

Essays in Financial Econometrics and Machine Learning

Can the Premium for Idiosyncratic Tail Risk be Explained by Exposures to its Common Factor?
(Job Market Paper)

Stocks in the highest idiosyncratic tail risk decile earn 8% higher average annualized returns than in the lowest. I propose a risk-based explanation for this premium, in which shocks to intermediary funding cause idiosyncratic tail risk to follow a strong factor structure, and the factor, common idiosyncratic tail risk (CITR), comoves with intermediary funding. Consequently, firms with high idiosyncratic tail risk have high exposure to CITR shocks, and command a risk premium due to their low returns when intermediary constraints tighten. To test my explanation, I create a novel measure of idiosyncratic tail risk that is estimated using high-frequency returns, and theoretically establish its time-aggregation properties. Consistent with my explanation, CITR shocks are procyclical, are correlated to intermediary factors, are priced in assets, and explain the idiosyncratic tail risk premium. Furthermore, volume tail risk also earns a premium, follows a strong factor structure, and its common factor is priced. This duality of idiosyncratic tail risk and volume tail risk provides evidence for my risk-based explanation, and further supports the hypothesis that intermediaries' large trades cause idiosyncratic tail risk and volume tail risk from Gabaix et al. (2006).

Regulatory Capital and Incentives for Risk Model Choice under Basel 3
(with Lars Stentoft) *Journal of Financial Econometrics*, forthcoming. Invited to be presented at the European Central Bank.

In response to the Subprime Mortgage crisis, the Basel Committee on Banking Supervision (BCBS) has spent the previous decade overhauling the regulatory framework that governs how banks calculate minimum capital requirements. In 2019, the BCBS finalized the Basel 3 regulatory regime, which changes the regulatory measure of market risk and adds new complex calculations based on liquidity and risk factors. This paper is motivated by these changes and seeks to answer the question of how regulation affects banks' choice of risk-management models, whether it incentivizes them to use correctly specified models, and if it results in more stable capital requirements. Our results show that, although the models that minimize regulatory capital for a representative bank portfolio also result in the most stable requirements, these models are generally rejected as being correctly specified and tend to produce inferior forecasts of the regulatory risk measures.

Intraday Market Predictability: A Machine Learning Approach
(with Dillon Huddleston and Lars Stentoft) *Journal of Financial Econometrics*, conditionally accepted. Invited by the Chief Editors

This paper analyses and demonstrates the predictability of intraday market returns. Conducting, to our knowledge, the largest study ever of five-minute market returns using state-of-the-art machine learning models trained on lagged returns to forecast five-minute equity market index returns, we show that regularized linear models such as lasso and elastic nets along with nonlinear tree based models such as random forests yield significant predictability. Ensemble models that combine individual model predictions perform the best across time and their return predictability translates into economically significant profits with Sharpe ratios after transaction costs of 0.98. This strong predictability of intraday market returns provides evidence against market efficiency over short time horizons. Consistent with the hypothesis that predictability is driven by trader inefficiency, predictability decreased after decimalization, and market returns are more predictable during the middle of the day, on days with high volatility or high illiquidity, and in years of financial crisis.