
GAUTI B. EGGERTSSON

Discussion of “Price-Level Targeting and Stabilization Policy”

BERENTSEN AND WALLER’S (2011, THIS ISSUE) paper contributes to the growing literature recently identified as “New Monetarist Economics” (Williamson and Wright 2010). Here, I wish to contrast some of the modeling assumptions of the New Monetarist literature to those of the New Keynesian and explore the consequence of these differences for the question at hand. To frame the discussion, I find it useful to start by laying out what I think has been the main contribution of the New Monetarist literature. I find this helpful to put the contribution of this paper in context, but also useful to contrast it with what the New Keynesian literature is all about.

1. THE MAIN CONTRIBUTION OF THE NEW MONETARIST LITERATURE

In my view the most successful element of the New Monetarist research agenda has been to provide an interesting answer to a question any monetary economist confronts: “Why do we have money?” From the perspective of theory, it is indeed puzzling that in order to trade goods, people living in our models need to trade pieces of paper with pictures of dead presidents on them rather than just handing the physical goods to one another. What this literature has helped clarify with a series of elegant models is that one can think of fiat money as a solution to the problem people encounter in barter economies due to the “double coincident of wants”: When we meet you not only have to have what I want but also want to want what I have. I have always liked Narayana Kocherlacota’s parable that “money is memory,” which

I thank Antoine Martin and Marco Del Negro for many helpful comments. The views expressed are those of the individual author and do not necessarily reflect official positions of the Federal Reserve Bank of New York, the Federal Reserve System, or the Board of Governors.

GAUTI B. EGGERTSSON *is with the Federal Reserve Bank of New York (E-mail: Gauti.eggertsson@ny.frb.org).*

Received October 10, 2010; and accepted in revised form October 25, 2010.

Journal of Money, Credit and Banking, Supplement to Vol. 43, No. 7 (October 2011)

© 2011 The Ohio State University

is the title of his classic 1998 *Journal of Economic Theory* paper. It captures exactly the role of money as an intermediary of exchange. In principle we would never need to exchange these pieces of paper with dead presidents on them, if only we could keep an all encompassing ledger that keeps track of all the trades that takes place in the economy (subject—of course—to some enforcement mechanism). Once I buy Coca Cola, for example, the ledger should debit me with the dollars the Coca Cola costs and similarly credit the seller by the same amount. In principle, why should we need to exchange any funny paper things with pretty pictures on them? Paper money is just a crude way of constructing this ledger; encode this transaction “memory” in a way that is incentive compatible. I think of the New Monetarist models as a very elegant formalization of how this record keeping takes place with commodity and/or fiat currency.

2. THE NEXT STEP: BUSINESS CYCLES

Until recently the New Monetarist models only existed as simple parables that were not suited for business cycle analysis. This has started to change with the pioneering work of Lagos and Wright (2005) and Berentsen and Waller’s own work, such as Berentsen, Camera, and Waller (2007). The main “problem” with some of the early New Monetarist models was their intrinsic heterogeneity. This heterogeneity was obviously essential in order to model the problem of “double coincident of wants.” But it also made the models very intractable and difficult to use for practical policy. Lagos and Wright (2005) suggest solving this problem by giving the people access to complete markets from time to time, where complete record keeping is possible and so in principle no money is needed to facilitate transactions. What this means in practice is that you can aggregate everything up at these distinct points, which makes the whole problem manageable. And hence, New Monetarism was ready for regular business cycle analysis.

This paper takes this research agenda to the next logical step. What does the New Monetarist model say about optimal stabilization policy over the business cycles? In the paper—as usual—business cycles are variations in the endogenous variables due to exogenous shocks to preferences and technology. Let me first summarize the basic structure of the model, whose key ingredients are becoming increasingly standard, and then summarize the key results.

Each period is divided up as follows. There are three markets, 1, 2, and 3. Money is needed in market 2. Policy is a state-contingent money transfer into market 1 that is then possibly extracted back when market 3 is open. There are two interest rates defined. The interest rate between the first and the third markets within each period, $i_1(\omega)$, where ω indexes the state of the economy (affected by shocks to technology and preferences). In addition there is an interest rate defined between two periods called i_3 . It prices a risk-free loan between the third market in period t to the third market in period $t + 1$.

Berentsen and Waller's paper has two main results. First, the paper shows that if (for some exogenous reason) the interest rate between periods is different from the Friedman rule, that is, $i_3 > 0$, then $i_1(\omega) > 0$ for all states of the worlds ω . In other words if policy does not satisfy the Friedman rule between periods (despite the Friedman rule being optimal) then it has to be optimal to deviate from the Friedman rule for the interest rate that is defined within each period.

