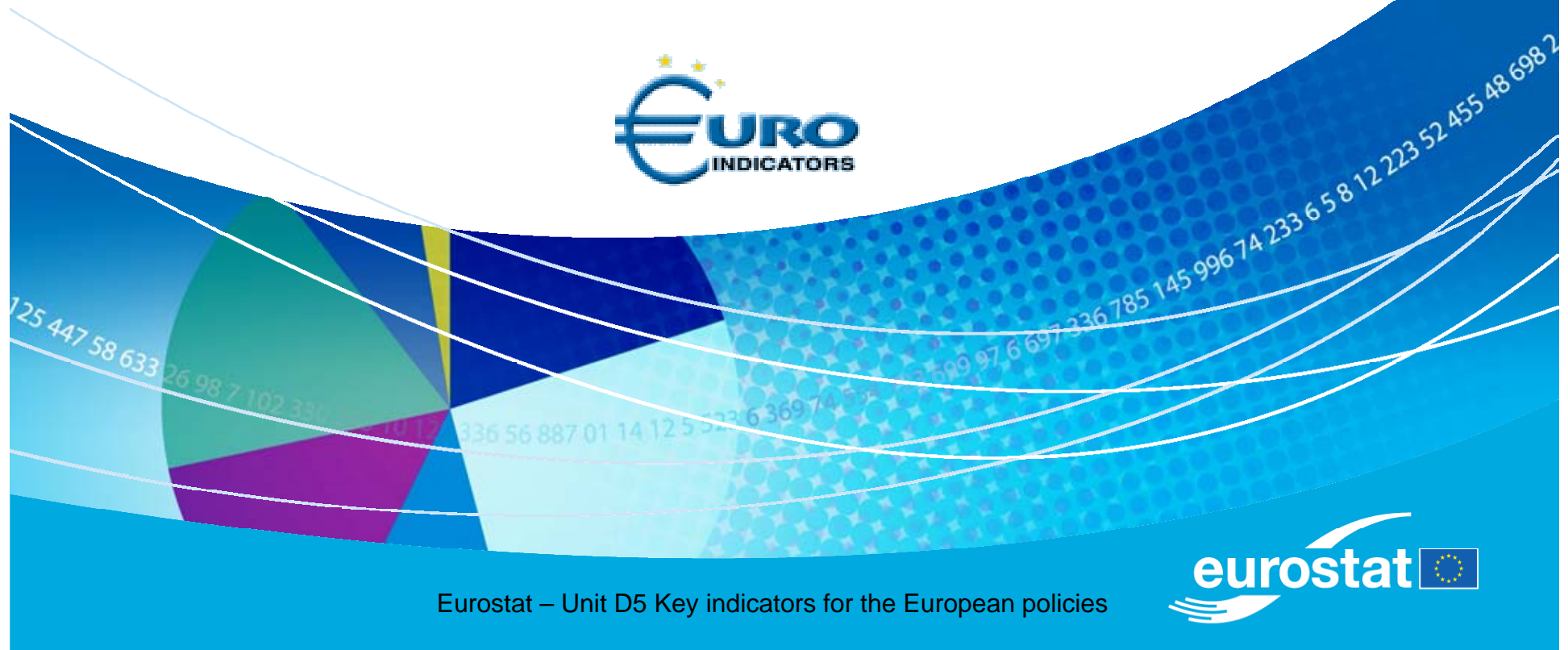# Third International Seminar on Early Warning and Business Cycle Indicators, 17-19 November 2010, Moscow

Session 3: Composite indicators

OUTLINE

■ *New Tools for Tracking the Mexican Business Cycle*

Yuriko Yabuta, National Institute of Statistics and Geography, Mexico

■ *Russian Cyclical Indicators: Their Usefulness in 'Real Time'*

Sergey V. Smirnov, Higher School of Economics, Russia

■ *Construction of a Composite Leading Indicator for India*

T.Rajeswari, Central Statistical Office, India

New Tools for Tracking the Mexican Business Cycle

Yuriko Yabuta, National Institute of Statistics and Geography, Mexico

- In 2000, National Institute of Statistics and Geography (INEGI) released the Mexican System of Composite Indicators (SCI1)

