Zero lower bounds and a Stackelberg problem:
Stochastic analysis of unconventional monetary policy

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Abstract

There exist difficulties in escaping from stagnation and/or deflation if the economy hits zero lower bounds on short-term nominal interest rates because the central bank cannot stimulate the economy further using rate cuts. How can they escape from them? Answering the question, we extend a closed-looped solution of a Stackelberg problem (also known as a Ramsey problem) by introducing zero lower bounds. Herein, we formulate a constrained Stackelberg problem and derive a solution for it. In our extension, we found that the discounted Lyapunov equation is necessary to obtain the shadow price of the economy that hits the zero lower bounds. Additionally, we emphasize that our method is consistent with rational expectations hypothesis. Herein we apply our method to new Keynesian models with zero lower bounds. In the numerical analysis, we evaluate the quantitative effects of zero interest rate policies with committing mild or zero inflation. Our simulation shows that committing to mild inflation engenders positive effects on the economy and that managing inflation expectations is necessary to escape from the bounds.

Keywords: constrained Stackelberg problem, discounted Lyapunov equation, zero lower bound, unconventional monetary policy, inflation target

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