Macroeconomic Uncertainty Indicators for Russia

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Uncertainty: A multitude of macroeconomic effects…

- Disincentives for investment in the presence of fixed costs (a “real options” effect)
- Disincentives for consumption through a rise in precautionary savings
- Tighter financial constraints (a “financial frictions” effect)

… and a multitude of possible indicators

- Financial proxies, e.g. VIX (Bloom, 2009)

…but financial uncertainty does not always correlate with macroeconomic uncertainty

- Economic policy uncertainty (EPU): media-based indices popularized by (Baker, Bloom, Davies, 2012), number of expiring items in tax codes per year, dispersion of public spending forecasts; related concept: geopolitical risk indices (GPR by Caldara, Iacovello, 2019)
- Uncertainty as 'unforecastibility' of economic variables: non-parametric (e.g. based on dispersion of forecasts by experts/ firms)

…but expert forecasts may be subject to systematic bias

or parametric – based on standard deviation of model forecast errors (Jurado, Ludvigson, Ng, 2015)

Existing body of literature on uncertainty for Russia relatively scarce

- (Rautava, 2013): quarterly squared change in value of currency basket as a proxy; negative impact on output, imports and real exchange rate
- (Fedorova et al., 2019) construct an indicator of Russian policy uncertainty (RPUI) accounting for sanctions and trade restrictions on top of 'traditional' policy uncertainty terms; negative impact on Russian financial indicators is confirmed
- (Naidyonova, Leontieva, 2020) demonstrate negative impact of Russia's EPU on investment at the firm level
- (Afanasyev et al., 2021): sentiment of Trump's tweets concerning Russia positively correlates with ruble exchange rate

Macroeconomic uncertainty indicator based on (Jurado et al., 2015) (1)

Aggregate uncertainty as a weighted average of uncertainties of individual economic variables from a large dataset, defined as conditional volatilities of the purely unforecastable component of the future value of the series

$$U_t(\mathrm{h}) = \sum_j w_j U_t^{(j)}(h), \;\; U_t^{(j)}(h) = \sqrt{E\left[\left(y_{t+h}^{(j)} - \widehat{y_{t+h}^{(j)}}|t\right)^2 |t\right]}.$$

… for *h=1* approximated through forecast errors of factor-augmented forecasting models

$$y_{t+1}^{(j)} = \rho(\mathbf{L})y_t^{(j)} + \beta(\mathbf{L})\mathbf{F_t} + \gamma(\mathbf{L})\mathbf{F_{1,t}^2} + \delta(\mathbf{L})\boldsymbol{W_t} + \zeta(\mathbf{L})\mathbf{G_t} + e_{t+1}^{(j)}$$

(**F**$_\mathbf{t}$ – first principle components from $\{y^{(j)}\}$, **W**$_\mathbf{t}$ – first principle components from $\{(y^{(j)})^2\}$, **G**$_\mathbf{t}$ – exogenous variables)

Macroeconomic uncertainty indicator based on (Jurado et al., 2015) (2)

For h>1, uncertainty is calculated recursively, assuming autoregressive factor dynamics and stochastic volatility of errors (both for economic variables and factors)

$$e_{t+1}^{(j)} = \sigma_{j,t}^{y}\varepsilon_{j,t}^{y}, \quad \varepsilon_{j,t}^{y} \sim i.i.d\ N(0,1), \quad ln\sigma_{j,t}^{y} = \alpha_{j}^{y} + \beta_{j}^{y} ln\sigma_{j,t-1}^{y} + \tau_{j}^{y}\eta_{j,t}$$

$$\eta_{j,t} \sim i.i.d\ N(0,1)$$

Overall, uncertainty for h>1 has four components: (1) autoregressive component; (2) component due to volatility in predictors; (3) stochastic volatility; (4) covariance term for series and predictor errors

Data for Russia

- Monthly dataset 2004:01-2020:02 for 39 macroeconomic and financial variables (e.g. GDP, industrial production, freight turnover; employment by sector, real wages; retail trade; credit to households and businesses, monetary aggregates; exchange rate, external trade; CPI and PPI; interest rates, stock and bond indices)
- Pandemic period excluded due to 1) emergence of new common factors; 2) extremely high volatility that would dominate factor estimation throughout the entire period
- 8 common factors $\mathbf{F_t}$ selected from $\{y^{(j)}\}$ based on (Bai, Ng, 2002) criteria, accounting for 57% in variation. 1st factor: 18%, large weights on government bond yields, credit interest rate. 2nd factor: 12%, large weights of GDP, manufacturing, freight turnover

