

Nataliia Arkhireiska,
University of Customs and Finance
Volodymyr Stulei,
Institute of Applied Systems Analysis.
National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"
Andrii Poderiako
University of Customs and Finance

**SYNERGETIC APPROACH TO ASSESSING THE SYSTEMICALLY SENSITIVE
PROBABILITY OF DEFAULT OF NON-FINANCIAL BUSINESS ENTITIES UNDER
CONDITIONS OF HIGH UNCERTAINTY IN UKRAINE'S ECONOMIC ENVIRONMENT**

The article substantiates and implements a synergetic approach to assessing the systemically sensitive point-in-time probability of default (PD PIT) for non-financial corporations (NFCs) amidst radical macroeconomic uncertainty. Traditional retrospective risk management paradigms are proven ineffective due to unprecedented economic turbulence and structural breaks caused by full-scale military aggression. The study proposes a hierarchical master-model (PD PIT.MM) architecture that integrates an ensemble of specialized sub-models. This ensemble includes PD TTC models for fundamental creditworthiness, adaptive expert adjustments using Saaty and Fishburn methods to formalize war-related impacts (e.g., asset loss, logistics disruption), and GDP-transmission models. A distinctive feature of the proposed methodology is the inclusion of a «Level» predictor to measure the depth of economic stress and a «KWAR» parameter characterizing residual economic uncertainty. The master-model provides high granularity by accounting for sectoral specifics and enterprise size. Impact calibration is achieved through a Sectoral GVA Model, while risk for small NFCs is adjusted using the Cornish-Fisher expansion to handle «heavy-tailed» crisis distributions. The mathematical core utilizes the Wilson logit-model, COBYLA non-gradient optimization to ensure scenario monotonicity, and HuberT robust regression to isolate extreme war-induced outliers. Validation results demonstrate that the PD PIT.MM generates conservative, scientifically grounded estimates with high predictive power ($Pseudo R^2 > 0.6$) and statistical significance ($p\text{-value} < 0.01$). The implementation of this synergetic approach ensures compliance with IFRS 9 Forward Looking requirements even during structural shifts. Practically, it enables financial institutions to form objective, systemically sensitive credit risk assessments and adequate reserves, fundamentally strengthening financial stability during wartime and the subsequent recovery of Ukraine.

Keywords: turbulent-emergent risks, probability of default, synergetic approach, hierarchical master-model, high uncertainty, IFRS 9, Wilson model, systemic risk, PD PIT.