

## Specifying Asymmetric STAR models with Linear and Nonlinear GARCH Innovations: Monte Carlo Approach

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Economic and finance time series are mostly asymmetric and are expected to be modeled using asymmetrical nonlinear time series models. Smooth Transition Autoregressive (STAR) models: Logistic (LSTAR) and Exponential (ESTAR) are known to be asymmetric and symmetric respectively, and these have gained their popularity in empirical econometric modelling. Estimating only the LSTAR model for economic and finance data may give models that are not well diagnosed. Under non-normal and heteroscedastic innovations, the residuals of these models are estimated using Generalized Autoregressive Conditionally Heteroscedastic (GARCH) models with variants which include linear and nonlinear forms. The small sample properties of these STAR-GARCH variants are yet to be established but these properties are investigated using Monte Carlo (MC) simulation approach. An MC investigation was conducted to investigate the performance of selections of STAR-GARCH models by the classical nonlinear selection approaches. The ARCH(1) and GARCH(1,1) were the linear GARCH while the Logistic Smooth Transition-ARCH (LST-ARCH(1,1)), Logistic Smooth Transition-GARCH (LST-GARCH(1,1)) and Asymmetric Nonlinear Smooth Transition-GARCH (ANST-GARCH(1,1)) were the nonlinear GARCH. The nonlinearity parameter in the variance equations and Autoregressive (AR) parameters were varied along with different sample sizes. With the assumption of normality, the results showed that the selection of LSTAR models were actually affected by the structure of the innovations and this improved as sample size increased. Misspecification tests actually showed that these models cannot be misrepresented in the real sense.

**Keywords:** Asymmetry, Monte Carlo simulations, GARCH, Smooth Transition Autoregression