ABSTRACT

An entropy-based early warning indicator for measuring systemic risk

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Background: From the latest financial crises, a lot of attention has been deserved to model systemic risk events. Many authors in the literature proposed models and measures for detect systemic crises and turbulent periods in the markets (Bisias et al. 2012). On the macroeconomic perspective, this is relevant to policy makers, central banks and international institutions whom are interested in containing and mitigating these financial crises (Aftab, 2013). The ability of modelling systemic risk has received particular attention in the last years with the so-called “double-dip” recession.

Objectives: The purpose of our analysis is the construction of an early warning indicator for systemic risk using entropy measures. The empirical analysis is based on the cross-sectional distribution of marginal systemic risk measures such as Marginal Expected Shortfall (Acharya et al. 2010; 2012), Delta CoVaR (Adrian and Brunnermeier, 2011; Boucher et al., 2013) and network connectedness (Billio et al. 2012; Diebold et al. 2014).
These measures are conceived at a single institution for the financial industry in the Euro area. We estimate entropy on these measures by considering different definitions (Shannon, Tsallis and Renyi). Finally, we test if these entropy indicators show forecasting abilities in predicting banking crises. In this regard, we use the variable reported by the Expert Group on Countercyclical Capital Buffers (ECB) for European banks.

**Methods:** The methodology has been developed in two steps. The first step focuses on the estimation of systemic risk measures using the most relevant indicators proposed in the literature. In the second step we estimate different entropies on the obtained systemic risk measures. Then, we estimate a Logit model by considering as dependent variable the banking crisis to test the predictive ability of the obtained entropy indicators.

**Results:** The entropy indicators are strongly significant in explaining banking crisis.

**Conclusions:** The proposed early warning signals reveal to be effective in forecasting financial distress conditions. Entropy indicators show promising forecast abilities to predict financial and banking crisis. The obtained results deserve further research considering for instance entropy aggregation.

**Main references**


