Tracking Indian Growth in Real Time

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Motivation

- Assessment of current state of the economy is key for effective policy making.
- Obtaining early warnings about low-frequency key economic indicators in an imperfect information environment is a challenge
- Longer-term projection requires some "structural" model
- Short-term forecast/nowcast is key input for effective longer term analysis (as initial conditions for the model)

Motivation

How can one gauge the current state of the economy?

- Tracking growth would be best performed using a measure like GDP

- But can we just "sit" on the most recent quarterly GDP figures?
- No, we can do better: by *nowcasting* GDP
- Exploit the available information on data which is related to GDP but:
    - collected at higher frequency
    - released in a more timely manner

What do we know about GDP?

- GDP estimates are released at annual and quarterly frequency
- Estimation is released on the production and expenditure side
- Estimates are released with a considerable delay
- Estimates subject to revisions for a considerable time frame of 3 years
- Quarterly estimates based on a *narrow set of indicators*

Discrepancy in the production and expenditure side GDP

std of the discrepancy=1.35

y-o-y growth rate vs Time

Production side
Expenditure side
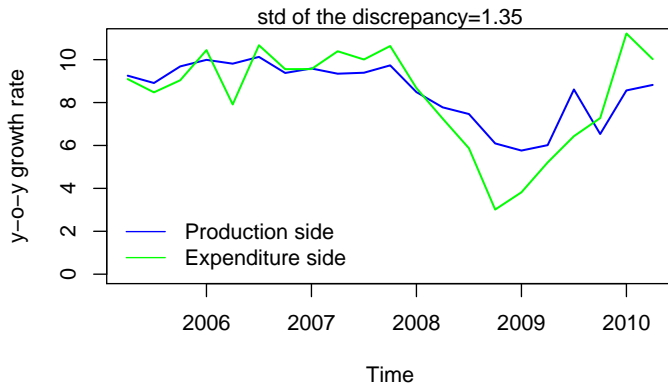
What do we know about GDP and other monthly indicators?

We have various monthly indicators

On Aug.30 2010 just before the Q2-2010 GDP data release we knew:

- GDP: Q1-2010
- IIP: June 2010
- Monetary variables: July 10
- Small set of activity series like car sales, commercial vehicles production
- Financial markets data

Fragmented picture:

- $\rightarrow$ hard to gauge most recent conditions
- $\rightarrow$ even harder to see through the up/downs (smoothing)

Using monthly information to track GDP growth

Nowcasting is routinely performed within Central Banks, Finance Ministries and private analysts:

- Bridge equations: Barhoumi et.al, 2008, Angelini et.al, 2008
- Dynamic Factor Models: Stock and Watson, 2002, Forni et.al, 2000, Giannone et.al, 2005, Agostino et.al, 2008
- Bayesian VARs: Banbura et.al, 2008

Tracking Indian GDP

- Nowcast GDP excluding agriculture
- Exclude agriculture: mainly monsoon-driven, very volatile

Nowcasting Indian GDP : methods used

We start with simpler models as a first time exercise.

- Simple Naive and ARIMA forecasts
- Bridge style models with monthly indicators (direct)
- Bridge model: bottom up approach (indirect)

Bridge models

- The bridge models approach (Baffigi et al., 2003, Barhoumi et al., 2008) is designed to "bridge" early releases of monthly indicators with quarterly GDP
- Short-run forecasting (actually nowcast) in a real time setting, taking into account the non-synchronous release of monthly information throughout the quarter
- Bridge models resort to hard (e.g. IIP) and soft data (e.g. surveys)
- In India: little or no literature on the subject

GDP "reconstructed" from a limited information set

As a first step, we attempt *in-sample* to mimick the CSO methodology
From the available monthly indicators, we seek to obtain estimates of GDP
growth by aggregating sectoral Value Added.

