

## **Implications of Globalization for Monetary Policy**

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The purpose of this note is to provide some background for a discussion of the monetary policy implications of globalization. By globalization I simply mean the increased mobility and interdependence of the world's financial markets, goods markets, and labor markets, due to improved information technology and the reduction in government barriers to doing business internationally. I take the process of globalization itself, as well as its macroeconomic and microeconomic impacts, as given—documented in other reports prepared for this meeting.

### ***Modern Monetary Theory and Policy: The International View***

The implication of globalization for monetary policy has already been the subject of many papers and speeches. This year Fisher (2006), Kohn (2006), Rogoff (2006) among others have written about it, and the BIS, the OECD, and the IMF have devoted large sections of their publications to it. (See Helbling, Jaumotte, and Sommer (2006) in the IMF's spring World Economic Outlook, for example).

I plan to approach the question from the perspective of academic research on monetary policy, asking what modern monetary theory can tell us. By way of background, two developments fundamentally distinguish modern monetary theory from its predecessors: first, the embedding of forward-looking (rational) expectations and microeconomic-based theories of wage/price formation into classical monetary models, and, second, the use of optimal monetary policy rules to describe and analyze policy. The origins of these developments can be traced to

the 1970s, though their full realization is more recent, and they have since spawned many more breakthroughs.

The focus on policy rules for the setting of the interest rate by the central bank, more than any thing else, characterizes modern monetary theory. For example, Michael Woodford's (2003) recent treatise on the theory of monetary policy is all about monetary policy rules.<sup>1</sup> Modern monetary theory has been highly relevant, in my view, for the actual conduct of monetary policy, both in the United States and globally.<sup>2</sup> Practically speaking, when monetary theory is applied to current monetary policy problems, it usually takes the form of an empirical model—either statistically estimated or informally calibrated—again exemplified by Woodford (2003) where the main objective is to use such models to determine optimal, or at least good, ways for monetary policy makers to set interest rates.

Although Woodford's treatise does not cover international models or policy issues (as stressed by Richard Fisher (2006) in a convincing case for more policy work on globalization), much of the research and empirical modeling which his book exemplifies is in fact international in scope. Indeed, the very early work building models that could be used to find good monetary policy rules had a strong international orientation, including work at Stanford (Taylor (1993)), the Fed, the IMF and Brookings, and this has continued (see, for example, the models in Levin, Wieland, and Williams (1999)). In fact, as vehicles to assess the policy implications of globalization, these international models have, in certain areas, been ahead of their time, correctly anticipating the high degree of mobility and interdependence of capital and foreign exchange markets, quick moving expectations of the term structure of interest rates and

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<sup>1</sup> Chapter 1 of Woodford (2003) provides an excellent non-technical summary of the highly technical analysis in the body of the nearly 800 page book.

<sup>2</sup> A good recent example is the analysis presented by Reifschneider and Williams (2000) which gave a theoretical basis for what became the “considerable period” and “measured pace” policies three years later.

exchange rate arbitrage, and interconnections between prices in different countries. So I begin with a review of what existing international monetary models tell us about the policy implications of globalization. More specifically I ask whether and how globalization might change the optimal monetary policy rule for setting interest rates according to in these models. I then consider features of globalization where existing models fall short (or will fall short over time as globalization continues) and discuss how the policy implications might be modified.<sup>3</sup>

### ***The Exchange Rate: Optimal Responses, Regimes, and Principles***

I begin with the key international variable, the exchange rate. The exchange rate plays three significant roles in international monetary theory or models. First, its expected change affects relative rates of return from holding dollars versus other currencies as financial capital can move instantaneously around the globe to obtain the best return. Second, its level affects the relative price of goods and labor in different countries and thus affects exports and imports. And, third, its past and expected rate of change affects inflation through the pass-through mechanism.

Despite this significant role of the exchange rate in the models, they imply that interest rate setting by the central bank should not react directly to the exchange rate. Rather, policy decisions should focus primarily on the evolution of inflation and real GDP. More technically, to implement its price stability goal the central bank's policy rule for the interest rate rule should include inflation (as a deviation from the target rate of inflation) and real GDP (relative

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<sup>3</sup> There are differences, of course, among the existing models, so gleaning these policy implications requires some judgment, and is not entirely objective. One area where there appears to be much disagreement is in the specification of wage and price setting and this is a very active research topic. The September issue of the *International Journal of Central Banking* is devoted to this topic.

to potential GDP), but not the level or rate of change in the exchange rate. Since the models already assume perfect capital mobility, it is hard to see how more globalization of the financial markets would change this result.

