Nowcasting Global Economic Growth:
Combining Forecasts or Combining Information?

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Motivation

- many studies analyzing IMF (WEO) forecasts
  ... compared with institutional and private (international) forecasters
  ... for many time series (GDP, unemployment, debt/GDP,...)
  ... for many countries (G7, US, UK, DE,...)
- but missing or rare studies
  ... on country aggregates (world, advanced, emerging)
  ... that analyze usefulness of leading indicators for forecasting
  ... that use forecast pooling methods to improve IMF forecasts
  ... that compare various methods
- objectives:
  - evaluation of predictive quality of IMF's WEO forecasts for GDP growth (benchmark)
  - combining indicator based forecasts (Drechsel, Giesen, Lindner 2014) or combining information (Ferrara, Marsilli 2014)
  - determination of prediction accuracy of different models compared to IMF forecasts

IMF World Economic Outlook Data and Forecasts

Real-Time Data

- GDP annual growth rates of the World Economic Outlook (WEO)
  ... in PPP (ex post and forecasts)
  ... published in April & October, with updates in January and July
  ... sample from 1990-2015

Real-Time Data Flow

	29-Jan-08	9-Apr-08	15-Jul-08	8-Oct-08	28-Jan-09	22-Apr-09	8-Jul-09	1-Oct-09	
	WEO_2008_1	WEO_2008_2	WEO_2008_3	WEO_2008_4	WEO_2009_1	WEO_2009_2	WEO_2009_3	WEO_2009_4	
2005	2.5	2.6		2.6		2.6		2.6	
2006	3.0	3.0	3.0	3.0		3.0		3.0	
2007 ...	2.6	2.7	2.7	2.6	2.7	2.7	2.7	2.7	
2008	1.8	1.3	1.7	1.5	1.0	0.9	0.8	0.6	
2009		1.3	1.4	0.5	-2.0	-3.8	-3.8	-3.4	...
2010		2.7		2.0	1.1	0.0	0.6	1.3	
					2.6		2.5		

- aggregates: total world economy, advanced economies, developing and emerging countries
- revision of ex-post data and updates of forecasts with each new WEO
  $\Rightarrow$ creation of a real-time WEO database starting in 1990

IMF Forecast Rounds

	Forecast Round	Forecast for	Realization
1	January WEO in t	$\hat{y}_t^{(1)}$	y_{t-2}
2	April WEO in t	$\hat{y}_t^{(2)}$	y_{t-1}
3	July WEO in t	$\hat{y}_t^{(3)}$	y_{t-1}
4	October WEO in t	$\hat{y}_t^{(4)}$	y_{t-1}
1	January WEO in t+1	$\hat{y}_{t+1}^{(1)}$	y_{t-1}
2	April WEO in t+1	$\hat{y}_{t+1}^{(2)}$	y_t

- results of IMF forecast evaluation

First Release

Sample	Forecast Round	World	Advanced	Emerging
1991 - 2014	1	1.360	0.937	1.921
	2	0.853	0.509	1.121
	3	0.856	0.496	1.103
	4	0.522	0.253	0.760
1991 - 2007	1	1.240	1.002	2.227
	2	0.958	0.506	1.266
	3	0.961	0.505	1.263
	4	0.580	0.246	0.859
2008 - 2009	1	2.865	1.061	0.852
	2	0.608	0.510	0.707
	3	0.852	0.707	0.852
	4	0.608	0.447	0.752
2007 - 2014	1	1.510	0.711	0.767
	2	0.481	0.487	0.619
	3	0.495	0.444	0.515
	4	0.337	0.262	0.414

Final Release

Sample	Forecast Round	World	Advanced	Emerging
1991 - 2014	1	1.121	0.925	1.434
	2	0.935	0.604	1.593
	3	0.929	0.611	1.577
	4	0.598	0.470	1.625
1991 - 2007	1	0.823	0.914	1.636
	2	1.011	0.595	1.817
	3	0.999	0.592	1.802
	4	0.597	0.446	1.875
2008 - 2009	1	2.850	1.503	0.791
	2	1.012	0.828	1.237
	3	1.217	1.098	1.373
	4	0.962	0.919	1.259
2007 - 2014	1	1.553	0.890	0.872
	2	0.727	0.595	0.883
	3	0.704	0.615	0.793
	4	0.588	0.500	0.704

Note: RMSFE is shown for IMF's GDP growth forecast in percentage points.

Data Set

Indicators Used

- country data for 37 economies (more than 80% of the world total GDP):
  industrial production, retail sales, (un)employment, building permits (housing starts), car sales, consumer and producer price indices, nominal and real effective exchange rates, monetary aggregates, stock market indices, 10-year interest rates, 3-month interest rates, household confidence indices, PMI manufacturing indicators, OECD composite indicators
- world and regional indicators:
  world export and import prices, oil price, energy prices (HWWI indices), global PMI, aggregated OECD CLI

Data Adjustments

- series are made stationary, seasonally adjusted and standardized
- pseudo real time data for indicators
- sample 1995m1-2014m12

Methods

- during a specific year 12 forecasts $\hat{y}_{t+h}$ are conducted by $x_{j,t}^{(M)}$, with $j = 1, ..., 12$
- MIDAS approach (Ghysels 2007) from monthly to annual frequency

MIDAS Regression Setup

$$y_t = \beta_0 + \beta_1 B(L^{(1/m)}; \theta) x_t^{(m)} + \lambda y_{t-1} + \epsilon_t^{(m)}$$

where $B(L^{(1/m)}; \theta) = \sum_{k=0}^{K} B(k; \theta) L^{(k/m)}$ is the weighting scheme used for aggregation and $L^{(1/m)} = x_{t-1/m}^{m}$ is the lag operator

- aggregation of individual indicator forecasts according to:

$$\tilde{y}_t = \sum_{i=1}^{n} \omega_{i,t} \hat{y}_{i,t} \quad \text{with} \quad \sum_{i=1}^{n} \omega_{i,t} = 1$$

- weighting schemes: equal weights, median, SIC, R^2

Factor-MIDAS Setup

two step procedure (Ferrara and Marsilli, 2014):

- extraction of monthly factor from our n monthly indicators $X = \Lambda f + \zeta$, with loading matrix Λ and the common factors f
- use of common factor in the MIDAS regression to forecast annual GDP growth (Marcellino, 2010)

$$y_t = \beta_0 + \sum_{i=1}^{r} \beta_i m_K(\theta_i; L) \hat{f}_{i,t}^{m} + \lambda y_{t-1} + \epsilon_t$$

with $\hat{f}_{i,t}^{m}$ is the monthly stationary factor

Conclusion and Outlook

- forecast combination approaches and dynamic factor models are better than IMF forecasts at the beginning of the year
- ambiguity whether indicator forecasts or indicator information should be combined
- forecast errors decrease significantly with increasing forecast rounds
- forecast errors for developing countries are larger than for advanced countries and world aggregate

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