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Range Volatility Models and Their Applications in Finance

| Chapter

| pp 1273–1281 | [Cite this chapter](#)



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Abstract

There has been a rapid growth of range volatility due to the demand of empirical finance. This paper contains a review of the important development of range volatility, including various range estimators and range-based volatility models. In addition, other alternative models developed recently, such as range-based multivariate volatility models and realized ranges, are also considered here. Finally, this paper provides some relevant financial applications for range volatility.



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Notes

1. See Garman and Klass ([1980](#)), Beckers ([1983](#)), Ball and Torous ([1984](#)), Wiggins ([1991](#)), Rogers and Satchell ([1991](#)), Kunitomo ([1992](#)), Yang and Zhang ([2000](#)), Alizadeh et al. ([2002](#)), Brandt and Diebold ([2006](#)), Brandt and Jones ([2006](#)),

Chou ([2005](#), [2006](#)), Cheung ([2007](#)), Martens and van Dijk ([2007](#)), Chou and Wang ([2007](#)), Chou et al. ([2007](#)), and Chou and Liu ([2008a,b](#)).

References

Alizadeh, S., M. Brandt, and F. Diebold. 2002. "Range-based estimation of Stochastic Volatility models." *Journal of Finance* 57, 1047–1091.

[Article](#) [Google Scholar](#)

Andersen, T., T. Bollerslev, F. Diebold, and H. Ebens. 2001. "The distribution of realized stock return volatility." *Journal of Financial Economics* 61, 43–76.

[Article](#) [Google Scholar](#)

Andersen, T., T. Bollerslev, F. Diebold and P. Labys. 2003. "Modeling and forecasting realized volatility." *Econometrica* 71, 579–625.

[Article](#) [Google Scholar](#)

Andersen, T., T. Bollerslev, P. Christoffersen, and F. Diebold. 2006a. "Volatility and correlation forecasting," in *Handbook of economic forecasting*, G. Elliott, C. W. J. Granger, and A. Timmermann (Eds.). North-Holland, Amsterdam, pp. 778–878.

[Google Scholar](#)

Andersen, T., T. Bollerslev, P. Christoffersen, and F. Diebold. 2006b. "Practical volatility and correlation modeling for financial market risk management," in *Risks of financial institutions*, M. Carey, and R. Stulz (Eds.). University of Chicago Press for NBER, Chicago.

[Google Scholar](#)

Ball, C. and W. Torous. 1984. "The maximum likelihood estimation of security

price volatility: theory, evidence, and application to option pricing.” *Journal of Business* 57, 97–112.

[Article](#) [Google Scholar](#)

Barndorff-Nielsen, O. and N. Shephard. 2003. “How accurate is the asymptotic approximation to the distribution of realised volatility?,” in *Identification and inference for econometric models*, A Festschrift for Tom Rothenberg, D. Andrews, J. Powell, P. Ruud, and J. Stock (Eds.). Econometric Society Monograph Series, Cambridge University Press, Cambridge.

[Google Scholar](#)

Bauwens, L., S. Laurent, and J. V. K. Rombouts. 2006. “Multivariate GARCH models: a survey.” *Journal of Applied Econometrics* 21, 79–109.

[Article](#) [Google Scholar](#)

Beckers, S. 1983. “Variances of security price returns based on highest, lowest, and closing prices.” *Journal of Business* 56, 97–112.

[Article](#) [Google Scholar](#)

Bollerslev, T. 1986. “Generalized autoregressive conditional heteroscedasticity.” *Journal of Econometrics* 31, 307–327.

[Article](#) [Google Scholar](#)

Bollerslev, T. 1990. “Modeling the coherence in short-run nominal exchange rates: a multivariate generalized ARCH model.” *Review of Economics and Statistics* 72, 498–505.

[Article](#) [Google Scholar](#)

Bollerslev, T., R. Y. Chou, and K. Kroner. 1992. “ARCH modeling in finance: a

review of the theory and empirical evidence.” *Journal of Econometrics* 52, 5–59.

[Article](#) [Google Scholar](#)

Brandt, M. and F. Diebold. 2006. “A no-arbitrage approach to range-based estimation of return covariances and correlations.” *Journal of Business* 79, 61–74.

[Article](#) [Google Scholar](#)

Brandt, M and C. Jones. 2006. “Volatility forecasting with range-based EGARCH models.” *Journal of Business and Economic Statistics* 24, 470–486.

[Article](#) [Google Scholar](#)

Cappiello L., R. Engle, and K. Sheppard. 2006. “Asymmetric dynamics in the correlations of global equity and bond returns.” *Journal of Financial Econometrics* 4, 537–572.

[Article](#) [Google Scholar](#)

Cheung, Y. 2007. “An empirical model of daily highs and lows.” *International Journal of Finance and Economics* 12, 1–20.

[Google Scholar](#)

Chou, R. 2005. “Forecasting financial volatilities with extreme values: the conditional autoregressive range (CARR) model.” *Journal of Money Credit and Banking* 37, 561–82.

[Article](#) [Google Scholar](#)

Chou, R. 2006. “Modeling the asymmetry of stock movements using price ranges.” *Advances in Econometrics* 20A, 231–257.

[Article](#) [Google Scholar](#)

Chou, R. Y. and N. Liu. 2008a. *The economic value of volatility timing using a range-based volatility model*, Working paper, Academia Sinica.

[Google Scholar](#)

Chou, R. Y. and N. Liu. 2008b. *Estimating time-varying hedge ratios with a range-based multivariate volatility model*, Working paper, Academia Sinica.

