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Optimal monetary policy rules in a two-country economy with a zero bound on nominal interest rates

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ABSTRACT

This paper investigates optimal monetary policy rules when two large countries simultaneously face non-negativity constraints on nominal interest rates. Under policy coordination, domestic optimal monetary policy rules depend on domestic endogenous variables, foreign inflation, and domestic and foreign policy rates when the zero lower bound is never binding. Such policy rules generally lose the optimality once both countries face the zero bound simultaneously. We demonstrate that even in such a situation the domestic central bank can obtain an optimal interest rate rule that retains the history dependence from endogenous variables such as inflation and the output gap of both countries.

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1. Introduction

How should the central bank conduct monetary policy when the nominal interest rate faces the zero lower bound? Generally speaking, the economy is subject to non-negativity constraints as the inflation rate approaches zero. The central bank, which manipulates the short-term nominal interest rate as an instrument variable, cannot push nominal interest rates below zero once the zero lower bound is binding. In other words, the central bank might lose the effectiveness of monetary policy when the nominal interest rate adheres to zero.

Interest rate rules have become prominent subject in monetary policy analysis. Taylor (1993) argued that a simple rule which reacts to inflation and the output gap can account for movements in the federal funds rate. Also, as pointed out in Clarida, Gali, and Gertler (1998, 2000), central banks, such

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as the Federal Reserve Bank (FRB) and the Bank of Japan (BOJ), appear to gradually manipulate their policy rates in response to economic shocks. Furthermore, Giannoni and Woodford (2002a, 2002b) theoretically show that in a forward-looking model, an optimal interest rate rule with commitment includes an interest rate smoothing term in addition to the reaction to inflation and the output gap.

Amato and Laubach (1999) and Woodford (1999) also address the effectiveness of interest rate smoothing, which implies that monetary policy is characterized by history dependence via lagged interest rates. The reason that interest rate smoothing is effective is that the central bank can refer to important information about lagged interest rates. As shown in Sugo and Teranishi (2005), however, a monetary policy rule with interest rate smoothing loses important information about lagged policy rates under the zero lower bound. Moreover, the non-negativity constraints on the nominal interest rate simultaneously bind in developed economies, such as the United States, the United Kingdom, and Japan. Is a monetary policy rule that includes information about policy rates still effective even when the zero lower bound simultaneously hits developed countries?

The purpose of this paper is to explore the property of optimal monetary policy rules in situations where central banks that implement interest rate smoothing simultaneously face the zero lower bound in a two-country sticky price model.¹ Our main question is whether monetary policy rules still retain the optimality of a commitment policy when two countries simultaneously face non-negativity constraints. As mentioned above, non-negativity constraints now are simultaneously binding in several developed countries, including the United States, the United Kingdom, and Japan. Indeed, central banks, notably the FRB and the BOJ, have implemented a zero interest rate policy (ZIRP) to combat the recession that followed the 2008 financial crisis.

What is an optimal monetary policy when central banks set the nominal interest rate at zero? Sugo and Teranishi (2005) show that a rule which excludes lagged interest rates is optimal even when the zero lower bound is binding.² Also, as pointed out in Eggertsson and Woodford (2003), Jung, Teranishi, and Watanabe (2005), and Adam and Billi (2006, 2007), the central bank can insulate the aggregate demand through the history dependence of a commitment policy even when the nominal interest rate reaches the zero bound.³ However, these studies examine optimal monetary policy with the zero bound in closed economies and have limited bearing on the current global situation. Nakajima (2008) investigates optimal monetary policy in a two-country economy, but in his work only the domestic interest rate is zero. Fujiwara, Sudo, and Teranishi (2010) also examine optimal monetary policy in the case where two countries simultaneously set nominal interest rates to zero. They show that there are gains from a commitment policy when both domestic and foreign central banks coordinate monetary policies.

This paper highlights the importance of the central bank's concern about how the zero bound affects the properties of an optimal monetary policy rule in an open economy. The main contributions of this paper are as follows. First, in contrast to Nakajima (2008) and Fujiwara et al. (2010) who explore optimal monetary policy under policy coordination, we analyze optimal monetary policy rules under regimes of policy coordination and no coordination.

Second, this paper considers optimal monetary policy with interest rate smoothing to explicitly derive optimal interest rate rules when monetary policy is internationally coordinated and when it is not. We show that an optimal monetary policy rule under no policy coordination is the same rule as one derived in Sugo and Teranishi (2005), whereas an optimal monetary policy rule under policy coordination depends on domestic endogenous variables, foreign inflation, and domestic and foreign policy rates. Such an interest rate rule under policy coordination generally loses the optimality from a commitment policy, however, once both countries simultaneously face non-negativity constraints.

¹ Clarida, Gali, and Gertler (2001), and Gali and Monacelli (2005) discussed optimal monetary policy in a small open economy. Also, Kam (2009) investigates the role of interest rate smoothing in a small open economy. Moreover, there are several studies for the New Open Macroeconomics by using money supply rule as the central bank's instrument. For example, see Betts and Devereux (2000), Corsetti and Pesenti (2001), and Devereux and Engel (2003).

² Although above-previous studies use the new Keynesian framework of Woodford (2003) type, there are several studies of optimal monetary policy under the zero lower bound on nominal interest rates. For example, Reifschneider and Williams (2000) analyze monetary policy under the zero lower bound using the Federal Reserve Board's FRB/US model. Also, Kato and Nishiyama (2005) analyze optimal monetary policy by using a backward-looking framework.

³ For instance, see Clarida et al. (1999) and Woodford (1999, 2003) for a detailed discussion of the history dependence.

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