A Unified Framework to Estimate Macroeconomic Stars

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Abstract

• Implement a medium-scale semi-structural model to estimate jointly several macroeconomic “stars” – long-run equilibrium levels of
  - Growth rate of output (g*)
  - Unemployment rate (U*)
  - Real rate of interest (R*)
  - Productivity growth (p*)
  - Price inflation (pi*)
  - Wage inflation (W*)

• Ingredients of the model motivated by economic theory and empirical features necessitated by changing economic environment: (1) time-variation in macroeconomic relationships; (2) stochastic volatility in error variances

• Crucial element: allow for explicit links between model-based stars and the long-run survey expectations to improve stars’ econometric estimation

• By-products: time-varying estimates of wage and price Phillips curve, pass-through between prices and wages, evolving cyclicity of productivity, which provide new insights into these empirical relationships’ instability in US data; Other objects of interest: estimates of output gap, monetary policy stance

• Given the richness of the model, document an expansive set of empirical results

Model Description

• Star (long-run equilibrium of a particular macroeconomic series): infinite-horizon forecast conditional on the current information set; Beveridge-Nelson trend

Empirical Findings: Highlights

• Baseline model and its variants: Base-NOTVP (shut down time-variation in parameters), Base-NOSV-NOTVP (shut down both stochastic volatility and time-variation in parameters)

• Baseline model (feature rich) vs. restricted variants: Baseline wins

• Model yields credible estimates of stars and the output gap
  - Prior to COVID, output gap similar to the CBO’s production function approach; thereafter, more optimistic than CBO
  - Cf. to smaller-scale model estimates: can be different enough for long periods of time to matter for policy

• Role of survey data I: crucial for stars estimation during the COVID-19 pandemic, without it, the high-dimensional model difficult to estimate

• Role of survey data II: data alone suggest weak link between R* and g*; survey expectations data strengthen link (supporting Laubach and Williams)

• Okun’s Law in US data? Strongly supported

• Time variation? Yes, strong evidence in many of the model parameters capturing important macroeconomic relationships

• Stochastic volatility? Strongly supported in model equations defining cyclical fluctuations

• Narrower credible intervals around stars compared to typical estimates reported elsewhere, allowing for more precise inference

• Real-time vs. final estimates: progress made in mitigating well-known difficulties associated with the real-time estimation of stars

• W-star is new, as is its model-based decomposition into p-star and pi-star determinants (based on economic theory)

• Real-time forecasting properties of the model? Highly competitive

• Estimated stars useful as terminal values for external models? Yes

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