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Discussion on "Scarcity of Safe Assets, Inflation, and the Policy Trap" by Andolfatto and Williamson[1]

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Abstract

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I. Introduction

In the last few years, the U.S economy has experienced very low nominal interest rates with the short-maturity end of the yield curve pegged effectively at the zero lower bound. At the same time, inflation has been positive and most of the time fluctuating in a range of 1 to 2 percent on an annual basis. The obvious implication of these facts is that the effective real interest rate has been very low (and even negative, depending on maturities) for a considerable period of time. Andolfatto and Williamson set up a relatively simple model that is able to accommodate these facts and then study the implications of such a model for monetary policy.

Simple models that generate, in a plausible way, relatively low real interest rates in the medium to long run are hard to come by. Interestingly, there is a large body of work in the macro-finance literature dealing with this kind of issue (Kocherlakota, 1996). Standard dynamic macroeconomic models tend to generate risk-free interest rates that are too high for what was observed in U.S. data during the 20th century. In the process of adapting models to deal with this fact, it is now well recognized in the macro-finance literature that one way to lower real rates in a representative-agent model is to introduce a transaction role for risk-free bonds (Bansal and Coleman, 1996).

Andolfatto and Williamson seem to get to a similar idea but from a different starting point. Both Andolfatto and Williamson have been active contributors to the literature that emphasizes the micro-foundations of the use of money in exchange. It is a natural step in that literature to study the role of other assets besides money in the mechanism of exchange. Williamson (2012) incorporates some of the insights from that body of work, the so-called "new monetarist" perspective, into a macroeconomic model suitable for analyzing the impact of different monetary policies.[2] In this new paper, Andolfatto and Williamson take a step toward simplicity by imposing ad-hoc Clower-type constraints for both cash and bonds and then studying the monetary policy implications of assigning a transaction role to government bonds.

There are good reasons, beyond theoretical plausibility, to consider such a specification. As Krishnamurthy and Vissing-Jorgensen (2012) extensively discuss, there appears to be a strong negative relationship in the U.S. data between the yield spread of corporate bonds over Treasuries and the total outstanding amount of government debt over GDP. This relationship suggests that when there are more government bonds outstanding, the price of bonds falls and the yield increases, closing the gap with the yield on corporate debt. Krishnamurthy and Vissing-Jorgensen use a "bonds-in-the-utility-function" model (a la Sidrauski) to interpret their empirical findings. Andolfatto and Williamson recast the idea in the form of a "bonds-in-

[2] Lagos (2010) is one paper in the new monetarist tradition that addresses the asset-pricing puzzles reviewed by Kocherlakota (1996) using transactions liquidity as an added characteristic of certain assets.

advance" constraint and concentrate on the monetary policy implications of that observed relationship between total debt and its yield.

During the recent period of very low interest rates in the United States, it has been common to hear experts and policymakers argue that the zero lower bound has been binding. If it were possible, these experts conclude, it would be optimal to lower the short-term nominal rate to a value below zero. A similar logic has been extensively used to justify non-conventional monetary policy, such as forward guidance and asset purchase programs (see, for example, the discussion in Woodford, 2012). In sharp contrast with this view, in the model of Andolfatto and Williamson, under certain circumstances, the economy may find itself with a nominal and a real interest rate that are too low and further reducing the nominal interest rate actually exacerbates the problem, causing output (and welfare) to fall further away from its efficient level. In my opinion, such a clear challenge to what might be considered conventional wisdom makes the paper by Andolfatto and Williamson worthy of serious consideration.

II. Assessing the results

The paper by Andolfatto and Williamson is a technical paper. As such, it deserves a technical discussion. To do that, I will briefly describe a simplified version of their model and then point out some issues and interpretations.

The model is a general equilibrium dynamic macroeconomic model with a large number of identical households and two goods, 1 and 2, that are produced by the households allocating labor n to a one-to-one production technology. Utility from each good is given by a smooth utility function $u(c)$ with the usual properties, and a linear disutility of labor equal to γn is assumed. Each household cannot consume its own output but can consume other households' output. I am going to assume that the economy is non-stochastic and that agents have perfect foresight. This is all I need for the purpose of my discussion. While Andolfatto and Williamson set up the model as if there were shocks, as far as I can tell not much of the stochastic aspect of the model comes into play in their results.

There are two financial assets in the economy: cash and one-period zero-coupon nominal government bonds. Let q_t be the price of the bonds in period t. Households enter each period with a stock of money that results from holding one-period nominal bonds and from selling goods in the previous period. Within the period, they first have an opportunity to trade in an asset market where the government also sells new bonds to households. Households cannot short bonds.

