IMPROVING THE INTEGRATED INDICATOR SYSTEM FOR ASSESSING THE FINANCIAL STABILITY OF COMMERCIAL BANKS

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Abstract

The thesis systematises modern approaches to the construction of integrated indicator systems for assessing the financial stability of commercial banks and proposes conceptual directions for their improvement. Financial stability is interpreted as a bank's ability to preserve its capital adequacy, liquidity, asset quality and profitability under normal and stressed conditions. On the basis of a critical review of the works of Berger and Bouwman, Laeven and Levine, Cihák and Schaeck, Vazquez and Federico, IMF and Basel Committee documents, the paper distinguishes four generations of integrated banking stability indices: CAMELS-type composites, Z-score based measures, market-based composites (Distance-to-Default, SRISK) and hybrid machine-learning based frameworks. A comparative table of the four generations is presented. The thesis concludes that a modern integrated system must synthesise micro-level ratios, market-based signals and macroprudential indicators within a single real-time dashboard, adapted to the specific features of the Uzbek banking system.

Keywords

commercial bank, financial stability, integrated indicator system, CAMELS, Z-score, Distance-to-Default, SRISK, Basel III, macroprudential monitoring, banking supervision, Republic of Uzbekistan.

Introduction

Financial stability of commercial banks is one of the pivotal categories of modern banking science and practice. The 2008 global financial crisis, the 2020 COVID-19 pandemic and the 2023 collapse of Silicon Valley Bank, Signature Bank and First Republic Bank have made it clear that a bank's failure to remain stable produces disproportionately large economic and social costs, and that the traditional balance-sheet-based supervisory frameworks are no longer sufficient. Modern regulators and researchers therefore devote considerable effort to designing integrated indicator systems capable of capturing multiple dimensions of banking stability — capital adequacy, liquidity, asset quality, profitability, sensitivity to market risk and macroprudential exposure — within a single measurable score.

The relevance of the research topic is reinforced by three interrelated trends. First, the digital transformation of banking has multiplied the number and speed of factors influencing bank stability, from social-media driven bank runs to cyber-risk incidents; the traditional monthly CAMELS-based supervisory ratings cannot capture these signals in real time. Second, the harmonisation of prudential regulation under Basel III / IV standards, IFRS-9 expected-loss accounting and Pillar Two international taxation has created a rich but fragmented reporting landscape that must be consolidated into a coherent indicator framework. Third, in the Republic of Uzbekistan the Central Bank has since 2020 been actively implementing Basel III standards and building its own SupTech infrastructure, and the systematic review of the international experience of integrated stability indicators is a necessary methodological basis for this work.

The aim of this thesis is to systematise the theoretical and applied approaches to constructing integrated indicator systems for banking financial stability and to propose directions for their improvement, with particular reference to the banking system of the Republic of Uzbekistan. The methodology relies on scientific abstraction, comparative and structural analysis, the historical-logical method and content analysis of academic

publications indexed in Scopus and Web of Science over the last decade, as well as the regulatory documents of the Basel Committee on Banking Supervision and the IMF.

Main body

The evolution of integrated banking stability indicators can be organised into four consecutive generations. The first generation is represented by CAMELS-type composite ratings that emerged in U.S. supervisory practice in the late 1970s and consolidated the assessment of Capital adequacy, Asset quality, Management, Earnings, Liquidity and Sensitivity to market risk into a single 1–5 scale. Cole and Gunther (1998), Cole and White (2012) and Betz, Peltonen and Sarlin (2014) empirically confirmed that CAMELS ratings are a useful predictor of bank failure at horizons of up to three years, but they suffer from three important limitations: they are subjective, they are based on backward-looking accounting information and they are updated too infrequently for the digital age.

The second generation was formed around the Z-score, developed by Boyd and Runkle (1993) and popularised by Laeven and Levine (2009) as the ratio of the sum of return on assets and equity-to-assets to the standard deviation of return on assets. The Z-score captures the number of standard deviations that a bank's return would have to fall before it exhausts its capital and became the workhorse measure of banking stability in the international empirical literature. Beck, De Jonghe and Schepens (2013) and Anginer, Demirgüç-Kunt and Zhu (2014) demonstrated the usefulness of the Z-score in cross-country comparative studies. However, the Z-score too has limitations: it is based on accounting data, treats stability as a purely idiosyncratic phenomenon, and does not incorporate systemic or macroprudential dimensions.

