

## Model Risk of Bucketing Banks Based on Systemic Risk Measures Using K-Means\*

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### Abstract

Systemic risk measures (SRMs) are designed to quantify a financial institution's contribution to overall financial systemic stress. Regulatory bodies use these measures to cluster banks with similar risk profiles, applying appropriate tools for managing systemic stress. This clustering approach is emulated using k-means algorithm on three SRMs: market capitalization, marginal expected shortfall, and delta conditional value at risk. By adjusting SRM estimation parameters within Monte Carlo (MC) simulations, model risk is estimated as a function of the clustering agreement from the k-means algorithm outcomes. Depending on the chosen thresholds for model risk, our results indicate considerable model risk in the bucketing method, with little reliable agreement based on three different agreement metrics. The main aim of this paper is to estimate three aforementioned SRMs using 12 different combinations of Monte Carlo simulation parameters with the intention of assessing model risk with Krippendorff's alpha of the k-means based bucketing algorithm that uses the three SRMs to allocate a risk bucket to the banks.

**Keywords:** k-means, Krippendorff's alpha, systemic risk measures, model risk