



Nowcasting global trade in goods and services

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International Organizations

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Some context

Increased demand for up-to-date estimates of global trade

Global trade aggregates are published with a considerable lag

UNCTAD macro models for forecasting or policy evaluation,
but lack of a nowcasting model

First nowcasts published in December 2018

Target variables

1. World trade in goods, value and volume
2. World trade in services, value
3. Global GDP

Target variables at annual frequency, but currently transitioning to quarterly frequency

“Official” figures are published in April and June following the end of the year, respectively, for annual trade and GDP

Quarterly trade figures released approximately with a four-month lag

Objectives

Estimate target variables at the current and next quarters by using all available information

Rely on methodologies that produce quantitative estimates

Update nowcasts regularly for dissemination or inputs to other estimation models

Build a real-time monitoring tool for global trade

Value added

One of few nowcasts for world trade in goods and the first, to our knowledge, for trade in services

Methodology has been modified to accommodate additional variable types: levels, m-o-m or y-on-y growth rates, etc.

Implementation is very general and it can easily incorporate variables of many different types and frequencies

Estimation algorithm emphasizes model selection

How is the nowcast calculated?

Definition of the model

We rely on dynamic factor models (DFMs), frequently used in nowcasting applications

This model is expressed in a state-space representation

$$G_t = Bh_t + u_t \quad \Leftarrow \quad \text{Measurement equation}$$

$$h_t = Dh_{t-1} + v_t \quad \Leftarrow \quad \text{Transition equation}$$

This is a joint model of the target variable and all indicators

How is the nowcast calculated?

Estimation algorithm

1. Select target variable
2. Collect database of relevant indicators and transform them as required
3. Estimate the parameters of DFM through QML
4. Use the estimated factor for real-time monitoring of target variable

How is the nowcast calculated?

Statistical challenges

In practice, the implementation of this idea is complicated by two issues

1. Data complications
2. Data-rich environment

How is the nowcast calculated?

Statistical challenges: data complications

Missing data, variables of heterogeneous frequency and ragged ends [sample](#)

Recent methodological developments allows us to work around most data issues

Our model is based on the implementation by Mariano & Murasawa (2003) and Camacho & Perez-Quiros (2010), adapted to allow different frequencies and types of variables

How is the nowcast calculated?

Statistical challenges: data-rich environment

The remaining issue and the core difficulty of nowcasting is one of **model selection**.

How to select among many potentially relevant indicators while keeping the model simple and avoiding overfitting?

Building the database of potential indicators

Inclusion criteria

- ▶ Theoretical, structural or empirical relevance
- ▶ Timely available
- ▶ Frequency at least as high as the target
- ▶ Available for a long enough period of time
- ▶ Future availability

Building the database of potential indicators

Selection process

- I. Define initial model, variables selected *a priori*
- II. Discard variables that were not significant or that have a low contribution
- III. Choose lag structure of the model
- IV. Apply a forward selection process by blocks of variables
- V. Choose final model

Building the database of potential indicators

Selection criteria

This is required to choose the configuration of the model and the indicators that will be considered

Model selection is based on three criteria:

- ▶ Percentage of the variability of the target variable explained by the model (over the full sample)
- ▶ Mean absolute error of the estimates at $t - 1$ and one quarter before (calculated over the testing sample)
- ▶ Diebold-Mariano test of predictive accuracy

Nowcast, global trade in goods, value

Indicators

- A. Sub-components of the target variable
- B. Structural variables
- C. Other related indicators
- D. “Soft” indicators
 - ▶ Business and consumer confidence indices
 - ▶ Industrial/manufacturing (export) orders
 - ▶ PMIs
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in goods, value

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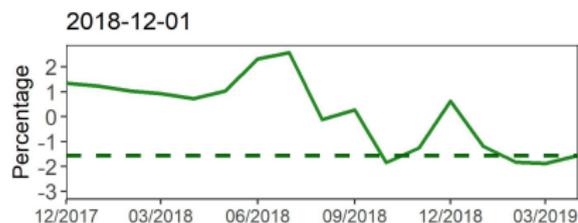
Nowcast, global trade in goods, value