After the asset market closes, households trade goods. In the goods market, each household faces two "means-of-payment" constraints. First, good 1 must be paid with cash, so that $p_{1t}c_{1t} \leq M_t$, where p_{1t} is the dollar price of good 1 at time t, c_{1t} is the quantity of good 1 consumed by the household at time t, and M_t is the nominal money holdings of the household after trading in the asset market of period t. Second, a portion of the quantity that the household purchases of good 2 must be paid with bonds, so that $p_{2t}(c_{2t} - \kappa) \leq B_t$, where p_{2t} is the dollar price of good 2 at time t, c_{2t} is the quantity of good 2 consumed by the household at time t, and B_t is the holdings of nominal bonds that the household acquired in the asset market of period t. Here, κ is the quantity of good 2 that the household can produce for itself.[3]

In a situation where both goods are produced, traded, and consumed, the representative household should be indifferent between producing and selling good 1 or good 2. Furthermore, one unit of cash and one unit of bonds are equivalent in the payment of goods from the perspective of the seller: In both cases, the seller ends up with one unit of cash next period. Denote by S_{t+1} the quantity of cash that the representative household will have at the beginning of period $t+1$ from selling goods in period t. Using this notation, we have that:

$$S_{t+1} = p_{1t}c_{1t} + p_{2t}(c_{2t} - \kappa) = (p_{1t} - p_{2t})c_{1t} + p_{2t}(n_t - \kappa),$$

which tells us that unless $p_{1t} = p_{2t}$ the seller would choose to produce and sell only one of the two goods. Therefore, from now on, consider only the case where both goods are traded and denote by p_t the common price of goods. Before moving on, though, note that from the perspective of the buyer, whenever $q_t < 1$, buying good 2 is cheaper than buying good 1. This is the case because good 2 can be paid with "dollars tomorrow" that were acquired today at a discount (i.e., at less than a dollar).

As is common in cash-in-advance economies, when $q_t < 1$ in equilibrium we have that $p_t c_{1t} = M_t$. Assume, for simplicity, that the cash-in-advance constraint also holds with equality when $q_t = 1$. This is compatible with equilibrium and it is not crucial for any of the results I will discuss.

Now denote with lower-case letters the real value of all nominal quantities. The representative household's budget set is then described by the following set of equations:

$$m_t + q_t(b_t + b^a_{t+1}) = s_t + \tau_t,$$

$$c_{1t} = m_t,$$

$$c_{2t} - \kappa = b_t,$$

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[3] Andolfatto and Williamson give a slightly different interpretation of κ. They call κ the portion of good 2 that can be bought with credit.

$s_{t+1} = \frac{p_t}{p_{t+1}}(n_t - \kappa + b^a_{t+1})$,

and the no-short-selling constraint $b^a_{t+1} \geq 0$. Here, again, we denote with the letter s the real value of cash holdings that the representative household has at the beginning of the period as a result of selling goods the previous period and holding nominal bonds over and above what was needed to pay for the purchases of consumption good 2 (that is, b^a_{t+1}). The household maximizes the sum of future discounted utility, that is $\sum \beta^t[u(c_{1t}) + u(c_{2t}) - \gamma n_t]$, subject to the constraints that describe its budget set.

A key component of the theory developed by Andolfatto and Williamson is their characterization of government policy. I will argue that they deal with a very particular set of policies and will discuss how results would change when alternative policies are followed. Here is what they do. They first define the real value of consolidated government debt as $V_t = \bar{m}_t + q_t\bar{b}_t$. Then, they assume that the fiscal authority adjusts transfers τ_t and the supply of bonds to target a given sequence of V_t. The monetary authority, via open market operations, targets the value of q_t, which is effectively a way to target the economy's nominal interest rate.

Let $\pi_{t+1} = p_{t+1}/p_t$, the gross inflation rate. Given a policy $\{q_t, V_t\}$, an equilibrium can be characterized by a sequence $\{c_{1t}, c_{2t}, \pi_{t+1}\}$ satisfying the following set of equations:

$u'(c_{2t}) = q_t u'(c_{1t})$,

$\gamma = \beta \frac{u\prime(c_{1t+1})}{\pi_{t+1}}$,

and

$u'(c_{2t}) = \gamma$ if $c_{1t} + q_t(c_{2t} - \kappa) \leq V_t$,

or

$c_{1t} + q_t(c_{2t} - \kappa) = V_t$ if $u'(c_{2t}) > \gamma$.

