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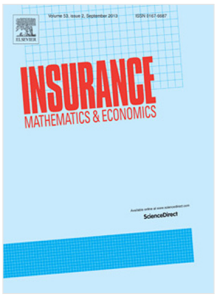

The impact of negative interest rates on optimal capital injections

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The Impact of Negative Interest Rates on Optimal Capital Injections

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Abstract

In the present paper, we investigate the optimal capital injection behaviour of an insurance company if the interest rate is allowed to become negative. The surplus process of the considered insurance entity is assumed to follow a Brownian motion with drift. The changes in the interest rate are described via a Markov-switching process. It turns out that in times with a positive rate, it is optimal to inject capital only if the company becomes insolvent. However, if the rate is negative it might be optimal to hold a strictly positive reserve. We establish an algorithm for finding the value function and the optimal strategy, which is proved to be of barrier type. Using the iteration argument, we show that the value function solves the Hamilton–Jacobi–Bellman equation, corresponding to the problem.

Key words: negative interest rate, capital injections, Markov-switching, optimal stochastic control, Hamilton–Jacobi–Bellman equation.

JEL Subject Classification: C61, G22

2010 Mathematical Subject Classification: Primary 93E20;
Secondary 49L20, 91B30

1 Introduction

On the 16th of March 2016 the European Central Bank (ECB) set the key interest rate on 0%. The deposit facility rate (currently -0.4%) remains negative since the 11th of June 2014, confer [20]. It means, that instead of getting paid for depositing money into the central bank, one has to pay the central bank for it. Also, the yields on government bonds are currently close to their historical minimum. For instance, the yield on the 10-year German government bond, considered one of the safest assets in the world, sank below zero in June 2016 for the first time ever.
But why would anyone buy a government bond, lacking annual payments and

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