Consistent country- and regional-level nowcasts of industrial production

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Second Technical Workshop on Nowcasting
May 2022
Indices of industrial production (IIPs) are among the most common indicators in nowcasting/forecasting models of economic activity

- Available in many countries
- Quarterly or monthly frequency
- Relatively short publication lag
- Manufacturing activity closely mirrors overall economic activity

However, in some cases IIPs are available only infrequently or published with long delays

IIPs are good candidates for nowcasting given the availability of many relevant indicators shortly after the reference period
Uses of nowcasting at UNIDO

► UNIDO has the international mandate for producing, compiling and disseminating comparable industrial statistics
► Increased interest for timely and disaggregated industrial statistics
► Up-to-date indicators for monitoring trends in industrial activity at the sector, country and global levels
► Evidence for guiding and evaluating policy programmes
► Six industry-related SDG 9 indicators
► Need for transparent, simple and scalable methodologies for (SDG) indicator nowcasting/forecasting
Current practice

- UNIDO has published nowcasts of manufacturing value added (MVA) since ~2005
- Boudt, Todorov and Upadhyaya (2009)
- Methodology exploits the relationship between MVA and indicators/forecasts of overall economic activity
- By assuming a fixed sector structure, estimates at the division level are also produced
- For quarterly and monthly IIP series, country-level series are estimated through ARIMA models, but only to fill gaps when calculating aggregates
Current practice

- New nowcasting model for industrial production
- Target variables: quarterly output at the global and regional levels
- Methodology: DFM using EM algorithm to deal with missing data (Bok et al., 2017)
- Objective: system of consistent country-, regional- and global-level nowcasts
Current practice

- Database of 1000+ monthly and quarterly indicators
  - Country-level IIPs
  - Trade indices
  - Merchandise transport/freight
  - Retail trade/consumption
  - Sector-specific indicators (automobiles, steel, oil, etc.)
  - Employment
  - Electricity consumption
  - Soft indicators (business confidence, new orders, PMIs, etc.)
  - Trade and GDP forecasts

- Curse of dimensionality: computationally demanding, risk of overfitting, challenging to maintain and difficult to communicate

- Importance on model selection
Top-down vs. bottom-up approach

- Should we target aggregates directly, or should we nowcast country-level indicators and then aggregate?
- Although country-level estimates are more relevant and timely, the large number of estimates significantly increase the complexity of the task.
- In addition, by estimating country models independently, inter-country correlations are not considered and this could lead to inconsistent estimates.
Ad hoc methodology

1. Obtain a (top-down) global/regional nowcast as a starting value
   ▶ Careful model selection of all potential variables
2. Calculate country-level nowcasts
   ▶ Short models based on a reduced set of potential variables
3. Construct a new (bottom-up) global/regional nowcast by aggregating country-level estimates
4. Iterate steps 2 and 3 until convergence
Target variable

- Quarterly Latin American IIP (ECLAC definition)
- Most countries in the region have quarterly or monthly IIP (86% of regional MVA)
- Most countries publish IIP within 45 or even 30 days after the end of the reference period, but there are some laggards

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Target variable

- Database built in January 2022, last observed regional aggregate: Q2 2021
- Target periods: Q3 2021, Q4 2021, Q1 2022
Step 1: Top-down nowcast

- Direct nowcast of the regional aggregate, based on many candidate indicators
- Model selection based on a recursive forward- & backward-selection process following predetermined blocks of variables:
  - Overall block
  - Industry
  - Trade and transport
  - Consumption
  - Latin America
  - High-income economies
  - Middle and low-income economies
  - Soft indicators and forecasts
- Selection criteria: best predictive performance over a testing sample
- These are the starting values of the algorithm
Step 2: Country-level nowcasts

- Each country’s model is built automatically, including the following indicators:
  - Indicators specific to the country
  - Selected indicators of main trading partners
  - Current value of the Latin American regional estimate

- The inclusion of the regional aggregate ensures consistency between the country-level nowcasts and the regional nowcast

- Country-level nowcasts calculated for the three target periods
Step 3: Bottom-up nowcast

- Once the country-level nowcasts are available, a regional aggregate is calculated for the three target periods.
- These will be the new values for the next iteration of the algorithm.
Step 4: Iterate until convergence

- The previous two steps are repeated until convergence.
- Convergence is obtained when the average difference between the current and the previous iteration (for the regional nowcast in the three target periods) falls below a convergence threshold.
- Using a threshold of $1\text{e}-4$, convergence was achieved in only 8 iterations.
Results

-The methodology proposed produced a smaller average prediction error for the regional aggregate over a testing sample
- Convergence achieved quickly in all tests
- Feasible methodology that produces consistent country- and regional-level nowcasts
Next steps

- Adapt the estimation methodology to include annual variables, increasing country coverage
- Additional tests, including for other regions and for global industrial production
- Modify the algorithm to include two-layers of regional aggregates
- Estimators at the division level, by exploiting not only inter-country correlations but also co-movements within the same industry?