Nowcasting GCC Quarterly GDP
(preliminary work)

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Outline

• About GCC-Stat
• Why nowcasting?
• Data: timeliness and predictors
• Estimation techniques and evaluation
• Results and discussion
• Conclusions
About GCC-Stat

• The Statistical Centre for the Cooperation Council for the Arab Countries of the Gulf *(GCC-Stat)* headquartered in Muscat, stated in 2013
  • the only official source of statistics for the GCC block.

• Key strategic objectives
  • Project the GCC region as a fully integrated economic and social agglomeration.
  • Support the functioning of GCC’s Common Market and Customs Union.
  • Aims to achieve coherence, integration and coordination on statistical work in the Gulf region
  • Implement international standards and classifications in GCC statistics
About GCC-Stat

For each, we have:
- objectives over the next five years
- how the datasets will evolve over time
- their frequency and timeliness
- statistical standards to be followed
- role of GCC-Stat in developing the statistics in that field

More details:
http://www.gccstat.org
Why nowcasting?

• Monitor current state of economy in a timely manner
• Provide inputs for policy making and evaluations (customs union, common market, etc.)
• Overcome considerable publication delays in reporting QGDP in GCC region
• Quarterly estimates of GDP can then be used to nowcast/forecast annual GDP
• Hardly no previous nowcasting attempts for the GCC countries/region
Why nowcasting?

Quarterly GDP growth (YoY)

-0.08  -0.04  0.00  0.04  0.08  0.12

I II III IV I II III IV I II III IV I II III IV I II III IV I II III IV I II

D4QGDP_BAH  D4QGDP_GCC
D4QGDP_KSA  D4QGDP_KWT
D4QGDP_OMN  D4QGDP_QTR
D4QGDP_UAE
Why nowcasting?

Quarterly non-oil GDP growth (YoY)

Data: timeliness

<table>
<thead>
<tr>
<th>Country</th>
<th>Available time series</th>
<th>Publication lag</th>
<th>Compilation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>2010Q1 – 2019Q2</td>
<td>+90 days</td>
<td>production method ((current and constant prices)) ((2010 = 100))</td>
</tr>
<tr>
<td>Kuwait</td>
<td>2010Q1 – 2019Q2</td>
<td>+90 days</td>
<td>production method ((current and constant prices)) ((2010 = 100))</td>
</tr>
<tr>
<td>Oman</td>
<td>2010Q1 – 2019Q2</td>
<td>+105 days</td>
<td>production method ((current prices))</td>
</tr>
<tr>
<td>Qatar</td>
<td>2011Q1 – 2019Q2</td>
<td>+90 days</td>
<td>production method ((current and constant prices)) ((2013 = 100)) + GDP by expenditure method ((current prices))</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2010Q1 – 2019Q2</td>
<td>+90 days</td>
<td>production method ((current and constant prices)) ((2010 = 100)) + Gross domestic product by expenditure method ((current and constant prices)) ((2010 = 100))</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>2012Q1 – 2019Q2</td>
<td>+90 days</td>
<td>production method ((current and constant prices)) ((2013 = 100)) + GDP by expenditure method ((current prices))</td>
</tr>
</tbody>
</table>
Data: possible predictors

Production and Expenditures
- No monthly IPI, Service Index, or Retail Sales / other indicators published with long lags
- Oil production / monthly imports financed by banks

Local goods prices
- CPI / PPI

Financial and monetary
- Monetary aggregates / bank credit / Interest rates / Exchange rates / Stock prices

Global activity
- Oil prices / commodity prices / uncertainty index / MCSI_World / US_IPI / OECD LCI

Soft data (surveys)
- No monthly confidence indicators
- Only quarterly for few countries

Labor data
- No monthly labor statistics
- Only quarterly, published with long lags
Estimation Strategy

• Nowcasting preliminary estimates of quarterly GDP using most recent monthly indicators that measure economic activity

• We take the growth rate over 4 quarters to eliminate the seasonality within the data

• Compare two mixed frequency approaches: Mixed-Data Sampling (MIDAS); and dynamic factor, and also discuss the usefulness of forecast combination.

• Monthly predictors would be available within 5-6 weeks after the last day of the reference quarter (3-4 weeks before the official QGDP is released)
  • We could nowcast GDP well before, either by smoothing missing data or by simply leaving the data with later publication dates out of the sample.

