

## Commentary

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In their conference paper, Gaetano Antinolfi, Costas Azariadis, and James Bullard (2007) develop and analyze a macroeconomic model with heterogeneous agents in which individual incomes fluctuate, aggregate income remains constant, and frictions that inhibit the strict enforcement of private contracts place endogenous limits on agents' ability to borrow and lend and hence to engage in intertemporal trade. Further, because the model features only a single good, intertemporal trade is the only trade that potentially takes place in equilibrium. Bewley (1980), Townsend (1980), Kehoe and Levine (1993), Kocherlakota (1996), and Alvarez and Jermann (2000) previously and famously considered similar models. Here, however, Antinolfi, Azariadis, and Bullard go beyond all of this previous work by highlighting that these models typically feature multiple equilibria.

Here, in fact, the authors' model has two steady-state equilibria under *laissez-faire*. In one, no trade takes place, so that equilibrium allocations are autarkic; in the other, agents trade actively. Hence, the two steady states can be Pareto-ranked: All agents prefer the good equilibrium with trade to the bad equilibrium without. The authors' policy problem then arises, because the bad steady state is stable and the good steady state is unstable, implying that even if the economy begins arbitrarily close to but not exactly in the good steady state, it will converge over time to the bad steady state. In Antinolfi, Azariadis, and Bullard's analysis, the government's stabiliza-

tion policy aims at keeping the economy at or near the good steady state.

Stabilization policy in this analysis therefore plays an important but somewhat unfamiliar role. Typically, in mainstream macroeconomic models, stabilization policy calls for the monetary and fiscal authorities to adjust their policy instruments in response to shocks that buffet the economy around a given steady state. In Antinolfi, Azariadis, and Bullard's model, by contrast, stabilization policy works on a more fundamental level, to actually pick out the steady state toward which the economy gravitates. Hence their paper's title, "Monetary Policy as Equilibrium Selection."

Here, monetary policy helps achieve this stabilization goal by reversing the properties of the two steady states, rendering the good steady state stable and the bad steady state unstable.

Specifically, the authors show that active policies that call for the government to adjust its policy instruments vigorously in response to changes in the underlying state of the economy succeed in achieving this goal. By contrast, passive policies—including constant money growth rate rules—that call for little or no policy response to changes in the economy fail by leaving the bad steady state as the economy's most likely destination.

Antinolfi, Azariadis, and Bullard's analysis, results, and conclusions combine to make their paper quite interesting and useful. The paper is novel in its focus on active versus passive policy rules in models of the type used in Bewley (1980) and Townsend (1980). Ljungqvist and Sargent

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(2000), for example, take a far more limited approach to policy analysis in a version of Townsend's (1980) turnpike model. Specifically, Ljungqvist and Sargent simply assume that the economy starts in its good steady state and then ask what the optimal constant rate of money growth in that good steady state is. Antinolfi, Azariadis, and Bullard qualify and extend these earlier results in an important way by making clear that Ljungqvist and Sargent's preferred constant money growth rate rule does not prevent the economy from leaving a neighborhood of its good steady state and converging to the bad steady state instead.

By highlighting the importance of this active-versus-passive distinction for the design of welfare-enhancing monetary policy, Antinolfi, Azariadis, and Bullard's paper also becomes quite useful, as it draws previously unnoticed links between the branch of the literature that works with Bewley-Townsend-type models and another branch of the literature in monetary economics that works with a very different class of models. In particular, recent work with New Keynesian models featuring monopolistic competition and staggered nominal price setting in goods markets establishes what Woodford (2003) and others call the "Taylor principle." This Taylor principle indicates that the central bank can stabilize the inflation rate around a desired target value through the use of an interest rate rule for monetary policy of the kind proposed by Taylor (1993), provided that rule is sufficiently active, calling for a vigorous adjustment of the short-term nominal interest rate instrument in response to shocks that push the inflation rate away from target. Antinolfi, Azariadis, and Bullard's results favor the use of active monetary policy rules as well, helping to establish the generality and robustness of these findings across two otherwise divergent branches of inquiry.

