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EXCESSIVE ACTIVISM OR PASSIVISM OF MONETARY POLICY?

by Wilko Letterie (*) and Francesco Lippi (**)

Abstract

The view of monetary policy that emphasizes transmission uncertainty tends to view policy as excessively passive. By contrast, the view that emphasizes credibility aspects tends to see it as excessively active. We formulate a model that integrates simple features from both these views, rather than neglecting *a priori* any of them. The model highlights a clear distinction between two notions of policy activism. Two measures of policy activism are obtained that under certain assumptions may simultaneously appear in the model. This implies that normative judgment about policy activism generally requires a precise specification of the notion one is referring to. We then consider the effects of the degree of transmission uncertainty on welfare.

Contents

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1. Introduction[1]

In almost every field of economics there are scholars who disagree about the interpretation and the evaluation of economic phenomena. Although the disagreement sometimes arises from mutually incompatible assumptions, in other instances a common root can be found and the different opinions may be reconciled within a wider framework in which the original views are encompassed as special cases. The usefulness of a general framework to reconcile different, apparently incompatible, views is twofold. First, it provides a "common language" that can be used to communicate between apparently insulated ideas. Second, it highlights the determinants of the disagreement by showing which are the conditions that generate one or the other of the conflicting views as special cases of a more general model. In this paper we discuss one of these controversies, the debate on the desirable level of monetary policy activism, and we attempt to formulate a unifying model that encompasses two conflicting views on this issue. Our hope is to attain some of the benefits suggested above.

Economists and policy makers disagree about the desirable level of monetary policy activism. Two opposing views are found in the monetary economics literature, each focusing on specific features of the policy environment. We label them the *credibility* view and the *uncertainty* view.

The literature on credibility emphasizes that monetary policy is anticipated by agents who form their expectations in a consistent way and do not systematically make wrong

[1] We are grateful to the Dutch Organization for Scientific Research (NWO) for providing financial support to visit the Eitan Berglas School of Economics at Tel Aviv University. We thank the people there, two anonymous referees, seminar participants at CERGE in Prague and Otto H. Swank for giving comments on a previous version of this paper. Remaining errors are of course our own.

forecasts. Two additional assumptions are usually made: that private agents' decisions are locked into nominal contracts and that policy makers have a motive to increase output growth above its natural level by creating inflation surprises which reduce real wages, thereby raising employment. In this context, in the absence of reputational or institutional mechanisms that make the time-inconsistent policy sustainable, the strategic interaction of the rational agents and of the policy maker produces an inflationary bias which has no real policy effects and places the economy in a suboptimal position. For instance, if money growth is the policy instrument, the rational-expectations equilibrium rate of money growth chosen by the policy maker is excessively high and eventually results in excessive inflation (Barro and Gordon, 1983). From a normative perspective, the structural component of policy could be reduced to the benefit of inflation without affecting real variables. Hence, these models tend to view the main problem of policy as its being too active.

The distinguishing feature of the uncertainty view is that it sees monetary policy as plagued by policy makers' imperfect knowledge of the mechanisms of transmission from policy instruments to policy targets. In the non-rational expectations context where this literature has originated, the main implication of the theory is that the existence of uncertainty leads to a conservative (i.e. less activist) use of policy instruments (Brainard, 1967). However, from a normative perspective, it would be desirable to reduce the uncertainty surrounding policy in order to increase policy effectiveness and the policy maker's capacity to stabilize the economy. Hence, this approach emphasizes that the pervasive uncertainty surrounding the mechanisms of economic transmission from instruments to targets leads to an excessively passive policy stance.

The contrast between the normative implications of the two approaches is captured by Charles Goodhart (1994) in his review of Alex Cukierman's book (1992):

> Alex Cukierman sees the main problem [of monetary policy] as being the excessive *activism* of Central Banks, who can control inflation exactly via monetary base control, seeking to spring unanticipated inflation upon us in pursuit of employment objectives. I see the main problem, instead, as the excessive *passivism* of Central Banks in varying interest rates, precisely because they are uncertain both of future (inflation) outcomes and of the future effect of their instrument on the economy (p. 113).[2]

This statement reflects the distance between the two approaches. Depending on the researcher's belief about the main problem to which monetary policy is subject (credibility or uncertainty), economic models have been developed that integrate either credibility or uncertainty aspects. However, suach an approach is unsatisfactory since the predominant importance of one of these aspects (with the consequent neglect of the other) is assumed *a priori* rather than explained. It is thus hard to discuss and compare the policy prescriptions of the two approaches, as they arise from different assumptions about the "main problem of monetary policy".

