Modelling Cross Dependence in BINAR(1) Models

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Abstract:

The bivariate integer-valued auto-regressive process of order one (BINAR(1)) is an extension of the classical integer-valued model from McKenzie (86). The crucial components in the BINAR(1) are the paired innovations and the survival part. However, the survival structure depends on the thinning operator with constant or random coefficient. These two components are essential to model the inter dependence between the two series. In the initial BINAR(1) proposed by Pedeli and Karlis (2011), the inter dependence was induced from the paired innovations only. The question of interest is whether the paired innovations can capture the total dependence between the series. Alternatively, if allowing the thinning coefficients to be pairwise distributed, ideally, bivariate beta distributed and on the other hand, innovations are also jointly distributed, we can expect that the resulting BINAR(1) model can capture the total dependence between the series. This research proposes a novel BINAR(1) process that allows for both paired thinnings and innovations, keeping the diagonal BINAR structure in hand. Evidently, this proposed BINAR(1) needs to compete among the existing BINAR(1) models. Thus, Monte Carlo simulation experiments and real-life data applications to football will be performed to validate the workability and goodness of fit of the new BINAR(1) process.

Keywords:

Bivariate, Random, Thinning, Innovations, Survival.