Insurance: Mathematics and Economics 53 (2013) 491–503

Contents lists available at ScienceDirect

Insurance: Mathematics and Economics

journal homepage: www.elsevier.com/locate/ime

The value of interest rate guarantees in participating life insurance contracts: Status quo and alternative product design

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HIGHLIGHTS

- We analyze proportional interest rate guarantees in different economic environments.
- We find guarantee values to depend heavily on the average market rate.
- We introduce alternative guarantee types to mitigate the interest rate dependency.
- We find that, for customers, there is not much difference in utility between the various guarantees.

ARTICLE INFO

Article history:
Received September 2012
Received in revised form
July 2013
Accepted 3 August 2013

JEL classification:
G13
G22

Keywords:
Participating life insurance contract
60% rule
Interest rate guarantee
Alternative guarantee design
Comparative analysis

ABSTRACT

We compare cliquet-style interest rate guarantees used in German participating life insurance contracts across different economic environments. These guarantees are proportional to the average market interest rate at contract inception and typically set at 60% of the 10-year rolling average of government bond yields. Currently, however, in the face of prolonged low interest rates and stricter solvency regulation, the continued viability of this type of product is in question. A discussion of alternative guarantee designs is thus highly relevant. To this end, we perform a comparative analysis of contracts sold in different interest rate environments with regard to the guarantee value and show that the current practice of proportional guarantees leads to higher guarantee values the lower the market interest rate. We also observe an increased interest rate sensitivity. Additionally, alternative product designs that mitigate the interest rate dependency of the guarantee value are illustrated and assessed from the policyholder perspective.

1. Introduction

Interest rate guarantees are a common feature of traditional life insurance products. We focus on so-called cliquet-style guarantees, found in the German market, under which the insurance company promises to credit the policyholder's account with at least a guaranteed rate of return every year. As the policyholder's account also contains previous years' surplus, the guarantee is implicitly applied to the distributed surplus as well. The guaranteed interest rate is proportional to the current average market interest rate at contract inception, typically 60% of the 10-year rolling average of government bond yields. Hence, we refer to it as *the* 60% *rule*.[2]

Over the last decade, the life insurance industry's situation has deteriorated due to substantial changes in both the economic and regulatory environment. Under the upcoming Solvency II regime, the industry's solvency requirements will be fundamentally reformed and lead to higher capital requirements for these traditional interest rate guarantees. At the same time, insurers' earnings have been adversely affected by the sustained decline of returns on low-risk fixed-income assets. In Germany, life insurers are under additional pressure due to peculiarities of national regulation, such as the participation of policyholders in asset valuation

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[2] The 60% rule is a result of the establishment of a common European insurance market in 1994 and the accompanying unification of national regulatory systems. See, e.g., Eling and Holder (2013).

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http://dx.doi.org/10.1016/j.insmatheco.2013.08.002

reserves upon contract termination (see Section 153 German Insurance Contract Act, VVG) as this accelerates the replacement of old higher yielding bonds with new lower yielding bonds (Fromme, 2011). Stocks and other asset classes cannot be used to compensate for low earnings from fixed-income assets due to the significantly increased volatility of capital markets. The former strategy of buying low-risk bonds is thus no longer possible to the extent traditional interest rate guarantees would require. Unfavorable development of the capital market and shortcomings in risk management have led to life insurer default in several countries.[3] Therefore, participating life insurance contracts and their embedded options, such as interest rate guarantees, have received a great deal of attention and analysis from academia over the last decade.[4]

There are two prevailing approaches to analyzing financial guarantees in life insurance: the actuarial and the financial. Consequently, most of the literature on the topic can be divided into two groups; some, however, such as Barbarin and Devolder (2005), Gatzert and Kling (2007), and Graf et al. (2011), combines both approaches.

The actuarial approach focuses on analyzing the risk of different contract specifications and surplus distribution schemes under an objective probability measure. Participating contracts are analyzed by Bartels and Veselčić (2009), Cummins et al. (2007), Kling et al. (2007a,b), and Rymaszewski (2011). Cummins et al. (2007) provide an empirical comparison of life insurance contracts typical of several European markets and those common in the United States by computing risk–return profiles. Different surplus distribution schemes and their interaction with the guaranteed rate with respect to the insurer's shortfall risk are analyzed by Kling et al. (2007a,b). Bartels and Veselčić (2009) extend this model with a jump process asset framework and dynamic asset allocation strategies in order to quantify the model risk. Rymaszewski (2011) also considers the risk arising from interest rate guarantees and quantifies the diversification effect caused by pooling undistributed surplus among inhomogeneous policyholder groups.

