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Optimal sustainable monetary policy ☆

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ABSTRACT

In recent monetary policy literature, optimal commitment policy and its variant from a timeless perspective have been studied with emphasis on welfare gains from policy commitment. These policies, however, involve a time-consistency problem called a *stabilization bias* in forward-looking models. We analyze Chari and Kehoe's [1990. Sustainable plans. Journal of Political Economy 98, 783–802] sustainable equilibrium and examine *optimal sustainable policy*, i.e. a policymaker's strategy in the best sustainable equilibrium. This paper shows that such a policy becomes consistent with the optimal commitment policy in sufficiently later periods. It also shows that whether the optimal sustainable policy can attain the Ramsey equilibrium outcome depends on the magnitude of shocks hitting the model economy. Moreover, the paper finds a sustainable policy that attains higher social welfare than discretionary policy does.

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1. Introduction

Since Kydland and Prescott's (1977) seminal work, the time-consistency problem of optimal commitment policy has been well known. Nevertheless, recent monetary policy literature has studied this optimal policy and its variant from a timeless perspective proposed by Woodford (1999), with emphasis on welfare gains from policy commitment.[1] This recent literature has addressed the time-consistency problem called a *stabilization bias*, which arises from an inefficient trade-off in policymaking with private agents' *forward-looking* behavior and differs from the well-known inflation bias studied in traditional literature starting from Kydland and Prescott (1977) and Barro and Gordon (1983a).

In this paper we analyze Chari and Kehoe's (1990) sustainable equilibrium in a canonical model with the stabilization bias and examine a policymaker's strategy in the best sustainable equilibrium.[2] This policy strategy is called *optimal*

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[1] For the timeless-perspective variant, see also Woodford (2003), McCallum and Nelson (2004), and Jensen and McCallum (2002).

[2] Chari and Kehoe proposed sustainable equilibrium for policy games played between a government and competitive private agents in infinite-horizon economies. See also Stokey (1991).

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sustainable policy. The present paper shows first that discretionary policy induces the worst sustainable equilibrium. Using this result, it shows next that the entire set of sustainable equilibrium outcomes can be fully represented by private agents' optimality condition and a set of inequalities called a *sustainability constraint*.[3] This constraint requires that in each period an equilibrium outcome in question attains at least as high a present value of social welfare as the worst sustainable equilibrium outcome induced by the discretionary policy. This paper then finds that the optimal sustainable policy is a policy strategy which specifies to continue a policy that yields the best sustainable equilibrium outcome, as long as this policy has been adopted in the past; otherwise, the strategy specifies to switch to the discretionary policy forever.

To examine the optimal sustainable policy, this paper uses a Lagrange method of Marcet and Marimon (1998), who develop Kydland and Prescott's (1980) pioneering work. By maximizing a social welfare function within the entire set of sustainable equilibrium outcomes, this method generates a policy that attains the best sustainable equilibrium outcome in the *presence* of a commitment technology. Such a policy is referred to as *optimal quasi-sustainable policy*. The optimal sustainable policy now becomes a policy strategy that specifies to continue the optimal quasi-sustainable policy as long as it has been adopted in the past; otherwise, the strategy specifies to switch to the discretionary policy forever. This implies that the optimal sustainable policy is conducted by following the optimal quasi-sustainable policy and accomplishes the best sustainable equilibrium outcome in the *absence* of commitment technologies.[4] This is because private agents are policy takers and the optimal sustainable policy leads the policymaker to have no temptation to deviate from the optimal quasi-sustainable policy.

