

Consistent country- and regional-level nowcasts of industrial production

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Nowcasting industrial activity

- ▶ 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

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

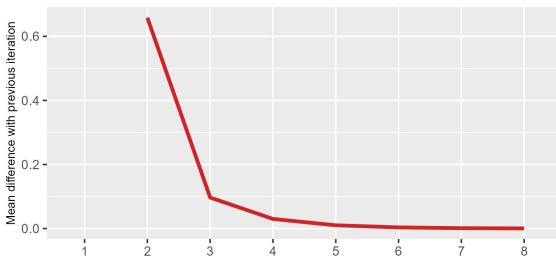
- ▶ Each country's model is built automatically, including the following indicators:
 - ▶ Indicators specific to the country
 - ▶ Selected indicators of main trading partners
 - ▶ Current value of the Latin American regional estimate
- ▶ The inclusion of the regional aggregate ensures consistency between 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 $1e-4$, 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?