In this paper we present a simple model that integrates credibility and uncertainty aspects, not assuming away the relevance of one of them. The model serves two ends: first, it shows that a question about whether policy is excessively active or passive needs further specification as to the *type* of activism referred to, because the terms that appear in the reaction function of monetary policy do not allow for a unique

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[2] Italics in the original.

definition of policy activism. One term relates to the "level" of the policy instrument, or the structural policy component, that according to the credibility view is excessively active. Another term relates to the "range" over which the policy instrument is used in response to unforeseen shocks. According to the uncertainty view, the range of the policy response is smaller than desirable and hence policy is excessively passive. The clarification of terminology delivered by the model suggests that policy activism cannot be described by a single parameter in an integrated model where credibility and uncertainty problems are present.

The welfare implications of the analysis constitute the second end served by the model. We evaluate the relationship between the policy maker's welfare (in terms of inflation and output growth) and the degree of transmission uncertainty. The results are related to a strand of literature that has dealt with the welfare aspects of imperfect instrument control (for example Cukierman and Meltzer, 1986; Devereux, 1987; Swank 1994). In our model, higher multiplicative uncertainty a) reduces the inflationary bias, as in Devereux (1987) and Swank (1994) and b) distorts the ability to stabilize the economy in reaction to shocks. The issue at (b), which hinges on the assumption that policy is partially effective and that multiplicative uncertainty affects policy transmission, has not been treated in the literature before. We show that private information concerning exogenous shocks may provide an incentive to reduce the noise (uncertainty) that surrounds policy transmission. This contrasts with Cukierman and Meltzer (1986) and develops the results of Swank (1994) where however higher uncertainty unambiguously increases welfare.

The next section introduces the elements of the analytical model. Section 3 discusses the two benchmark cases of the credibility view and of the uncertainty view. In

Section 4 an integrated model is presented and the different notions of policy activism are discussed. Section 5 considers the welfare implications of transmission uncertainty. A final section draws the main conclusions.

2. The model

In this section we develop a model that will act as the basis for the rest of the discussion. We consider a policy maker who is concerned with both inflation and output. The loss function denoting her preferences is given by:

$$(1) \qquad L = \left(y - y^{*}\right)^{2} + A \cdot \pi^{2}$$

where $A>0$ and $y^{*}>0$. The variables y and π denote the growth rate of real output and the inflation rate. The parameter A is an index for the inflation aversion of the policy maker; it measures the costs that the latter attaches to creating inflation relative to deviations of output from its target rate y^{*}, which exceeds the natural growth rate of output normalized to zero.

We adopt the notion that output can be affected by unanticipated inflation. This is captured by a Phillips relation between output and inflation due to long-term contracts in the labor market (cf. Fischer, 1977; Taylor, 1980):

$$(2) \qquad y = \alpha\left(\pi - \pi^{e}\right)$$

where the superscript ^{e} denotes expectations formed rationally by the private sector before the actual implementation of policy. Up to now we have introduced the elements of the standard credibility model of monetary policy (Barro and Gordon, 1983). We add to this that the policy maker cannot fully control policy outcomes (see also Goodhart, 1989, Ch. VI; Cukierman and Meltzer, 1986; Swank, 1994). The policy instrument, x^p, is assumed to affect economic outcomes (π) according to the equation:

$$(3) \qquad \pi = \mu \cdot x^p - \nu$$

which describes the transmission mechanism of monetary policy. The parameters μ and ν are random variables with the following properties:[3]

$$(4) \qquad E(\mu) = 1, \quad \mathrm{Var}(\mu) = \sigma_\mu^2, \quad E(\nu) = 0, \qquad \mathrm{Var}(\nu) = \sigma_\nu^2 .$$

Equation (3) and the stochastic properties of the policy parameters (4) capture the uncertainty of the policy maker concerning the transmission mechanism of policy. In a stylized way they account for the policy maker's imperfect knowledge of the links between policy instruments and economic targets. For instance, without affecting our results, we could specify the model so that one could interpret (3) as a (reduced form) quantity theory of money equation where ν is a money velocity

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[3] We assume that these properties are known to all the players in the monetary policy game. Although this treatment of uncertainty is admittedly simplistic, it allows us to capture in a clear way some features of the uncertainty view.

shock, μ is the (random) multiplier and x^p is the growth rate of the money base.[4]

It is important to notice that the uncertainty described by the parameter μ has a significant influence on policy choices. Brainard (1967) points out that in the presence of this type of uncertainty, usually referred to as multiplicative (or structural) uncertainty, the policy maker's actions (x^p) affect the variability of the final targets. Accordingly, an optimal choice of x^p takes into account that policy actions inject variability into the economy. If the loss function of the policy maker is not risk-neutral, then multiplicative uncertainty reduces the incentive for a policy maker to choose high levels of x^p.

