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ON OPTIMAL WAGE INDEXATION WHEN SHOCKS ARE REAL

by

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A B S T R A C T

This note studies the optimal degree of wage indexation in the presence of real shocks. Contrary to what is indicated in the literature, it is demonstrated that the optimal degree of indexation is not limited to $(0;1)$ but may take any value in $(-\infty;\infty)$.

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In two important contributions, Gray (1976) and Fischer (1977a) study the effect of wage indexation on macroeconomic stability. Allowing for both monetary and real shocks, they assume that contracts establishing a base nominal wage and a degree of indexation are concluded before the realization of the shocks, while the level of employment is determined by the demand for labor after the realization of the shocks. As Gray puts it (1976, p. 221), they find that "while indexing insulates the real sector from the effects of monetary shocks, it may exacerbate the real effects of real shocks." Gray also determines an optimal degree of indexation by minimizing the expected value of the squared deviation of the log of the actual output from the log of the market-clearing output, where the latter is the output for which the demand and supply of labor are equal. Her result is that in the presence of a monetary shock only, indexing should be full, while in the presence of a real shock only, indexing should be partial. In the presence of both monetary and real shocks, indexing should be a weighed average of the degrees of indexing obtained for the two extreme cases, and hence should be partial.

This note demonstrates that the partial-indexing result obtaines only because of the particular (multiplicative) specification of the real shock in Gray's model. Choosing a different specification of the real shock, I show that the optimal degree of indexation with a real shock only is not limited to $(0;1)$ but may take *any* value in $(-\infty;\infty)$.

Gray's specification implies that the optimal degree of indexation is constant and that if there is only a real shock, the realized contractual wage will equal the market-clearing wage for the given realization of the real shock. The present specification of the real shock preserves these convenient features. As a consequence of the last feature, one need not be concerned about the determination of the employment for a non-market-clearing wage [see the discussion in Barro (1977), Fischer (1977b) and Cukierman (1980)]: employment will always be determined where the demand and supply of labor are equal.

Let w denote the real wage, L the employment, Y the aggregate production, and P the price level. Assume that the supply of labor is an increasing function of w, that w and L clear the labor market, and that P is inversely proportional to Y (the simple quantity theory). In Gray's case w increases in Y, but since it increases less in percentage terms than Y, indexation should be partial. If, however, w and Y are related in any other way, indexation should *not* be partial. For instance, if w is independent of Y, indexation should be full, and if w and Y change the same in percentage terms, there should be no indexation; furthermore, if w decreases in Y, indexation should be more than full, and if w increases in Y, but more in percentage terms than Y, indexation should be negative.

To demonstrate that w and Y may be related such that the optimal degree of indexation can take any value in $(-\infty;\infty)$, consider the following model, which, except for the specification of the real shock, is a special case of Gray's model. Aggregate production is of the Cobb-Douglas type,

$$Y = \alpha^{x(2-\alpha)-1} L^{\alpha} ,$$

where $x \neq \frac{1}{2}$ is a constant and α $(0 < \alpha < 1)$ is the random shock. Profit maximizing implies that the demand for labor satisfies

$$\alpha^{x(2-\alpha)} L^{\alpha-1} = w.$$

The supply of labor has unitary elasticity

$$L = w.$$

Market-clearing values of w, L, and Y are determined by the demand and supply of labor being equal:

$$\alpha^{x(2-\alpha)} L^{\alpha-1} = 1 \iff w = L = \alpha^{x} \text{ and } Y = \alpha^{2x-1} .$$

There is no monetary shock, and assuming a constant velocity,

$$PY = \text{constant}.$$

If γ is the degree of indexation, and w_i, P_i, and Y_i $(i = 1, 2)$ denote the values of w, P, and Y corresponding to the realization α_i of α, then following Gray,

$$\frac{w_1}{w_2} = \left(\frac{P_1}{P_2}\right)^{\gamma-1} , \quad \text{or} \quad \frac{w_1}{w_2} = \left(\frac{Y_1}{Y_2}\right)^{1-\gamma} .$$

The optimal degree of indexation (γ_0) is defined as the γ for which the actual output and the market-clearing output are qual. Substituting the market-clearing values of w and Y into the last equation, one obtaines that γ must satisfy

$$\left(\frac{\alpha_1}{\alpha_2}\right)^{x} = \left(\frac{\alpha_1}{\alpha_2}\right)^{(1-\gamma_0)(2x-1)} \iff x = (1-\gamma_0)(2x-1) \iff \gamma_0 = \frac{1-x}{1-2x} .$$

It is easy to see that one can choose x such that γ_0 takes *any* value in $(-\infty;\infty)$ with the exception of $\frac{1}{2}$. However, with Gray's specification of the real shock, a unitary elasticity of the supply of labor, and no monetary shock, she would obtain $\gamma_0 = \frac{1}{2}$. Accordingly, this note has demonstrated that with a real shock only, the optimal degree of indexation can take any value in $(-\infty;\infty)$. Of course, what degree of indexation would be optimal for actual labor markets is an empirical question which neither Gray's analysis nor this note can answer.

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