A Bayesian Phillips Curve

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Introduction

- I propose a Hierarchical Bayesian panel data for traditional Phillips Curve estimation.
- I use data from 21 OECD Countries from 1985 to 2018.
- I use OECDs CPI as proxy for inflation.
- I use OECDs Imports of goods and services, deflator, National Accounts basis (PMGS) as imported inflation proxy.
- I use the OECDs unemployment rate and his NAIRU estimate as structural unemployment.
- I use the common assumption of lagged inflation as an estimator of expected inflation.

The Model

$$\pi_t = \alpha_t + \beta_1^C + \beta_2^C \pi_{t-1} + \beta_3^C (u_t - u_t^*) + \beta_4^C \pi_t^I + \nu_t \tag{1}$$

- α_t a time varying intercept which absorbs the perturbations affecting all countries at the same time period.
- β_1^C a country intercept capturing all country particularities.
- β_2^C the country varying parameter for the lagged value of inflation.
- β_3^C the country varying slope of the unemployment gap.
- β_4^C the country varying slope of the imported inflation.
- σ the standard deviation of the model.

Priors

$$CPI_t \sim N(\alpha_t + \beta_1^C + \beta_2^C \pi_{t-1} + \beta_3^C (u_t - u_t^*) + \beta_4^C \pi_t^I, \sigma) \tag{2}$$

$$\sigma \sim exp(1), \qquad \alpha \sim N(\bar{\alpha}, \sigma_\alpha)$$

$$\begin{bmatrix} \beta_1^C \\ \beta_2^C \\ \beta_3^C \\ \beta_4^C \end{bmatrix} \sim MN \begin{pmatrix} \bar{\beta_1}^C & \\ \bar{\beta_2}^C & \\ \bar{\beta_3}^C & ,\Sigma \\ \bar{\beta_4}^C & \end{pmatrix}$$

$$\Sigma = \begin{pmatrix} \sigma_{\beta_1} & 0 & 0 & 0 \\ 0 & \sigma_{\beta_2} & 0 & 0 \\ 0 & 0 & \sigma_{\beta_3} & 0 \\ 0 & 0 & 0 & \sigma_{\beta_4} \end{pmatrix} R \begin{pmatrix} \sigma_{\beta_1} & 0 & 0 & 0 \\ 0 & \sigma_{\beta_2} & 0 & 0 \\ 0 & 0 & \sigma_{\beta_3} & 0 \\ 0 & 0 & 0 & \sigma_{\beta_4} \end{pmatrix}$$

$$\bar{\alpha}, \bar{\beta}_1^C, \bar{\beta}_2^C, \bar{\beta}_3^C, \bar{\beta}_4^C \sim N(0, 5)$$
$$\sigma_\alpha, \sigma_{\beta_1}, \sigma_{\beta_2}, \sigma_{\beta_3}, \sigma_{\beta_4} \sim exp(1)$$
$$R \sim LKJ(2)$$

Results

	Mean	sd	5 %	95 %	p-val	n eff	$\hat{R}$
α	0.19	1.87	-2.88	3.23	0.46	1348	1
β_1	0.53	1.87	-2.52	3.60	0.39	1349	1
β_2	0.66	0.03	0.62	0.70	0	21962	1
β_3	-0.38	0.08	-0.51	-0.26	5.6e-05	22276	1
β_4	0.11	0.01	0.09	0.14	0	31162	1
σ	1.05	0.03	1.00	1.10	0	35240	1

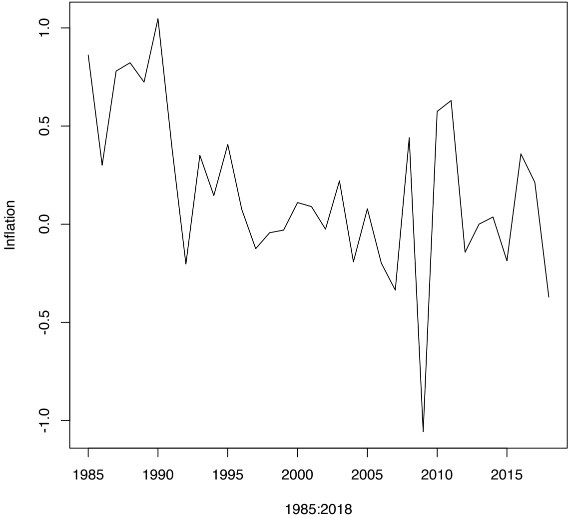

Figura 1: Time Trend

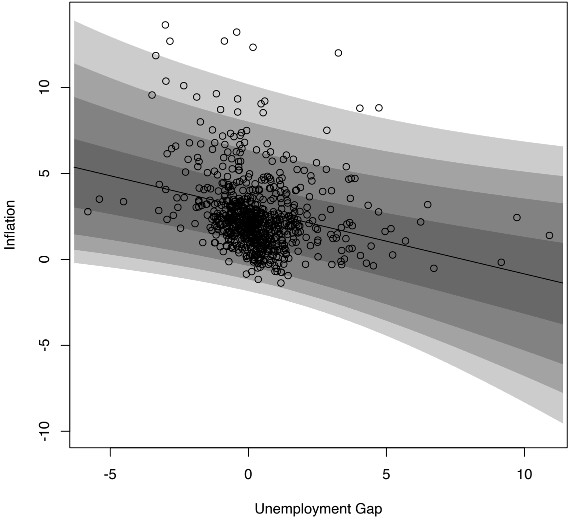

Figura 2: The Hierarchical Bayesian Phillips Curve

Conclusion

- We find a negative relation between unemployment gap and inflation.
- The introduction of a Time intercept allow us to control the effects of external global events, like the 2008 recession, on inflation.
- We show how the introduction of a Bayesian Hierarchical Model could be the solution to solve the puzzle of the relationship of inflation and unemployment.

Thank You