This new paper by Antinolfi, Azariadis, and Bullard thereby contributes importantly to the literature. It extends, as the other conference papers do, the "Frontiers in Monetary Policy Research." What's more, like many other papers that extend the frontiers of research—particularly

in monetary economics, it seems—this new paper raises a host of additional questions at the same time that it provides answers to existing ones. The remainder of my discussion focuses on some of these additional questions, pointing as Antinolfi, Azariadis, and Bullard's paper itself does to promising avenues for future research.

## IS PUBLIC POLICY REALLY NECESSARY?

This first and most basic question asks whether public policy is really crucial in an economic environment like the one described by Antinolfi, Azariadis, and Bullard's model. In their paper, the authors themselves provide a partial response to this question by indicating that the answer is "no" if private credit markets work well to begin with. In particular, the authors show that, when contracts can be perfectly enforced, trading in private credit markets supports an equilibrium allocation that is Pareto optimal. In this special case, government policy cannot help; *laissez-faire* works best.

Yet one might go a step further, as I am tempted to do, and note that even with limited contractual enforcement, the scope for welfare-enhancing public policy, though present, will necessarily be limited to the extent that the autarkic equilibrium is really not so bad. I raise this possibility with a specific concern in mind. The point is that all of these terms—"bad equilibrium," "autarkic allocations," "unstable steady states," and so on—have very specific meanings when used in the context of a formal study in macroeconomic theory like Antinolfi, Azariadis, and Bullard's. Of course, the authors very carefully and properly use these terms in their paper. However, the risk remains that, when presented to a broader audience of nonspecialists and policy-makers, these words will unintentionally conjure up images of disastrous outcomes under *laissez-faire*; in fact, though, a full, quantitative assessment of the welfare properties of equilibrium outcomes with and without government intervention—perhaps along the same lines as that presented by Krueger and Perri (2005) but applied

to the specific environment studied here—remains a task for future research.

In his famous essay “The Role of Monetary Policy,” Milton Friedman (1968, p. 14) cautions against the tendency toward overconfidence in economists offering policy advice: “[I]n this area particularly,” he warns, “the best is likely to be the enemy of the good.” It is almost surely true that, in reality, as in Antinolfi, Azariadis, and Bullard’s model, frictions prevent private markets—especially private credit markets—from operating with total efficiency so as to bring equilibrium allocations in line with Pareto-optimal outcomes. Yet, as Friedman emphasizes, it seems equally true that, in reality, even the most carefully designed government policies introduced into environments in which outcomes under *laissez-faire* are clearly suboptimal have often made matters much worse instead of much better. The inefficiencies in private credit markets are usefully highlighted in Antinolfi, Azariadis, and Bullard’s model. But, before we lean too heavily on those inefficiencies as the basis for justifying activist government intervention in those same segments of the U.S. economy, future research must more forcefully establish that those inefficiencies are severe enough, quantitatively, to also justify the risk that a well-designed public policy will be poorly implemented or will otherwise have unintended and detrimental consequences. Many sad lessons from history teach us that “reversion to autarky,” in the vernacular as opposed to the language for formal economic theory, most frequently occurs precisely because of excessive government involvement in private markets.

## IS MONETARY POLICY REALLY NECESSARY?

Although fiscal policy, in the form of a carefully designed system of income taxes and transfers, might seem to be the most direct and effective way of helping private agents in Antinolfi, Azariadis, and Bullard’s model stabilize their consumptions in the face of their fluctuating income streams, the authors point out that the successful implementation of such a policy requires the

government to obtain and exploit detailed information about individual agents’ economic circumstances. On these grounds, they advocate the search for monetary policy rules that help accomplish the same goal of income redistribution.