With the white noise term ν we also consider additive uncertainty (i.e. uncertainty which does not depend on the actions of the policy maker). In order to allow for a meaningful role of stabilization policy we will assume that the additive shock ν occurs after the private sector has formed inflation expectations, but before policy is chosen.[5] For the sake of clarity, in the basic model we disregard additive uncertainty which is not private information of the policy maker.[6] Figure 1 summarizes the sequence of events:

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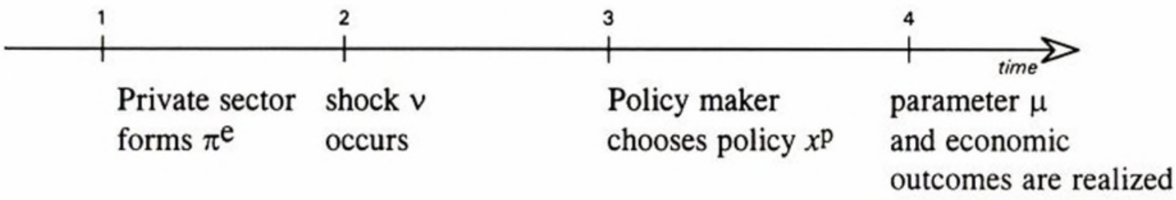
4 Swank (1994) develops a model that contains exactly this specification.

5 The importance of this assumption is that it allows for some degree of policy effectiveness, even in the presence of rational expectations. This reflects the assumption that the private sector does not have accurate information about the marginal optimization conditions faced by the policy maker when she chooses the optimal x^p.

6 This assumption does not affect our results (see Letterie, 1995).

SEQUENCE OF EVENTS Figure 1



Four separate stages are considered. In stage 1, the private sector forms expectations about the level of inflation π^e. After this, an innovation ν occurs at stage 2. Having observed ν, the policy maker chooses the policy x^p at stage 3. When choosing x^p the policy maker faces multiplicative uncertainty about the effects of policy. This is captured by the fourth stage of the game, in which the variable μ is realized and economic outcomes occur. To assume this sequence is to assume that monetary policy is implemented in a discretionary manner and that no *ex-ante* (i.e. at a virtual stage zero) commitment can occur.

The final step in this section pertains to the derivation of the loss function of the policy maker based on the structure of the model as denoted in the four stages. Substituting equations (2) and (3) into (1) gives

$$(5) \qquad E_\mu(L) = E_\mu\left\{\left[\alpha\left(\mu \cdot x^p - \nu - \pi^e\right) - y^*\right]^2 + A\left[\mu \cdot x^p - \nu\right]^2\right\}$$

which is the expected loss function that the policy maker faces in stage 3 and where $E_\mu[.]$ denotes that expectations are taken with respect to the random variable μ.

3. The two benchmark cases

To begin with, it is useful to solve the model separately under the credibility and the uncertainty assumptions in order to capture neatly the distinctive features of each of these views. Therefore, we focus on the elements of each view that are at work in the model, considering them one at the time. In Section 4 we come back to the integrated model, where both sets of assumptions are jointly considered.

To illustrate the argument of the credibility view, we assume that the rational expectations hypothesis holds and we disregard all types of uncertainty. These assumptions imply full policy neutrality. In terms of Figure 1, this amounts to a game composed of stages 1 and 3. Subsequently, we focus on the uncertainty view, assuming that expectations are parametric and that the policy transmission mechanism is uncertain. This corresponds to stages 3 and 4. Obviously in this case monetary policy has real effects owing to the absence of rational expectations.

In this section, therefore, we completely disregard stage 2, assuming that the random shock ν is identically equal to zero ($\nu\equiv0$). In fact, the consideration of the random shock ν is needed only in the integrated model, to allow for *some* degree of policy effectiveness required by the uncertainty argument.

Given these premises, the loss function minimized by the policy maker both for the credibility and for the uncertainty case is given by:

$$(6) \qquad E_\mu(L) = E_\mu\left\{\left[\alpha\left(\mu \cdot x^p - \pi^e\right) - y^*\right]^2 + A\left[\mu \cdot x^p\right]^2\right\}$$

which differs from equation (5) only in that the random shock ν is not present.