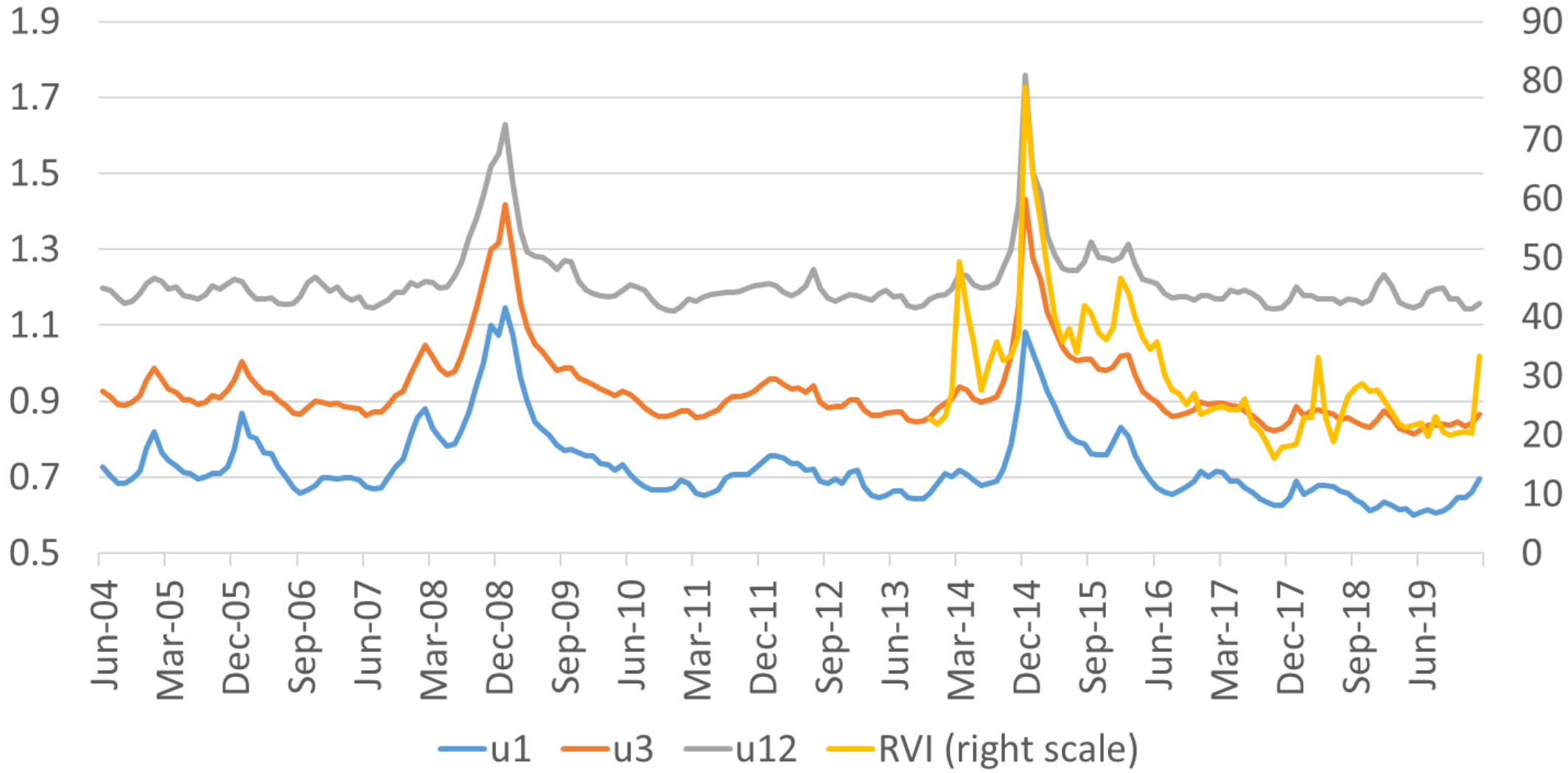
Estimation of uncertainty for Russia

- Exogenous variables: oil prices, sanction intensity index by (Omelchenko, Khrustalev, 2018), VIX

