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*Empirical Applications of the
Interacted Panel VAR Model*

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Abstract

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Abstract

The Vector Autoregressive (VAR) Models can be considered as a dynamic multivariate extension of the univariate autoregressive models. This family of models has become very popular in macroeconomics analysis after the work of Sims(1980) and they are widely used in time series literature thanks to their flexibility. As a matter of fact, by setting appropriately a VAR model, we can describe efficiently the dynamics of the economy and provide quite accurate forecasts.

During recent years, researchers developed different VAR models with the purpose to represent better the data generating process. Among these, the nonlinear VAR models have gained a central role in macroeconometric analysis in testing the theory, due to their capacity to capture a richer set of dynamics regarding current macroeconomic phenomenons. Depending on the specific model, they can allow, for example, different states (regimes) of the world, to allow the coefficients of the model to vary over time in each time unit, allowing for interactions between variables potentially revealing important information. The first paper included in this thesis is a survey which have the purpose to examine linear and nonlinear VAR models.

The second and third papers present two empirical applications of the Interacted Panel VAR Model, which is a new nonlinear methodology we illustrated over the first paper. Specifically, we analyze in both papers the behavior of government spending multiplier when the interest rate is at the Zero Lower Bound (ZLB). This is a highly topical question since the outbreak of Great Recession, given that many policy makers have wondered whether fiscal stimulus would be able to help the economy to recover from recession. In particular, there exist two different and opposite theoretical predictions. New Keynesian DSGE models show that, when the interest rate is at the ZLB, a

raise in government spending has a strong and positive impact on the economy. On the other side, theoretical prediction indicate very low multipliers, showing that an increase in government spending does not stimulate private activity.

Although there exist many theoretical predictions about the size of government spending multiplier at the ZLB, very few empirical evidences are provided. These two paper aim to shed light on the size of the government spending multiplier at the ZLB. Among the nonlinear VAR models, we choose the Interacted (Panel) VAR Model because it offers an important advantage compared to others nonlinear approaches. Thanks to the interaction term, we are able to investigate among the entire sample. This can be done also within a time varying framework, but it implies a larger number of estimates which requires informative priors. In order to be as more agnostic as possible, we also use a Bayesian approach for inference but with uninformative priors.

In the first paper we develop an Interacted VAR Model and conduct our analysis on the United States sample. In order to identify government spending shocks we use the sign restrictions approach, furthermore we use the forecast series of government spending to account for the potential effects of anticipation that can pose serious problems for the identification of government spending shocks. We find that the government spending multiplier ranges between 3.4 and 3.7 at the ZLB, while it ranges from 1.5 to 2.7 away from the ZLB. Then, we develop a Factor-Augmented IVAR (FAIVAR) model with the purpose to address another limited information problem. It confirms our results from a qualitatively point of view. As a matter of fact, the government spending multiplier ranges between 2.0 and 2.1 at the ZLB and between 1.5 and 1.8 away from the ZLB. These results are also in line with some recent studies which predict higher multipliers at the ZLB than in normal times.

In the second paper, we extend our analysis to the Euro Area countries by developing an Interacted Panel VAR Model (IPVAR). Also in this paper, we identify government spending shocks using sign restriction, and use the European Commission forecast of government spending to account for fiscal foresight. We find higher multipliers for times when we are away from the ZLB: the government spending multiplier ranges between 0.33 and 0.88 in the low interest rate state, while it ranges between 1.10 and 1.29 in the high interest rate state. However, we consider a Factor-Augmented IPVAR framework (FAIPVAR), we find that the government spending multiplier at the ZLB is very similar to multipliers computed in normal times, ranging between 1.08 and 1.41 at the ZLB and between 1.26 and 1.39 away from the ZLB. Next, we divide our sample into two groups of countries with high and low levels of debt-to-GDP ratio. The purpose of this exercise is to understand if the size of the government spending multiplier is influenced by the level of debt-to-GDP ratio. Considering, from our point of view, the more reliable specification with factors that contains a richer set of information, we find that if the debt-to-GDP ratio is low, the government spending multiplier is higher than multipliers computed when the debt-to-GDP is high.

Results for both papers are in line with New Keynesian DSGE models predictions, showing that a one unit shock of government spending raises GDP by more than 1%. In case of the US sample, we find that the government spending multipliers are larger when the interest rate is at the ZLB. On the other hand, the EA sample would not seem to support the latter result. Our interpretation is that, the EA findings may be influenced by a subset of countries that experienced high level of debt (especially during the crisis), which we have found to have depressive effect on the multipliers and which might be stronger than the positive effect exerted by the favorable conditions illustrated in some

theoretical models at the ZLB. Overall, we argue that a raise in government spending might be a useful additional instrument for policymakers to solve deep recessions, when monetary policy is at the ZLB, although the effect produced by unconventional monetary policies have currently shown to be more difficult to identify.