- Coincident Indicator:
  estimation of monthly GDP (a monthly disaggregation of quarterly GDP), Industrial Production Index, Retail Sales, Workers registered at the Mexican Institute of Social Security (approx. employment), Working conditions (unemployment and underemployment data)

- Leading indicator:
  real exchange rate, Mexican average oil price, Price index of Mexican stock exchange in real terms, worked hours in manufacturing industry, interest rate, production volume of construction industry

- Methodology based on classical business cycle approach

The Coincident and Leading Indicator Performance
(Base 2003 = 100)
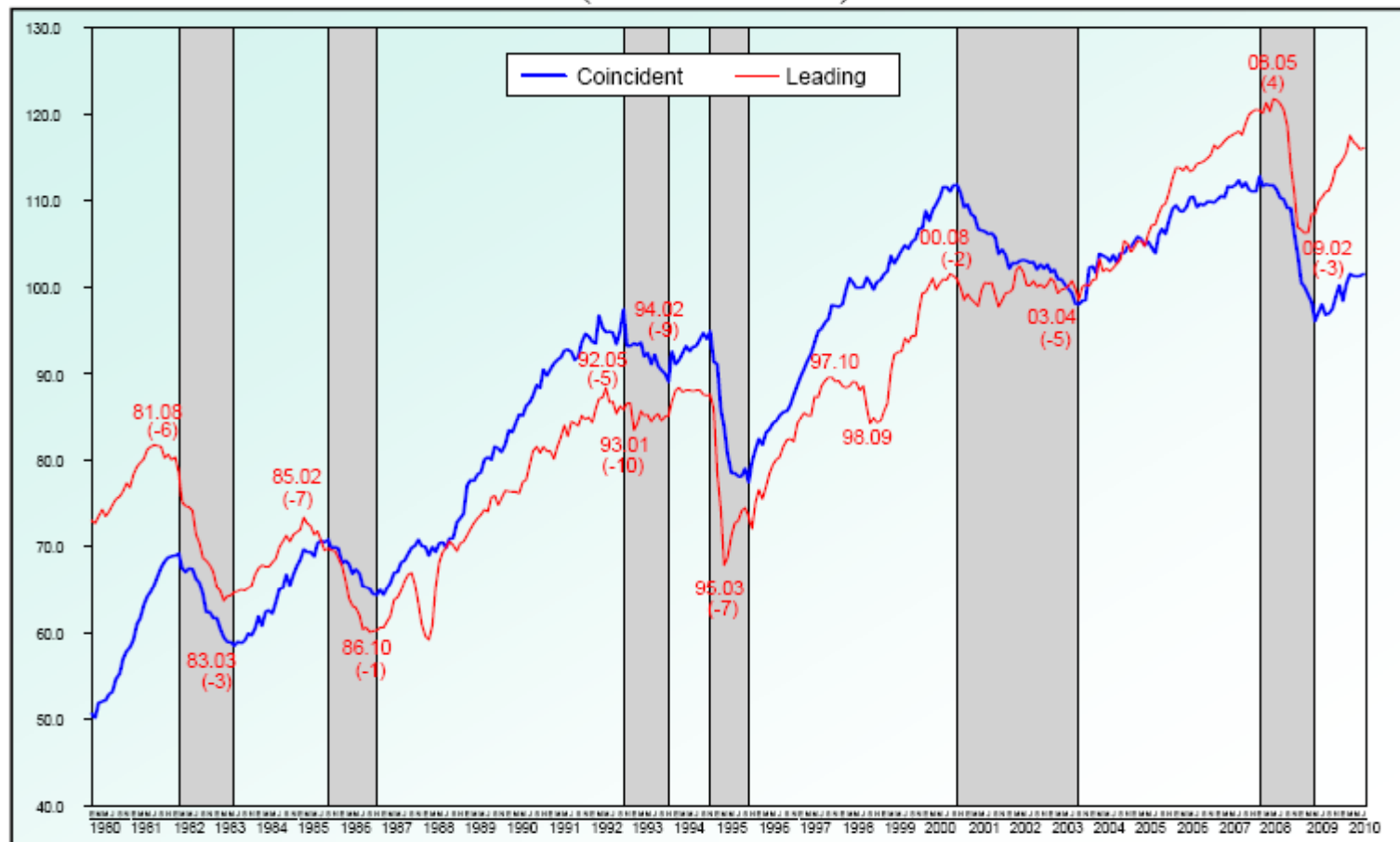
Note: Figures above the leading indicator graph refer to the anticipation of peaks and figures below the graphs refer to the anticipation of troughs