[Google Scholar](#)

Chou, H. and D. Wang. 2007. "Forecasting volatility of UK stock market: a test of conditional autoregressive range (CARR) model." *International Research Journal of Finance and Economics* 10, 7-13.

[Google Scholar](#)

Chou, R. Y., N. Liu, and C. Wu. 2007. *Forecasting time-varying covariance with a range-based dynamic conditional correlation model*, Working paper, Academia Sinica.

[Google Scholar](#)

Christensen, K. and M. Podolskij. 2007. "Realized range-based estimation of integrated variance." *Journal of Econometrics* 141, 323-349.

[Article](#) [Google Scholar](#)

Christoffersen, P. F. 2002. *Elements of financial risk management*, Academic Press, San Diego.

[Google Scholar](#)

Corrado, C. and C. Truong. 2007. "Forecasting stock index volatility: comparing implied volatility and the intraday high-low price range." *Journal of Financial Research* 30, 201-215.

[Article](#) [Google Scholar](#)

Cox, J. and M. Rubinstein. 1985. *Options markets*, Prentice-Hall, NJ.

[Google Scholar](#)

Engle, R. F. 1982. "Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation." *Econometrica* 50, 987–1007.

[Article](#) [Google Scholar](#)

Engle, R. 2002a. "Dynamic conditional correlation: a simple class of multivariate GARCH models." *Journal of Business and Economic Statistics* 20, 339–350.

[Article](#) [Google Scholar](#)

Engle, R. 2002b. "New frontiers for ARCH models." *Journal of Applied Econometrics* 17, 425–446.

[Article](#) [Google Scholar](#)

Engle, R., and K. Sheppard. 2001. "Theoretical and empirical properties of dynamic conditional correlation multivariate GARCH." *NBER Working Paper* 8554.

[Google Scholar](#)

Fernandes, M., B. Mota, and G. Rocha. 2005. "A multivariate conditional autoregressive range model." *Economics Letters* 86, 435–440.

[Article](#) [Google Scholar](#)

Gallant, R., C. Hsu, and G. Tauchen. 1999. "Using daily range data to calibrate volatility diffusions and extracting integrated volatility." *Review of Economics and Statistics* 81, 617–31.

Garman, M. and M. Klass. 1980. "On the estimation of security price volatilities from historical data." *Journal of Business* 53, 67-78.

[Article](#) [Google Scholar](#)

Grammatikos, T. and A. Saunders. 1986. "Futures price variability: a test of maturity and volume effects." *Journal of Business* 59, 319-330.

[Article](#) [Google Scholar](#)

Hanke, J. and D. Wichern. 2005. *Business forecasting*, 8th ed., Prentice Hall, New York.

[Google Scholar](#)

Harvey, A., E. Ruiz, and N. Shephard. 1994. "Multivariate stochastic variance models." *Review of Economic Studies* 61, 247-264.

[Article](#) [Google Scholar](#)

Kalev, P. S. and H. N. Duong. 2008. "A test of the Samuelson Hypothesis using realized range." *Journal of Futures Markets* 28, 680-696.

[Article](#) [Google Scholar](#)

Kunitomo, N. 1992. "Improving the Parkinson method of estimating security price volatilities." *Journal of Business* 65, 295-302.

[Article](#) [Google Scholar](#)

Mandelbrot, B. 1971. "When can price be arbitrated efficiently? A limit to validity of the random walk and martingale models." *Review of Economics and Statistics* 53, 225-236.

Martens, M. and D. van Dijk. 2007. "Measuring volatility with the realized range." *Journal of Econometrics* 138, 181-207.

[Article](#) [Google Scholar](#)

McAleer, M. and M. Medeiros. 2008. "Realized volatility: a review." *Econometric Reviews* 27, 10-45.

[Article](#) [Google Scholar](#)

Nelson, D. 1991. "Conditional heteroskedasticity in asset returns: a new approach." *Econometrica* 59, 347-370.

[Article](#) [Google Scholar](#)

Nison, S. 1991. *Japanese candlestick charting techniques*, New York Institute of Finance, New York.

[Google Scholar](#)

Parkinson, M. 1980. "The extreme value method for estimating the variance of the rate of return." *Journal of Business* 53, 61-65.

[Article](#) [Google Scholar](#)

Poon, S. H. and C. W. J. Granger. 2003. "Forecasting volatility in financial markets: a review." *Journal of Economic Literature* 41, 478-639.

[Article](#) [Google Scholar](#)

Rogers, L. and S. Satchell. 1991. "Estimating variance from high, low and closing prices." *Annals of Applied Probability* 1, 504-512.

[Article](#) [Google Scholar](#)

Rogers, L., S. Satchell, and Y. Yoon. 1994. "Estimating the volatility of stock prices: a comparison of methods that use high and low prices." *Applied Financial Economics* 4, 241–247.

[Article](#) [Google Scholar](#)

Shu, J. H. and J. E. Zhang. 2006. "Testing range estimators of historical volatility." *Journal of Futures Markets* 26, 297–313.

[Article](#) [Google Scholar](#)

Taylor, S. J. 1986. *Modelling financial time series*, Wiley, Chichester.

[Google Scholar](#)

West, K. and D. Cho. 1995. "The predictive ability of several models of exchange rate volatility." *Journal of Econometrics* 69, 367–391.

[Article](#) [Google Scholar](#)

Wiggins J. 1991. "Empirical tests of the bias and efficiency of the extreme-value variance estimator for common stocks." *Journal of Business* 64, 417–432.

[Article](#) [Google Scholar](#)

Yang, D. and Q. Zhang. 2000. "Drift-independent volatility estimation-based on high, low, open, and closing prices." *Journal of Business* 73, 477–491.

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