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# Uncertainty and implied variance bounds in long-memory models of the interest rate term structure

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## Summary

We find that long-term uncertainty in a linear model of the interest rate term structure can have dramatic effects on variance bounds implied by the expectations theories of the term structure. We bootstrap fractionally integrated models of the term structure of interest rates. The fractional order of integration's bootstrapped standard errors simulate uncertainty surrounding long-term forecasts of interest rates, and we find that it is possible to overstate the significance of variance-bounds violations by at least a factor of three and perhaps by a factor of ten when long-term uncertainty is ignored.

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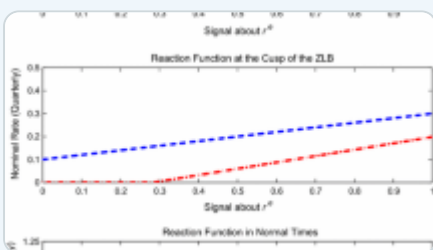
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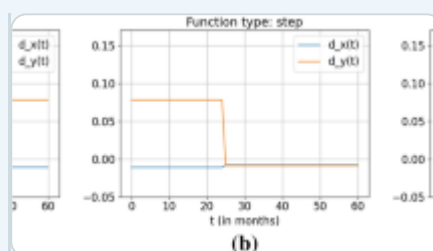
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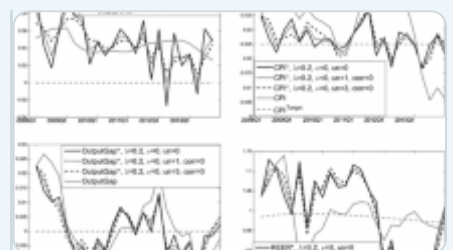


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## References

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Bloomfield P (1976) Fourier Analysis of Time Series: An Introduction, John Wiley & Sons, New York

[Google Scholar](#)

Box GEP, Jenkins GM (1976) Time Series Analysis: Forecasting and Control (revised ed), Holden-Day, San Francisco

[Google Scholar](#)

Brick R, Thompson HE (1978) Time series analysis of interest rates: Some additional evidence. Journal of Finance 33:93-103

[Google Scholar](#)

Campbell JY, Shiller RJ (1987) Cointegration and tests of present value models. Journal of Political Economy 95:1062-1088

[Google Scholar](#)

Cargill TF (1975) The term structure of interest rates: A test of the expectations hypothesis. Journal of Finance 30:761-771

[Google Scholar](#)

Cox JC, Ingersoll JE, Ross SA (1981) A re-examination of traditional hypotheses about the term structure of interest rates. *Journal of Finance* 36:769-799

[Google Scholar](#)

Diebold FX (1989) Random walks versus fractional integration: Power comparisons of scalar and joint tests of the variance-time function. In: Ray B (ed) *Advances in Econometrics and Modeling*, Kluwer Academic Publishers, Dordrecht

[Google Scholar](#)

Diebold FX, Rudebusch GD (1989) Long memory and persistence in aggregate output. *Journal of Monetary Economics* 24:189-209

[Google Scholar](#)

Efron B (1979) Bootstrap methods: Another look at the jackknife. *The Annals of Statistics* 7:1-26

[Google Scholar](#)

Efron B, Tibshirani R (1986) Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. *Statistical Science* 1:54-77

[Google Scholar](#)

Engle RF (1982) Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica* 50:987-1007

[Google Scholar](#)

Freedman DA, Peters SC (1984) Bootstrapping an econometric model: Some empirical results. *Journal of Business and Economic Statistics* 2:150-158

Flavin MA (1983) Excess volatility in the financial markets: A reassessment of the empirical evidence. *Journal of Political Economy* 91:929-956

[Google Scholar](#)

Geweke J, Porter-Hudak S (1983) The estimation and application of long memory time series models. *Journal of Time Series Analysis* 4:221-238

[Google Scholar](#)

Granger CWJ (1966) The typical spectral shape of an economic variable. *Econometrica* 34:150-161

[Google Scholar](#)

Granger CWJ (1980) Long memory relationships and the aggregation of dynamic models. *Journal of Econometrics* 14:227-238

[Google Scholar](#)

Granger CWJ (1981) Some properties of time series data and their use in econometric model specification. *Journal of Econometrics* 16:121-130

