A Subordinated Stochastic Framework for Supervisory Stress Testing

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In this study we develop and demonstrate a combined stochastic framework for supervisory stress tests that assesses the probable first passage time and the time-related likelihoods for banks to breach their regulatory minimum capital ratios. Our proposed framework allows regulators to intuitively integrate credit characteristics of the individual loans and risky assets within a bank's portfolio with the idiosyncratic bank's merits (such as the general bank's policies, risk tolerance, size, connectivity, and interconnectedness within the entire banking system). We develop the necessary derivations, illustrate the stochasticity of the measurements through several Monte Carlo simulations, and further draw inferences from some sensitivity analyses for the model's parameters. The proposed stress testing framework can assist monitored financial institutions, policy makers, and regulatory bodies.

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1. Introduction

In this study we develop a subordinated stochastic model for supervisory banks' stress tests. We present a simple and highly intuitive approach to assess the likely capital deterioration of banks in light of hypothetical adverse economic scenarios. Our proposed framework hereafter allows regulatory bodies and policymakers to consider both the credit characteristics of the individual assets within a bank's portfolio and the bank's overall attributes. Both aspects logically impact banks' survivability. Our model takes a more holistic attitude than other related frameworks and thus may improve the quality of supervisory stress tests.

Our framework contains four steps. First, each loan and risky asset within the bank's portfolio is analyzed based on its exposure time and possibly-changing exposure or declining rates. Second, we accumulate the expected singular capital losses in every time unit (quarter of a year, for instance) and compute the naïve drift and diffusion of the entire bank's capital losses. Third, we integrate vectors of idiosyncratic covariates based on the inspected bank's specific characteristics and obtain both the forward-looking mean and the variance rates of the inclusive bank's capital loss over time. Fourth, using the properties of the Inverse Gaussian distribution, we process the first passage time and the projected time to bank failure, when the bank's excess capital beyond the minimum regulatory threshold is