Forecasting exchange rate volatility: GARCH models versus implied volatility forecasts

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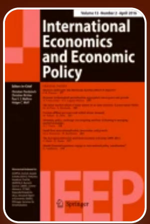

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Abstract

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.

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.

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