What is the meaning of this result? I interpret it as a typical "optimal second best" result in the tradition of Lipsey and Lancaster (1956). Judged in this light it is not altogether surprising. As Lipsey and Lancaster pointed out: if one condition for social optimum is violated then—in general—all the other conditions have to be violated as well. In this paper it is exogenously assumed that $i_3 > 0$, and hence all other conditions for social optimum must also be adjusted according to the theory of the optimal second best. Hence, $i_1(\omega) > 0$ for all ω .

The second main result of the paper is to show that if a monetary injection at the beginning of the period is permanent, then policy has no effect at all. Thus a "liquidity support" (withdrawal) has to be undone in the future to be effective. What seems to be going on here is that if the money supply injection is assumed to be permanent, then there is no effect on real money balances (because prices will move one-to-one with the new money supply). And money only has an effect here by influencing real balances as money only plays a role as a "medium of exchange." On the basis of this result, the Berentsen and Waller argue for the importance of managing expectations about future policy.

In terms of practical policy, perhaps, the most concrete proposal is therefore that "liquidity interventions" are only going to be effective to the extent that the central bank commits to undo them in the future. Berentsen and Waller use this property of the model to argue that this is the key to understand why the Federal Reserve tried to convince the markets in 2008 that their interventions were temporary. In the absence of such reassurances, then, firms would have readjusted their prices and the intervention would have been irrelevant.

3. SOME CRITICISM

It is certainly less than clear to me what the different interest rates here refer to. Is i_1 a short-term interest rate and i_3 a long-term rate? Hardly. This is a bit problematic, as the central result is cast in terms of these interest rates. More generally, I think the main challenge is to explicitly link each of the objects in the model to something we observe in the data. Are markets 1 and 3 the formal economy and 2 the informal one? Such assignment of economic objects in the model to ones found in the data would make it easier to evaluate whether or not the model provides a coherent theory of the business cycle and short-run behavior of aggregate variables. In the Berentsen and Waller's defense, however, this is first study of this issue in "a modern micro-founded model with flexible prices" by which I think they have in mind the New Monetarist

set of models (there are of course many RBC style studies with flexible prices that have been written on this topic; see e.g., Cooley and Hansen 1989). It is sufficient to say that while I think it is worthwhile to study short-run fluctuation in these models, we still have a long way to go before the models can be either confirmed or refuted by the data.

With respect to practical policy, I found the result interesting that the only way interventions can have an effect, is if they are explicitly temporary. One interesting aspect of this idea is that it is opposite from what is suggested by the New Keynesian model at zero interest rate as I will now discuss. But before getting there, I want to speculate more broadly on if this model is suitable for studying business cycles.

4. THE RIGHT MODEL AND THE RIGHT FRICTION?

The New Monetarist research agenda relies on a fundamental assumption that is yet to be proven. The assumption is that the basic reason for why people hold paper currency—the problem of the “double coincident of wants”—is also the basic mechanism we need to study to understand the effect of monetary policy on output and prices at business cycle frequencies. This remains a conjecture that needs to be confirmed or rejected by the data.

The New Keynesian literature, the tradition I consider myself a part of, has taken the opposite approach. The most common stance in that literature is that the exact details of the frictions that makes people hold paper currency is not at the heart of monetary policy in practice. Instead, what is central, is that monetary authorities control some nominal variable one way or another. This matters as soon as one assumes that prices do not instantaneously adjust to various disturbances. This line of reasoning—that nominal variables matter because of price frictions—is not really special to Keynes or Keynesians, however. Authors ranging from 18th-century David Hume to 20th-century Milton Friedman have made use of it. But to be more specific, the New Keynesian literature quite often assumes that the central bank set directly the nominal interest rate (as this does happen to be the case in practice under regular circumstances) without worrying at all about the exact institutional details of the transaction frictions that give the bank this power.

What is the rationale for this assumption? A classic reference is Michael Woodford's 2003 book *Interest and Prices* and his 2000 paper “Monetary Policy in a World without Money.” There, among other things, Woodford parameterizes a model that has money in the utility function. One interpretation of the Lagos and Wright (2005) paper is that it provides microfoundations for this sort of utility. The “real effect” money has in Woodford's model—that is, independent of the effect it has coming from price sluggishness—comes about because real money balances “facilitate transactions” and thus save people the labor effort of bartering with goods.

In Woodford's parameterization, however, it becomes clear that this effect is likely to be quantitatively small in his model. Why? Because the monetary base, that is,

non-interest-bearing paper currency in circulation, is very small as a fraction of total output (and in any case to a very large extent held abroad or in the informal economy, a point made, e.g., by Summers 1991). The way I like to interpret this quantitative result is that the modern banking system, with all its paper-free debit cards, checking accounts, and so on, has to a large extent replaced paper currency as a store of “memory” to use Kocherlacota’s parable. It seems to me that one implication of this is that the fundamental problem of “double coincident of wants” has been solved with modern payment technology. Money has to large extent been replaced by a gigantic computerized ledger that is run by our banking institutions (with the important exception of the informal economy in the United States and various less developed economies).