Note that in equilibrium $p_{1t}c_{1t} = \bar{M}_t$, which determines the price level given a policy-induced supply of currency $\bar{M}_t$. In equilibrium, the real allocation depends not on the price level but on (gross) inflation π_t.

As a benchmark example, consider the situation when policymakers target a constant V_t and a constant q_t. Denote these targets by $\bar{V}$ and $\bar{q}$. If $\bar{V}$ is large enough, then the equilibrium is unconstrained, in the sense that the constraint on short-selling is not binding in the optimization problem of the representative household. The real allocation in the unconstrained equilibrium is equivalent to the one that obtains in the more familiar case when all of good 2 can be produced and consumed at home. We denote this equilibrium with $\{c^*_1, c^*_2, \pi^*\}$ and note that c_1^* and c_2^* solve the equations $\gamma = u'(c_2^*) = \bar{q}u'(c_1^*)$, which also shows why both equilibrium consumptions are constant over time. Note also that $\pi_t = \pi^* = \beta/\bar{q}$. It is easy to see from the cash-in-advance constraint that the equilibrium is consistent with a constant money growth rate equal to $\beta/\bar{q}$. The gross real rate of interest is equal to $1/\beta$. In summary, the monetary authority controls inflation by targeting the price of the nominal bonds and the real interest rate is invariant to policy (as long as the equilibrium remains unconstrained).

Suppose now that $\bar{V}$ is relatively small. In particular, suppose that $c_2^* - \kappa > \bar{b}$. This is the situation that Andolfatto and Williamson call a “scarcity of safe assets” in the economy. In this case, the equilibrium is constrained and $c_2^{**} = \bar{b} + \kappa < c_2^*$ (where we denote with double-stars the constrained equilibrium). Consumption of good 1 is given by the solution to $u'(c_1^{**}) = (1/\bar{q})u'(\bar{b} + \kappa)$, and inflation is given by $\pi^{**} = (\beta/\gamma)u'(c_1^{**})$. The gross real interest rate now depends on $\bar{b}$ as follows:

$$\frac{1}{\bar{q}\pi^{**}} = \frac{1}{\beta}\frac{\gamma}{u\prime(\bar{b}+\kappa)} < \frac{1}{\beta},$$

where the last inequality results from the fact that $c_2^{**} < c_2^*$. In contrast with the unconstrained equilibrium, marginal changes in fiscal policy in the constrained equilibrium affect the real interest rate and inflation, given a policy followed by the monetary authority.

In light of the experience of the United States, where the nominal rate has been close to zero and inflation has been in the neighborhood of 2 percent for the last few years, it seems most relevant to understand equilibrium when $\bar{q} \approx 1$. In the unconstrained equilibrium, just as in standard cash-in-advance models, the real interest rate is positive and equal to $1/\beta$ and the gross inflation rate π^* is equal to β, which implies that the economy actually experiences deflation. In the constrained equilibrium, in contrast, the gross real interest rate is lower than $1/\beta$ and π^{**} is greater than β. In principle, inflation could be positive and the net real interest rate could be negative, which seems to align well with the recent U.S. experience.

How does monetary policy influence outcomes in the Andolfatto-Williamson model? In the unconstrained equilibrium, a lower $\bar{q}$ implies a higher relative price of good 1 from the perspective of the buyer. In other words, higher nominal interest rates imply that the cash good is more “expensive” and households consume less of it. This is a standard result in cash-in-advance economies. More concretely, for a given value of $\bar{V} = \bar{m} + \bar{q}\bar{b}$, a lower $\bar{q}$ implies a lower c_1^* and hence a lower $\bar{m}$. Fiscal policy reacts to this by setting a higher value of $\bar{b}$. But, as we saw before, changes in the value of $\bar{b}$ do not change the real allocation in the unconstrained equilibrium.

In the constrained equilibrium, the interaction between fiscal and monetary policy is crucial for the real allocation. For a given value of $\bar{V}$, a lower $\bar{q}$ implies a lower c_1^{**} and hence a lower $\bar{m}$.

Fiscal policy reacts to this by setting a higher value of $\bar{b}$, which changes the value of c_2^{**} and the value of the real interest rate. Andolfatto and Williamson use this logic to argue that in the constrained equilibrium the monetary authority can change the real interest rate and the consumption allocation in the economy by changing the target for the price of the nominal bonds.