Estimated quarterly growth rate, 2005-1Q2020



Nowcast, global trade in goods, value

Pseudo-real-time forecast of annual growth rate, last 4 quarters



Nowcast, global trade in goods, volume

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Indicators

- A. Sub-components of the target variable
 - ▶ Quarterly or monthly export volumes of main world exporters (countries or aggregates)
- B. Structural variables
- C. Other related indicators
- D. “Soft” indicators
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in goods, volume

Indicators

- A. Sub-components of the target variable
- B. Structural variables
 - ▶ Industrial production indices of countries with largest manufacturing VA
 - ▶ Retail trade volumes of countries with largest consumption
 - ▶ Construction permits
- C. Other related indicators
- D. “Soft” indicators
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in goods, volume

Indicators

- A. Sub-components of the target variable
- B. Structural variables
- C. Other related indicators
 - ▶ Maritime and air transport of cargo
 - ▶ Global and regional export values of main exporters
 - ▶ Commodity and manufacturing price indices
 - ▶ International cooperation index
- D. “Soft” indicators
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in goods, volume

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Nowcast, global trade in goods, volume

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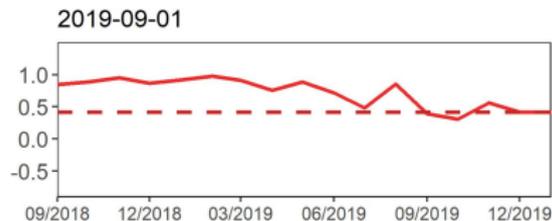
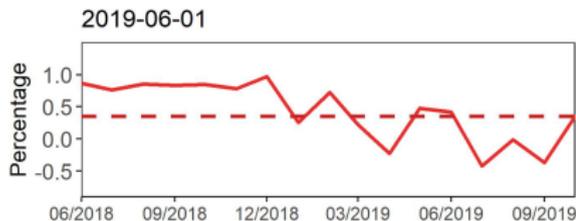
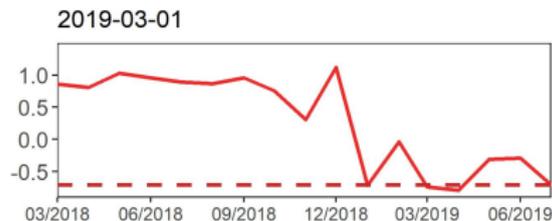
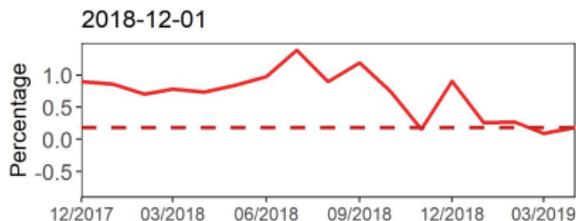
Nowcast, global trade in goods, volume

Estimated quarterly growth rate, 2005-1Q2020



Nowcast, global trade in goods, volume

Pseudo-real-time forecast of annual growth rate, last 4 quarters



Nowcast, global trade in services

[skip](#)

Indicators

- A. Sub-components of the target variable
 - ▶ Quarterly or monthly service exports of main exporters
- B. Structural variables
- C. Other related indicators
- D. “Soft” indicators
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in services

Indicators

- A. Sub-components of the target variable
- B. Structural variables
 - ▶ Merchandise trade values and volumes
 - ▶ International tourism statistics
 - ▶ Industrial production and retail trade indices
 - ▶ Air and maritime merchandise transport
 - ▶ FDI flows
- C. Other related indicators
- D. “Soft” indicators
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in services

Indicators

- A. Sub-components of the target variable
- B. Structural variables
- C. Other related indicators
 - ▶ Services production indices at the country level
 - ▶ Unit prices of exports, commodity prices
 - ▶ International cooperation index
- D. “Soft” indicators
- E. Forecasts/preliminary estimates of the target variable

Nowcast, global trade in services

Indicators

- A. Sub-components of the target variable
- B. Structural variables
- C. Other related indicators
- D. “Soft” indicators
 - ▶ Business confidence indices of service sector
 - ▶ Non-manufacturing PMIs
 - ▶ Consumer confidence indices
- E. Forecasts/preliminary estimates of the target variable