But if modern payment technology is to a large extent eliminating the need for paper currency to overcome transaction frictions, does this mean that monetary economics is becoming irrelevant? Within the New Monetarist models, I think the answer is far from obvious, but I worry that the frictions modeled are slowly disappearing with modern payment technology. But within the New Keynesian models the answer is clearly no, based, among other things, on Woodford’s work cited above. He shows that even in a “cashless limit” it is still the case that the central bank controls nominal quantities and—in particular—the nominal interest rate. As long as the government has a role in defining the unit of account, it can have important effects. The effect of policy, however, does not come about due to the transaction frictions that paper money helps overcome but because the entire economy denominates their prices in this unit of account. And this is the distinct role money has in this class of models; it is the unit of account. To the extent that nominal prices are slow to adjust, monetary policy fiddling with nominal variables can have important real effects. Those nominal frictions can of course come from various sources, for example, from information frictions (an early example is Calvo 1983 but for a more recent contribution with detailed microfoundations using information theory see Woodford 2009) or from menu costs (an early example is Mankiw 1985 but for a more recent approach with much more detailed microfoundations see Gertler and Leahy 2008).

5. THE NEW KEYNESIAN APPROACH

Here I want to summarize the basic New Keynesian model and contrast monetary policy and expectation management in this model to the role it plays in the current paper. In its most simple form the New Keynesian model can be summarized by the following (log-linearized) aggregate demand equation (from households’ consumption maximization problem)

$$\hat{Y}_t = E_t \hat{Y}_{t+1} - \sigma(i_t - E_t \pi_{t+1} - r_t^e),$$

and aggregate supply equation (from firms' optimal pricing decisions)

$$\pi_t = \kappa \hat{Y}_t + \beta E_t \pi_{t+1},$$

where Y_t is output in deviation from steady state, i_t is the nominal interest rate, r_t^θ is an exogenous disturbance, π_t is inflation, E_t an expectation operator and the coefficients $\sigma, \kappa > 0$ and $0 < \beta < 1$.

In contrast to the New Monetarist theory, monetary policy here works exclusively through influencing the short-term nominal interest rate, which is the interest rate paid on a one-period risk-free loan contract. This intertemporal nominal price has real consequences in the model because inflation does not jump around freely due to the firms pricing equation above. This can imply that by cutting the nominal interest rate, the central bank makes spending today relatively cheaper than it was before. This gets people to buy more goods and services. The firms lurking in the background are committed to supply whatever demanded at the prices they post (they are monopolistically competitive) so the increase in demand will increase output. Also notice another important thing. If you forward the aggregate demand equation you see that demand does not only depend on current interest rate and inflation expectation. It depends on the entire path of future nominal interest rates and expected inflation into the infinite future.

Relative to the New Monetarist model, what is particularly noteworthy here is that the effect of monetary policy does not rely on any transaction friction. Instead, it relies on the assumption that the government can control some nominal variable, more specifically the nominal interest rate. In summary, what is important is (i) the government's role as defining the unit of account (not that it supplies paper money) that gives it the power to control some nominal variable, (ii) the assumption that the firms that price their good in this unit of account do not continuously adjust their prices, and (iii) that the firms are committed to supply whatever is demanded at the price they post. As has been pointed out by Woodford (2000) it is logically consistent to write a model in which this is the only meaning of money, that is, that the economy is "cashless" in the sense that no paper money is actually traded.

What does this model say about the current crisis in contrast to the current paper? The current crisis is characterized among other things by the fact that the nominal interest rate is zero. Because the nominal interest rate is zero, this means that the central bank cannot accommodate any real shocks such as a negative r_t^e . The policy coming out of the New Keynesian model is to reduce the real interest rate to increase demand, for example by committing to lower future short-term nominal interest rates and allow some future inflation (see, e.g., Eggertsson and Woodford 2003). This was the key policy recommendation of the New Keynesian models analyzed before the crisis, and as far as I can tell, it seems to be one rationale behind some policy actions by various central banks during the crisis. Some central banks have, for example, tried to influence markets expectations about future short rates, either by linking future increases in the short rate to calendar dates (e.g., the Bank of Canada) or

by using forward looking language in their policy statements (see Bernanke 2010). Similarly, it appears that the Federal Reserve Open Market Committee (FOMC) in the United States, for example, views further deterioration in inflation expectation as being contractionary, because of the demand effect. Here is a passage from minutes of FOMC September 2010.

A number of participants commented on the important role of inflation expectations for monetary policy: With short-term nominal interest rates constrained by the zero bound, a decline in short-term inflation expectations increases short-term real interest rates (that is, the difference between nominal interest rates and expected inflation), and thereby damping aggregate demand. Conversely, in such circumstances, an increase in inflation expectations lowers short-term real interest rates, stimulating the economy.

