

High-Frequency Monitoring of Growth-at-Risk ¹

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¹The views expressed here are those of the authors and do not necessarily reflect those of the Banque de France

Growth-at-Risk

- Our paper elaborates on the useful GaR tool introduced by Adrian, Boyarchenko and Giannone (2019, AER) in order to assess macro risks around the central scenario
- $\text{GaR}(\tau \%)$ is the quantile at $\tau \%$ of the future GDP conditional distribution, conditioned by financial markets' information
- The GaR methodology is simple and relies on 2 tools:
 - 1 a quantile regression that relates current GDP growth to past Financial Conditions (and past GDP)
 - 2 a flexible parametric distribution as the Generalized Skewed-Student distribution (Azzalini and Capitanio, 2003) fitted to conditional quantiles

Our contribution

- We extend the GaR approach of Adrian *et al.* (2019) by accounting for the high-frequency nature of the FCIs through a Mixed Data Sampling (MIDAS) approach.
- We focus on the Euro area and we consider two daily financial condition indexes (BdF FCI and ECB CISS) for which we provide an approach to optimally combine those 2 indexes.
- In addition, we also control by a macro forward-looking index (Composite PMI).
- We focus on the 10th quantile of the conditional predictive distribution of EA GDP and build an indicator of financial downward risks to *current* real activity: **GaR(10%)** and show how it can be used in real-time.

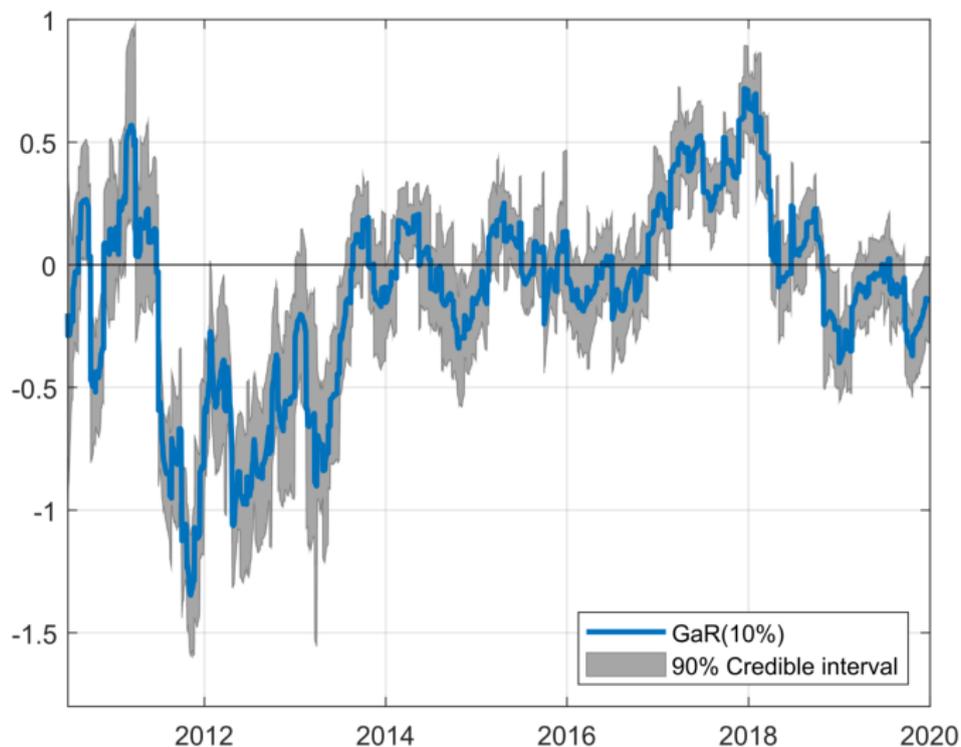
The estimation algorithm in a nutshell

- 1 For each financial index $i = 1, 2$, Bayesian estimation of MIDAS-QR model and the τ -th conditional predictive quantile function of $y_{T|T-h_d}$
- 2 Fit Skewed- t distribution to $\widehat{Q}_{i,y_{T|T-h_d}}(\tau|X)$, and get $Q_{i,y_{T|T-h_d}}^*(\tau|X)$.
- 3 Gather $Q_{i,y_{T|T-h_d}}^*(\tau = 0.10|\mathbf{X}_i)$
- 4 Combined conditional predictive quantile function is computed:

$$Q_{C,y_{T|T-h_d}}^*(\tau|\mathbf{X}) = \sum_{i=1,2} \omega_{i,T-h_d} \times Q_{i,y_{T|T-h_d}}^*(\tau|\mathbf{X}_i)$$