3.1 *The credibility argument*

In the credibility model the policy maker minimizes equation (6) using the policy instrument, x^p. In this case no uncertainty is assumed to exist about the transmission mechanism, which means that $\sigma_\mu^2 \equiv 0$ and $\mu \equiv 1$. The optimal policy is derived from the first order condition of equation (6) with respect to x^p. This yields:

$$(7) \qquad x^p = \frac{\alpha y^* + \alpha^2 \pi^e}{\alpha^2 + A}$$

which is the policy maker's reaction function for each level of inflation expectations. Under the rational expectations hypothesis, equation (7) is known by private agents when forming inflation expectations at stage one. From equation (3) we have that $\pi^e = E_{\mu,\nu}\left(\mu \cdot x^p - \nu\right) = x^p$. Applying this condition to equation (7) yields the equilibrium value for inflation expectations, which in this case of full certainty coincides with a perfect-foresight forecast of policy (subscript $_{cr}$ denotes the results of the credibility model):

(8) $$\pi^e_{cr} = x^p_{cr} = \frac{\alpha y^*}{A}.$$

Equation (8) captures the essence of the well-known credibility argument. Discretionary policy is subject to an inflationary bias that has no real effect on output and places the economy in a suboptimal position. Since output is always at its natural level in this model (y=0), the policy maker would be better off if inflation expectations were zero. However, as one can see from equation (7), when inflation expectations are zero the optimal level of the policy instrument is positive. Hence, π^e=0 is not the private agents' best reply to policy (since $\pi^e \neq x^p$) and, therefore, zero inflation expectations are not a Nash equilibrium. In equilibrium, expectations will be set at a level where the marginal benefits of policy surprises equal the marginal costs of inflation. As shown by equation (8), this happens for a positive level of inflation.

It is apparent that policy may be judged as excessively active in this framework: the (anticipated) equilibrium level of the policy is higher than its optimal level. This can be readily seen by computing the policy maker's losses as a function of the equilibrium policy, x^p. Substituting $\pi^e = x^p$ into (6) and recalling that μ≡1, these are given by:

(9) $$L_{cr} = (y^*)^2 + A\left[x^p\right]^2.$$

The policy that minimizes losses is given by x^p=0. Moreover, all the x^p belonging to the interval $(-x^p_{cr}, x^p_{cr})$ reduce losses as compared to $x^p = x^p_{cr}$. If money growth is the policy instrument, lower-than-equilibrium rates of money growth would reduce the policy maker's losses. Hence, from a normative perspective, the equilibrium level of the policy instrument should be reduced. In this sense, owing to the credibility problem, policy is deemed too "active".

3.2 *The uncertainty argument*

To present the argument of the uncertainty model we resume the hypothesis of uncertain transmission between the policy instrument (x^p) and the policy target (given by the random variable μ) and we assume that inflation expectations are parametric, to allow for policy effectiveness. The random variable μ captures, in a stylized way, the effects generated by the existence of uncertainty. The optimal policy for this model is obtained by setting the first order conditions of (6) equal to zero and taking expectations with respect to μ. This yields:

$$x^p_{un} = \frac{\alpha y^* + \alpha^2 \pi^e}{(\alpha^2 + A)(1 + \sigma^2_\mu)} \tag{10}$$

which is the equilibrium level of the policy instrument (subscript $_{un}$ denotes the results of the uncertainty model). Since expectations are parametric in this model, policy is obviously effective in affecting output growth. Without uncertainty ($\sigma^2_\mu = 0$), the optimal policy equates the marginal gains of an additional output-growth unit with the marginal costs of the higher inflation caused by policy intervention.

However, the existence of uncertainty (related to policy intervention) prevents a full equalization between the uncertainty-free marginal costs and marginal gains. This happens because policy intervention is now associated with the additional uncertainty costs injected into the economy by policy actions. Hence, as is apparent from (10), uncertainty increases the costs of policy intervention and therefore leads to a conservative use of the policy instrument (Brainard, 1967).

In this type of model uncertainty forces the policy maker to be modest and to implement a less ambitious policy than the one she would implement if she had more precise knowledge about the working of the economy. Thus, from a normative point of view, policy in an uncertain world is considered excessively passive as compared to an optimal situation without uncertainty. That less uncertainty (and hence a more activist policy) improves welfare can be seen by substituting (10) into (6). The resulting expression gives the policy maker's expected losses as a function of the uncertainty, σ_μ^2. These are equal to:

$$L_{un} = \left[-\frac{\alpha^2}{\left(A+\alpha^2\right)\left(1+\sigma_\mu^2\right)} + 1 \right] \left(\alpha\pi^e + y^*\right)^2 . \tag{11}$$

It appears from (11) that a lower degree of uncertainty reduces the policy maker's losses by allowing a more efficient trade-off between the output-growth gains and the inflation costs.[7] Hence, in this context policy tends to be seen as excessively passive because of the uncertainty that constrains

[7] Of course there is a second effect, namely that lower uncertainty reduces the costs induced by the variability of the targets.

the use of the instruments and prevents the achievement of the ideal policy trade-off.

