EUROPEAN CENTRAL BANK

EUROSYSTEM

Discussion of:

“Addressing COVID-19 Outliers in BVARs with Stochastic Volatility”

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COVID-19, increase in volatility (and forecasting uncertainty)

- Since March 2020, the global economy has experienced unusual levels of volatility, implying also an extremely large forecasting uncertainty

- Eurosystem projection ranges (source: www.ecb.europa.eu)

December 2019 Projection Ranges				
	2019	2020	2021	2022
HICP	1.2 [1.2 - 1.2]	1.1 [0.6 - 1.6]	1.4 [0.7 - 2.1]	1.6 [0.8 - 2.4]
Real GDP	1.2 [1.1 - 1.3]	1.1 [0.5 - 1.7]	1.4 [0.5 - 2.3]	1.4 [0.4 - 2.4]

June 2020 Projection Scenarios			
	2020	2021	2022
HICP	Baseline: 0.3 Mild: 0.4 Severe: 0.2	Baseline: 0.8 Mild: 1.1 Severe: 0.4	Baseline: 1.3 Mild: 1.7 Severe: 0.9
Real GDP	Baseline: -5.9 Mild: -8.7 Severe: -12.6	Baseline: 5.2 Mild: 6.2 Severe: 3.3	Baseline: 3.3 Mild: 2.2 Severe: 3.8

This paper

- How can we “vaccinate” our models, from this extreme level of volatility and allow them to adequately characterize the increase in forecast uncertainty?

- This paper: outlier correction (outliers are uncorrelated across variables and time)

SV is a BVAR with stochastic volatility (baseline model)

$$v_t = A^{-1}\lambda_t^{0.5}\varepsilon_t \text{ with } \log(\lambda_t) = \log(\lambda_{t-1}) + e_t$$

General issue posed by COVID-19 and this paper

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SVO is SV plus first type of outliers

$$v_t = A^{-1}\lambda_t^{0.5}\boldsymbol{O_t}\varepsilon_t \text{ with } \log(\lambda_t) = \log(\lambda_{t-1}) + e_t$$

- The elements of O_t are either equal to 1 or distributed U(2,20), with probability to be estimated

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- How can we “vaccinate” our models, from this extreme level of volatility and allow them to adequately characterize the increase in forecast uncertainty?

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SVO-t model is SVO plus second type of outliers

$$v_t = A^{-1}\lambda_t^{0.5}\boldsymbol{O_t}\boldsymbol{G_t}\varepsilon_t \text{ and } \log(\lambda_t) = \log(\lambda_{t-1}) + e_t$$

- The elements of O_t are either equal to 1 or distributed U(2,20), with probability to be estimated

- The elements of G_t are distributed as inverse gamma (equivalent to SVO with t-residuals)

A few minor questions

- Why estimating the model in differences? And with several priors of unit root?
- Two sets of outliers, I am still wondering about the exact role of the two. Do we need two sets of outliers because the stochastic process for O_t is too rigid?
- If some variables have many outliers, should we just drop them?