By analyzing the optimal quasi-sustainable policy, this paper obtains three features of the optimal sustainable policy. First, the optimal quasi-sustainable policy is an intermediate one between the optimal commitment policy and the discretionary policy. Therefore, the best sustainable equilibrium outcome achieved by the optimal sustainable policy is also an intermediate one between the Ramsey equilibrium outcome and the worst sustainable equilibrium outcome attained, respectively, by the latter two policies. Second, the optimal quasi-sustainable policy becomes consistent with the optimal commitment policy in sufficiently later periods, regardless of values of the model parameters. This implies that even in the absence of commitment technologies, the optimal commitment policy can be credibly adopted after the policymaker keeps the optimal quasi-sustainable policy for a sufficiently long period.[5] Last, if the sustainability constraint is never binding, the optimal quasi-sustainable policy is completely consistent with the optimal commitment policy and hence the time-consistency problem does not matter in that the optimal sustainable policy can achieve the Ramsey equilibrium outcome. The present paper shows that this holds if private agents are patient enough. This is because for a sufficiently high discount factor, sticking to the optimal commitment policy yields such a large present value of future social welfare that a policymaker's deviation from it never pays. Using this result, the paper examines whether the optimal sustainable policy can attain the Ramsey equilibrium outcome. It finds that the answer to this question depends on the magnitude of shocks hitting the model economy. If narrow bounds of the shocks are considered, the optimal sustainable policy can do so. For wide bounds of them, however, this is not the case because for a range of realistic calibrations of the model parameters, a certain lower bound on the discount factor for which the Ramsey equilibrium outcome is attainable is extremely close to one. Recent monetary policy literature assumes the Normal distributions for shocks and supports fairly wide bounds, suggesting that the optimal commitment policy may not be the desirable policy benchmark for actual policymakers, i.e. central banks, which do not possess commitment technologies perfectly.

In addition to the analysis of the optimal sustainable policy, this paper finds a sustainable policy that achieves the best Markov equilibrium outcome and attains higher social welfare than the discretionary policy does, for any values of the model parameters.[6]

Among related literature, Ireland (1997) analyzes sustainable equilibrium in a model with the inflation bias. Albanesi et al. (2003) investigate Markov equilibrium in variants of Lucas and Stokey's (1983) cash-credit model and Christiano et al.'s (1997) limited participation model. These studies find that the inflation bias is unlikely to matter in their models. Loisel (2005) and Levine et al. (2007) are the two most related papers, which consider the stabilization bias.

[3] In their fiscal policy model, Chari and Kehoe (1990) showed that the entire set of sustainable equilibrium outcomes can be represented by private agents' optimality condition, the government budget constraint, and a sustainability constraint. The present paper follows a common practice in recent monetary policy literature of leaving hidden fiscal policy and the government budget constraint. This would be the case if fiscal policy is "Ricardian", i.e. it appropriately accommodates consequences of monetary policy for the government budget constraint.

[4] The Lagrange method of Marcet and Marimon (1998) is the one for recursive contract theory. This implies that the optimal quasi-sustainable policy can be interpreted as an optimal self-enforcing contract in which a policymaker is expected to adopt a policy that generates higher social welfare than the discretionary policy does. Interestingly, this interpretation is in stark contrast with the optimal sustainable policy, which a policymaker willingly adopts so as to seek the highest social welfare in the absence of commitment technologies. Although the optimal contract and the optimal sustainable policy are based on opposite perspectives on the design of monetary policy, these two accomplish the same equilibrium outcome in the model.

[5] This finding seems to be related to Woodford's (1999) timeless-perspective variant of optimal commitment policy and Jensen's (2003) delay in implementation of discretionary policy. Woodford regards the variant as one to which a policymaker would have wished to commit at a date far in the past. Jensen shows that the performance of the discretionary policy improves by introducing a delay between the publication and implementation of it and approaches that of the optimal commitment policy as the period of such a delay is lengthened.

[6] This sustainable policy is a policy strategy which specifies to continue a policy rule that can achieve the best Markov equilibrium if a commitment technology is available, as long as this policy rule has been adopted in the past; otherwise, the strategy specifies to switch to the discretionary policy forever. Such a policy rule is also investigated by Clarida et al. (1999) and is consistent, in the model, with what Woodford (2003) calls the "optimal non-inertial plan". One crucial point of the present paper is that the sustainable policy requires no commitment technology but achieves the same best Markov equilibrium outcome as the policy rule does in the presence of such a technology.

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