Now, consider an alternative fiscal policy. Suppose that instead of targeting $\bar{V}$, the real value of total consolidated government debt, the fiscal authority targets the real value of outstanding government bonds, $\bar{b}$. As before, monetary policy targets the price of bonds, or equivalently, the nominal interest rate. This change in the specification of policy is inconsequential in the unconstrained equilibrium, of course. Suppose, then, that the economy is in the constrained equilibrium. Now, just as before, a lower $\bar{q}$ implies a lower c_1^{**} and hence a lower $\bar{m}$. However, since now $\bar{b}$ is fixed, c_2^{**} does not change (it is equal to $\bar{b} + \kappa$), and in consequence, monetary policy does not affect the real interest rate, but just inflation, as is commonly the case in cash-in-advance models.

In the unconstrained equilibrium, the optimal monetary policy is the Friedman rule (i.e., $\bar{q} = 1$). As it turns out, though, in the constrained equilibrium it matters whether the fiscal authority is targeting $\bar{V}$ or $\bar{b}$ for how the monetary authority should set optimal policy. If fiscal policy fixes $V_t = \bar{V}$, then the Friedman rule is *not* optimal. To see this, suppose that $\bar{q} \approx 1$. A lower $\bar{q}$ implies a lower c_1^{**} and hence a lower $\bar{m}$, which leads the fiscal authority to set a higher $\bar{b}$. This, in turn, increases c_2^{**}. It is easy to show that when $\bar{q} \approx 1$, the change in c_2^{**} dominates the change in c_1^{**} and welfare is higher when $\bar{q}$ is set to be lower than unity. Note that the reaction of fiscal policy to monetary policy is crucial for this result. In fact, if the fiscal authority targets $\bar{b}$, then the Friedman rule is again optimal. Perhaps, then, one of the main lessons from the Andolfatto-Williamson paper is that, at the time of setting policy, the monetary authority needs to be mindful of the reaction of the fiscal authority, if the ultimate goal is to maximize the welfare of society.[4]

Optimal monetary policy in the constrained equilibrium is non-trivial. Andolfatto and Williamson do not spend a lot of energy on this issue. Instead, they move on to study how Taylor rules perform in their environment. They consider a monetary policymaker who follows a nominal interest rate rule of the form:

$$\frac{1}{q_t} = \max[\pi_t^{\alpha}(\pi^*)^{1-\alpha}x_t, 1],$$

[4] Of course, there is an extensive literature studying this kind of idea. See, for example, the AEA Presidential Address by Christopher Sims (2013). The title of section II.A of Sims' paper is: "Monetary Policy Actions, to be Effective, Must Induce a Fiscal Policy Response."

where x_t is a real interest rate adjustment factor in the sense that if the monetary authority hits its target for inflation π^* in all periods, then the real gross interest rate $1/q_t\pi_{t+1}$ equals x_t.

There is no clear justification for following a Taylor rule within the context of the model. Andolfatto and Williamson argue that "real-world central bankers take an interest" in this kind of rule and, for that reason, it could be interesting to understand how the rule can go wrong in their model. But, presumably, real-world central bankers would not want to follow a rule that is obviously suboptimal, unless they have a misperception with respect to how the economy actually works. In other words, more generally, Andolfatto and Williamson are proposing us to consider the perils of having "misguided" policymakers.

In the unconstrained case, for the target inflation π^* to be attainable in a stationary equilibrium situation, we need $x_t = 1/\beta$. In this case, then, it is easy to show that when $\alpha > 1$ (the Taylor principle) there are two equilibria with constant inflation and no equilibria with transitional dynamics (i.e., non-stationary equilibria). This situation is similar to the situation discussed by Benhabib, Schmitt-Grohe, and Uribe (2001b) in their "simple example," where the cross-partial derivative between money and consumption in the utility function are equal to zero.

The constrained case is more interesting. Now, the long-run real interest rate is actually endogenous and, a priori, it is not as obvious what x_t should be if the monetary authority intends to hit the target π^* in the long run. One possibility is to set x_t equal to the current real gross interest rate at each time t. Andolfatto and Williamson show that this way of conducting policy creates scores of non-stationary equilibria. An alternative specification, not considered by Andolfatto and Williamson, is to set $x_t = 1/q_t\pi^*$. With this value of x_t there are again only stationary equilibria. I find this value of x_t somewhat attractive to the extent that it suggests that the policymaker is calculating the adjustment factor with its long-run inflation target in mind. But, of course, there are no clear standards for how "misguided" a policymaker can be in a theoretical model.

