Abstract

Within this dissertation I describe several statistical problems that occur when modeling return series of economic quantities with time-varying volatility models. Both the one-shock and two-shock models have their pros and cons and picking an appropriate one is a rather challenging task. Therefore I present two different model selection techniques, one for discriminating between two different models (going back to Davidson and MacKinnon (1981)) and one that is capable of discriminating between up to M different models (going back to Hagemann (2012)). As it is seen, the capability of rejecting all models is necessary because for both tests there exist return series where none of the models under consideration is selected. This shows the need of a nonnested testing framework in contrast to the nested testing framework that is still the main workhorse in the literature.

On the one hand comparing one SV-model with one GARCH-model, the GARCH-model is always rejected in presence of the SV-model. On the other hand the SV-model is rejected only four out of ten times in presence of the GARCH-model, indicating the superiority of the SV-model. In contrast to the GARCH-model, the SV-model allows both the conditional mean and the conditional variance to be driven by two different stochastic processes. This additional flexibility is one of the reasons why the two-shock models are superior to the one-shock models, referring to chapter 5. The test in chapter 6 describes how to compare more than just two models at the same time. Looking at the results of the empirical applications, it is seen that for all time series except the NIKKEI returns a model is selected. The APARCH- and the SV-model are selected five respectively three times, while the t-GARCH-model is only selected once.

Both tests in chapter 5 and 6 suffer from size distortions in the form of overrejection, but as it is shown by using bootstrapped techniques this bias is reduced dramatically and the bootstrapped version of the test maintains its theoretical level of significance. One major drawback of the tests is that one needs to estimate the models beforehand. Especially the estimation of the SV-model is challenging and the technique used here tends to produce parameter estimates with a rather large variance for smaller sample sizes. This is one possible explanation for the observable size distortions if the SV-model is the data generating process.

Chapter 4 shows that the persistence within SV-models can be estimated arbitrarily close to 1, if structural breaks occur within the sample. But different to GARCH-models the sample size does not affect the estimated persistence.

Keywords

Stochastic Volatility, GARCH, persistence, nonnested testing

References

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