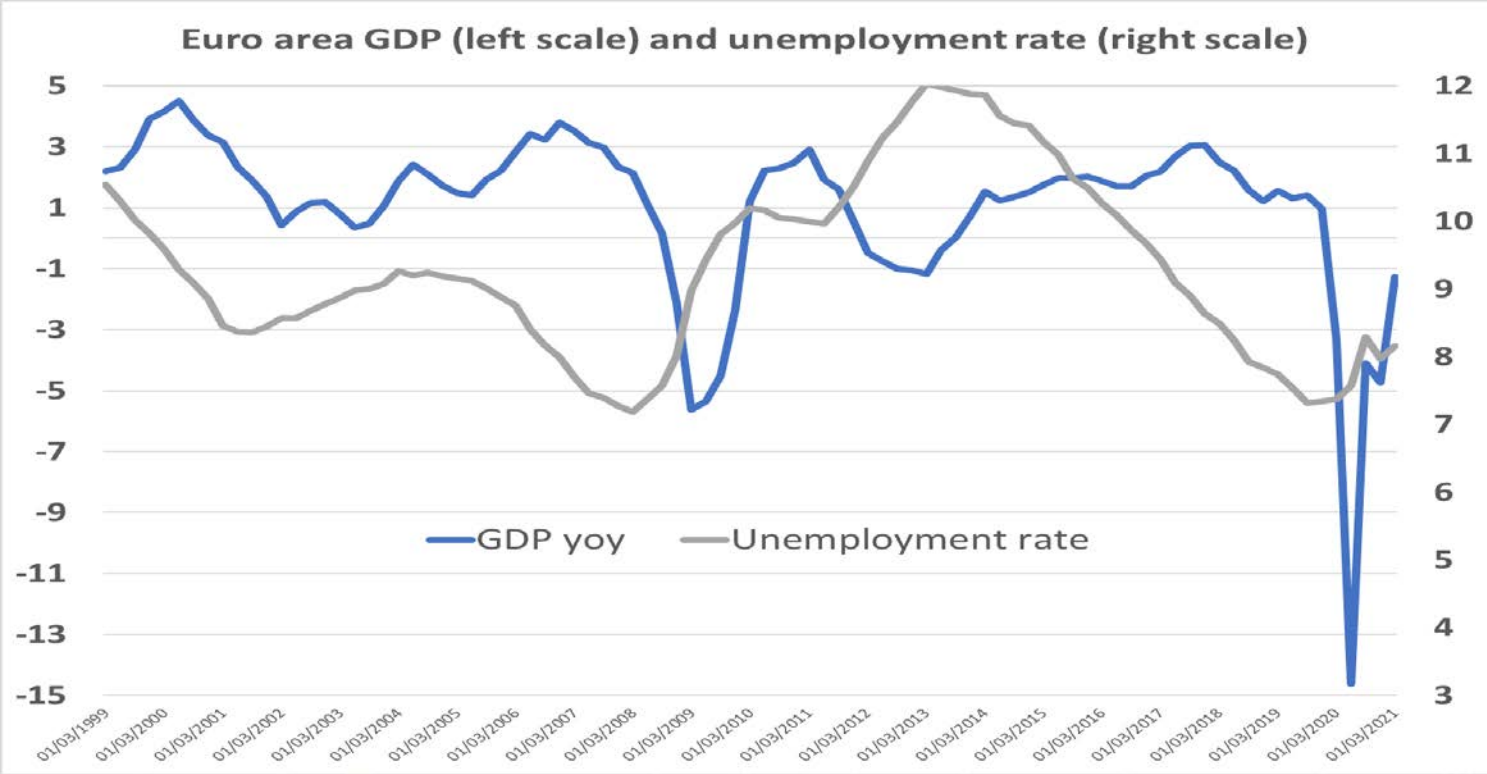
The rest of the discussion (with some euro area data)

- Pros and cons of this methodology
  - Variable specific outliers may play an important role (in general, for outlier correction)
  - How does the model capture forecast uncertainty?
- When does stochastic volatility matter and its interpretation

Pros and Cons of this methodology

- The outliers in this model are variable specific. This is an important feature for a method which aims to capture outliers, in general (besides the COVID-19 times)
- COVID-19 as a “common” increase in volatility?
  - Plausible assumption (see the results in this paper and Lenza and Primiceri, 2020).
  - But the extra degrees of freedom granted by the variable specific outliers may matter, in some circumstances.
  - One example: GDP and unemployment in the euro area in COVID-19 times