This result first emerged very early in simulations with multi-country models (Taylor (1993)). To be sure, more recent work on small open economy models (e.g. Ball (1999)) shows that reacting to the exchange rate can improve economic performance by reducing the variance of real GDP for a given variance of inflation. However, the gains are small and do not hold up universally across models.

There are two explanations for this finding, in my view (Taylor (2001)). First, exchange rates are volatile compared with real GDP and inflation, so reacting to them would cause the interest rate to ratchet around too much, with likely harmful side effects on the economy. Second, by reacting sufficiently to inflation there is automatically a response to the exchange rate because a depreciation of the exchange rate is, to some degree, usually passed through to domestic inflation; thus raising the interest rate as inflation rises is effectively a response to a depreciation of the exchange rate. This channel also exists, and may even be stronger, if the policy interest rate reacts to the forecast of inflation. Note that this explanation of why it is not beneficial to react directly to the exchange rate is very similar to that of Bernanke and Gertler (1999) who argued against placing asset prices in monetary policy rules.

Another exchange rate implication of the international monetary models pertains to the exchange rate regime, and this is the superiority of using flexible exchange rates rather than fixed exchange rates. This result is based on extensive model simulations, but the simple rationale is that the fixed exchange rate removes the ability of the central bank to focus directly on the inflation target in its own country. To be sure there may be other reasons to have a fixed exchange rate, including setting up a force for political union or latching on to the credibility of

another central bank , and in some cases (especially small open economies) these rationales may be sufficient to outweigh the advantage of having an independent monetary policy. Nevertheless, even with the highly mobile capital assumptions of the monetary models a flexible exchange rate is the preferred regime, and it is hard to see how more globalization will imply anything else. On the contrary, the movement toward greater capital mobility reinforces it.

However, in a highly interdependent world economy more needs to be said about exchange rate policy than simply recommending a flexible exchange rate regime and an interest rate policy that focuses on price stability. In Taylor (2007), for example, I argue that four additional exchange rate principles are needed, at least for the United States and other large developed countries, when a flexible exchange rate regime is chosen. Because responsibility for exchange rate policy goes beyond the central bank and includes the Treasury (or finance ministries in other countries) these principles apply to the “monetary authorities” more generally. They are: (1) avoid intervention in the currency markets, (2) avoid *verbal* intervention in the currency markets, (3) develop an explicit *exchange rate diplomacy* because the exchange rate depends on the sovereign actions in other countries, and some of those countries will not refrain from currency market intervention (direct or verbal), and (4) recognize that the exchange rate is more than a financial variable so that a good policy requires that a decision making process be put in place to incorporate foreign policy and national security considerations.

### ***Policy Responses to International Commodity Prices***

A closely related question is whether, in a highly interdependent world economy, international commodity price movements, including crude oil, require an explicit interest rate

response or whether focusing on the domestic inflation rate or its forecast is sufficient. The international monetary models of which I am aware give an answer very similar to the case of the exchange rate and for much the same reason. An explicit reaction is not needed, but since such commodity price movements can raise the overall rate of inflation, responding to the inflation rate itself will provide an indirect response to such price movements. But the models do say that the response to such inflation increases should be smoothed out, either by using a moving average of the inflation rate, a forecast of the inflation rate, or some “core” measure of inflation that includes only the indirect effects.

It should be emphasized that the inflation variable that policy makers respond to does not have to be the same as the inflation variable that they decide to target. An example that I have found helps clarify this issue relates to unemployment or the output gap. A central bank does not need to have the output gap in its objective function in order to justify the presence of the gap in its reaction function; that the output gap helps forecast inflation is sufficient reason. Similarly, the central bank could target the core inflation rate, but find that it is optimal to respond to a smoothed version of the actual inflation rate.