1. to estimate sector s VA, use sectoral proxies Xs (growth rate)

$$g_{s,t}^{VA} = \alpha + \sum_{j=1}^{k} \beta_j g_{jt}^{Xs} + \epsilon_{nt},$$

where g_{jt}^{Xs} denotes growth rate of monthly indicators relevant for the nth subsector

2. Aggregate sectors VA to obtain GDP growth (*bottom up approach*)

# Quarterly national accounts (production side): the information set

Sectors	Indicators
mining and quarrying	IIP mining, monthly production of coal and crude petroleum
manufacturing	IIP manufacturing
electricity, gas and water supply	IIP electricity
construction	Monthly production of cement, steel and coal
trade, hotels, transport and communication	Commercial vehicles production, railway goods traffic port traffic, cellular subscription
banking and insurance	deposits , non food bank credits, WPI, NSE turnover
other services	central govt revenue expenditure, CPI

In-sample fit : only relying on monthly indicators
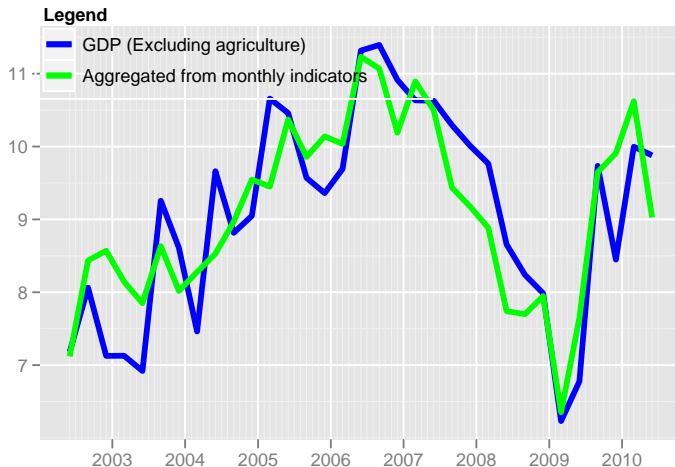
A first evaluation of the *bottom-up approach*

- For some of the sub-sectors, a very good fit
- For others, we are not able to completely replicate the sectoral VA produced from CSO
- Fit seems better at the end of sample
- Not so good earlier: probably because of data revisions. For example, monthly IIP data is used at first to estimate quarterly GDP, but later ASI data when annual estimates of GDP are released

The real time forecasting exercise

The above results holds in sample. However a more acid test can be based on a real time exercise:

- Apply a set of bridge models to pseudo real time forecasting exercise
- "Pseudo"-as we are not relying on actual real time vintages of data releases
- Over a span of years, each time the GDP is released, we mimick as closely as possible, the real time flow of information.
- We take into account the actual release dates:

  (e.g. at the end of Aug.2010 we have IIP up to June, but commercial vehicles production up to July)

- At each month, we estimate our bridge models and forecast the upcoming GDP release

The real time forecasting exercise

- For each quarter we consider 3 consecutive forecasts (*nowcasts*):

  1. month 2: two months ahead of GDP release

  2. month 1: one month ahead of GDP release

  3. month 0: just ahead of the GDP release (our information set closest to the CSO one)

Forecasting exercise: one month away from GDP release (July 2010)

- At 1 month away from GDP release, our information set is not complete.
- As an example, IIP data is available till May, commercial vehicles production is available till June.
- The bridge model is estimated using the quarterly proxy indicators up to Q1,2010.
- Using ARIMA models, forecast IIP till June.
- Apply bridge models to the monthly indicators to get an estimate of GDP growth.
- The same principle is applied for forecasting exercise two months away from GDP release.

Forecasting exercise: zero month from GDP release: August 2010

- At zero month from GDP release, our information set is closest to the CSO.
- In Aug 2010, IIP data is available till June, some other variables like commercial vehicles production is available till July.
- We use the information set available till June..
- Apply bridge models to the monthly indicators to get an estimate of GDP growth.

Does survey data help?

Inclusion of soft data in the nowcasting information set is a critical ingredient (Giannone et al., Altissimo et al.)

- they provide a signal that is obtained directly from the participants regarding the short-term evalauation of their activity.
- they are more timely than the hard data.
- They are subject to almost no revisions.
- Based on sentiments and expectations, they can contain leading information

Survey data in India?