- Four lags initially included in $y_{t+1}^{(j)} = \rho(\mathbf{L})y_t^{(j)} + \beta(\mathbf{L})\mathbf{F_t} + \gamma(\mathbf{L})\mathbf{F_{1,t}^2} + \delta(\mathbf{L})\boldsymbol{W_t} + \zeta(\mathbf{L})\mathbf{G_t} + e_{t+1}^{(j)}$, with only regressors significant at 1% level eventually preserved. Estimates of $e_{t+1}^{(j)}$ used to construct 1-month-ahead uncertainty and to estimate stochastic volatility equation through Markov chain Monte Carlo methods

- $\alpha_j, \beta_j, \tau_j$ estimates are then used to assess uncertainty for farther horizons

Estimation results: month-, quarter- and year-ahead uncertainty



Uncertainty estimates: properties

- More persistent and countercyclical compared to many other uncertainty proxies

	u1	u3	u12	RVI	EPU	RPUI	GPR	SU	OILV
AR(1) coefficient	0,94	0,91	0,81	0,79	0,19	0,76	0,41	0,69	0,85
corr(*, u1)	1	0,98	0,89	0,87	0,02	-0,06	0,29	0,34	0,49
corr(*, u3)		1	0,96	0,90	0,06	-0,01	0,31	0,38	0,48
corr(*, u12)			1	0,88	0,11	0,02	0,31	0,38	0,49
corr(*, GDP_{+1})	-0,33	-0,27	-0,17	-0,25	0,27	0,55	0,07	0,18	-0,51

- Role of common uncertainty in individual series uncertainty higher in recessions and increases with horizon: average R^2 rises from 26% for u1 to 49% for u12

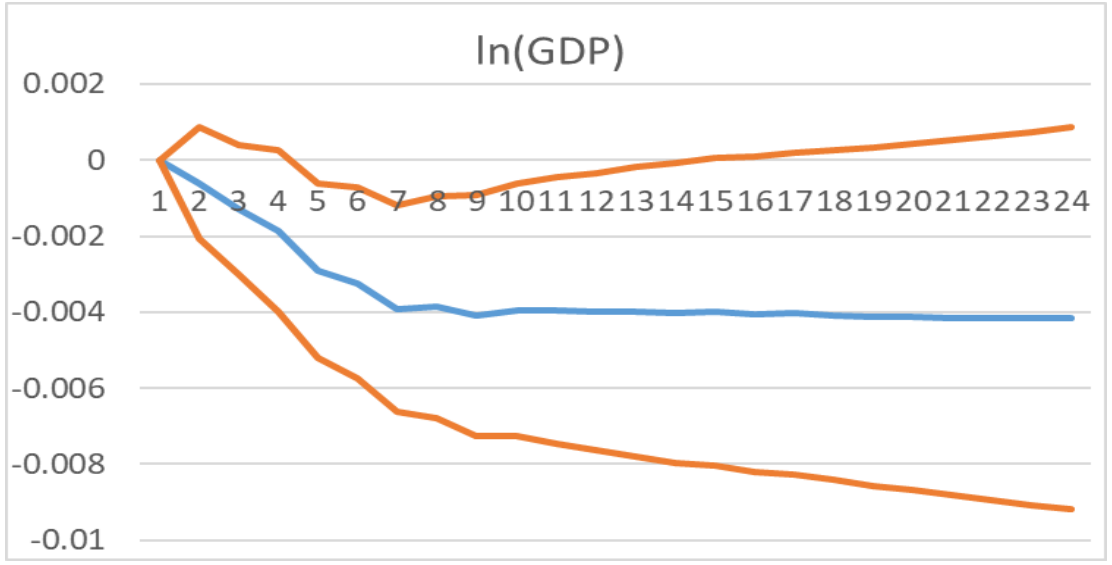
Uncertainty: impact on economic dynamics