[Google Scholar](#)

Granger CWJ, Joyeux R (1980) An introduction to long-memory time series models and fractional differencing. *Journal of Time Series Analysis* 1:15-39

[Google Scholar](#)

Granger CWJ, Rees HJB (1968) Spectral analysis of the term structure of interest rates. *Review of Economic Studies* 35:67-76

[Google Scholar](#)

Greene MT, Fielitz BD (1977) Long-term dependence in common stock returns. *Journal of Financial Economics* 4:339-349

[Google Scholar](#)

Grossman SJ, Shiller RJ (1981) The determinants of the variability of stock market prices. *American Economic Review* 71:222-227

[Google Scholar](#)

Haubrich JG, Lo AW (1989) The sources and nature of long-term memory in the business cycle. Unpublished manuscript, University of Pennsylvania, the Wharton School

Kaen FR, Rosenman RE (1986) Predictable behavior in financial markets: Some evidence in support of Heiner's hypothesis. *American Economic Review* 76:212-220

[Google Scholar](#)

LeRoy SF, Porter RD (1981) The present-value relation: Tests based on implied variance bounds. *Econometrica* 49:555-574

[Google Scholar](#)

Li WK, McLeod AE (1986) Fractional time series modelling. *Biometrika* 73:217-221

[Google Scholar](#)

Lo AW (1988) Long-term memory in stock market prices. Unpublished manuscript, MIT, Sloan School of Management

Lo AW, MacKinlay AC (1988) The size and power of the variance ratio test in finite samples: A Monte Carlo investigation. Unpublished manuscript, NBER

Mandelbrot BB (1972) Statistical methodology for nonperiodic cycles: from the covariance tor/s analysis. *Annals of Economic and Social Measurement* 1:259-290

[Google Scholar](#)

Mankiw NG, Romer D, Shapiro MD (1985) An unbiased reexamination of stock market volatility. *Journal of Finance* 40:677-687

[Google Scholar](#)

Mattey J, Meese R (1986) Empirical assessment of present value relations. *Econometric Reviews* 5:171-234

[Google Scholar](#)

Nelson CR, Plosser CI (1982) Trends and random walks in macroeconomic time series: Some evidence and implications. *Journal of Monetary Economics* 10:139-162

[Google Scholar](#)

Porter-Hudak S (1982) Long-Term Memory Modelling-A Simplified Spectral Approach. Unpublished PhD dissertation, University of Wisconsin, Dept of Economics

Roll R (1970) *The Behavior of Interest Rates*, Basic Books, New York

[Google Scholar](#)

Shea GS (1982) The Japanese Term Structure of Interest Rates. Unpublished PhD dissertation, University of Washington, Dept of Economics

Shea GS (1984) Pitfalls in smoothing interest rate term structure data: Equilibrium models and spline approximations. *Journal of Financial and Quantitative Analysis* 19:253-269

[Google Scholar](#)

Shea GS (1987) Long-memory models of interest rates: Estimation, forecasting, and inference for variance bounds on the interest rate term structure. Unpublished manuscript, The Pennsylvania State University, Dept of Finance

Shea GS (1989a) Qualms about the linearized expectations hypothesis and variance-bounds studies of the interest rate term structure. Unpublished manuscript, The Pennsylvania State University, Dept of Finance

Shea GS (1989b) Ex-post rational price approximations and the empirical reliability of the presentvalue relation. *Journal of Applied Econometrics* 4:139-159

[Google Scholar](#)

Shea GS (1989c) Regression estimation and bootstrap inference on the order of fractional integration in multivariate time series models. Unpublished manuscript, The Pennsylvania State University, Dept of Finance

Shiller RJ (1979) The volatility of long-term interest rates and expectations models of the term structure. *Journal of Political Economy* 87:1190-1219

[Google Scholar](#)

Singleton KJ (1980) Expectations models of the term structure and implied variance bounds. *Journal of Political Economy* 88:1159-1176

[Google Scholar](#)

Sowell FB (1988) Maximum likelihood estimation of fractionally integrated time series models. Unpublished manuscript, Carnegie-Mellon University, GSIA

Yajima Y (1985) On estimation of long-memory time series models. Australian Journal of Statistics 27:303-320

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