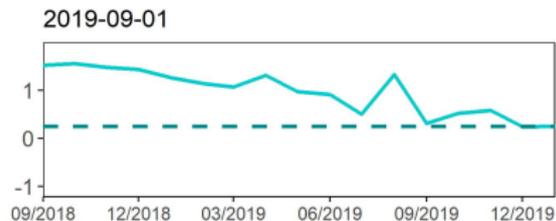
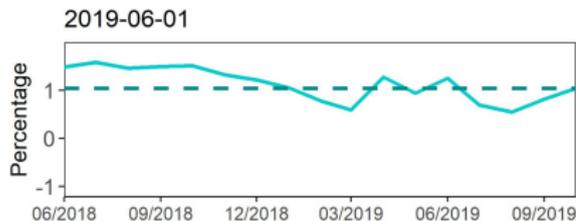
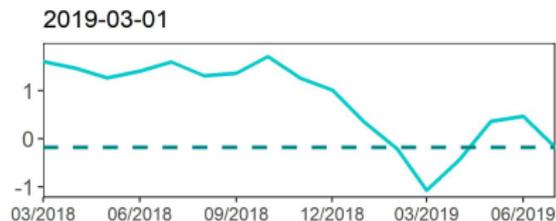
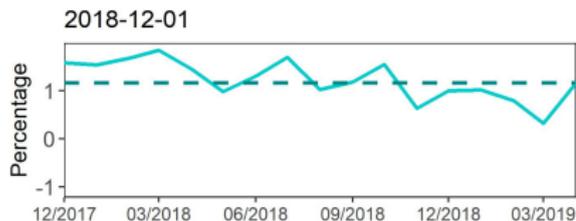
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Nowcast, global trade in services

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Dissemination

UNCTAD working paper

Handbook of Statistics

Future dissemination mechanisms

Next steps

- ▶ Move to another implementation using EM algorithm (for example, Bok et al, 2017)
- ▶ Apply methodology to other variables of interest (FDI)
- ▶ Develop nowcasts of related variables (trade by region, trade of specific product groups, GDP by component)
- ▶ Automatic model selection methodologies
- ▶ Explore alternative models (in particular, MIDAS or factor-augmented MIDAS)
- ▶ Develop a real-time monitoring tool of global trade and its main components



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Sample data

Period	Services exports, US	Services exports, OECD	IPI, DE	IPI, CN	Tourist arrivals, world	Tourist arrivals, FR	Commodity prices	PMI, US	PMI, CN
2018/06	68796		107.4	6.0	5.8	4.1	127.1	60.0	51.5
2018/07	68791		105.6	6.0	3.9	5.6	124.7	58.4	51.2
2018/08	68901		105.8	6.1	5.5	6.9	124.0	60.8	51.3
2018/09	69002	1021762	105.7	5.8	5.1	6.0	129.7	59.5	50.8
2018/10	68865		104.9	5.9	5.2	8.5	132.2	57.5	50.2
2018/11	68852		103.8	5.4	3.9	9.7	119.9	58.8	50.0
2018/12	69080	1022798	104.5	5.7	3.9	-0.9	111.3	54.3	49.4
2019/01	68915		103.2		3.9	-1.7	112.0	56.6	49.5
2019/02	69341		103.5		4.1	-3.7	116.0	54.2	49.2
2019/03	69614	1028584	104.2	8.5	2.2	-10.3	117.7	55.3	50.5
2019/04	70053		101.7	5.4	7.3	12.9	120.8	52.8	50.1
2019/05	71109		102.6	5.0	3.2		118.6	52.1	49.4
2019/06	71097	1041046	101.0	6.3	6.5	3.6	112.0	51.7	49.4
2019/07	70641		100.5	4.8	3.5	-3.5	113.9	51.2	49.7
2019/08	70620		101.4	4.4	3.1	-2.4	108.8	49.1	49.5
2019/09	70722	1044078	100.1	5.8	4.2	20.9	112.5	47.8	49.8
2019/10	71105		98.4	4.7	3.2	-5.5	109.8	48.3	49.3
2019/11	71470			6.2	2.9		113.0	48.1	50.2
2019/12					2.3			47.2	50.2

main