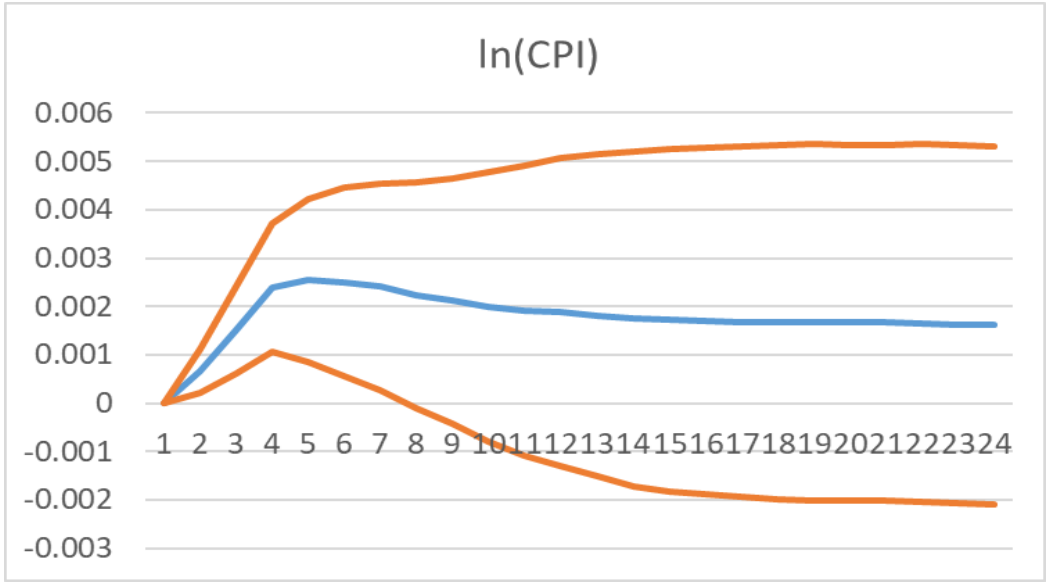
- VAR model with 4 endogenous (GDP, CPI, 1-year government bond yield, uncertainty) and 3 exogenous (oil prices, sanctions intensity, VIX) variables; 6 lags for endogenous, 3 for exogenous

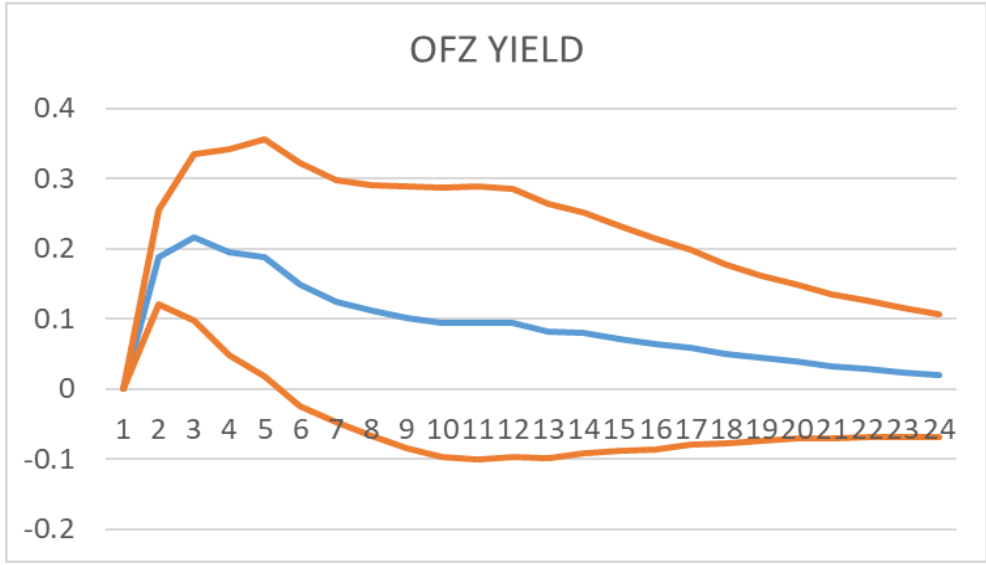
- Uncertainty ranked last in Cholesky decomposition, following (Ludvigson et al., 2021) evidence that macro uncertainty is rather a shock propagation channel than the main source of shocks itself

- Alternative uncertainty indicators: GPR, EPU, OILV

Impulse response functions







Share of GDP variance explained by uncertainty indicators, %

Horizon, months	u1	u3	u12	GPR	EPU	OILV
3	0,2	1,0	2,3	0,5	2,0	2,1
6	4,0	6,7	6,5	0,7	4,1	1,0
12	10,3	13,6	8,7	2,8	3,9	1,1
18	9,2	13,7	8,2	6,4	7,8	2,1
24	8,3	13,3	7,7	8,4	13,2	2,3

Conclusions

- Estimated uncertainty indicators have a long half-life compared to alternatives and demonstrate negative impacts on output and price stability
- Impact of uncertainty shocks on output persistent: no return to the 'pre-shock' level
- Important questions for macroeconomic policies:

- do uncertainty shocks reduce the effectiveness of countercyclical fiscal and monetary measures?

- and, the other way around, can countercyclical policies dampen uncertainty shocks?

Thank you for your attention!