Re-estimating Potential GDP: New Evidence on Output Hysteresis

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Introduction

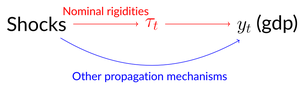
Potential GDP is one of the key concepts for policy-making decisions and forecasting. It is the level of output absent price/wage rigidities (flexible-price output). There is no consensus on the best estimation method for this counter-factual. The reduced-form approach is subject to Lucas Critique and the estimate does correspond to flexible-price output. The DSGE-based approach requires estimations for a large set of parameters, suffering from identification issues.

We propose a simple structural method to estimate potential GDP. Our approach is derived from a standard New Keynesian (NK) model, yet it is consistent with a wide range of structural assumptions. Moreover, it is not subject to the Lucas Critique, it does not resort to Bayesian estimation of the underlying model, and it is consistent with a large set of possible parametrizations. We estimate potential GDP for the US and use our series to contribute to the debate on the effects of demand shocks on aggregate supply. We find evidence supporting hysteresis hypotheses claiming that demand shocks can affect potential GDP.

A general picture

NK models are RBC models with an endogenous labor wedge $\tau_t \equiv mpn_t - mrs_t$. Note that $\tau_t = (mpn_t - w_t + p_t) + (w_t - p_t - mrs_t) = \mu_t^p + \mu_t^w$ where μ_t^p is price markup and μ_t^w is wage markup.

τ_t fluctuates over business cycles due to wage or price rigidities. It summarizes the propagation mechanism related to nominal rigidities.



Potential GDP is the output only affected through the blue channel.

Method

Underlying baseline DSGE model for our method is the textbook NK model with

1. Nominal wage rigidities (no price rigidities): Hence, $\tau_t = \mu_t^w$
2. No capital: $Y_t = A_t N_t^{1-\alpha}$
3. TFP shocks: $\log A_t = g + \log A_{t-1} + \sigma_a \varepsilon_{at}$
4. Preferences: $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t Z_t \left[\log\left(C_t - h\bar{C}_{t-1}\right) - \chi \frac{N_t^{1+\varphi}}{1+\varphi} \right]$
5. Taylor Rule: $R_t = R_{ss} \Pi_t^{\phi_\pi} \exp(\sigma_i \nu_t)$

The potential output growth Δy_t^p in the model is

$$\Delta y_t^p = \theta_1 \Delta y_{t-1}^p + \theta_0 \varepsilon_{at}$$

where

$$\theta_0 \equiv \frac{\frac{1+\varphi}{1-\alpha}\sigma_a}{\frac{1+g}{1+g-h} + \frac{\alpha+\varphi}{1-\alpha}} \qquad \theta_1 \equiv \frac{\frac{h}{1+g-h}}{\frac{1+g}{1+g-h} + \frac{\alpha+\varphi}{1-\alpha}}$$

Proposition 1: θ_0 and θ_1 can be estimated from the SVAR

$$\begin{bmatrix} \Delta y_t \\ \mu_t^w \end{bmatrix} = \mathbf{B} \begin{bmatrix} \Delta y_{t-1} \\ \mu_{t-1}^w \end{bmatrix} + \mathbf{C} \begin{bmatrix} \varepsilon_{at} \\ \xi_t \end{bmatrix}$$

where ξ_t is a weighted average of demand shocks. In particular,

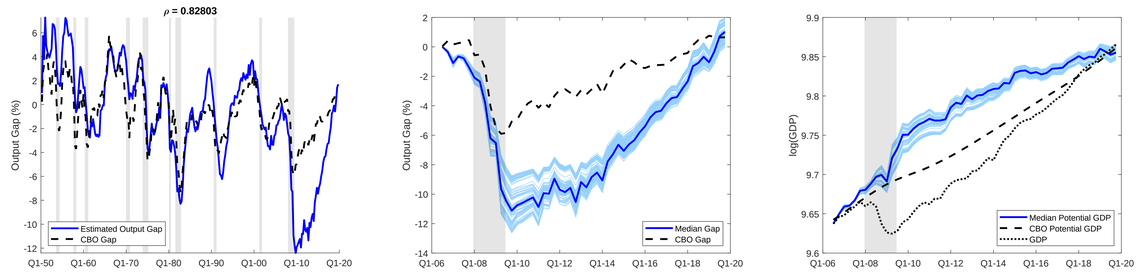
$$\theta_0 = c_{11} - \frac{c_{21}c_{12}}{c_{22}} \qquad \theta_1 = b_{11} - \frac{b_{21}c_{12}}{c_{22}}$$

And ε_{at} can be calculated using forecast errors and $\mathbf{C}$

To estimate $\mathbf{C}$, we use SVAR-IV as in Stock and Watson (2008) using Fernald (2007)'s TFP as an instrument variable for the baseline. We get a series for μ_t^w assuming log utility and unit Frisch elasticity in line with Galí, Gertler, Lopez-Salido (2007).

Potential GDP and output gap

The estimated potential GDP and output gap (1950Q1-2019Q4) are given in the figure below.



The estimated series are highly correlated with CBO's, but with a stark difference during and after the Great Recession. It points to an increase in potential GDP during the crisis, but poor potential growth afterwards. This is related to Fernald's TFP evolution during and after the crisis.

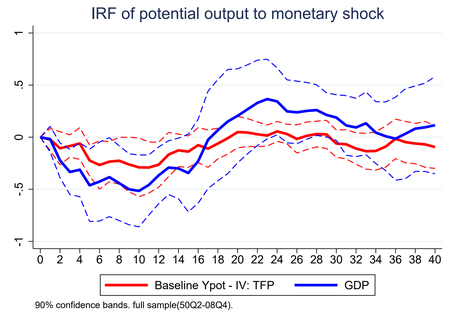
Output Hysteresis

Output hysteresis hypothesis claims that demand shocks can have long lasting impacts on GDP. In other words, TFP and potential GDP can react to demand shocks. We provide new evidence supporting this view using our estimates.

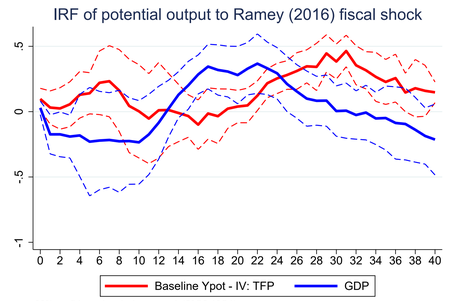
Using local projection methods as in Jordà (2005),

$$\log\left(Y_{t+j}^p\right) = \beta_j \epsilon_t + \text{Controls} + u_{t+j} \qquad j \geq 0$$

where β_j measures the impact of shock after j quarters in percentage points.



90% confidence bands. full sample(50Q2-08Q4).



90% confidence bands. long sample(50Q2-19Q4).

This indicates that demand shocks affect not only Y but also Y^p with a lag.

Conclusion

We provide a simple method to compute potential GDP. We show that

(i) Estimated potential GDP series are highly correlated with CBO's but display important deviation during and after the Great Recession

(ii) Evidence indicating that demand shocks affect potential GDP