Прикладная эконометрика, 2022, т. 68, с. 50–72.
Applied Econometrics, 2022, v. 68, pp. 50–72.
DOI: 10.22394/1993-7601-2022-68-50-72

V. Lapshin, A. Markov[1]

MCMC-based credit rating aggregation algorithm to tackle data insufficiency

This paper investigates how credit rating aggregation might lead to a more efficient estimation of key portfolio risk management metrics: expected credit losses (ECL) and risk-weighted assets (RWA). The proposed technique for credit rating aggregation is based on the Markov Chain Monte-Carlo methodology and leads to a statistically smaller variance of ECL and RWA than the naïve and distribution-based alternatives. This conclusion holds for three public datasets and four simulated studies. The paper results might be helpful for portfolios that suffer from data insufficiency or rely on external ratings for credit risk assessment: portfolios of international companies, interbank loans, and sovereign debt.

Keywords: credit risk; probability of default; Markov chains; migration matrices; confidence estimation; MCMC; portfolio segmentation.

JEL classification: C11; C15; C61; G21; G32.

1. Introduction

External credit ratings are often employed as an additional source of information on the borrower's financial health. Risk analysts employ external ratings to estimate various credit risk metrics, such as expected credit loss (ECL) or risk-weighted assets (RWA). The availability of such ratings is essential for smaller corporate portfolios, such as 'blue chips', international corporations, or interbank loans, where developing an internal model might be time-consuming or impractical.

Unfortunately, the external ratings are often highly discrete and are associated with the following data insufficiency problems: we might observe zero and non-monotonous default rates for some of the ratings, even for corporate portfolios, long observation periods (20 years and above), and the most prominent international rating agencies' reports (Fitch, 2020, p. 1; Moody's, 2018, p. 30; S&P, 2019, p. 53). See, for example, AAA, AA, and A ratings in the Fitch report. Obviously, we would expect that better ratings have lower probabilities of default than more speculative ratings, and all probabilities should be above zero. Otherwise, we either have an inadequate scoring model, or face data insufficiency. One of the common solutions to this problem is credit ratings aggregation, for example, grouping AA+, AA, and AA– ratings in a single AA group.

In this paper, we aim to demonstrate that credit rating aggregation does not only alleviate the data insufficiency problems but could also lead to more efficient estimates for the critical

[1] **Lapshin, Viktor** — HSE University, Moscow; vlapshin@hse.ru.
Markov, Anton — HSE University, Moscow; markov.anton.a@gmail.com.