- RBI's Industrial Outlook Survey (quarterly from 1998): released at the end of the quarter, with current quarter assessment and next quarter expectations on financial situation, availability of finance, production assessment etc.
- Purchasing Managers Index (PMI) for India released by JP Morgan, in collaboration with HSBC: monthly survey released one month before the GDP release.
- The Dun and Bradstreet Business Optimism Index: quarterly survey, released few days after the end of the quarter.

RBI deems these surveys to be useful:
The surveys provide information that is valuable to economic policy makers and analysts. Although they do not provide precise information on levels of output, sales, investment or employment they can be used to predict changes in these aggregates and, for that reason, they are particularly useful for analysing the business cycle. -Report of the Working Group on Surveys. We will test this proposition formally in our real-time exercise.

Bridge bottom up approach: Incorporation of the "Other services" component

- The "Other services" component is affected by significant volatility on account of public sector outlays.
- We perform the nowcasting analysis on two target variables
  1. Exluding agriculture.
  2. Excluding agriculture and other services.
- The two alternative set of exercises will enable us to have a comparative evaluation of our nowcasting exercise when a significant source of noise is taken away from the computation.
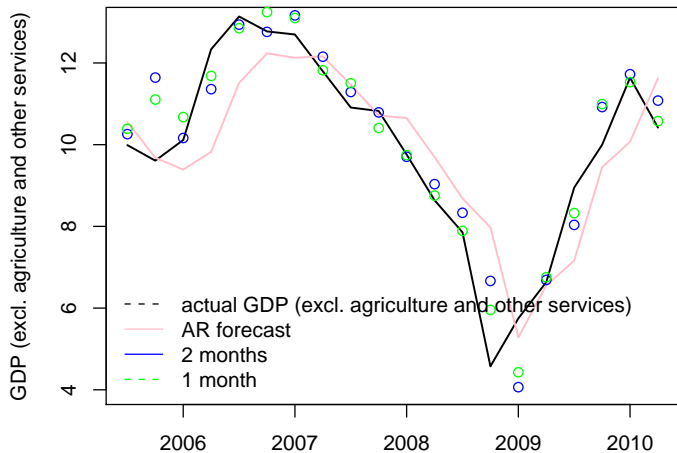
Forecasting performance of the benchmark AR model
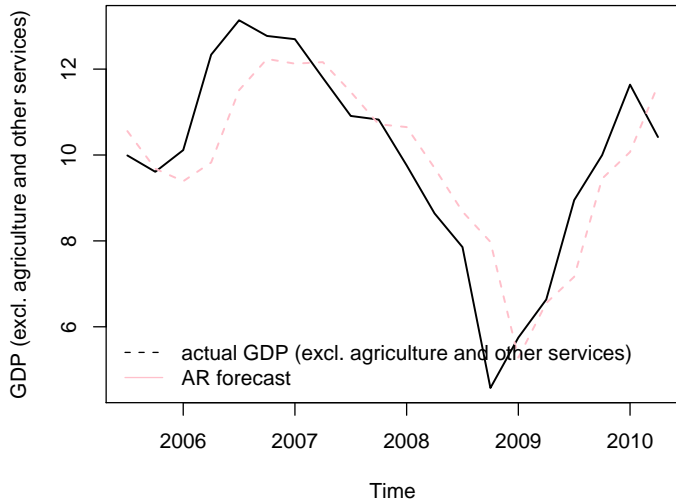
Forecasting performance of the AR model with 2 months bridge forecast: Comparison
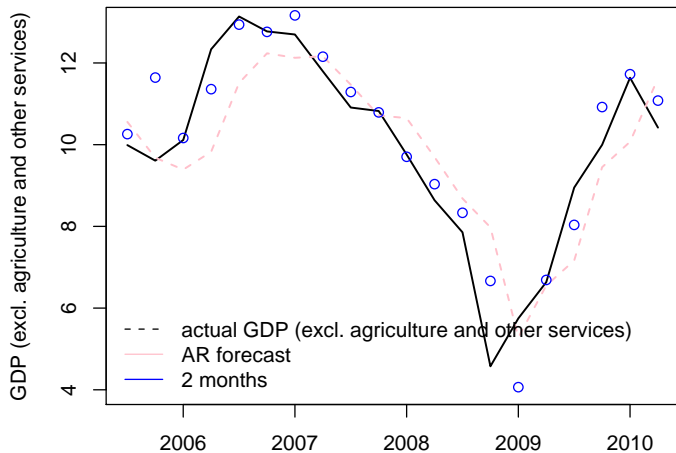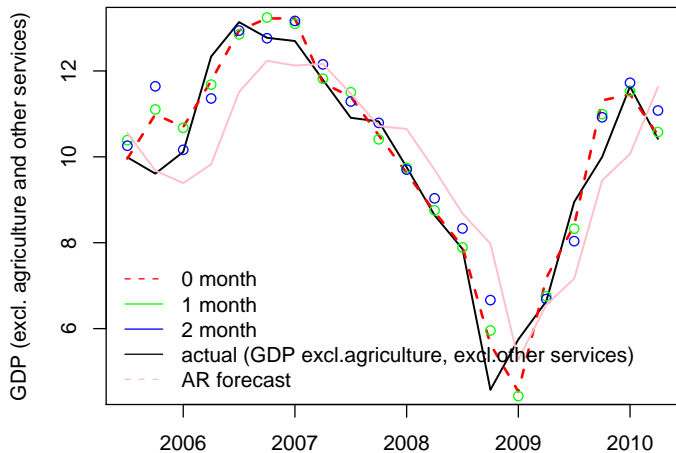
Forecasting performance of the AR model with 1 month bridge forecast: Comparison