■ In general, from 1980 to 2008 the leading indicator fulfilled its function to anticipate the coincident indicator turning points, averaging 5.8 months on peaks and 5.2 months on troughs

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- But leading indicator did not anticipate the beginning of the recessive phase in 2008. In fact, the recession came from abroad and was spread through a drop of Mexican exports, remittance by Mexican emigrants from U.S. and the decline of foreign tourism.

- When constructing a system of composite indicators, it is necessary to consider alternatives of other possible sources of shock, even if history does not show a strong relation.

- Inclusion of components not showing a "perfect" behavior in the past recessive or expansive phases but might having leading characteristics at the present time.

A new system of composite indicators

- A new system of composite indicators, using the same OECD methodology, was recently studied:

  System of Cyclical Indicators (SCI2)

- For coincident indicator, two differences from the former system: unemployment and underemployment was substituted by urban unemployment rate, total imports were included

- For leading indicator, a U.S. variable was included (Standard & Poor`s 500 Index), oil price was substituted by non-oil exports

- Methodology based on growth cycle approach

System of Cyclical Indicators
(Growth cycle)
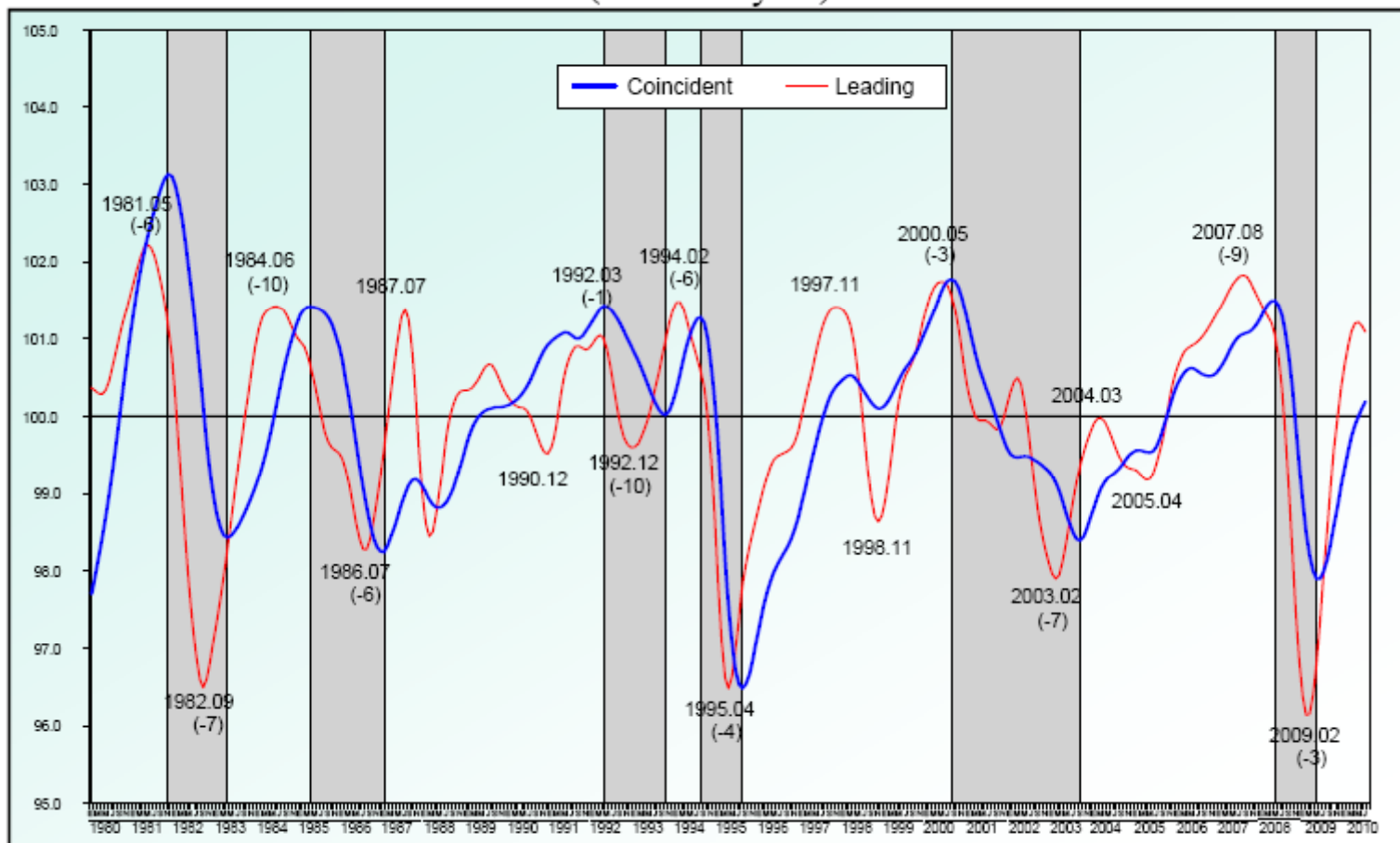
- The system anticipated the last two coincident turning points (9 months in the peak, 3 in the trough).
- Leading indicator showing possible peak in expansion…. but ex-post spurious turning points can be observed