• Prepare a nowcast for each country, then combine the nowcasts for the GCC block using GDP weights
The Models

• **MIDAS: Mixed Data Sampling**

  • *directly estimates the current quarter using a lag structure*, Ghysels, Santa-Clara, and Valkanov (2004); Clements and Galvão (2008).

  • Parsimonious and works for ragged-edge data structure

  \[
  y_t = \alpha + \sum_{i=1}^{k} \sum_{j=0}^{l_i} \beta_{i,j} x_{i,3t-j}^M + \epsilon_t
  \]

  • *\( y_t \) denotes a GDP growth in quarter \( t \).*
  • *\( x_i^M \) denotes a monthly economic indicator \( i \) in \( 3t-j \)th month.*
  • *\( k \) stands for the number of indicators, and \( l \) denotes the number of lags for the indicator \( i \) in terms of month \( j \).*
The Models

• **DFM: Dynamic Factor Model**

• Dynamic factor models summarize the information contained in the monthly dataset using a limited number of factors
  • Factors are specified as vector autoregressive processes.
• Kalman filter generates estimates of the unobserved monthly factors (Stock and Watson (2002a, 2002b))

\[
\begin{align*}
x_t &= \mu + \Lambda f_t + \varepsilon_t, \\
f_t &= A_1 f_{t-1} + \cdots + A_p f_{t-p} + u_t, \quad u_t \sim i.i.d. N(0, Q) \\
\varepsilon_{i,t} &= \alpha_i \varepsilon_{i,t-1} + \varepsilon_{i,t}, \quad \varepsilon_{i,t} \sim i.i.d. N(0, \sigma_i^2)
\end{align*}
\]

• \( x_t \) is a vector of observed monthly indicators
• \( f_t \) is a vector of (unobserved) common factors
• \( \varepsilon_t \) is a vector of idiosyncratic components
• \( \Lambda \) denotes the factor loadings for the monthly variables.
Forecast Evaluation

• We split the sample in two parts and use data starting from 2017Q1 for the out-of-sample analysis.

• Out-of-sample forecasts are obtained as follows. We first estimate the various models from 2010Q1 to 2016Q4 and obtain forecasts for 2017Q1.

• We then expand the estimation window forward by one quarter (as more information become available), re-estimate the models and calculate forecasts for 2017Q2.

• We compare forecast performances of different models using the root mean square forecast error (RMSFE).
Results

GCC quarterly GDP growth rate (YoY): Actual and various nowcasts

[Graph showing actual and various nowcasts for GCC quarterly GDP growth rate (YoY) from 2017 to 2019.]
Results

GCC Quarterly non-oil GDP growth (YoY): Actual and various nowcasts

Actual AR DFM-AR
DFM MIDAS-DFM MIDAS

GCC Quarterly non-oil GDP growth (YoY): Actual and various nowcasts

2017 2018 2019
Table 3: Quarterly GDP Forecast performance of all models measured by RMSFE for the out-of-sample (2017Q1 – 2019Q1)

<table>
<thead>
<tr>
<th></th>
<th>Benchmark</th>
<th>AR</th>
<th>MIDAS</th>
<th>MIDAS_AR</th>
<th>DFM</th>
<th>F-MIDAS</th>
<th>F-AR</th>
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</thead>
<tbody>
<tr>
<td>Bahrain</td>
<td>1.00</td>
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<td>1.30</td>
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<td>1.01</td>
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<tr>
<td>Kuwait</td>
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<td>0.97</td>
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<td>Saudi Arabia</td>
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<td>0.91</td>
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<tr>
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<tr>
<td>GCC</td>
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<td>1.30</td>
<td>1.12</td>
<td></td>
<td>0.98</td>
<td>1.13</td>
<td>0.93</td>
</tr>
</tbody>
</table>
Discussion

• Superior nowcasts using YoY growth compared to QoQ growth

• DFM and MIDAS give less accurate predication compared to other economies
  • Lack of timely economic activity measures

• findings suggest that mixed frequency models record out-of-sample performance when augmented to AR model. Also, there is a gain from combining model nowcasts
  • large body of literature that suggests that forecast combinations can provide more accurate forecasts by combining multiple models rather than relying on a specific model (see Hendry and Clements, 2004; and Timmermann, 2006)
Conclusions

• This paper presents a QGDP nowcasting exercise in a limited-data environment.
• Incorporation of monthly information in nowcasting procedures pays off partially in terms of forecasting accuracy
  • Underscore the importance of publishing high frequency leading indicators in GCC region
• Models proposed should be regularly reviewed and updated
• Future steps: nowcast other components of National Accounts
Thank you

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