4. An integrated model of transmission uncertainty and credibility

This section integrates the ideas presented above within the four-stage rational expectations model discussed in Section 2. In the two benchmark cases policy effectiveness was intentionally taken to be either nil (credibility) or full (uncertainty). We now abandon these extreme cases and postulate that policy is partially effective. This is done by assuming the policy maker has an information advantage with respect to the public concerning the additive shock ν (e.g. Canzoneri, 1985). The implications of this crucial assumption about policy effectiveness will be discussed later in the light of our results. Our integrated model has the following ingredients: i) rational expectations, ii) uncertainty about policy transmission, and iii) partial policy effectiveness. This set-up incorporates both the credibility and the uncertainty elements that were separately discussed in the previous section. We will show that two notions of policy activism exist in this "integrated" set-up, implying that normative judgment about policy activism generally requires a precise specification of the notion one is referring to. We now turn to the solution of the integrated model.

At stage 3 the policy maker chooses the optimal policy action, x^p, before knowing the realization of the transmission variable: μ. Hence, she optimizes equation (5) taking expectations with respect to μ. The optimal policy decision is given by the reaction function:[8]

$$(12) \qquad x^p = \frac{\alpha y^d + \alpha^2 \pi^e + \left(\alpha^2 + A\right) \cdot v}{\left(\alpha^2 + A\right)\left(1 + \sigma_\mu^2\right)}.$$

At stage 2 expectations are formed rationally and in equilibrium it holds that $\pi^e = E_{\mu,v}(x^p)$. Since for the private sector $E(v)=0$, we obtain

$$(13) \qquad \pi^e = \frac{\alpha y^*}{A\left(1 + \sigma_\mu^2\right) + \alpha^2 \cdot \sigma_\mu^2} \equiv B > 0$$

Substituting (13) into (12) gives

$$(14) \qquad x^p = B + \frac{v}{1 + \sigma_\mu^2}$$

which is the policy implemented in equilibrium. Equation (14) reveals that the optimal policy consists of two parts. The first part of x^p, B, represents the inflationary bias of policy, which, as shown in the previous section, reduces the policy maker's welfare. From equation (13) it can be seen that a higher degree of inflation aversion of the policy maker (A) lowers the inflationary bias (B). Also, the precision of

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8 This is obtained by taking the first order derivative of equation (5) with respect to x^p, and setting the resulting expression equal to zero.

transmission (σ_μ^2) affects the inflationary bias. This happens because a more imprecise transmission mechanism leads to a more conservative use of policy instruments. Since private agents anticipate this, inflation expectations decrease if σ_μ^2 increases.[9] Therefore, activism as measured by *B* depends on both the inflation aversion of the policy maker and on the transmission uncertainty. This type of activism describes the structural component of policy i.e. the anticipated policy "level". It is this index that the credibility literature refers to when judging policy to be excessively active.

The second part of policy, contingent upon the occurrence of the shock *v*, is also affected by σ_μ^2. We refer to this second component of policy as the *effective* part of policy, since it is not anticipated by the private sector and therefore affects output. The term $1/(1+\sigma_\mu^2)$ measures the policy maker's degree of activism in response to the shock *v*. This implies that a policy maker's reaction to a shock decreases if transmission uncertainty increases (larger $1+\sigma_\mu^2$). This second index of activism describes the "range" of policy response to unanticipated shocks. It accords with the notion of the *uncertainty* view that a policy maker's ability to stabilize economic outcomes improves if uncertainty concerning policy transmission is lower.

Is the equilibrium policy of the integrated model excessively active or passive? In the model there are two

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9 The fact that a more imprecise policy control may (beneficially) decrease the inflationary bias has been analyzed before by Devereux (1987) and Swank (1994). This result occurs since, in a second best context, additional distortions do not necessarily decrease welfare (another well-known example is the possibility that policy cooperation reduces welfare in the presence of a credibility problem, as in Rogoff (1985)).

indices that provide a measure of policy activism: (1) the term B and (2) the term $1/(1+\sigma_{\mu}^{2})$. We noticed that each index corresponds to a specific view of policy: the credibility and the uncertainty view, respectively. Therefore, in an integrated model, comprising elements of both views, there is no unique definition of policy activism and, consequently, a generic question about what is the optimal degree of policy activism lacks context. It follows from the above that an optimal policy should decrease the activism of the first type in order to reduce the inflationary bias and increase the activism of the second type in order to enhance the stabilization of shocks. Thus, when judging the optimal degree of policy activism, it seems appropriate to make a clear distinction between the two concepts of activism, since they originate from different views of the economy and affect the policy maker's welfare in opposite directions.