### ***Responding to Variables in Other Countries***

Given that international monetary models have strong links between markets in different countries, it is natural to ask whether an implication of globalization is that a central bank in one country needs to start reacting more to events or variables in another country. Even if the objective function of the central bank pertains only to developments at home, in principle the answer must be yes. In virtually all international models, a recession in one country will tend to lower inflation at home through the impact of import prices and other channels, so an optimal response to that foreign recession will be to lower the interest rate and

keep the inflation rate on target. However, simulations of models have found that the effect is very small. Moreover, the estimated size of the effects is highly uncertain so that reacting to them is not robust; that is why most recommended policy rules have omitted such complex responses. In sum, the implication is, as with the exchange rate and international commodity prices, that a direct response is not necessary; the indirect responses to domestic inflation and output are close to optimal and far more robust.

### ***International Coordination in the Design of Monetary Policy Rules***

Another globalization issue concerns the need to coordinate monetary policy across central banks in different countries. In the context of modern monetary theory, the question must be cast as whether there are gains from international coordination in the *design* of monetary policy rules (Taylor (1985)). Academic research suggests that there are such gains from such coordination. In particular, the theory suggests that it is better for economic performance in the world as a whole for central banks to cooperate. The particular form of cooperation has them being more accommodative to inflation (raising the interest rate by less when inflation increases, though still by an amount greater than the inflation rise), than they would if they were not cooperating in their choice of a reaction function. However, according to existing empirical models the effects are very small quantitatively, and as a practical matter the policy recommendations have been to ignore these effects (Carlozzi and Taylor (1985)). Nonetheless, when thinking about the future of globalization it is prudent to understand the issues and the reasons for the findings.

To explain the results it is necessary to be more formal about what is meant by cooperation and lack of cooperation. The non-cooperation concept comes from game theory, and, as it seems quite stylized, should be viewed as an approximation. Using game theory

terminology, the Cournot-Nash solution represents the non-cooperative case; it occurs when policy makers in one country take as given policy reactions in the other countries. To be concrete, it is as if the Federal Reserve Board staff takes the policy rules of other central banks as given when it does alternative Greenbook simulations, and that the FOMC reacts optimally given those foreign policy rules. Since this is a pretty accurate characterization of current practice, this part may not seem stylized, but the Cournot-Nash solution goes further. It assumes that other central banks do the same thing, and moreover, that there is an equilibrium where the rule that every central bank takes as given for other central banks is actually optimal for those other central banks. In contrast, the coordinated or cooperative solution is where all central banks jointly maximize a global objective function—perhaps one that aims to keep inflation close to target in each country with small output fluctuations and with some device for weighting the deviations from target in each country.

Using these definitions it is possible to actually compute such cooperative and non-cooperative solutions using international monetary models with all the linkages between countries that I have been assuming. The results are that the cooperative solution entails a smaller response of the interest rate to an inflation rate increase than the Cournot-Nash solution. Why? When a central bank raises its interest rate in response to an incipient inflation rate increase in its own country, the exchange rate tends to appreciate in that country and to depreciate in the other countries. That depreciation abroad tends to be inflationary abroad and requires that the central banks in the other countries tighten. It is also optimal to react to inflation developments in other countries with the response different on the cooperative and non-cooperative case. In the cooperative solution, the interest rate is cut when inflation rises in the other countries; this provides an appreciation of the currency in the other country and attenuates the inflation rise abroad and the negative output effects at home.

### ***No Radical Change Needed***

In sum, there is some good news in this quick trip through existing monetary theories: monetary policy does not need to change much in order to deal with the greater mobility and interdependence of markets, at least as these changes have been incorporated into the models. The policies that monetary theory has told us would work well do not have to be thrown out because of globalization.

But are the theories missing something? Is the world changing more rapidly than models can adjust? (a common worry of model builders and users). Are there things that monetary policy makers and their advisers should be on the look out for, preparing for the future as the globalization process continues? Now let me briefly consider some recent changes that may be related to globalization, but that are too recent to have affected the parameters or the structure of monetary models, whether they should have or not.

### ***The Decline in Pass Through***

One of the most remarkable changes in the global economy pertaining to monetary policy in recent years is the sharp reduction in exchange rate pass-through. Some have attributed this decline to globalization and the reduced pricing power of firms due to foreign competition, but in my view the decline is closely related to changes in monetary policy and its focus on price stability compared with earlier years. With the adoption of clear goals of low inflation, exchange rate changes have become less persistent and more temporary. Under such circumstances, it is optimal for firms to delay passing on changes in imported input costs due to changes in the exchange rate because they are likely to be reversed (Taylor (2000)).