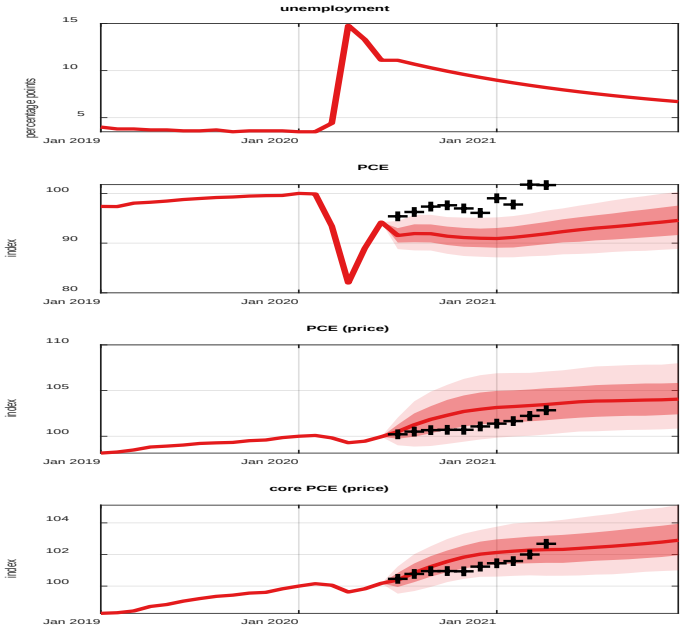
Pros and Cons of this methodology

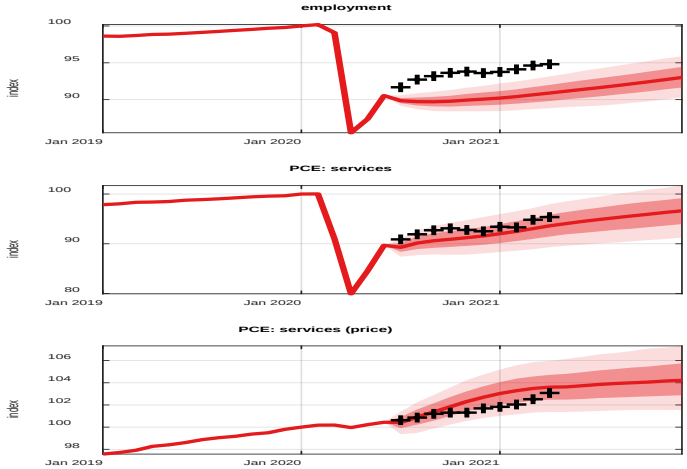


Pros and Cons of this methodology

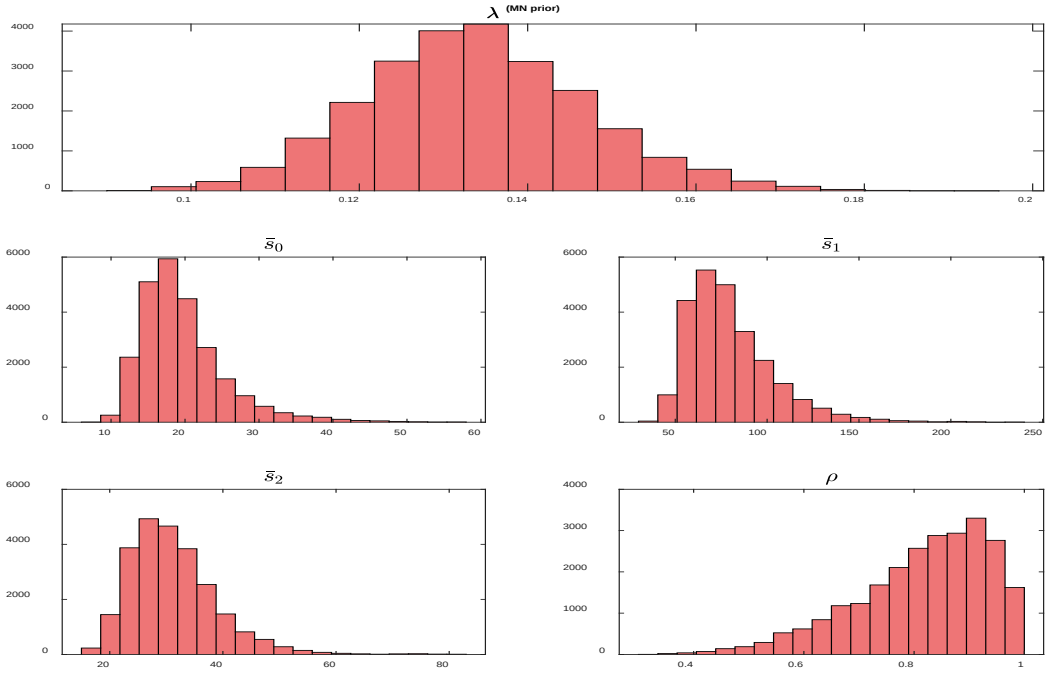
- Outliers uncorrelated across time
  - From the perspective of an economist in, say, June 2020, each increase in forecast uncertainty is permanent.
- Lenza and Primiceri (2020) allow COVID-19 related shock volatility to be autocorrelated after May 2020 – estimation of the "speed of decay" ρ
  - Our density forecasts factor a higher level of shock volatility due to COVID-19
  - Example: conditional forecast (based on real-time Blue-Chip unemployment rate projections) as of June 2020 in our BVAR model