Along the same lines, however, one might also note that the monetary policy rule that the authors propose later, shown in their equation (37), requires the central bank to adjust the rate of money growth in response not just to movements in the aggregate variable  $R$ , which measures the real return to money (or the inverse of the inflation rate), but also to the variable  $x$ , which measures not aggregate income or consumption but rather the share of aggregate consumption enjoyed by high-income agents. In a more complicated model with richer forms of heterogeneity, the analog to the variable  $x$  would be a statistic or set of statistics summarizing the cross-sectional distribution of consumption. Successful implementation of this preferred monetary policy, therefore, also requires the government to collect and process much of the same individual-specific data needed to run an optimal tax-and-transfer fiscal scheme.

For this reason, an alternative policy rule that takes the form of the authors’ equation (38) and therefore calls for a monetary response to changes in the aggregate variable  $R$  alone may represent a more appealing and realistic alternative to pure *laissez-faire* or to a passive constant money growth rate rule. In any case, working out the implications of private information and the incentives that the government can offer agents to truthfully reveal that private information in settings like that described by Antinolfi, Azariadis, and Bullard’s model remains another important task for future research; those implications may draw sharper and more reliable distinctions between fiscal and monetary policies as effective tools for income redistribution.

## IS TIME CONSISTENCY A PROBLEM?

In Antinolfi, Azariadis, and Bullard’s model, activist policy works to stabilize the economy

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around its good steady state by influencing private expectations of future inflation under various contingencies that arise both in and out of equilibrium. As Kydland and Prescott (1977) emphasize, however, public policymakers who make announcements in an attempt to shape private expectations often fall victim to the time-consistency problem. Once private expectations based on a policymaker's announcements have been built into private decisions, that same policymaker may have an incentive to deviate from his or her promised action. The problem then arises because private agents recognize that the policymaker has this incentive to renege on any initial promise. In equilibrium, a policymaker without the ability to commit strongly to a preannounced policy may be unable to influence expectations in the desired way.

All of Antinolfi, Azariadis, and Bullard's analysis proceeds under the assumption that the central bank has this ability to commit. At the same time, however, their model builds directly and importantly on the idea that private agents' inability to precommit to their own future actions is precisely what provides room for welfare-enhancing public policy in the first place. What justifies this assumption that the government faces no similar commitment problem? And if the optimal activist monetary policy rules shown in equations (37) and (38) turn out to be time inconsistent, how do optimal policies under discretion compare with these counterparts under commitment, both in terms of their implications for the behavior of the money stock and inflation and in terms of their ability to stabilize the economy around the good steady state? These questions, too, remain to be answered in future research.

## **IS CREDIBILITY A PROBLEM? WHICH EQUILIBRIA ARE EXPECTATIONALLY STABLE?**

In addition to the time-consistency problem described above, a second potential difficulty may arise when the central bank tries to use the optimal activist policies described by equations

(37) and (38) to stabilize the economy around its good steady state: Once the economy reaches the good steady state—immediately under (37) and eventually under (38)—these activist policies call for constant money growth and inflation rates and may therefore appear to private agents as being observationally equivalent to passive policies, such as a constant money growth rate rule. Hence, once the economy reaches the good steady state, either of these activist policies retains its power to stabilize the economy only through the effects that the central bank's commitment to the policy rule has on private expectations of what would happen, out of equilibrium, if the economy begins to slip away from that good steady state.

Given the potential tenuousness of the expectational forces keeping the economy in the good steady state, even under an active monetary policy rule, one might reasonably ask, What would happen if, instead of forming their expectations based on how they believe the government would behave out of equilibrium, private agents formed their expectations based on how they actually observe the government to behave in equilibrium? Would the central bank have to act, periodically at least, to maintain the credibility of its commitment to the optimal rule?

Often, in the literature following Kydland and Prescott (1977), "credibility" is used synonymously with "time consistency." In this case, however, the term as I use it refers to ideas that are closer in spirit to the concepts of "expectational stability" and "learnability" that, in previous work, Bullard (2006) uses to characterize the government's ability to keep the economy in or around a desired steady state when private agents form their expectations adaptively, based on historical data as opposed to full knowledge of the economy's true structure.