Regardless of whether the reduction in pass-through is due to globalization or to

monetary policy, it has implications for monetary policy. For example, it reduces the gains from cooperation as I described earlier. In other words, reduction in exchange rate pass through due to a more inflation-focused monetary policy has reduced the need to coordinate policy in the game theory sense that I described earlier.<sup>4</sup>

### ***The Flatter Phillips Curve and the Great Moderation***

Another remarkable change is the reduction in the slope of the short-run Phillips curve (see Roberts (2006)) which, depending on its cause, also has implications for monetary policy. This change, however, is unlikely to have been due to globalization. As Rogoff (2004) and Bean (2006) have argued, the increased competition of globalization would be expected to make the short run Phillips curve steeper, to make prices more responsive. In fact, Rogoff's suggestion that the excellent inflation record of the last two decades has been induced by globalization does not square with the observed lower slope of the Phillips curve. In general, the idea that greater competition is a source of the better inflation performance is at odds with inflation being a monetary phenomenon—unless one can show that the greater competition affects monetary policy decisions—and is reminiscent of outdated theories of the 1960s and 1970s that said inflation was due to market power of firms and/or unions.

Another possibility is that the lower slope of the Phillips curve is due to a globalization of aggregate demand effects, where inflation in one country is related to output and unemployment in all countries. If so, then the lower coefficient on a country's output in the Phillips curve would be offset by higher coefficients on other countries' outputs in that Phillips curve, but as Kohn (2006) has argued there is little evidence for this.

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<sup>4</sup> Canzoneri, Cumby and Diba (2006) argue that the gains from cooperation may actually be larger.

Yet another possibility is that direct linkages between wages in different countries have strengthened, reducing the role of output or unemployment, due to off-shoring of labor as described by Grossman and Rossi-Hansberg (2006). There is still little evidence of such an increased wage-wage connection, but off-shoring has only recently been increasing rapidly. An important topic for future research is to modify the models of staggered wage and price setting to capture this aspect of globalization, which is certainly not in the existing monetary models.

There is a good alternative explanation of the declining Phillips curve slope which is due to Roberts (2006). It fits the facts very well and has nothing to do with globalization. According to Roberts (2006) the slope has gotten flatter because monetary policy has become more responsive—the coefficients in the central bank’s policy rule have increased. In other words, it is not changes in the structure of the economy—global or domestic—that have caused the Phillips curve to flatten, but rather successful monetary policy. Roberts also finds that the improved economic performance in recent years (the great moderation) is due to these same changes in monetary policy—adding weight to the argument that globalization was not responsible for this welcome change. And such an increased responsiveness of the interest rate set by central banks is a global phenomenon (Huston and Spencer (2005)).

### ***Concluding Remarks***

In these remarks I have argued that globalization should not radically change the way monetary policy has been operating in the United States during in the past two decades. Nevertheless, policy makers and their advisers should be on the lookout for ongoing and future changes in the global economy and be ready to adapt their models and policy frameworks, taking account, for example, of changing wage-price dynamics due to off-shoring.

Globalization does not make monetary policy any easier.

Although not the subject of this meeting, there are also potential implications of globalization for the operation of international financial institutions, especially the International Monetary Fund. Of course, central banks have an important role to play in the operations of such institutions. The securitization movement of the 1990s probably increased the connectivity of debt and equity markets globally, as the Russian financial crisis of 1998 and the response of the Federal Reserve to the contagion of the crisis made clear. This has increased the potential role of the International Monetary Fund in dealing with such crises. Recent research has stressed the importance of clarifying the response of the IMF to such crises, effectively arguing for rules for the IMF to increase predictability, and in the past few years guidelines for large scale IMF loans have been created (Taylor (2007)).

More generally, globalization calls for greater clarity and predictability for central banks and the international financial institutions. Having a sense of the policy rule that other central banks or international institutions are likely to follow (at least as an approximation) and when they are likely to deviate from such behavior makes central banking easier and more efficient.

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