The Mexican Business Cycle Clock

- General users may need a more visual, intuitive tool to track the economic activity, complementary used in the dissemination of the SCI2

- Based on the Business Cycle Tracer (by Statistics Netherlands), the INEGI developed the Mexican Business cycle Clock during the second half of 2010

- 16 indicators included: coincident indicators (C), leading indicators (A), their components (C1, C2… etc and A1, A2,… etc), two sentiment indicators (not included before in the composite indicators because of their short length, but here included as indicative of the economic situation), which are producer confidence (IP) and consumer confidence (IC).

- Interface: main clock with animation buttons, 4 quadrants for the economic phases (expansion, slowdown, recession, recovery)

Mexican business cycle clock
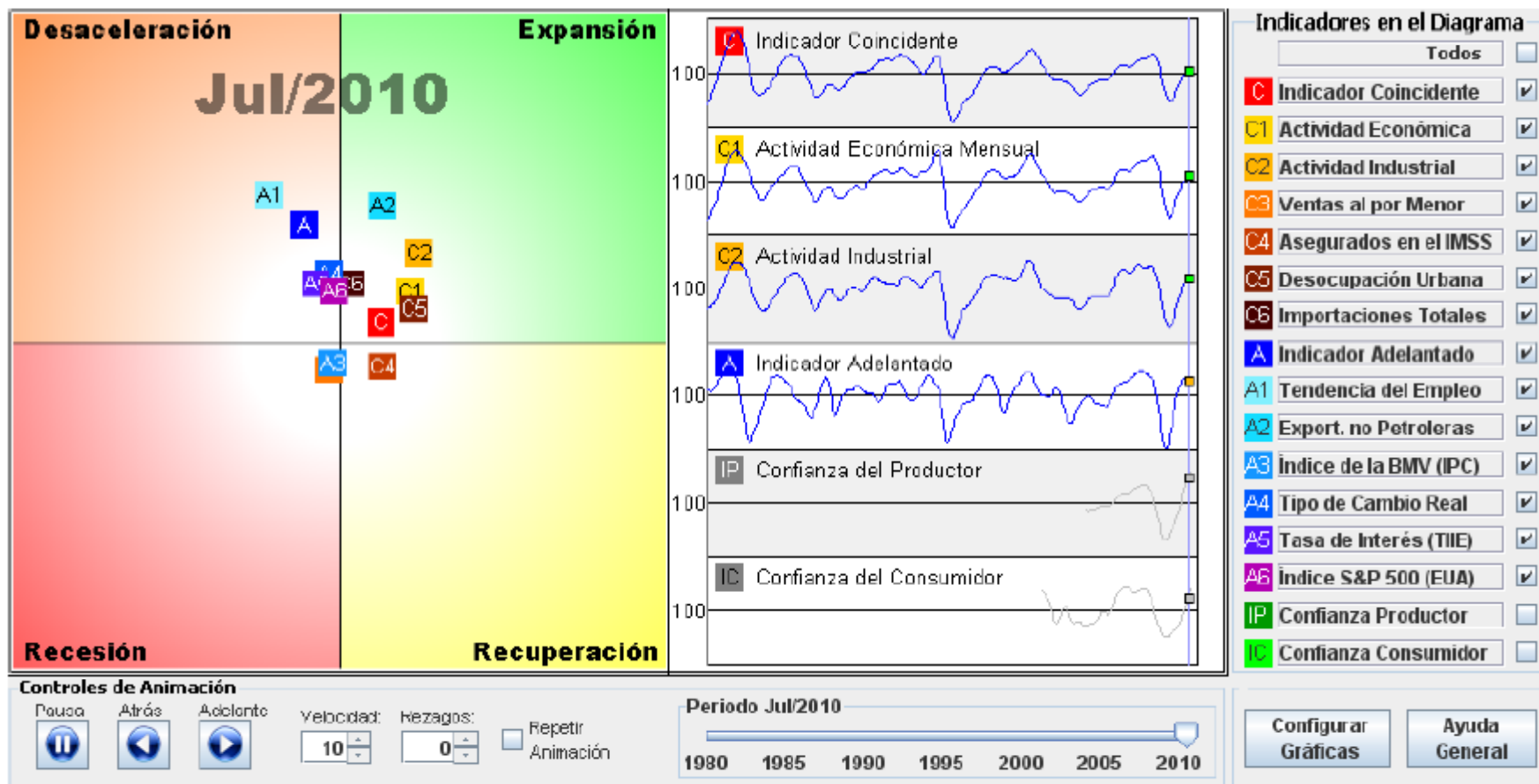
The indicators are grouped in three columns: a) coincident indicator and components; b) leading indicator and components and c) sentiment indicators.
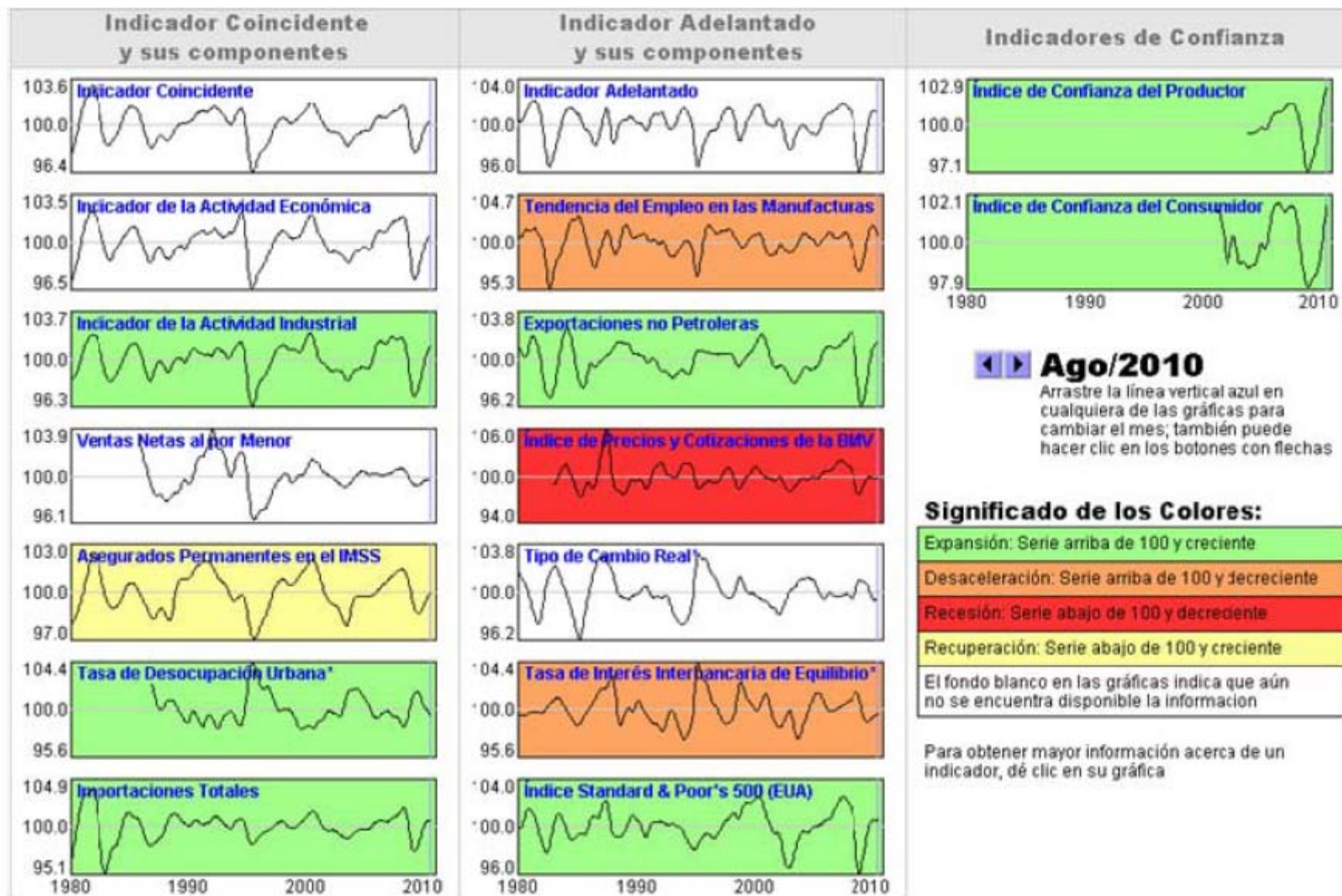
Rapid Estimate of Gross Domestic Product