Moreover, both types of policy activism coexist in the integrated model. This indicates that, although each notion of activism is clearly related to a view of policy effectiveness, the two concepts are not mutually exclusive. This specification provides a more precise terminology for policy activism. In relation to the passage quoted reported in the introduction, our terminology indicates that there is no contradiction in seeing the stabilization-related activism as too passive *and* the credibility-related activism as too active. Within the context of our model, for example, the apparently conflicting views of the reported quote can be reduced to a matter of imprecise terminology.

5. Effects of transmission uncertainty on welfare and activism

Proponents of the uncertainty approach emphasize that policy makers' welfare is reduced by the imperfect knowledge of the relation between policy targets and instruments. In their view reducing transmission uncertainty improves welfare by enlarging the range over which shocks can be stabilized by policy makers. The point is correct but it gives only a partial description of the problem, for it fails to consider that less uncertainty, while improving stabilization, increases the inflationary bias. The model of the previous section captures both the stabilization and the inflationary bias effect, since it integrates elements of the credibility and of the uncertainty approach. This allows us to analyze the welfare effects of different degrees of transmission uncertainty in a more general model.

Let us hypothesize that the policy maker has the possibility to employ a team of economists who can develop a more accurate procedure for monetary control (i.e. one that reduces σ_{μ}^{2}), for instance by changing reserve requirements for the banking system. We see the decision concerning this parameter as a choice related to the monetary policy regime, in the sense that it is concerned with a variable that has a lower frequency of revision than policy implementation and expectation formation. Therefore the choice concerning transmission uncertainty is assumed to occur before the game is played.

The policy maker's choice of the optimal degree of transmission uncertainty depends on a trade-off. On the one hand increasing precision is detrimental from a credibility point of view, since it increases the inflationary bias. On the other hand it augments a policy maker's ability to affect economic outcomes in a desirable way according to the uncertainty view. To make these arguments more precise in terms of our model, consider the loss function of the policy maker taking as given the policy formation process in stages one to four.[10] Taking expectations with respect to both ν and μ yields:

$$(15) \qquad E_{\nu,\mu}(L) = (y^{*})^{2} + \mathrm{var}(y) + A \cdot \mathrm{var}(\pi) + A \cdot B^{2} .$$

The variances of inflation and real output growth can be derived by using the stochastic properties of μ and ν and the result that $E(\pi)=B$, obtaining:

$$(16) \qquad \mathrm{var}(\pi) = \sigma_{\mu}^{2} \cdot B^{2} + \sigma_{\nu}^{2} \cdot \frac{\sigma_{\mu}^{2}}{1+\sigma_{\mu}^{2}}$$

$$(17) \qquad \mathrm{var}(y) = \alpha^{2} \cdot \mathrm{var}(\pi) .$$

To get some insights in the welfare effects of transmission uncertainty, let us substitute equations (16) and (17) into equation (15) and then take the derivative of the resulting expression with respect to the parameter[11] σ_{μ}^{2}:

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10 As usual, the evaluation of a "regime parameter" is done according to the expected welfare it yields before the game is played, i.e. at an ideal stage zero. Analytically, this corresponds to an evaluation of the expected value of the loss function (5) with respect to *both* ν and μ, after replacing the equilibrium values for policy (14) and expectations (13) into it. The expectations with respect to ν need to be taken because *ex-ante*, at the time of the regime choice, this variable is not yet known by the policy maker.

11 We are minimizing expected losses with respect to the "regime" parameter σ_{μ}^{2}, which is assumed to be fixed before the game is played. This affects welfare by influencing equilibrium *discretionary* policy,

(18) $$\frac{\partial E_{\nu,\mu}(L)}{\partial \sigma_{\mu}^{2}} = \left[\frac{\sigma_{\nu}^{2}}{1+\sigma_{\mu}^{2}} - B^{2} \right] \cdot \left(A+\alpha^{2} \right)$$

In the Appendix we show that the sign of the first order derivative (18) is given by:

(19) $$\frac{\partial E_{\nu,\mu}(L)}{\partial \sigma_{\mu}^{2}} \propto A - c + \left(A + \alpha^{2} - c \right) \cdot \sigma_{\mu}^{2}$$

where

$$c \equiv \frac{\alpha \cdot y^{*}}{\sigma_{\nu}} > 0 .$$

It follows from (19) that we can distinguish three cases of the welfare effects of transmission uncertainty, depending on the configuration of the structural parameters A, α, y^{*} and σ_{ν}^{2}:

a) Welfare-increasing transmission uncertainty

If the policy maker is not very inflation averse (implying a credibility problem caused by a low A or a high y^{*}) and if the stabilization issue is relatively unimportant (σ_{ν}^{2} is low), then the condition $c > A + \alpha^{2}$ may hold. If that is the case, it follows from equation (19) that more transmission

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as can be seen from eq.(12). If we had chosen to model *commitment* policy, then we should have minimized expected losses with respect to *both* the regime parameter and the policy variable (x^{P}) simultaneously. Obviously, since in the commitment case there is (by definition) no credibility problem (and hence no excessive activism), the optimal value of transmission uncertainty is zero, because better policy control generates no credibility costs and improves stabilization effectiveness.

uncertainty (higher σ_μ^2) reduces the policy maker's expected losses ($\partial E_{\nu,\mu}(L)/\partial\sigma_\mu^2$ is negative). This implies that the policy maker's incentives to deal with the credibility problem dominate her desire to stabilize the economy. To put it differently, increasing σ_μ^2 lowers the inflationary bias and therefore reduces the credibility problem but it also reduces the capacity to stabilize. However, in this case the benefits of reducing the credibility problem outweigh the costs of a worse stabilization policy.

b) Welfare-decreasing transmission uncertainty

Suppose now that the policy maker is tough on inflation (A is high and y^* is low) and that stabilization is a relatively important issue (σ_ν^2 is high). Then the condition $c<A$ may hold. If it does, equation (19) shows straightforwardly that in this case the policy maker always benefits from increasing her ability to stabilize economic outcomes by increasing policy precision, even at the expense of a small increase of the inflationary bias ($\partial E_{\nu,\mu}(L)/\partial\sigma_\mu^2$ is positive). As a consequence, the stabilization issue dominates the credibility problem now.

c) Intermediate case

It follows from cases *a)* and *b)* considered above that an intermediate case may occur if the structural parameters satisfy the condition: $A<c<A+\alpha^2$. In this case the welfare of the policy maker improves by decreasing the precision of

policy if $\sigma_{\mu}^{2} < k$, as in case *a)*.[12] This means that credibility is more important than stabilizing the economy. On the contrary, if $\sigma_{\mu}^{2} > k$, welfare can be improved by increasing the precision of policy. This implies that the stabilization issue is the more important economic problem (as in case *b)*).

The threshold k is itself dependent on the structural parameters of the game (see footnote 12). If the credibility problem becomes more important relative to the stabilization issue (lower A, higher y^{*} or lower σ_{v}^{2}) then k increases, making it more likely that the policy maker wants to increase transmission uncertainty.

Let us consider again the claim that the main problem of monetary policy is the uncertain response of economic outcomes to policy instruments. This proposition implicitly asserts that decreasing policy uncertainty increases welfare because it allows central banks to be *more active* in varying policy instruments. Our model suggests that this claim needs further clarification.

A decrease of policy uncertainty increases both the *level* of the policy instrument which is associated with the inflationary bias and the *range* over which shocks are stabilized. Hence, if more precise control procedures are adopted, policy activism is higher by both standards. Thus, from a positive perspective, the model indicates that reducing policy uncertainty increases policy activism (as measured by both indices of activism). Whether such an increase of policy activism is welfare improving, however, depends on the

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[12] Note that $k \equiv (c-A)/(A+\alpha^{2}-c)$ is the optimal value for σ_{μ}^{2} under the condition $A<c<A+\alpha^{2}$. On the optimal degree of policy precision see also Devereux (1987) and Letterie (1995).

relative importance of the stabilization versus the credibility problem.[13] We showed that unconditional conclusions on the welfare effects of policy uncertainty are obtained if one of the two problems is ruled out by assumption (i.e. by postulating *ex-ante* what is "the main problem of the economy"). When neither problem is ruled out, the welfare effects of uncertainty depend on the configuration of the policy maker's preferences and of the economic parameters.

6. Conclusions

In order to highlight the incentive-constraint elements of monetary policy, credibility models have traditionally overlooked a number of practical policy issues, such as the uncertainties and the lags of the policy transmission mechanism, which are fundamental in the actual implementation of monetary policy.[14] Because of the lack of integration between credibility and transmission-uncertainty problems, these two strands of monetary policy theory have evolved into separate views over a number of policy issues, sometimes revealing a deep disagreement.

