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Optimal delegation implications of central bank transparency[☆]

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ABSTRACT

The interrelationship between monetary regime design and central bank transparency is examined. We find optimal delegation requires the central bank be either: 'representative', not choosing to publicly reveal its private information; or 'ultraconservative', deciding to be fully transparent.

1. Introduction

This paper investigates the optimal delegation implications of economic transparency. In particular, it considers how central bank decisions concerning whether or not to reveal publicly its private information concerning the state of the economy interact with the question of the appropriate design of central bank objectives. Although the individual issues of transparency and of monetary regime design are each the subject of an extensive literature, the potential interrelationship between the two remains a relatively neglected topic.

The framework analyzes the strategic interaction between discretionary monetary policy and union wage setting, and is related to the models developed in, for example, Acocella and Di Bartolomeo (2004), Holden (2005) and Coricelli et al. (2006), but with stochastic supply shocks present and playing a central role. We show that, taking account of the influence of central bank preferences on its decision regarding whether or not to disclose its private information concerning supply shocks, optimal delegation requires that the central bank be, depending on parameter values, one of two types. That is, either 'representative', i.e. with the same preferences as society, in which case it will choose not to reveal its information regarding supply shocks; or 'ultraconservative', i.e. concerned only with inflation stabilization, in this instance choosing to be fully transparent.

2. The model

The framework draws on James and Lawler (2006, 2010),[1] with output produced by a continuum of monopolistically competitive firms and the labor force organized into a finite number of unions, with each union acting as a monopoly supplier of labor to a common fraction of the total number of firms. The key structural and reduced-form relationships are as follows, with all variables other than inflation expressed as logarithms:

$$y_i^s = \alpha l_i + \theta, \quad 0 < \alpha < 1,\ \theta \sim N(0, \sigma_\theta^2) \tag{1}$$

$$y_i - y = -\varepsilon(p_i - p) \quad \text{where } 1 < \varepsilon,$$

$$y = \int_{i=0}^{1} y_i \mathrm{d}i,\ p = \int_{i=0}^{1} p_i \mathrm{d}i, \tag{2}$$

$$y = m - p \tag{3}$$

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[1] Although these precursor papers share a common framework and methodology with that of the present study, their focus is different, as neither considers the relationship between central bank preferences and transparency.

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$$l_i^d = \frac{m - p - \varepsilon(w_i - p) + (\varepsilon - 1)\theta}{\alpha + \varepsilon(1-\alpha)} \tag{4a}$$

$$l_j^d = \int_{(j-1)/n}^{j/n} l_i^d \mathrm{d}i \Big/ \int_{(j-1)/n}^{j/n} \mathrm{d}i \tag{4b}$$

$$l_j^s = 0 \tag{5}$$

$$L_j^u = \gamma(w_j - p)^2 + l_j^2, \quad \gamma > 0 \tag{6}$$

$$s = \theta + u, \quad u \sim N(0, \sigma_u^2) \tag{7}$$

$$L^s = \lambda_s \pi^2 + l^2, \quad l = \int_0^1 l_i \mathrm{d}i = \frac{1}{n}\sum_{j=1}^n l_j, \qquad \lambda_s > 0 \tag{8}$$

$$L^b = \lambda_b \pi^2 + l^2, \quad \lambda_b > 0. \tag{9}$$

Eq. (1) describes the common production technology, with y_i^s representing firm i's output level, l_i firm i employment, and where θ is a stochastic productivity shock, identical across firms. Firm i's share of aggregate demand, y_i–y, is determined according to (2), with y identifying the level of aggregate demand, specified by (3) to depend on real money balances, i.e. the nominal money stock, m, deflated by the price level, p. Profit maximization implies a demand for firm i labor, l_i^d, as described by (4a), with w_i representing the nominal wage paid by firm i. Eq. (4b) then aggregates (4a) over union j's employer firms, with the latter indexed contiguously over the relevant segment of the unit interval, to yield the demand for union j's labor. Labor is taken to be immobile across unions, with desired labor supply assumed to be completely inelastic, as given by (5) following a convenient normalization of union membership at zero.

Nominal wages are determined at the beginning of each period and embodied in single-period contracts of the Fischer–Gray type, with employment then demand-determined within the contract period. Union j sets its nominal wage, w_j, identical across all firms to which it supplies labor, to minimize the expected value of its loss function, (6). The union's choice of w_j reflects its expectation of θ and recognizes the implication of its choice for aggregate variables, while taking the nominal wages of all other unions as given. The specification of (6) is typical of the literature concerned with the macroeconomic consequences of union wage setting: see for example Herrendorf and Lockwood (1997), Holden (2005) and Calmfors and Johansson (2006).[2] The quadratic nature of the loss function reflects the assumption that unions regard fluctuations of employment and the real wage around their target values (both assumed to be consistent with unconditional expected labor-market clearing) as inherently undesirable. The parameter γ identifies the strength of unions' aversion to real wage variability relative to employment variability.

