

[Home](#) > [International Economics and Economic Policy](#) > [Article](#)

Forecasting exchange rate volatility: GARCH models versus implied volatility forecasts

| Original Paper | Published: 09 May 2014

| Volume 12, pages 127–142, (2015) [Cite this article](#)

 [Save article](#)

[View saved research](#) >



[International Economics and
Economic Policy](#)

[Aims and scope](#) →

[Submit manuscript](#) →


[Keith Pilbeam](#) ¹ & [Kjell Noralf Langeland](#)¹

 **3666** Accesses  **55** Citations  **1** Altmetric [Explore all metrics](#) →

Abstract

This study investigates whether different specifications of univariate GARCH models can usefully forecast volatility in the foreign exchange market. The study compares in-sample forecasts from symmetric and asymmetric GARCH models with the implied volatility derived from currency options for four dollar parities. The data set covers the period 2002 to 2012. We divide the data into two periods one for the period 2002 to 2007 which is characterised by low volatility and the other for the period 2008 to 2012 characterised by high volatility. The results of this paper reveal that the implied volatility forecasts significantly outperform the

three GARCH models in both low and high volatility periods. The results strongly suggest that the foreign exchange market efficiently prices in future volatility.

 This is a preview of subscription content, [log in via an institution](#)  to check access.

Access this article

[Log in via an institution](#) →

Subscribe and save

✓ Springer+

from €37.37 /Month

- Starting from 10 chapters or articles per month
- Access and download chapters and articles from more than 300k books and 2,500 journals
- Cancel anytime

[View plans](#) →

Buy Now

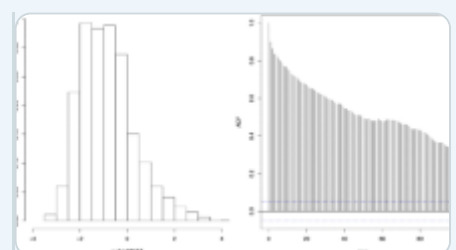
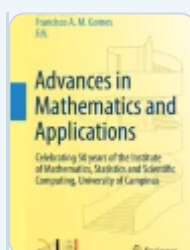
[Buy article PDF 39,95 €](#)

Price includes VAT (Poland)

Instant access to the full article PDF.

[Institutional subscriptions](#) →

Similar content being viewed by others



Inference in (M)GARCH Models Improving (E)GARCH

Is intraday data useful for forecasting VaR? The evidence from EUR/PLN exchange rate

Article | 16 April 2018

Inference in (M)GARCH Models in the Presence of Additive Outliers: Specification, Estimation, and Prediction

Chapter | © 2018

Improving (E)GARCH forecasts with robust realized range measures: Evidence from international markets

Article | 25 January 2017

Explore related subjects

Discover the latest articles, books and news in related subjects, suggested using machine learning.

[Capital Markets](#)

[Econometrics](#)

[Financial Econometrics](#)

[Financial Economics](#)

[Quantitative Finance](#)

[Statistical Finance](#)

Notes

1. A symmetric model means that when a shock occurs, we will have a symmetric response of volatility to both positive and negative shocks. Asymmetric models on the other hand, allow for an asymmetric response with empirical results show that negative shocks will lead to higher volatility than a positive shock.
2. Over fitting happens when the statistical model describes a random error or noise instead of the underlying relationship, causing biasedness in parameter estimates.
3. The leverage effect is typically interpreted as a negative correlation between lagged negative returns and volatility.
4. As with the EGARCH the GJR-GARCH model captures the leverage effect but the way that it acts is not the same as for the EGARCH, The GJR-GARCH does not measure log returns, so in this model we still need to impose non-negative constraints.

5. We observe that the difference between ARCH and GARCH is the last term that makes the model less likely to break the non-negativity constraint.
6. If the restriction does not hold we will have non-stationarity in the variance, if $\alpha_1 + \beta = 1$, we have a unit root in the variance.
7. If $\gamma = 0$, the model is symmetric. There is no need to be concerned about the conditional variance being negative since $\ln(\sigma_t^2)$ is modelled.
8. Bollerslev et al. (2001) argue that this type of volatility is an unbiased and very efficient estimator of return volatility.
9. It should be noted that the parameters ($\alpha + \beta$) were less but close to unity, suggesting that the shocks are highly persistent and die out only gradually.
10. It should be noted that the parameters are “forced” to be positive since we are measuring the natural log of returns. In theory, the “EGARCH benchmark model” has an AR(1) mean equation, but in our case the parameters proved to be more significant using a constant mean equation.

