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Monetary policy at the zero interest bound: A model comparison exercise

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In this paper, we summarize the findings from zero-interest-bound simulation exercises conducted on the policy/forecasting models of the three major central banks. After imposing a fixed-period zero-interest-bound episode on each model, we consider common variations in the monetary-policy reaction function to minimize the macro-economic consequences of such a deflationary regime. Although there is some heterogeneity in the ranking of these remedial policies, reflecting the different properties of the models, we find that more aggressive policy rules and price-targeting rules are potentially candidates for robust monetary strategies. *J. Japanese Int. Economies* **20** (3) (2006) 305–313. Research and Statistics Department, Bank of Japan; Research Department, European Central Bank; Board of Governors of the Federal Reserve System. Published by Elsevier Inc.

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1. Introduction

This paper and the three that follow consider the effectiveness of a number of proposals for reducing the consequences of the zero lower bound on nominal interest rates using simulations of the policy models of three major central banks: the Bank of Japan's JEM model (Fujiwara et

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al., 2005); the European Central Bank's Area-Wide Model (Fagan et al., 2001) and the Federal Reserve's FRB/US model (Brayton et al., 1997). Our goal is to look for policies that work well across a number of models.[1] These papers were originally prepared for a conference held in September 2004 as part of the joint NBER/CIRJE/EIJS/CEPR "Japan Project" meeting.

The zero bound poses a problem for monetary policy because central banks typically respond to weak aggregate demand conditions by lowering short-term interest rates. Since nominal interest rates cannot be reduced below zero, some modifications in monetary-policy strategy will be needed at low levels of interest rates. Interest in such strategies has increased in recent years because short-term interest rates have been very low in a number of countries: in Japan, the call money rate has been at or below 50 basis points since late 1995; in the United States, the federal funds rate was below 150 basis points from late 2002 to the summer of 2004; and in the euro area, the equivalent rate was held at 200 basis points from summer 2003 until late 2005.

Accordingly, a number of proposals have been made to reduce the consequences of the zero lower bound on nominal interest rates. A common element of these proposals is that they work by lowering expected future real short-term interest rates, either lowering expectations of future nominal rates or raising expectations of future inflation.

Our use of central-bank models to evaluate the effects of these policies is a key feature of this project. Some earlier studies have examined the effects of changes in monetary policy using highly stylized models—for example, Wolman (2005) and Eggertson and Woodford (2003). We believe, however, that using policy models has some important advantages relative to those relatively more compact frameworks. For instance, in the central-bank policy models, there is a much richer range of economic mechanisms at work, and these additional mechanisms allow a more detailed examination of the drawbacks and advantages of certain policies. Moreover, the central bank models are estimated, and thus may provide a more-realistic platform for policy evaluation. Finally, these models are, for better or for worse, familiar to policymakers, and so provide them with a natural benchmark for variant analysis.

In this project, we evaluate various policies looking at the response of the economy to a specific shock under broadly harmonized conditions. In each model, a set of demand shocks is chosen so that the short-term interest rate would be pinned at zero for a period of four to five years—under the assumption that the central bank will follow a baseline "Taylor rule" policy once the zero-bound is no longer binding. We consider such a shock to be a good approximation to the kind of severe demand shock that leads to fears about the zero bound. Indeed, in each model, the zero bound makes the effects of the shock on output and inflation considerably worse than would otherwise be the case.

Given this benchmark, we consider whether specific policies can undo some of the consequences of this shock:

- Reifschneider and Williams (2000) have argued that *a more-aggressive monetary policy* can reduce the adverse effects of the zero bound. We model this more-aggressive policy as larger coefficients on output and inflation in a Taylor rule.
- A central bank may promise to *make up any shortfall in monetary-policy stimulus* relative to the Taylor rule that occurs during a zero-bound period (Reifschneider and Williams, 2000). Under such a policy, future short-term interest rates will be lower than they would be under

[1] Furthermore, examining the performance of given policy rules across a number of (potentially non-nested) models is now recognized as a key aspect in evaluating their robustness, e.g., Levin et al. (2003), Adalid et al. (2005).