In this paper we propose a simple model that integrates a credibility problem with a problem of monetary policy effectiveness and controllability, not assuming away the relevance of one of them. This model offers conceptual

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[13] The results appear to be robust to the type of shock in the economy. Instead of assuming a demand shock (using equation 3) we could have assumed a supply shock (using equation 2). Our conclusions remain unchanged qualitatively, in the sense that the results still depend on the relative importance of the stabilization issue versus the credibility problem (see Letterie, 1995).

[14] Another recent attempt to integrate credibility models with some aspects of the policy transmission process is provided by Goodhart and Huang (1995), who introduce into the standard Barro-Gordon (1983) model the problem of the policy transmission lags.

elements that are helpful to judge whether monetary policy is excessively active or passive.

Three main considerations are suggested by our analysis. First, the model indicates that different notions of policy activism exist, each one being related to an assumption about *policy effectiveness*, which thus turns out to be a fundamental determinant of the disagreement between the uncertainty and the credibility views. From a normative perspective a distinction between these concepts is useful, since one type of activism (that related to the effective part of policy) appears to be beneficial for the policy maker whereas the other type of activism (related to the non-effective part of policy) does not.

Second, the model shows that the two notions of activism may coexist in a model where monetary policy is partially effective. This reinforces the importance of distinguishing between them. Accordingly, it is not always possible to judge policy as excessively active or passive in an exclusive way. After having defined two notions of policy activism, we showed that discretionary policy may simultaneously contain an excessively active structural component *and* an excessively passive contingent component. Within the context of our model, it is possible to reduce the disagreement on the optimal degree of policy activism described in the introduction to a matter of imprecise terminology.

Finally, we have analyzed the welfare effects of the degree of transmission uncertainty. The results indicate that uncertainty generally has ambiguous effects on welfare, depending on how serious is the credibility issue versus the stabilization issue faced by the policy maker. Clear-cut conclusions on the welfare effects of policy uncertainty can be obtained if either the credibility or the uncertainty problem is ruled out. When both problems coexist, the welfare effects of uncertainty depend on the configuration of the policy maker's preference and the parameters of the economy.

APPENDIX

Consider the first order derivative of $E_{\nu,\mu}(L)$ with respect to σ_μ^2:

$$\text{(A1)}\qquad \frac{\partial E_{\nu,\mu}(L)}{\partial \sigma_\mu^2} = \left\{ \frac{\sigma_\nu^2}{\left(1+\sigma_\mu^2\right)^2} - \frac{\left(\alpha y^*\right)^2}{\left[A\left(1+\sigma_\mu^2\right)+\alpha^2\sigma_\mu^2\right]^2} \right\} \cdot \left(A+\alpha^2\right).$$

Using $c = \frac{\alpha y^*}{\sigma_\nu}$ (A1) is equivalent to

$$\text{(A2)}\qquad \frac{\partial E_{\nu,\mu}(L)}{\partial \sigma_\mu^2} = \left\{ \frac{\sigma_\nu^2}{\left(1+\sigma_\mu^2\right)^2} - \frac{c^2 \cdot \sigma_\nu^2}{\left[A\left(1+\sigma_\mu^2\right)+\alpha^2\sigma_\mu^2\right]^2} \right\} \cdot \left(A+\alpha^2\right)$$

$$= \sigma_\nu^2 \cdot \left\{ \frac{1}{\left(1+\sigma_\mu^2\right)} - \frac{c}{\left[A\left(1+\sigma_\mu^2\right)+\alpha^2\sigma_\mu^2\right]} \right\} \cdot$$

$$\cdot \left\{ \frac{1}{\left(1+\sigma_\mu^2\right)} + \frac{c}{\left[A\left(1+\sigma_\mu^2\right)+\alpha^2\sigma_\mu^2\right]} \right\} \cdot \left(A+\alpha^2\right)$$

According to this equation the sign of the first order condition is determined by the first term in the curly brackets. Hence, after some straightforward manipulation of this term it can be shown that the sign of (A2) is proportional to:

$$\text{(A3)}\qquad \frac{\partial E_{\nu,\mu}(L)}{\partial \sigma_\mu^2} \propto A \cdot \left(1+\sigma_\mu^2\right) + \alpha^2 \cdot \sigma_\mu^2 - c \cdot \left(1+\sigma_\mu^2\right) = A - c + \left(A+\alpha^2 - c\right) \cdot \sigma_\mu^2 .$$

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