\Rightarrow Real-time combined high-frequency measure of downward financial risks to real activity – GaR(10%)

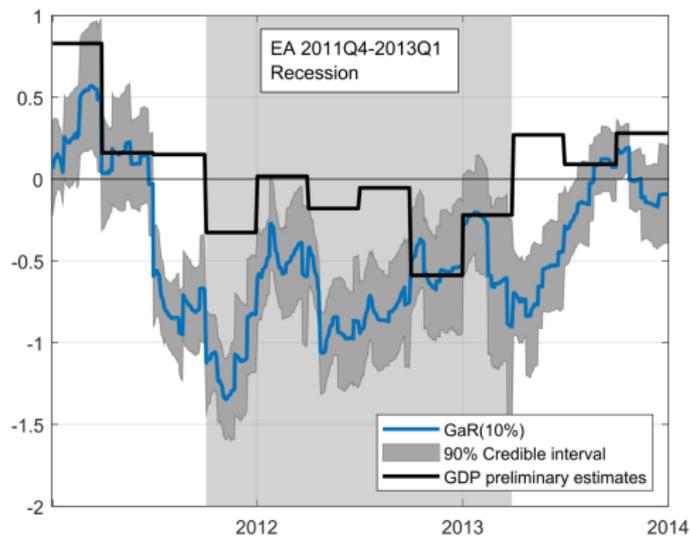
The daily combined GaR(10%) (2010Q3-2019Q4)



Four applications (main results)

- 1 **The 2011Q4-2013Q1 EA recession:** the GaR(10%) quickly captures a risk of recession during the summer 2011
- 2 **Nowcasting (2010Q3-2019Q4):** GDP density nowcasting using results for all quantiles; outperforms its competitors for relatively short forecast horizons.
- 3 **UMP announcements:** the GaR(10%) is very reactive by increasing immediately after each announcement
- 4 **Covid-19 crisis:** Swift responses from the GaR(10%), but do not fully recover the amplitude of the pandemic shock

Application 1 - The 2011Q4-2013Q1 EA recession



Application 2 - Nowcasting (2010Q3-2019Q4)

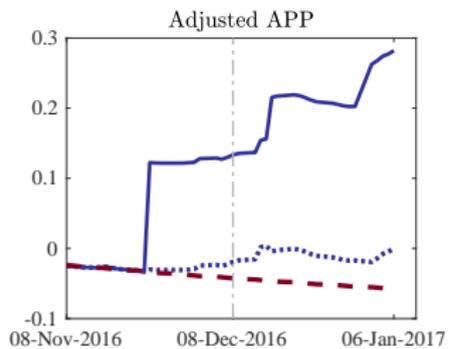
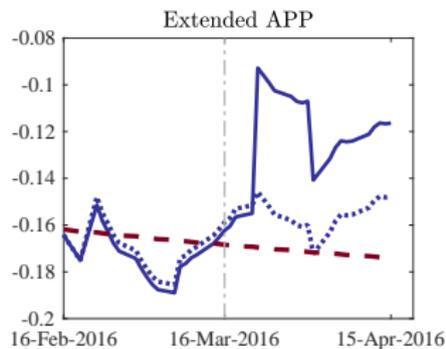
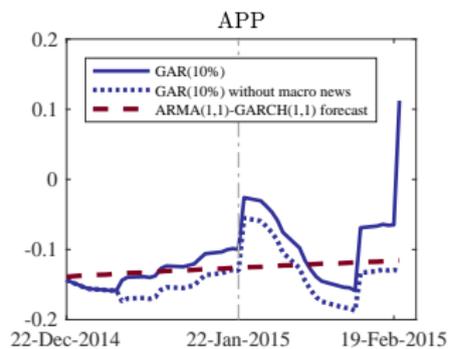
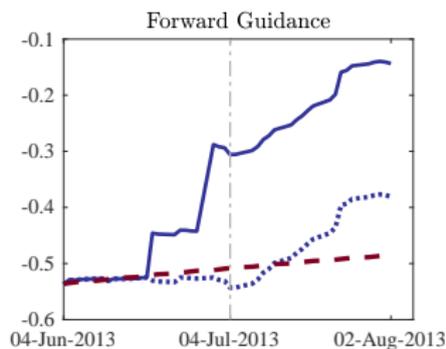
- Density forecasts are compared with BMIDAS and BQAR models
- Comparison based on 4 various criteria: LS, CRPS, QWPS and LS: Quantile-MIDAS outperforms in the short-run

