



RE-ANALYSIS OF THE EU PUBLIC DEBT CRISES WITH NARX

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ABSTRACT

Purpose- This paper employs the public debt equation of motion, which covers variables that represent a country's competitiveness, such as past public debt, GDP, external balance, real exchange rate, real interest, and inflation, to estimate the public debt of Southern EU countries (Greece, Ireland, Italy, Portugal, and Spain). The paper is designed to test whether the public debt equation of motion (see Croce and Ramon, 2003; IMF, 2013; Chirwa and Odhiambo, 2018), which is characterized by significant variables representing competitiveness in macroeconomics, can statistically account for the public debt of Southern EU countries after the monetary union period including the EU public debt crisis. Consequently, based on the findings, it will be determined whether the competitiveness problems of Southern EU countries are important in the EU public debt crisis.

Methodology- The analysis is performed with the nonlinear autoregressive network with exogenous inputs (NARX) with quarterly data for the period from 2005Q1 to 2021Q4. In NARX, which is a dynamic non-parametric neural network used in time series analysis, the prediction performance of the model is more robust than other neural network models, as the gradient descent approaches the local minimum perfectly (see Lin et al., 1996; Gao and Er, 2005; Diaconescu, 2008). However, it is important to define the parameters correctly in NARX to obtain effective results. In the study, parameters are defined according to the minimum Mean Squared Error values. The feedback Levenberg-Marquardt (LM) algorithm, which produces fast and effective results, is used as the training algorithm. The performance of the training algorithm for robustness is compared with testing and validation.

Findings- The analysis results reveal that public debt in Southern EU countries is statistically explained by the public debt equation of motion with a confidence ratio of over 95%.

Conclusion- This result implies that the public debt problem in Southern EU countries is associated with their competitiveness (see also Hall and Soskice, 2001; Dallago and Guglielmetti, 2011; Hall, 2012; Lane, 2012; Gros, 2012; Iversen et al., 2016; De Ville and Vermeiren, 2016; Frieden and Walter, 2017). In addition, the analysis goes beyond parametric analyzes that relate economic growth or a few variables with public debt and reveals the importance of inclusive variables and non-parametric analyzes in the estimation of public debt.

Keywords: EU public debt crises, Southern EU countries, NARX, competitiveness problems

JEL Codes: C45, F35, F45, N14, N24

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