

# Market Risk Prediction under Long Memory: When VaR is Higher than Expected\*

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## Abstract

Multi-period value-at-risk (VaR) forecasts are essential in many financial risk management applications. This paper addresses financial risk prediction for equity markets under long range dependence. We present the major properties of long memory, its implications for risk management and a novel approach to multi-period market risk prediction under long memory. Our empirical study of established equity markets covers daily index observations during the period January 1975 to December 2007. We document substantial long range dependence in absolute as well as squared returns, indicating a significant influence of long memory effects on volatility. We account for long memory in multi-period value-at-risk forecasts via a scaling based modification of the GARCH(1,1) forecast. Our results show that (i) traditional value-at-risk forecasting techniques underestimate market risk while (ii) our new approach outperforms traditional techniques with as short as 10 or more trading days.

**Keywords:** long memory, GARCH, fractional Brownian motion, Hurst exponent, autocorrelation, value-at-risk, backtesting, multi-period

**JEL Classification:** C22

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