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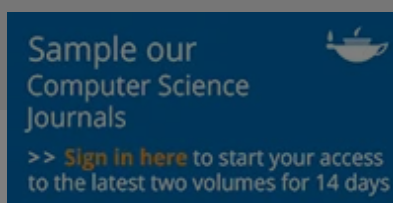
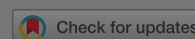
Original Articles

A robust closed-form estimator for the GARCH(1,1) model

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Pages 1605-1619 | Received 07 Feb 2015, Accepted 25 Jul 2015, Published online: 19 Aug 2015

Cite this article <https://doi.org/10.1080/00949655.2015.1077387>



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returns and analyse their performances in estimating and forecasting the volatility and the value-at-risk.

Keywords:

- additive outliers
- autocorrelations
- robustness
- value-at-risk
- volatility forecasting

JEL Classifications:

- C22
- C53
- C58

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Financial support from the Spanish Ministry of Education and Science, research projects MTM2010-17323, ECO2012-32401 and Campus Iberus. The usual disclaimer applies. This work was supported by project FONDECYT 11121531.

Notes

1. See [2] for a detailed discussion of the asymptotic behavior of the estimator $\hat{\sigma}_T^2$ and $\hat{\sigma}_T^2$ in $[1; +\infty[$.
2. Result 1.1 of [1] shows that $\hat{\sigma}_T^2$ is a consistent estimator of σ^2 under the conditions of the theorem.
3. Theorem 1.1 of [1] shows that $\hat{\sigma}_T^2$ is a consistent estimator of σ^2 under the conditions of the theorem. $KSS = T/6$ and $yt \cdot a$ and $yt \cdot a$ are $(0,1)$, then KSS and $yt \cdot a$ are $(0,1)$.
4. The first part of the theorem shows that $\hat{\sigma}_T^2$ is a consistent estimator of σ^2 under the standard conditions of the theorem.



$LRuc = -2\log L(p; l_1, l_2, \dots, l_n) L(\hat{\pi}; l_1, l_2, \dots, l_n) \sim \text{asy} \chi^2(1)$, where $\{l_t\}_{t=1}^n$ is the indicator sequence, p is the theoretical coverage, $\hat{\pi} = n_1 / (n_0 + n_1)$ is the maximum likelihood estimate of the alternative failure rate π , n_0 is the number of zeros and n_1 is the number of ones in the sequence $\{l_t\}_{t=1}^n$. The second tests for the independence part of the conditional coverage hypothesis (denoted $LRind$) and it is also a likelihood ratio test

$LRind = -2\log L(\hat{\Pi}^2; l_1, l_2, \dots, l_n) L(\hat{\Pi}^1; l_1, l_2, \dots, l_n) \sim \text{asy} \chi^2(1)$, where

$\hat{\Pi}^1 = n_{00}(n_{00} + n_{01})n_{01}(n_{00} + n_{01})n_{10}(n_{10} + n_{11})n_{11}(n_{10} + n_{11})$, $\hat{\Pi}^2 = 1 - \hat{\pi}^2 \hat{\pi}^{21} - \hat{\pi}^2 \hat{\pi}^{22}$, n_{ij} is the number of observations with value i followed by j and $\hat{\pi}^2 = (n_{01} + n_{11}) / (n_{00} + n_{10} + n_{01} + n_{11})$. Finally, the third is a joint test of coverage and independence (denoted $LRcc$) given by

$LRcc = -2\log L(p; l_1, l_2, \dots, l_n) L(\hat{\Pi}^1; l_1, l_2, \dots, l_n) \sim \text{asy} \chi^2(1)$.

5. For computing [32]'s Dynamic Quantile test, $H_t(\alpha)$ is defined as $H_t(\alpha) = l_t(\alpha) - \alpha$ where $l(\alpha)$ is a vector composed by ones (VaR violations) and zeros (VaR no violations). By the definition of VaR, we expect that the conditional expectation of $H_t(\alpha)$ given the past information must be zero. This assumption can be tested with the following linear regression model:

(20)

$H_t(\alpha) = \beta_0 + \beta_1 l_{t-1}(\alpha) + \beta_2 l_{t-2}(\alpha) + \dots + \beta_K l_{t-K}(\alpha) + \gamma_1 \epsilon_t$
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