Examining the need and scope for activist monetary policy to stabilize the economy described by Antinolfi, Azariadis, and Bullard's model around the good steady state when expectations are formed through adaptive learning also remains an important and useful task for future research.

## ARE ACTIVE POLICIES ROBUSTLY OPTIMAL?

This last question comes full circle, back to Milton Friedman's (1968) caveats about activist public policymaking. Antinolfi, Azariadis, and Bullard's main result, concerning the optimality of activist policy rules, seems quite sensible: If the central bank wants to stabilize the economy around a desirable steady state, then it certainly stands to reason that its monetary policy ought to react strongly whenever the economy begins to deviate from that steady state. The authors' main result shares the same powerful, intuitive appeal as the Taylor principle from the literature on New Keynesian economics.

However, their statement about robustness—that, looking across many different macroeconomic models, optimal policy rules are all activist—remains logically distinct from (and therefore does not imply) another statement about robustness: that any given activist policy rule, fine-tuned to fit the special features of any given model, will continue to work well across many different macroeconomic models. Barnett and He (2002) make this point quite forcefully, using methods and arguments that are quite similar to Antinolfi, Azariadis, and Bullard's.

In this earlier paper, Barnett and He focus on a macroeconomic model that is quite different from the one studied here by Antinolfi, Azariadis, and Bullard; specifically, Barnett and He work with an older-style, medium-scale macroeconomic model developed originally by Bergstrom, Nowman, and Wymer (1992). Nevertheless, Barnett and He begin their analysis just as Antinolfi, Azariadis, and Bullard do, by demonstrating that, although the Bergstrom-Nowman-Wymer model has an unstable steady state under *laissez-faire*, it can be stabilized by an appropriately designed activist fiscal policy rule. At the same time, however, Barnett and He also show that this activist fiscal policy rule, when properly calibrated to stabilize the economy under a given configuration of the model's nonpolicy parameters, works counterproductively to destabilize the economy still further when improperly calibrated to a slightly different set of nonpolicy parameters.

Barnett and He's results thereby echo Friedman's caveat about the best being the enemy of the good by confirming that an activist policy that is fine-tuned to work well within one particular model may perform quite poorly when applied to a very similar, but still slightly different, economic environment. Barnett and He's results clearly indicate that additional careful and rigorous analyses like Antinolfi, Azariadis, and Bullard's are needed to establish the robustness of optimal activist fiscal and monetary policies.

## CONCLUSION

Antinolfi, Azariadis, and Bullard's conference paper contributes to scientific knowledge in several ways. It stands as the first paper to consider the important distinction between active and passive policy rules in a heterogeneous-agent model with endogenously incomplete markets that builds on Bewley's (1980) and Townsend's (1980) early formulations. By considering this distinction and by highlighting the stabilizing powers of activist monetary policy rules, it also draws useful and previously unnoticed links between the branch of the literature in monetary economics that studies the properties and implications of Bewley-Townsend-type models and the until-now completely distinct branch of the literature that studies New Keynesian models of monopolistic competition and nominal price rigidity. Finally, Antinolfi, Azariadis, and Bullard's paper contributes to scientific knowledge by raising a host of questions for future researchers who share these authors' technical sophistication, fine attention to detail, and intellectual rigor.

Before closing, let me ask some of these questions again, phrasing them in a slightly different way than they appear in my discussion above. The optimal activist monetary policy characterized by Antinolfi, Azariadis, and Bullard's equation (37) calls, in the authors' own words (p. 340), for the "money growth rate to drop by about 7 percentage points" in response to "each additional 1 percentage point of inflation." Is this optimal policy time consistent? Is this optimal policy credible or expectationally stable? Is this optimal

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policy robust to various changes in the economy environment? And is this optimal policy really necessary? All of these questions await the same type of careful and rigorous analysis contained in Antinolfi, Azariadis, and Bullard's very fine conference paper.

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