Forecasting performance of the AR model with 0 month bridge forecast

RMSE of forecasts of GDP and its sub-sectors

Target indicator is GDP excluding agriculture and other services

Model	Sector	Forecast	Nowcast		
			Month 0	Month 1	Month 2
Naive		1.31			
AR		1.27			
Bridge bottom up			0.65	0.69	0.88
	Manufacturing		1.27	1.53	1.57
	Electricity		1.66	1.83	1.82
	Trade and transport		1.53	1.53	1.56
	Finance		1.42	1.42	1.43
	Construction		2.56	2.56	2.60
	Mining		2.18	2.35	2.38
AR+X models					
IIP Manufacturing			0.75	0.77	0.89
Financial situation***		0.95			
Availability of finance**		1.05			
Inventory of finished products*		3.63			
Assessment of production capacity for 6 months*		3.47			
PMI Global			1.08	1.08	1.09
D&B business survey		3.87			
US (IIP)			1.252	1.258	1.26

Target indicator is GDP excluding agriculture

Model	Sector	Forecast	Nowcast		
			Month 0	Month 1	Month 2
Naive		1.04			
AR		1.05			
Bridge bottom up			0.93	0.95	0.92
	Manufacturing		1.270	1.534	1.57
	Electricity		1.657	1.830	1.82
	Trade and transport		1.532	1.532	1.56
	Finance		1.417	1.525	1.43
	Construction		2.557	2.557	2.60
	Mining		2.180	2.346	2.38
	Other services		3.11	4.13	4.29
AR+X					
IIP Manufacturing			0.77	0.77	0.95
Financial situation***			0.73		
Availability of finance**		0.78			
Inventory of finished products*		2.05			
Assessment of production capacity for 6 months*		1.70			
PMI Global			0.88	0.88	0.89
Bradbury business survey		2.30			
US IIP			0.92	0.927	0.93

Main findings

- Bridge bottom up approach seems promising but simpler narrower models can do almost as well.
- However the bridge bottom up approach is useful to have a consistent forecast, as the information flow becomes available over time.
- The results of the real time exercise outperform the univariate AR and naive models.
- Some survey variables provide useful information in tracking growth.

Policy suggestions

- Expand the depth of indicators.
- More visiblity on the indicators for the "Other services component'".
- Improve consistency in demand-supply side estimation.
- Conduct monthly surveys (time of release matters)

Thank you