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## Intraday Trading Invariance in the E-Mini S&P 500 Futures Market

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### Abstract

We document a transaction level invariance relation among concurrent activity variables in the S&P 500 futures market: return volatility per transaction is proportional to the inverse of the squared expected trade size. It captures the time series behavior extremely well. Even more strikingly, it also provides a good fit to the intraday activity patterns. No prior study quantifies this association across the daily trading cycle or predicts the time series and intraday interactions to line up in a consistent manner. The findings pose a challenge for theories seeking to rationalize the trading process on the world's primary equity-index futures market.

**Keywords:** market microstructure, invariance, high-frequency trading, liquidity, volatility, volume, time series, intraday patterns

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