

Systemic Risk Prediction: Cross-Market Contagion analysis using Deep Graph Learning and Market Sentiment

Abstract

This paper aims to introduce a somewhat novel framework for predicting systemic risk in financial networks by combining Graph Neural Networks (GNNs) with multi-modal market sentiment analysis. While traditional systemic risk models rely heavily on financial metrics and conventional network theory, they often fail to capture the complex, non-linear relationships that characterise modern financial systems. This approach will leverage the GNNs' ability to learn directly from graph-structured financial data while simultaneously incorporating market sentiment through the analysis of financial news, social media, and regulatory filings. By processing both structured financial data and unstructured text data through a multi-modal GNN architecture, the model can potentially capture both explicit financial relationships and implicit market sentiment connections between institutions.

This comprehensive aims to better predict potential systemic risks by understanding not just the interconnections between financial institutions, but also how market sentiment and institutional relationships may amplify or dampen financial shocks through the network. I hope to demonstrate that this combined approach achieves superior predictive performance compared to traditional methods and single-modal GNN models, and hence how this can influence policy moving forward.

Model Architecture and Data (1st Draft)

The model will aim to use a dual-stream Graph Neural Network architecture that processes both financial network data and market sentiment. The financial network data will aim to be constructed from quarterly bank filings and interbank lending data obtained from the Bank for International Settlements (BIS) database.

For market sentiment, I aim to collect data from these potential sources:

- Financial news articles from Reuters and Bloomberg APIs
- Social media sentiment from Twitter's financial streams
- Company earnings call transcripts accessed through S&P Global

Training will be performed on historical data, with particular attention to known stress periods for validation. The model is evaluated using both traditional risk metrics (CoVaR, DebtRank) and out-of-sample prediction accuracy during stress events.