

Could the test from the standard regression model could make significant regression with autoregressive noise become insignificant? *

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Abstract:

This paper extends Cheng, *et al.* (2022) to investigate whether the statistics T_N^β for testing $H_0^\beta : \beta = \beta_0$ versus $H_1^\beta : \beta \neq \beta_0$ from the traditional regression model from the standard regression model $Y_t = \alpha + \beta X_t + u_t$ where u_t is assumed to be iid $N(0, \sigma^2)$ could be used for regression with autoregressive noise. To

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do so, we set $Y_t = Y_{1,t} + Y_{2,t}$ with $Y_{2,t} = \phi Y_{2,t-1} + e_t$ in which $e_t \stackrel{iid}{\sim} (0, \sigma_e^2)$ so that the regression contains autoregressive noise and we use the statistics T_N^β for testing $H_0^\beta : \beta = \beta_0$ versus $H_1^\beta : \beta \neq \beta_0$ when the actual $\beta > 0$, for example, $\beta = 0.1$. In our simulation, we found that the average rejection rate is less than the level of significance for any sample size N smaller than 100. However, for large N , say, $N = 1000$, the test confirms that the model is significant. Our findings confirm that the test from the standard regression model could make a significant regression with autoregressive noise become insignificant for small sample sizes, but not for very large sample sizes.

Keywords: Stationarity, autoregression, regression, time series analysis, regression with autoregressive noise

JEL Classification: C01, C15, C22, C58, C60