The third generation of integrated indicators emerged after the 2008 global financial crisis and comprises market-based composite measures that draw on option-pricing theory and equity-market information. The Distance-to-Default (DD) indicator,

developed on the basis of Merton (1974) and popularised by Vassalou and Xing (2004), measures the number of standard deviations that a bank's asset value would have to fall before it hits the default threshold. Acharya, Pedersen, Philippon and Richardson (2017) introduced the Systemic Risk (SRISK) indicator, defined as the expected capital shortfall of a financial institution conditional on a systemic crisis. Adrian and Brunnermeier (2016) proposed CoVaR, the conditional Value-at-Risk of the financial system when a specific bank is in distress. These indicators have the advantage of being forward-looking and updated at market frequency, but they are meaningful only for listed banks and require sophisticated modelling.

The fourth — hybrid and machine-learning based — generation has been taking shape over the past five years under the influence of Big Data, SupTech and artificial intelligence. Petropoulos, Siakoulis, Stavroulakis and Vlachogiannakis (2020) demonstrated that Random Forest and Gradient Boosting models built on CAMELS-plus-macro features outperform traditional logit models in predicting bank distress at 12–24-month horizons. Barboza, Kimura and Altman (2017) used neural networks and support-vector machines for bankruptcy prediction. Vazquez and Federico (2015) proposed a framework that integrates funding stability, capital and asset quality into a joint stress-testing metric. The IMF Global Financial Stability Report (2024) reflects the modern consensus that supervisors should adopt hybrid dashboards that combine ratio-based, market-based and machine-learning based signals within a unified real-time framework. The comparison of the four generations is summarised in Table 1.

Table 1. Evolution of integrated indicator systems for the financial stability of commercial banks

Generation	Key representatives (year)	Central idea and typical instruments

CAMELS-type composites	Cole & Gunther (1998); Cole & White (2012); Betz, Peltonen & Sarlin (2014)	Supervisor-scored composite of Capital, Assets, Management, Earnings, Liquidity, Sensitivity
Z-score generation	Boyd & Runkle (1993); Laeven & Levine (2009); Anginer, Demirgüç-Kunt & Zhu (2014)	Distance from insolvency measured as (ROA + CAR) / σ(ROA); accounting-based
Market-based composites	Vassalou & Xing (2004); Acharya et al. (2017); Adrian & Brunnermeier (2016)	Distance-to-Default, SRISK, CoVaR — forward-looking, updated at market frequency
Hybrid / machine-learning	Barboza, Kimura & Altman (2017); Petropoulos et al. (2020); IMF (2024)	Random Forest / Gradient Boosting / Neural Networks over ratio-plus-market-plus-macro features

A critical review of the domestic literature and supervisory practice shows that the banking system of the Republic of Uzbekistan currently relies mainly on first-generation CAMELS-type composites and traditional prudential ratios, complemented since 2020 by Basel III liquidity indicators (LCR, NSFR). Second-generation Z-score based measures are used only in academic research, while third- and fourth-generation instruments are practically absent from the supervisory toolkit. The integration of these approaches into a unified dashboard, supported by real-time data and SupTech infrastructure, is therefore a priority strategic direction of banking supervision reform in the country.

Conclusion

The conducted study allows four generalising conclusions to be formulated. First, over the past four decades the theory and practice of integrated banking stability indicators have passed through four consecutive generations — CAMELS composites,

Z-score based measures, market-based composites (DD, SRISK, CoVaR) and hybrid machine-learning frameworks — each of which enriched rather than replaced the previous one. Second, the modern integrated dashboard should combine micro-level ratios (capital, liquidity, asset quality, profitability), market-based signals (for listed banks) and macroprudential indicators (systemic capital shortfall, credit-to-GDP gap, real-estate cycle) supported by real-time analytics and SupTech infrastructure.

Third, the empirical experience of the 2008 crisis, the 2020 pandemic and the 2023 U.S. mid-sized bank collapse demonstrated that no single indicator can fully capture the multidimensional nature of banking stability; supervisors must rely on a comprehensive dashboard that combines backward-looking, forward-looking and behavioural signals. Fourth, for the banking system of the Republic of Uzbekistan the priority directions of further research are the empirical estimation of Z-scores for domestic banks, the introduction of hybrid predictive models based on Random Forest and Gradient Boosting, the development of a national SupTech infrastructure and the systematic publication of an annual Financial Stability Report of banks based on the integrated indicator framework proposed in this thesis.

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