

## Discussion to the paper by Jaromír Tonner, Jiří Polanský, and Osvald Vašíček

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Policy questions at many central banks around the world have been analyzed within the class of dynamic stochastic general equilibrium models. The increasing popularity of these models stems mainly from their underlying principles. The models consistently describe the fundamental features of rationally behaving agents in the economy, and they are considered to be resistant to the Lucas critique. Hence, simulations of counterfactual scenarios for the effects of different policies are supposed to be valid.

The key point of the Lucas critique is that any change in policy changes the decision rules of agents and consequently the structure of the model. In DSGE models, the optimal decision rules of agents depend on the structure of the economy, which is described by primitive parameters. If all the parameters are invariant to changes in policies, the decision rules can be used to evaluate different policy experiments.

Resistance to the Lucas critique is, however, more a convenient assumption than a verified property of these models. It is indeed not straightforward to assert that some parameters are truly structural. Although the basic principles of the models lie in the microeconomic approach, the constraints which frame the economy are not always micro-founded. For example, the standard assumption that in every period firms optimally change the prices of a fixed share of goods no matter what the shape of the economy is, is more a convenient shortcut than a proper mechanism of price sluggishness. In fact, the share of goods whose prices are reoptimized may be higher in periods of high inflation and lower in periods of low inflation. An assessment of the assumption of parameter invariance is thus of high importance for policy institutions.

Thanks to recent enhancements in estimation methods (e.g. Fernández-Villaverde and Rubio-Ramírez, 2007), one can test whether the primitive behavioral parameters of DSGE models are indeed constant. This is the objective of the paper by Tonner, Polanský, and Vašíček (2011).

The authors estimate a model borrowed from Burriel, Fernández-Villaverde, and Rubio-Ramírez (2010) and compare it with the same model extended to include a few features that are specific to the Czech economy, as Andrlé, Hlédík, Kameník, and Vlček (2009) argue. In both versions, all the structural parameters are allowed to drift over time. The authors find that the estimated parameters of the model without technologies tailored to the Czech economy tend to oscillate, or that some of them even follow a trend over time. On the other hand, the incorporation of economy-specific technologies removes trends from, and substantially reduces the volatility of, the estimated paths of the parameters. Furthermore, the estimated paths of the econo-

<sup>\*</sup> The views presented here are those of the author and do not necessarily represent the official opinion of the National Bank of Slovakia.

my-specific technologies mimic the patterns of the corresponding observed variables. Nevertheless, the paths of several parameters remain volatile. The authors conclude that the baseline model enriched with technologies capturing specific features of the economy is suitable for historical filtering of the data, and due to more stable parameters it allows one to simulate the model on longer horizons.

The findings of the paper are indicative but not conclusive. The basic message is that the architects of a model should be careful when designing the model structure. Overlooking a specific feature of the modeled economy may lead to serious parameter instability problems, hence making the model analyses flawed. The authors argue that the additional features they incorporate into the model capture the convergence process and structural breaks. My impression is that these features deal with model misspecification rather than structural breaks. There is no clear systematic change in the estimated paths of the parameters that can mimic a changing pattern of policy. Increasing openness of economies is a world-wide phenomenon, while the Balassa-Samuelson effect captures an ongoing process of different productivity increases in the tradable and nontradable sectors. Both processes are of a longer-lasting nature and should be treated in the balanced growth assumption of the model, as the authors do. Otherwise, these low frequency movements may manifest themselves in the persistent exogenous processes of the model. Also, structural parameters may be better identified due to additional shocks, as Rios-Rull, Schorfheide, Fuentes-Albero, Krysko, and Santaaulàlia-Llopis (2009) argue.

It is difficult to pin down the real reason why parameters change over time. For example, Fernández-Villaverde and Rubio-Ramírez (2007) offer the following possible explanations. First, variation in parameters is fundamental. They capture environment characteristics that agents take into account in their decisions. Second, variation in parameters is a statistical feature. Evidence of time-varying parameters may indicate model misspecification. As these explanations are observationally equivalent, it is difficult to make an objective choice.

Understanding the nature of parameter instability is very important if policy-makers are going to put weight on the policy recommendations based on models such as in this paper. Unfortunately, interpretation of time-varying parameters is not straightforward. Even after controlling for developments in trade, the effects of productivity growth in the tradable sector, and administered prices, a few parameters remain still volatile, which may imply that certain features of the model may remain misspecified despite considerable improvements of the model in terms of the stability of other parameters.

The necessary next step in exploring the question of parameter stability is the second point suggested by Fernández-Villaverde and Rubio-Ramírez (2007) – are time-varying parameters a characteristic feature of the economic environment? This also includes structural breaks when agents take the changing policy into account and alter their behavior accordingly. Here, it is important to highlight that in the first-order approximation to the model solution, the agents do not know about the possibility of future changes in the parameters. In other words, the unawareness of the agents about the true structure of the environment contradicts the assumption of rational expectations. It is therefore necessary to expand the solution of the model beyond linear approximation to let agents consider volatility of the structural parameters when making decisions.

Documenting parameter instability problems is an important step toward understanding the economic structure. Misspecification and ignored structural breaks in the economy are likely reasons for model performance to be questioned. This is a problem not only with this paper, but also with the DSGE literature in general. I strongly believe that the economic profession needs to make more progress in that direction. For example, little is known about the extent to which the results depend on the data set used in the estimation. Guerron-Quintana (2010) documents that the choice of observables has significant effects on the estimates. Therefore, one may want to investigate the information content of the data. It is then easier to explore sources of time variation in the estimated parameters if certain patterns in the estimates are robust across observables.

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