Table: Out-of-sample results: relative accuracy of density forecasts

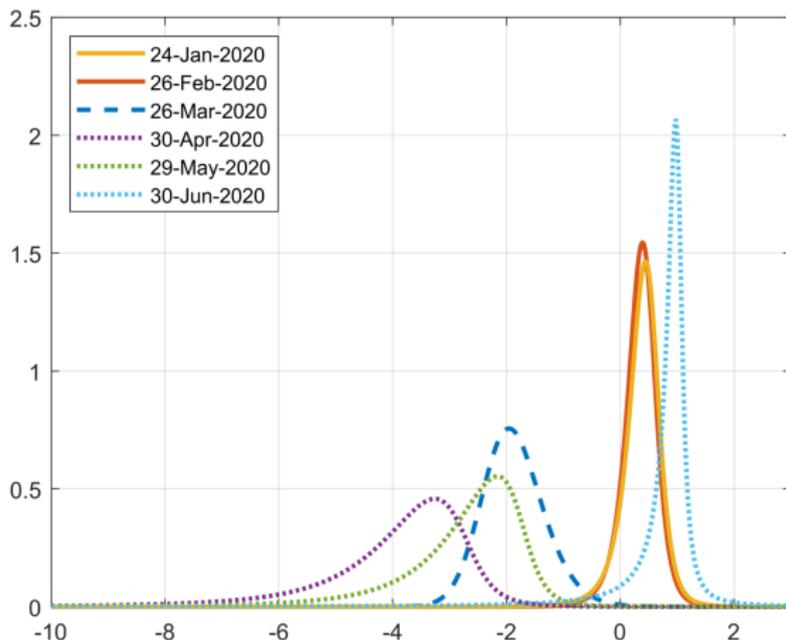
h_d	BMIDAS-QR				BMIDAS				BQAR(1)			
	LS	CRPS	QWPS	QS(0.10)	LS	CRPS	QWPS	QS(0.10)	LS	CRPS	QWPS	QS(0.10)
0	0.30	0.81	0.81	0.64	0.23	0.90	0.83	0.63	0.11	0.97	0.98	0.98
10	0.22	0.91	0.86	0.60	0.19	0.95	0.85	0.61	0.11	0.97	0.98	0.98
20	0.26	0.88	0.84	0.60	0.20	0.94	0.85	0.62	0.11	0.97	0.98	0.97
40	0.09	1.05	1.10	0.88	0.03	1.13	1.10	0.84	0.07	0.99	1.01	0.92
60	0.11	1.03	1.08	0.87	0.02	1.10	1.08	0.82	0.08	0.99	1.00	0.92

Notes: LS, CRPS, QWPS, and QS denote respectively the log-Score, the Continuously Ranked Probability Score, the Quantile Weighted Probability Score, and the Quantile Score (at $\tau = 0.10$), in relative terms with respect to the AR(1) benchmark. Bold-blue values denote the best outcomes for each forecast horizon h_d .

Application 3 - UMP announcements



Application 4 - The daily GaR(10%) and the COVID-19 episode



Conclusions

- We provide a real-time daily tool for monitoring downside financial risks to GDP growth of the euro area.
- We extend the seminal GaR approach by exploiting the high-frequency nature of FCIs through a Bayesian MIDAS-Quantile model
- We provided various examples of the effectiveness of this policy tool in terms of real-time macroeconomic analysis.
- During the Covid-19 episode, the EA daily GaR(10%) has provided a timely indication of tail risks on GDP, but *this time is different* as all the macro risks don't come from the financial sector.