High-Frequency Monitoring of Growth-at-Risk

Laurent Ferrara (SKEMA Business School)
Matteo Mogliani (Banque de France)
Jean-Guillaume Sahuc (Banque de France)

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1 The 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: \( \text{GaR(10\%)} \) and show how it can be used in real-time.
Our contribution

The estimation algorithm in a nutshell

1. For each financial index \( i = 1, 2 \), Bayesian estimation of MIDAS-QR model and the \( \tau \)-th conditional predictive quantile function of \( y_{T|T-h_d} \).

2. Fit Skewed-\( t \) distribution to \( \hat{Q}_{i,y_{T|T-h_d}}(\tau|X) \), and get \( Q_{i,y_{T|T-h_d}}^*(\tau|X) \).

3. Gather \( Q_{i,y_{T|T-h_d}}^*(\tau = 0.10|X_i) \).

4. Combined conditional predictive quantile function is computed:

\[
Q_{c,y_{T|T-h_d}}^*(\tau|X) = \sum_{i=1,2} \omega_{i,T-h_d} \times Q_{i,y_{T|T-h_d}}^*(\tau|X_i)
\]

\[\Rightarrow \text{Real-time combined high-frequency measure of downward financial risks to real activity — GaR(10\%)}\]
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

<table>
<thead>
<tr>
<th>$h_d$</th>
<th>BMIDAS-QR</th>
<th>BMIDAS</th>
<th>BQAR(1)</th>
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<tbody>
<tr>
<td></td>
<td>LS</td>
<td>CRPS</td>
<td>QWPS</td>
</tr>
<tr>
<td>0</td>
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<td>0.81</td>
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<tr>
<td>10</td>
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<td>40</td>
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<td>1.10</td>
</tr>
<tr>
<td>60</td>
<td>0.11</td>
<td>1.03</td>
<td>1.08</td>
</tr>
</tbody>
</table>

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

-0.6
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
04-Jun-2013 04-Jul-2013 02-Aug-2013
22-Dec-2014 22-Jan-2015 19-Feb-2015
16-Feb-2016 16-Mar-2016 15-Apr-2016
08-Nov-2016 08-Dec-2016 06-Jan-2017

Forward Guidance

APP

Extended APP

Adjusted APP

L. Ferrara
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.