effects of a productivity shock have exactly offsetting effects on the supply of labor.

Concluding Remarks

In an economy with capital investment, movements in θ will reflect changes in the capital stock as well as changes in total factor productivity. Similarly, movements in g will reflect changes in investment as well as changes in government purchases. Consequently, the current value of θ will depend upon past realizations of g . Also, the current value of g will depend upon today's expectation of future levels of total factor productivity, future real output, and future real factor prices. Since the policy derived above yields the same time paths of output and real factor prices as a market-clearing economy for any given time path of g , the policy remains optimal even in an economy with investment. In such an economy, however, it is essential that agents be confident that the policy will not be abandoned in the future.

Results derived above extend easily to an economy with multi-period, overlapping contracts--*provided that each contract sets the money wage equal to its expected market-clearing level, period by period, over the contract's life.* In this case, any change in the monetary authority's target must be announced far enough in advance that all existing contracts will have expired before the change takes effect. If, as in Taylor (1980), multi-period contracts specify a fixed wage level (rather than a wage path), or if prices as well as wages are "sticky," then the analysis presented above breaks down. More generally, results presented by West (1986) suggest that conclusions reached here are likely sensitive to alternative specifications of the aggre-

gate supply equation, expectations formation, and policymakers' objectives.

Note, finally, that labor contracts would probably move away from the simple form assumed here if the monetary authority insisted upon pursuing a rule not fully efficient given those contracts (Fischer 1974, p. 204).

NOTES

1. Note that the optimal policy rule does not require that the monetary authority observe the realized values of productivity disturbances.

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