Research Statement

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My research interests are in time series econometrics and empirical macroeconomics. I develop existing methodology further and apply it to empirically relevant questions, typically in tight connection with macroeconomic theory. I am particularly drawn to the relation between networks and dynamics.

In the following, I briefly situate 9 projects of mine, distinguishing between three areas: dynamic network effects, estimation of Dynamic Stochastic General Equilibrium (DSGE) models, and vector-autoregressions (VARs). The 9 papers include 2 published ones, 2 ongoing at an advanced stage (working papers in circulation), 3 ongoing at an early stage (working papers available upon request), and 2 in planning.

Dynamic Network Effects

How do inflation and production disruptions propagate along supply chains in an economy? Given a price increase in energy-related sectors or a shortage of primary metals, how do prices and production in other sectors react over time? In Mlikota (2024), I propose a methodology to conduct inference and optimize forecasts in such settings where networks generate dynamics of cross-sectional variables, and I demonstrate the framework's usefulness in two distinct applications. In the first, I show that the proposed Network-VAR (NVAR) approximates the process of sectoral output in a Real Business Cycle (RBC) economy with lagged input-output conversion. In turn, I quantify the extent to which business cycles are due to the lagged transmission of productivity shocks along supply chains as opposed to exogenous persistence in idiosyncratic and aggregate productivity shocks. In the second application, I forecast macroeconomic aggregates across OECD countries by assuming and estimating a network that underlies the dynamics. In line with an equivalence result I provide, this reduces out-of-sample mean squared errors relative to a dynamic factor model, with reductions ranging from -12% for quarterly real GDP growth to -68% for monthly CPI inflation.

In Mehl et al. (2023), we evaluate recent theories on invoicing currency choice in international trade by investigating the drivers behind the marked increases in euro- at the expense of US dollar-invoicing observed in non-Euro Area (EA) European countries. Consistent with theory, we use an augmented version of the NVAR to jointly model the fraction of exports invoiced in euro, exchange rate volatility and trade developments across 13 countries, while explicitly accounting for links that tie together variables across countries. Our results point to increased trade rather than reduced exchange rate volatility as the driver of the switch in dominant currency usage.

Thanks to the generous support of the Swiss National Science Foundation under grant 10.003.235, I explore further the NVAR's applicability in three co-authored projects. First, in Mlikota and Zhang (2025), we forecast product-level inflation in Sweden by linking it to the dynamic transmission of innovations along links constructed based on sectoral supply chain data and firm-level balance sheet

data. This generalizes the forecasting-application of the NVAR in Mlikota (2024) to a much higher-dimensional setting. Second, in an early-stage project with Frank Schorfheide, we demonstrate that sectoral output dynamics, interpreted through the lens of the dynamic transmission of (supply) shocks along input-output links, improve GDP now- and forecasts. Third, in an early-stage project with Wayne Gao, we use the NVAR to evaluate a microeconomic theory on households' consumption smoothing through social ties.

Estimation of DSGE Models

DSGE models are widely used in macroeconomic policy analysis. Compared to econometric models, they deploy a high degree of theoretical coherence, as variables' behavior is constrained by agents' optimality conditions. In contrast to more theoretical models used to illustrate a particular relationship between variables, they yield a satisfactory data fit. Ideally, these models are not calibrated, but estimated, in which case the model's data fit and policy implications are accompanied by the degree of uncertainty surrounding these estimates.

The analysis of many pressing questions necessitates nonlinear models. These are required, for example, to accommodate borrowing constraints, the effective lower bound (ELB) on interest rates, irreversible investments, or time-varying macroeconomic uncertainty. However, the estimation of such models is often considered practically infeasible, as it is time-consuming to evaluate their likelihood.

In Mlikota and Schorfheide (2023), we propose a method to substantially speed up the Bayesian estimation of nonlinear DSGE models.[1] It requires the researcher to specify an approximative model whose likelihood can be evaluated fast and whose posterior distribution is close to that of the actual model of interest. Our runtime reductions relative to alternatives range from 27% to 88%.

In Mlikota et al. (2024), we propose a method to estimate DSGE models without reyling on likelihood evaluations. We show that an approximation of the posterior can be obtained by simulating statistics from the model for different parameter values and evaluating their distance to the observed statistics.

VARs

VARs are arguably the most popular tool for empirical research in macroeconomics. They standardly assume that all variables have continuous support on the real line. However, during the Great Recession in the late 2000s, central banks' policy rates were lowered all the way or close to the ELB of zero, and they remained at this level for a long time. While the ELB could be accommodated more easily in DSGE models, it posed greater challenges for econometric models like the VAR. In Aruoba et al. (2022), we build a VAR with a censored dependent variable and

[1] The method applies more generally to time series models with slow likelihood evaluations.

regime-switching coefficients, i.e. a VAR which can accommodate the ELB on interest rates and changes in variables' dynamic relationships at and away from the ELB, consistent with a corresponding DSGE model. We derive necessary and sufficient conditions for identification. In turn we apply it to document that the inflation response to monetary stimulus is stronger at the ELB, whereas no evidence for changes in the response of GDP is found.

Numerous studies augment VARs with time-varying parameters (TVPs). In Amir-Ahmadi et al. (2024), we provide theoretical results on the origins and nature of TVPs in VARs. Supposing that data is generated by a general economic theory, i.e. a general DSGE model, we show that (i) non-linearity in economic dynamics is a necessary and sufficient condition for TVPs in VARs, and (ii) all parameters' time-variation is driven by the same, typically few sources of stochasticity: the shocks in the DSGE model. Motivated by these results, we model a set of macroeconomic and financial variables as a TVP-VAR with a factor-structure in TVPs. This reveals that most instabilities are driven by a few factors, which comove strongly with measures of macroeconomic uncertainty as well as the contribution of finance to real economic activity. Furthermore, relative to the TVP-VAR with TVPs evolving as independent random walks, our model delivers an improved forecasting performance.

References

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