References

Andersen T, Bollerslev T (1998) DM-Dollar volatility: intraday activity patterns, macroeconomic announcements, and longer-run dependencies. J Financ 53(1):219-265

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

Andersen T, Bollerslev T, Diebold FA, Labys P (2001) The distribution of realized exchange rate volatility. J Am Stat Assoc 96(453):42-55

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

Andersen T, Bollerslev T, Diebold FX, Labys P (2003) Modeling and forecasting realized volatility. *Econometrica* 71(2):579–626

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

Baillie RA, Bollerslev T (1991) Intra-day and inter-market volatility in foreign exchange rates. *Rev Econ Stud* 58(3):565–585

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

Balaban E (2004) Comparative forecasting performance of symmetric and asymmetric conditional volatility models of an exchange rate. *Econ Lett* 83(1):99–105

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

Bildirici M, Ersin O (2009) Improving forecasts of GARCH family models with the artificial neural networks: an application to the daily returns in Istanbul stock exchange. *Expert Syst Appl* 36(4):7355–7362

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

Bollerslev T (1986) Generalized autoregressive conditional heteroscedasticity. *J Econ* 31(3):307–327

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

Bollerslev T (2008) A Glossary of ARCH (GARCH), Creates Research Paper, 2008–49

Broll U, Hansen-Averlant S (2010) Exchange rate volatility, international trade and labour demand. *IEEP* 7(4):423–36

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

Brownlees C, Gallo M (2010) Comparison of volatility measures: a risk management perspective. J Financ Econ 8(1):29-56

[Google Scholar](#)

Busch T, Christensen B, Neilsen M (2012) The role of implied volatility in forecasting future realized volatility and jumps in foreign exchange, stock, and bond markets. J Econ 160(1):48-57

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

Chen X, Ghysels E, Wang F (2011) HYBRID GARCH models and intra-daily return periodicity. J Time Ser Econ 3(1):1-28

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

Donaldson R, Kamstra M (2005) Volatility forecasts, trading volume and the ARCH vs option implied volatility tradeoff. J Financ Res 27(4):519-538

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

Dunis C, Laws J, Chauvin S (2003) FX volatility forecasts and the informational data for volatility. Eur J Financ 17(1):117-160

[Google Scholar](#)

Engle R, Patton A (2001) What is a good volatility model? Quant Financ 1(2):237-245

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

Ghysels E, Santa-Clara P, Valkanov R (2005) Predicting volatility: getting the most out of return sampled at different frequencies. J Econ 131(1):59-95

[Google Scholar](#)

Glosten L, Jagannathan R, Runkle D (1993) On the relation between expected value and the volatility of the nominal excess return on stocks. J Financ 48(5):1779-1801

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

Hansen P, Lunde X (2005) A forecast comparison of volatility models: does anything beat a GARCH(1,1). J Appl Econ 20(7):873-889

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

Higgins M, Bera A (1992) A class of nonlinear ARCH models. Int Econ Rev 33(1):137-158

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

Neely C (2009) Forecasting foreign exchange volatility: why is implied volatility biased and inefficient? and does it matter? J Int Financ Mark Inst Money 19(1):188-205

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

Nelson (1991) 'Conditional heteroskedasticity in asset returns: a new approach'. Econometrica 59(2):347-370

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

Ranaldo A (2008) Segmentation and time-of-day patterns in the foreign exchange market. J Bank Financ 33(12):2199-2206

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

Sentana E (1998) Quadratic ARCH Models. The Review of Economic Studies 62(4):639-661

Silvennoinen A, Terasvirta T (2008) Multivariate GARCH models. In: Andersen TG, Davis, Kreiss, Mikosch (eds) Handbook of financial time series. Springer, New York

[Google Scholar](#)

Taylor S (1986) Modelling financial time series. Wiley, Chichester

[Google Scholar](#)

Zakoïan J (1994) Threshold heteroskedastic models. J Econ Dyn Control 18(5):931–955

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

Acknowledgments

We are extremely grateful for comments and suggestions from participants at the annual European Economics and Finance Society conference 2013 in Berlin and the comments of the two anonymous referees.

Author information

Authors and Affiliations

City University London, Northampton Square, London, EC1V 0HB, UK

Keith Pilbeam & Kjell Noralf Langeland

Corresponding author

Correspondence to [Keith Pilbeam](#).

Rights and permissions

About this article

Cite this article

Pilbeam, K., Langeland, K.N. Forecasting exchange rate volatility: GARCH models versus implied volatility forecasts. *Int Econ Econ Policy* **12**, 127–142 (2015). <https://doi.org/10.1007/s10368-014-0289-4>

Published

09 May 2014

Issue date

March 2015

DOI

<https://doi.org/10.1007/s10368-014-0289-4>

Keywords

[Exchange Rate](#)

[Volatility modelling](#)

JEL classification

[E44](#)

[G12](#)

Search

Search by keyword or author



Navigation

Find a journal

Publish with us