This is in sharp contrast to the mechanism proposed in this paper. In the model of this paper a decline in the price level would increase money balances and thus be expansionary.

What is particularly noteworthy about the nature of policy in the current crisis in the New Keynesian models is that rather than convincing the market that the interventions are temporary, the central bank needs to convince the market of the opposite: that the intervention is to some extent permanent and that it will raise the price level. In other words, if we append a money demand equation to the model sketched out above, the increase in the money supply needs to be permanent. This will increase inflation expectations and reduce the real rate of return. This is the opposite conclusion to the one reached by this paper.

6. CONCLUSION

Berentsen and Waller's paper marks an interesting turn in the New Monetarist literature into the messy area of short-term business cycle fluctuations. This is surely an important direction to take this literature and as with any novel and innovative research, I think it is a bit too early to tell how fruitful it will be. But if I speculate, my guess is that the biggest marginal contribution the New Monetarist literature can make does not focus on the role of paper currency in overcoming transaction frictions. Instead, it seems to me that the greatest potential is in exploring in more detail "inside money," that is, the evolution of various claims of individuals on one another that I guess could be characterized as the nitty gritty details of Narayana's "memory ledger." Inside money was at the heart of "Old Monetarism" and I think it may also be at the heart of the current economic crisis. Once we combine such a theory with one that can lead to inefficiently low production (e.g., due to sticky prices) then I believe we are closing in on a better macro theory of crisis such as the one we have seen in the past few years (Del Negro et al. 2010 is a recent example of an attempt to move our models in this direction).

In this commentary I have tried to contrast a bit the basic underlying assumption of frictions in the New Monetarist literature to that of the New Keynesian literature,

but up until now, the analysis of short-term fluctuation has mostly been the turf of New Keynesian models. It is yet to be seen how much impact the New Monetarist models will have on our thinking about short-run policy. Berentsen and Waller's paper is certainly a good start and I hope the authors keep on working on this line of research.

LITERATURE CITED

- Berentsen, Aleksander, Gabriele Camera, and Christopher Waller. (2007) "Money, Credit and Banking." *Journal of Economic Theory*, 135, 171–95.
- Berentsen, Aleksander, and Christopher Waller. (2011) "Price-Level Targeting and Stabilization Policy." *Journal of Money, Credit and Banking*, 43(7, Suppl.), 559–80.
- Bernanke, Ben S. (2010) "Implications of the Financial Crisis for Economics." *Speech at the Bendheim Center for Finance*. Princeton, NJ: Princeton University.
- Calvo, Guillermo, (1983) "Staggered Prices in a Utility-Maximizing Framework," *Journal of Monetary Economics*, 12, 383–98.
- Cooley, Thomas F., and Gary D. Hansen. (1989) "The Inflation Tax in a Real Business Cycle Model," *American Economic Review* 79, 733–48.
- Del Negro, Marco, Gauti B. Eggertsson, Andrea Ferrero, and Nobuhiro Kiyotaki. (2010) "The Great Escape? A Quantitative Evaluation of the Fed's Non-Standard Policies," Federal Reserve Bank of New York, mimeo. With Marco Del Negro, Andrea Ferrero, and Nobuhiro Kiyotaki Preliminary draft, March 2010.
- Eggertsson, Gauti, and Michael Woodford. (2003) "The Zero Bound on Interest Rates and Optimal Monetary Policy," *Brookings Papers on Economic Activity* 1, 212–19.
- Gertler, Mark, and John Leahy. (2008) "A Phillips Curve with an Ss Foundation," *Journal of Political Economy*, 116, 533–72.
- Lagos, Richard, and Randall Wright. (2005) "A Unified Framework for Monetary Theory and Policy Analysis," *Journal of Political Economy* 113, 463–84.
- Lipsey, Richard, and Kelvin Lancaster. (1956) "The General Theory of Second Best," *Review of Economic Studies* 11–32.
- Mankiw, Gregory. (1985) "Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly," *Quarterly Journal of Economics* 100, 529–37.
- Summers, Lawrence. (1991) "Panel Discussion: Price Stability. How Should Long-Term Monetary Policy Be Determined?" *Journal of Money, Credit and Banking*, 23, 625–31.
- Williamson, Stephen, and Randall Wright. (2010) "New Monetarist Economics," Federal Reserve Bank of St. Louis Review.
- Woodford, Michael. (2000) "Monetary Policy in a World without Money," *International Finance* 3, 229–60.
- Woodford, Michael. (2003) *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton, NJ: Princeton University.
- Woodford, Michael. (2009) "Information-Constrained State-Dependent Pricing," *Journal of Monetary Economics*, 56(Suppl.), 100–124.