BVAR forecasts without autocorrelated COVID dummies

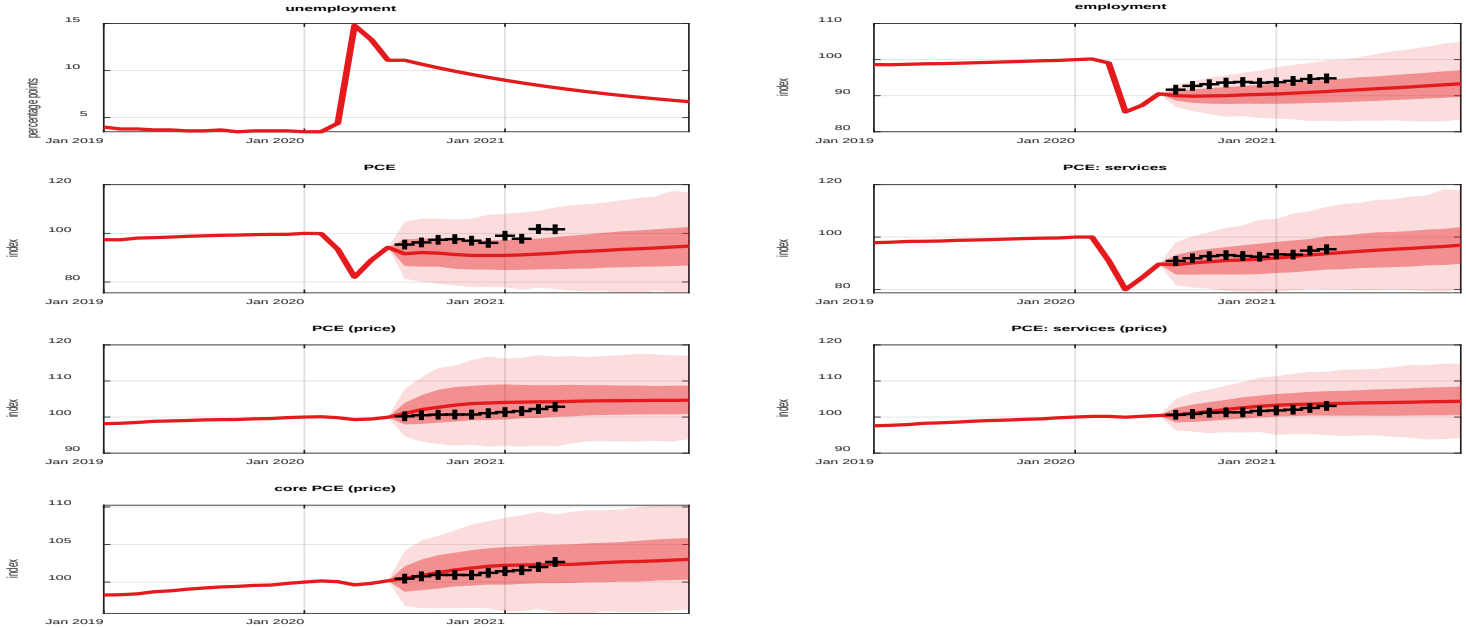




Hyperparameters estimates in Lenza and Primiceri (2020)



BVAR forecasts with autocorrelated COVID dummies



Pros and Cons of this methodology

- The SVO and SVO-t models outliers perform rather well during COVID-19
- Change in volatility is interpreted as a permanent change, projecting a larger than pre-COVID forecast uncertainty.
- If it is a permanent, more fundamental change in the volatility, what would be the interpretation? Shocks or change in economic structure?
  - This is a very important point in general, and even more for policy institution where the narrative is as important as the projections figures

