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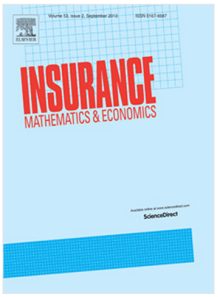

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LLN-type Approximations for Large Portfolio Losses

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Abstract

We are concerned with the loss from defaults of a large portfolio of defaultable obligors. A static structural model is constructed, in which for each obligor i its default is driven by a latent variable U_i and its loss given default (LGD) is driven by another latent variable V_i through a general loss settlement function G. In this way, the default indicator $1_{(U_i>a)}$, with a denoting a default threshold, and the LGD $G(V_i)$ are not necessarily comonotonic, hence essentially different from the ones used in some recent works. It is further assumed that the two latent variables U_i and V_i are correlated in the way that they share a common systematic risk factor but each has its own idiosyncratic risk factor. We employ the law of large numbers (LLN) to derive the exact limit distribution of the portfolio loss as the portfolio size becomes large. As applications, we also derive exact approximations for the TVaR and moments of the portfolio loss.

Keywords: portfolio loss; default; law of large numbers; systematic risk; loss given default; inverse.

JEL classification: G210; G320

1 Introduction

Approximating portfolio losses from defaults is becoming an increasingly interesting research topic, which is highly relevant for insurance, in particular in the current post financial crisis era. NAIC's (`http://www.naic.org`) Capital Markets Bureau Special Reports show that each year since 2010 the U.S. insurance industry allocates at least 67% of its assets to defaultable bonds. The U.S. subprime mortgage crisis, which triggered the financial crisis of 2007–2009, has posed new challenges to many subjects in insurance,

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