

IAA Life Colloquium, 7 – 9 September 2009

Dear Sir or Madam,

Thank you for the opportunity to submit a synopsis for a talk on: “Replicating Portfolio Techniques” (as described below in more detail) for the IAA Life Colloquium in Munich.

Should you have any queries, please do not hesitate to contact me.

I am looking forward to hearing from you.

Kind regards

Thorsten Wagner

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Title: Replicating Portfolios in the Life Insurance Business: Use and Limitations

Indication of topic: Life insurance and financial markets

Keywords: Replicating Portfolio, Market Consistent Embedded Value, Solvency II, Asset Liability Management, Hedging, Economic Capital, Householder Transformation, Lagrange Multiplier, R^2

Abstract:

A Replicating Portfolio (RP) is a basket of asset instruments whose cash-flows should fit – as good as possible – the cash-flows of a portfolio of life insurance contracts. Such RPs are mainly used to fasten the run-time of complex stochastic calculations e.g. for Market Consistent Embedded Value, Solvency II or Economic Capital. However, it is important to know the limitations of RPs when using them in the decision-making process.

The talk will briefly outline why RPs are important tools for the actuaries in the life insurance business and will describe various ways of applying them. The first main chapter will deal with the mathematical background, i.e. defining the minimization problem with a Lagrange Multiplier and solving it via Householder Transformation. Beyond the pure mathematical theory, however, the most important questions deal with two major selection options. Therefore, the talk will also cover the topic of asset selection for the basket as well as the definition which cash-flows have to be fitted.

To get first insight into the RP technique a rough life insurance asset liability model will be introduced in the second chapter of the talk. It will generate liability cash-flows which will be fitted by a RP. On the basis of that model the effects of the two selection options will be highlighted and the effectiveness/feasibility of a reasonable RP for this model will be demonstrated.

Risk Classification in Life Insurance

MICHEL DENUIT* SUSANNE GSCHLÖBL† PASCAL SCHOENMAEKERS‡

22nd January 2009

Abstract

In this talk we present generalised linear models (GLMs) as a method for risk classification and graduation in life insurance. We will demonstrate that GLMs, which are commonly used for premium rating in non-life insurance, might also be deployed for the analysis of experience data in life insurance. As such they provide a sound basis for a variety of actuarial applications.

We will give a brief introduction to GLMs in general and will address the issue of incorporation of continuous explanatory variables like, for example, the age of the insured life by means of non-parametric regression.

We will focus on how GLMs might be used to both identify and quantify risk factors in life insurance in order to derive best estimate rates, for example, mortality and surrender rates. Besides the identification of relevant risk factors within a portfolio, a GLM analysis provides information relating to the uncertainty associated with the estimated risk factors. This is an important basis for actuarial risk management (pricing, reserving and capital requirements).

The versatility of GLMs will be illustrated by means of data relating to the German life insurance market. We will conclude the talk by giving an outlook and discussion of further potential applications.

Keywords: generalised linear models, life insurance, risk classification.

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As a consequence of that effectiveness/feasibility the last chapter of the talk will deal with the limitation of RP techniques. I will highlight areas where such RPs cannot generate enough accurate information for the life insurance business. The talk will end with a short discussion about possible improvements for those “problematic” life insurance applications.