The financial approach is primarily concerned with fair pricing of contracts and the options embedded therein. Many scholars analyze participating contracts, including Bacinello (2001, 2003), Bauer et al. (2006), Büsing (2005), Grosen and Jørgensen (2000, 2002), Hansen and Miltersen (2002), Zaglauer and Bauer (2008), and Zemp (2011). Bacinello (2001, 2003) show how to decompose a fair participating Italian contract into three parts (basic contract, participation, and surrender option), which can be priced separately. For the case of Denmark, Grosen and Jørgensen (2000) find the fair contract value to depend significantly on the bonus policy applied and the spread between market rate and guaranteed rate. Hansen and Miltersen (2002) demonstrate that collecting an annual fee as compensation for providing interest rate guarantees allows greater contract variety compared to receiving a share of the distributed surplus. Bauer et al. (2006) analyze cliquet-style guarantees typical of German contracts and find fair contract values to be sensitive to several model parameters, including the risk-free rate. Zaglauer and Bauer (2008) provide an extension with respect to stochastic interest rates and show that the value of the embedded options changes significantly, whereas the total contract value is only moderately affected. Zemp (2011) compares the British, Danish, German, and Italian bonus distribution system with regard to risk valuation and shows that the Italian system is most sensitive to changes in asset volatility.

The extant literature tends to focus on pricing existing contracts in different economic environments. Thus the guaranteed rate is typically considered as fixed and independent of the economic environment. We take a step forward and analyze the 60% rule under different economic environments (high/low interest rates). A second contribution of this paper is to analyze alternative designs for the guaranteed rate in traditional products. To our knowledge, this has not yet been done in the academic literature, although it is an issue of high interest among practitioners. To date, the solutions most frequently suggested are temporary and reduced guarantees (see, e.g., Goecke, 2011; Heinen, 2011; Pohl, 2011).

This article presents a comparative analysis of the 60% rule and alternative product designs in different interest rate environments with respect to the fair guarantee value. The analysis is designed as a ceteris paribus analysis and we consider a typical German participating life insurance contract where the guaranteed rate depends on the long-term average of interest rates. We adopt the valuation framework presented in Bauer et al. (2006) and its extension for stochastic interest rates by Zaglauer and Bauer (2008). Their methodology allows us to decompose the contract into its components and hence price the interest rate guarantee separately. To compare contracts sold in different economic environments, we calibrate the surplus-related parameters so that the compared contracts have a net present value of zero under the risk-neutral pricing measure. We also assess the policyholder utility of the proposed alternative designs.

We find that the current practice of setting the guaranteed rate leads to significantly higher guarantee values in times of low interest rates and to an increased sensitivity to interest rates. However, alternative products can be designed to mitigate the interest rate dependency of the guarantee value. Our findings also show that from the policyholder perspective there does not appear to be a substantial difference between the different guarantee types. These results contribute to the ongoing discussion of how to reform insurance regulation and design products so as to cope with the pressures arising from low interest rates. Risk managers and regulators will particularly benefit from this analysis as we identify the shortcomings of proportional cliquet-style interest rate guarantee schemes. In our analysis we consider a typical German contract, but the model is sufficiently flexible so that our analysis can easily be extended to accommodate other regulatory regimes with cliquet-style guarantees.

The remainder of this paper is structured as follows. In Sections 2 and 3 we briefly introduce the general modeling framework and valuation methodology used by Bauer et al. (2006) and Zaglauer and Bauer (2008). A description of the different product designs is presented in Section 4. We also discuss adjustments to the existing model that are necessary to incorporate the new guarantee types and the utility analysis. Numerical results for both the 60% rule and its alternatives are given in Section 5. In Section 6 we conclude and identify areas for further research.

2. The model

In the following, most of our notation is adapted from Zaglauer and Bauer (2008). We assume that the insurance company's financial situation at time t is represented by the simplified balance sheet shown in Table 1, where A_t denotes the market value of the insurer's assets, L_t the book value of the policyholder's account, and the residual $R_t = L_t - A_t$ denotes the reserve account at time t. In this context, we refer to R_t as asset valuation reserves, even though it might also consist of other components, e.g., equity.

For the sake of simplicity, we consider a very basic contract type, a single-premium ($P = L_0$) term-fix insurance maturing after T

[3] Information about defaults in the United States (First Executive Corporation and others), Japan (Nissan Mutual and others), Germany (Mannheimer Lebensversicherung), and the United Kingdom (Equitable Life) can be found, e.g., in Briys and de Varenne (1997), Suzuki (2004), Himstedt (2004), and O'Brien (2006), respectively.

[4] Equity-linked life insurance has been subject to extensive academic research as well. However, this contract type is outside the scope of this article. The reader is referred to Bacinello and Persson (2002) for a discussion of the literature on equity-linked life insurance.