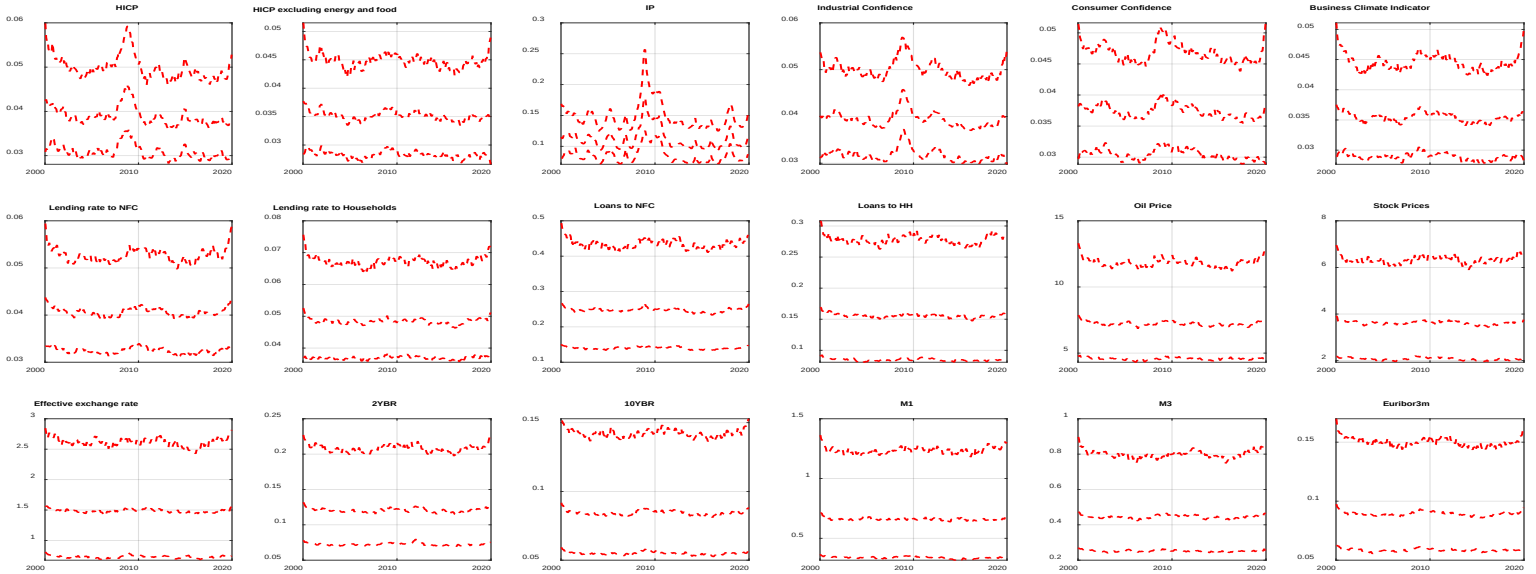
When does stochastic volatility matter and its interpretation

Let's now abstract from COVID-19, which is indeed an outlier

- In this paper, data from 60's to today
- Pre-85 and post-85 samples are very different, in terms of volatility of the economic variables. Stochastic volatility for US data is likely to matter a lot, due to the relevant difference in volatility across the two samples
- But should we take the SV-BVAR always as the benchmark model? When does stochastic volatility matter?
  - Jarocinski and Lenza (2016): Stochastic volatility does not help to improve euro area inflation forecasts [1992-2015 sample]

When does stochastic volatility matter and its interpretation

- VAR, 18 monthly variables, euro area data, similar type of variables as in this paper – estimation of the SV-BVAR over the sample January 1999-December 2019



When does stochastic volatility matter and its interpretation

- The relevance of stochastic volatility for the US is likely to be due to the long sample, which includes both the 60-70's and the most recent decades of lower volatility
- As mentioned for the COVID-19 example, also this change in volatility still needs to be accurately interpreted.
  - Before the Great Financial crisis, debate on whether the change in volatility was due to "good luck or good policy/change in economic structure".
  - Inflation targeting, flattening of the PC, change in slope of the IS curve …
- Given the relevance that SV models are taking in macro-econometrics, maybe the debate on how to interpret their results should be revived?