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Optimal monetary policy when interest rates are bounded at zero

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Abstract

This paper characterizes the optimal monetary policy reaction function in the presence of a zero lower bound on the nominal interest rate. We analytically prove and numerically show that the function is highly non-linear, more expansionary, and more aggressive than the Taylor rule. We then test its empirical validity taking the case of Japan in the 1990s. Qualitatively, we find some evidence of non-linear monetary policy. Quantitatively, we find the actual monetary policy to be too contractionary during the first half of the decade, while the low interest policy during the latter half turns out to be fairly consistent with the simulated path.

JEL classification: E52; E58; C63

Keywords: Deflation; Liquidity trap; Pre-emptive monetary policy; Zero bound

1. Introduction

A zero lower bound on the nominal interest rate is becoming a serious concern. Many central banks, especially in industrialized countries, have been successful in reducing average inflation rates to a range of 0–3% in recent decades. In this kind of low inflation era, especially when a central bank is faced by a severe recession, a zero lower bound on the short-term nominal interest rate – a policy instrument for most of the central banks – could be a serious constraint for the implementation of monetary

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policy. In the extreme case, when the nominal interest rate actually binds at zero, a central bank will no longer be able to stimulate the economy via the nominal interest rate channel – a phenomenon also known as a *liquidity trap*. In such circumstances, standard monetary policy, by controlling the short-term nominal interest, will become totally ineffective and the economy will have to bear the cost of increased volatility. Blinder (2000), being keenly aware of this predicament, succinctly warns, 'Don't go there.' The recent trend of low inflation accompanied by the issues stemming from a zero lower bound is the basic reason why it is becoming a realistic and serious concern for many central banks.

Reflecting the practical importance of a zero lower bound on the nominal interest rate, much research has been made regarding the conduct of monetary policy in the presence of such a constraint. The pioneering work is due to Fuhrer and Madigan(1997). They conducted an impulse response analysis taking into account of the zero lower bound and showed that stabilization policy is costly in the sense that it takes longer for the output and the inflation rate to return to a steady state than the case where there is no constraint. Orphanides and Wieland (1998), in their stochastic simulation study, showed that the probability of the economic state entering a liquidity trap will be lower when the inflation target is set higher and concluded that the social welfare loss can be reduced by setting a positive inflation target. Reifschneider and Williams (2000) provided an insightful study which shows that a variant of the Taylor rule is superior to a standard Taylor rule in stabilization capability by comparing the efficient policy frontier of stochastic simulation results. This implies that when the zero lower bound on the nominal interest rate is incorporated, the optimal policy is neither a linear function of state variables nor a standard Taylor rule. Orphanides and Wieland (2000) demonstrated that the optimal policy under the non-negativity constraint is a non-linear function of the inflation rate using a numerical method. Their numerical evidence suggests a central bank to adopt an 'aggressive' monetary policy as the nominal interest rate approaches the zero lower bound. Watanabe (2000) and Jung et al. (2001) investigated the optimal conditions for the termination of a 'zero interest rate policy' based on the forward-looking economy model following Woodford (1999). Using a simulation technique, they show that the optimal path of the nominal interest rate depends on historical policy conduct as well as a commitment for future policy conduct.[1] Hunt and Laxton (2003) investigated the role of an inflation target in the presence of the zero lower bound. Using the MULTIMOD simulation model, they show that targeting too low an inflation rate will induce a central bank to be susceptible to a deflationary spiral and suggest that the inflation rate should be targeted higher than 2% in the long run.

[1] For more recent studies in the context of forward-looking private agents, see Benhahib et al. (2002) and Eggertsson and Woodford (2003).