

# Nowcasting from Cross-Sectionally Dependent Panels

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# Introduction

**Nowcasting:** The tool for short-term outlook

## This paper: Panel Nowcasting

- Mixed frequency
- Spillovers
- Feedback between target and predictor
- Parameter heterogeneity
- Sparse estimation
- Doubly asynchronous daily calendar

## Motivation & Significance

- Mixed frequency panels improve nowcasts with different targets
- National macro nowcasting models target single country
- Limited provision for spillovers in nowcasting models
- International data enhance national macro nowcasts

# Panel Nowcasting Framework

$$y_{i,t+h} = c_{yi} + \phi_i y_{i,t} + \beta'_{0i} x_{i,t+w}^M + \beta'_{1i} x_{i,t+w-\frac{1}{3}}^M + \beta'_{2i} x_{i,t+w-\frac{2}{3}}^M + u_{i,t} \quad (1a)$$

$$u_{i,t} = \gamma'_i f_t + \epsilon_{i,t} \quad (1b)$$

$$x_{i,t+w}^M = c_{xi} + \alpha_i y_{i,t} + \Gamma'_i f_t + v_{it} \quad (1c)$$

- Can include more predictors/frequencies in Eq 1a

# Estimation of Factors

- Define

$$z_{it} = \begin{pmatrix} y_{i,t-1} \\ X_{i,t}^M \end{pmatrix}, \bar{z}_{wt} = \sum_{i=1}^N w_i z_{it}, \text{ and } \tilde{z}_{wt} = \bar{z}_{wt} - c_{zw} \quad (2)$$

- Writing compactly

$$A_{0i} z_{it} = c_{zi} + A_{1i} z_{i,t-1} + C_i F_t + e_{it} \quad (3)$$

- Estimation of factors:

$$f_t = G(L) \tilde{z}_{wt} + O_p(N^{-\frac{1}{2}}) \quad (4)$$

where

$$A_{0i} = \begin{pmatrix} 1 & 0 \\ -\alpha_i & 1 \end{pmatrix}, A_{1i} = \begin{pmatrix} \phi_i & \beta_i' \\ 0 & 0 \end{pmatrix}, C_i = \begin{pmatrix} 0 & \gamma_i' \\ \Gamma_i' & 0 \end{pmatrix}, F_t = \begin{pmatrix} f_t \\ f_{t-1} \end{pmatrix}$$

# Pseudo-real-time Experiment

## Data

- Nowcast Target: Annual changes in quarterly logarithm of GDP
- High Frequency Predictors:
  - Confidence Indices: OECD Business Surveys
  - Industrial Production
- Lack of international harmony in high-frequency macro data
- Panel Dimensions:
  - Time: 231 months (Jan 2001 to March 2020)
  - Cross - Section: 20-33

## Set-up

- Estimation Scheme: Recursive, one-step (quarter) ahead
- Time window: 155 days from start of nowcast quarter
- Update Frequency: Daily

# Estimation

## Calendar Effects

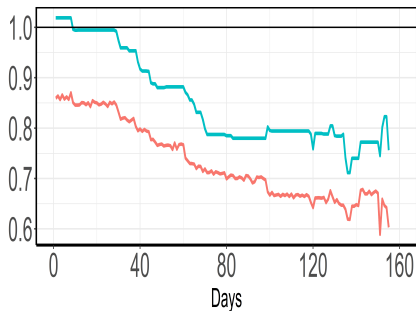
- Calendar: 2-level ragged edge :
  - Between Countries
  - Within Countries
  - Country dependent lag structure

## Shrinkage based Estimation

- LASSO type of shrinkage performs best in terms of out-of-sample evaluation
- The shrinkage based estimation further enables inclusion of countries with shorter history of macro data such as India, Canada, Mexico and Chile

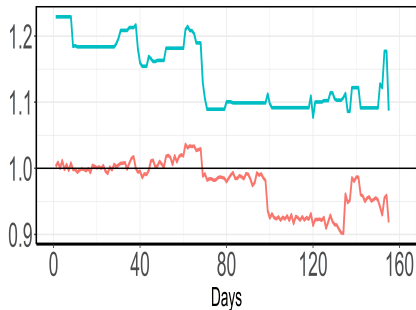
# Results

Mean<sup>2</sup>Relative RMSE, Predictor: Business Survey Manufacturing



Model - LASSO - PMIDAS

Figure: (b) Benchmark: Time Series MIDAS



Model - LASSO - PMIDAS

Figure: (a) Benchmark: Time Series AR(1)

# Results II

Per cent outperforming, Predictor: Business Survey Manufacturing

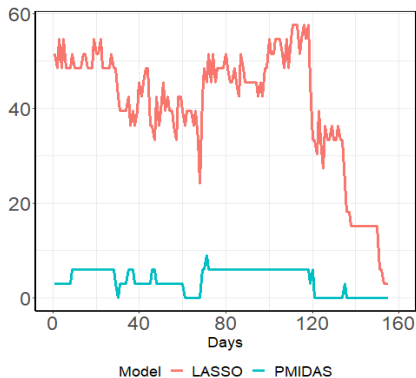


Figure: (a) Benchmark: Time Series AR(1)

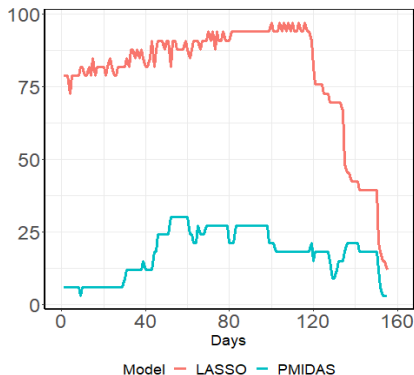
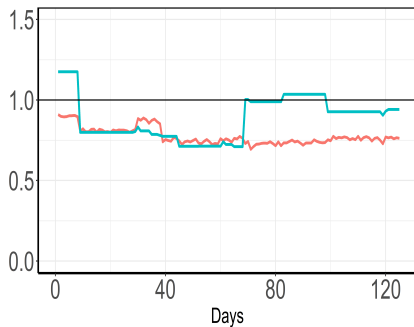


Figure: (b) Benchmark: Time Series MIDAS



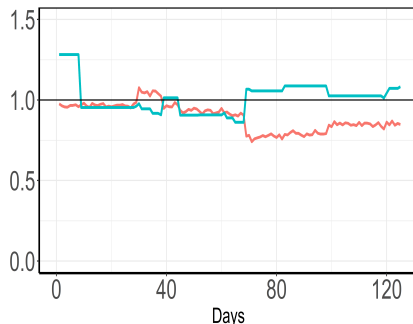
# Results - COVID times: Q1-Q3:2020

Mean<sup>3</sup>Relative RMSE, Predictor: Business Survey Manufacturing



Model — LASSO — PMIDAS

**Figure:** (a) Benchmark: Time Series AR(1)



Model — LASSO — PMIDAS

**Figure:** (b) Benchmark: Time Series MIDAS

<sup>2</sup>15 per cent upper trimmed

# To Sum Up

## Contributions

- Panel MIDAS model incorporating spillovers naturally
- CSD panel models: Causal to now/forecasting applications
- Empirical application
  - simultaneous nowcasting GDP for multiple countries
  - Two-level asynchronous nowcast calendar

## Key Findings

- Panel nowcasts beat standard benchmarks
- Monotonically improving nowcasts
- Survey data is relevant even later on in the nowcast quarter
- Improved performance during the COVID quarters

# Thank You