Prior to setting its respective nominal wage, each union observes an identical noisy signal of θ, denoted by s, as identified by (7). With the error term, u, assumed to be independent of θ, $E(\theta|s) = \beta s$ where $\beta = \sigma_\theta^2/(\sigma_\theta^2 + \sigma_u^2)$. We interpret the signal as information provided to the private sector by the central bank[3], which is assumed to observe the exact realization of θ.[4] The central bank controls the informativeness of s by its choice of the variance of the signal noise term: a reduction in σ_u^2 increases the signal's informativeness and thus corresponds to greater central bank transparency.

Equations (8) and (9) represent, respectively, the social loss function and the central bank loss function. The socially optimal values of inflation and employment implicit in (8) and (9) are both zero, while λ_s and λ_b identify the weights which society and the central bank in turn attach to inflation relative to employment. The delegation decision relates, as in Rogoff (1985), to the choice of λ_b by society, with the aim of minimizing the unconditional expectation of (8). Note, though, unlike in Rogoff and much of the optimal delegation literature, the present model contains no mean inflation bias, i.e. inflation fluctuates around an average value of zero.[5]

The timing of moves within the model is as follows, with the first two stages relating to 'regime design' and associated with commitments which are adhered to regardless of the actual or expected economic state, while subsequent stages describe actions which are made in the light of current information. In the initial stage, society chooses the central bank's weight parameter, λ_b, with the underlying objective of minimizing the unconditional expectation of (8). Next, given the assigned value of λ_b, the central bank chooses σ_u^2, and therefore its degree of transparency regarding future θ realizations, to minimize the unconditional expectation of its own loss function (9). In the third stage, the central bank observes θ and communicates the noisy signal (7) to private sector agents. Wages are then set in the light of this signal. Following the determination of the aggregate nominal wage, w, the central bank sets its instrument m to minimize its objective function (9) given the realized values of θ and w. Finally, firms learn the value of θ and choose their individual prices and employment levels, thus determining the remaining macroeconomic variables p, l and y.

3. Macroeconomic equilibrium

The equilibrium of the model is found by backward induction. With the central bank moving after wages have been determined, we begin by solving for the setting of monetary policy, given the realized values of w and θ[6]:

$$m = \frac{[1 - \lambda_b\alpha(1-\alpha)]w + \lambda_b(1-\alpha)\theta}{[1 + \lambda_b(1-\alpha)^2]} \tag{10}$$

The individual union chooses its nominal wage to minimize the expected value of (6), taking the nominal wages of all other unions as given and subject to its expectation of θ. This choice takes into account any impact it has on aggregate variables and the policy reaction of the central bank. Solving the union's first-order condition for its optimal individual wage choice and imposing symmetry then yields the unique symmetric Nash equilibrium nominal wage:

$$w = \frac{1}{\lambda_b(1-\alpha)} \times \left[\frac{\lambda_b^2\alpha(1-\alpha)^2 + \eta\{\lambda_b\varepsilon(1-\alpha) - \gamma[\alpha + \varepsilon(1-\alpha)]\}}{\lambda_b\alpha(1-\alpha) + \eta\{\varepsilon + \gamma(1-\alpha)[\alpha + \varepsilon(1-\alpha)]\}}\right]\beta s \tag{11}$$

where $\eta \equiv n[1 + \lambda_b(1-\alpha)^2] - 1$.

2 Duca and VanHoose (2001) also employ (6), though without interpreting it as a union objective function.

3 This assumption represents an important departure from James and Lawler (2006), which takes the signal observed by the private sector to be exogenously given and therefore outside the control of the central bank.

4 Assuming, instead, the central bank to observe a noisy signal of θ would not affect any of the qualitative conclusions drawn.

5 This reflects the fact that the union target values of employment and the real wage are consistent with (unconditional) expected labor-market clearing. If unions were alternatively assumed to have a desired real wage above the market-clearing level, then the mean position of the economy would be characterized by both unemployment and a positive inflation rate.

6 m is determined in the penultimate stage of the game, with the central bank knowing that the p and l values which are the outcomes of the game's final stage depend on its m choice according to $p = \alpha w + (1-\alpha)m - \theta$ and $l = m - w$. The resulting central bank expected loss $E(L^b|\theta) = \lambda_b[\alpha w + (1-\alpha)m - \theta - p_{-1}]^2 + (m - w)^2$, when minimized by choice of m yields (following the innocuous normalization $p_{-1} = 0$), Eq. (10).