

## A Novel Dynamic Ensemble Learning (DEL) Framework to Combat The Dataset Shift: The Case of Loss Given Default

### Abstract

Dataset shift presents a fundamental challenge in financial prediction, where machine learning models trained on historical data often fail to generalize, due to evolving economic conditions and structural changes in data distributions. Addressing this issue requires not only detecting and characterizing dataset shift but also developing adaptive modelling strategies that maintain predictive accuracy in dynamic environments. In this study, we propose a novel Dynamic Ensemble Learning (DEL) framework that enhances the robustness of the model under distributional shifts. First, we develop a feature-level dataset shift detection methodology to quantify changes in input distributions and assess their impact on model generalization. We further introduce a continuous monitoring system based on a sliding-window approach, allowing real-time tracking of evolving data distributions. To mitigate dataset shift, we propose four dynamic ensemble learning strategies that adaptively integrate base learners either horizontally (by sample distances) or vertically (by feature statistics). Using Loss Given Default (LGD) modelling as a case study, we demonstrate that non-parametric models exhibit greater resilience to dataset shift, and our feature-based dynamic ensemble strategy significantly outperforms traditional static ensembles and single models. Our findings provide actionable insights for financial institutions to enhance predictive accuracy, reduce model risk, and improve long-term decision-making in dynamic environments.

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