III. On misguided policymakers

Perhaps another important lesson from the Andolfatto-Williamson paper is that policymakers need to be wary of the prescriptions derived from simple macroeconomic models when it comes to monetary policy and stability. This is really not a new insight, of course. There is a well-known literature on this subject. Andolfatto and Williamson cite the "Perils" paper of Benhabib, Schmitt-Grohe, and Uribe (2001a), but those authors wrote several other papers on the subject as well. In fact, in one of those papers (Benhabib, Schmitt-Grohe, and Uribe, 2001b), they discuss in detail the properties of economies operating under Taylor-type interest rate rules and how stability depends critically on very specific details of the environment.[5] More recently, John Cochrane (2011) has come back to the issue and postulated that many of the arguments in favor of the Taylor principle are not technically convincing. He reports that a review of the existing literature did not reveal to him full answers to his concerns. The current state of the debate suggests to me that models often used to discuss monetary policy alternatives are ridden with multiple equilibria and hence not very powerful in predicting outcomes.

Andolfatto and Williamson present a model that is different, of course, from the one analyzed by Benhabib, Schmitt-Grohe, and Uribe, describing it as an alternative. It is then not surprising that monetary policy does not perform well under rules that have been designed to deal with economies of a different structure. Effectively, Andolfatto and Williamson are considering an environment where policymakers have bounded rationality and are mistaken about the way the economy works. My casual impression is that, generally speaking, misguided policymakers are more prevalent in real life than in the academic literature. Yet, in the particular case of monetary policy, decisions tend to be made by highly qualified and knowledgeable individuals, at least in the United States. While, for this reason, misguidedness in monetary policy looked to me like a relatively weak case to make when discussing the United States, the general idea was still worth thinking about.

In that process, I went back and read some of the statements that U.S. policymakers were making in the spring of 2012. That period was one in which labor market indicators had finally started to show some signs of improvement and the inflation rate was hovering around 2 percent after being somewhat higher in 2011. The Fed was relying mainly on forward-guidance language to fine tune the stance of monetary policy, with the target interest rate pegged at its effective lower bound. Evaluating monetary policy at that time was not easy, if it ever is. Interestingly, then-Vice Chair Janet Yellen seemed to have taken a relatively pragmatic view of the problem. In her April 11, 2012, speech, she said that "because I see no magic bullet for determining the 'right' stance of policy, I commonly consider a number of different approaches." She went on to discuss first the prescriptions from an optimal control procedure, pointing out that the analysis hinges "on the selection of a specific macroeconomic model as well as a set of simplifying assumptions that may be quite unrealistic." To complement her analysis, she found it helpful to "consult prescriptions from simple policy rules," arguing (based on work by Taylor and Williams, 2011) that "research suggests that these rules perform well in a variety of models and tend to be more robust." However, Yellen went beyond what some of the relevant literature seems to support when she said that "any benchmark rule should conform to the so-called Taylor principle." At this point, I suppose, the examples in the paper by

[5] Adão, Correia, and Teles (2011) study variations in the specification of the interest rate rules that could make them less conducive to multiplicity.

Andolfatto and Williamson (and in Benhabib, Schimitt-Grohe, and Uribe (2001b), for that matter) may look germane again.[6]

IV. Closing remarks

How to set monetary policy appropriately appears to be very sensitive to the structure of the economy. Sometimes practitioners give very precise advice based on details of the model of the economy that they have in mind. That seems better to me than advice that is just produced out of thin air. However, as Andolfatto and Williamson illustrate in their paper, equally plausible models of the economy often deliver very different recommendations. Perhaps this kind of work tilts the balance yet another notch toward simpler and potentially more robust policy rules. Lars Hansen and Thomas Sargent, of course, have been advocates of this way of thinking for a long time (see Hansen and Sargent, 2011, for a review). Furthermore, Sargent reports to be in good company when he tells us that Milton Friedman wrote in 1953 about "making policy when you do not trust your model" and recommended "surrounding a macroeconomic statistical model with shrouds of uncertainty and being cautious in applying it to construct quantitative policy advice" (Sargent, 2014). As if things were not complicated enough already, it seems to me that Andolfatto and Williamson just added a non-trivial point to the support of the distribution of models that Friedman wanted us to use when addressing the policy problem.

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[6] Full quote from Yellen (2012): "The commitment to a balanced approach has crucial implications when it comes to choosing sensible benchmarks from among the many alternative policy rules. In particular, any benchmark rule should conform to the so-called Taylor principle, which states that, other things being equal, a central bank should respond to a persistent increase in inflation by raising nominal short-term interest rates by more than the increase in inflation so that the real rate of interest rises, thereby helping to bring inflation back down."

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