- Composite indicators are providing high frequency information on the direction in which the economy is heading, but fail in providing quantitative figures

- Leading indicators provide a direction of the economy in short term but not in magnitude

- Therefore, INEGI is also working on Rapid estimate of GDP

- To estimate Mexico`s quarterly constant price GDP, a Vector Autoregressions model based procedure (VAR) is applied

- It yields 2 timely estimates of GDP, the first one with a lag of 15 days (after the end of the reference quarter), the second is obtained with 30 days delay (after the end of the reference quarter)

- The procedure follows a bottom up approach, which starts with the estimation of groups of subsectors of economic activity, then those results are added to estimate the three major activities and finally the total of GDP

- A careful assessment will be carried out on the results when this project will be finished

Russian Cyclical Indicators: Their Usefulness in 'Real Time'

Sergey V. Smirnov, Higher School of Economics, Russia

Composite Cyclical Indicators for Russia: a full spectrum

Russian Composite Cyclical Indicators

| Indicator	Producer	Fatal Shortcomings
Purchasing Managers' Index (PMI)	Markit Economics	No
Composite Leading Index (CLI)	OECD	No
Composite Leading Index (CLI)	Development Center (DC)	No
Composite Leading Index (CLI)	Institute of Economy (IE), Russian Academy of Science	Figures never published
Industrial Confidence Indexes (ICI)	Higher School of Economics (HSE)	No
Industrial Confidence Indexes (ICI)	Rosstat	Too short comparable time-series for comparison. Cyclical trajectory is quite similar to ICI's by HSE
Industrial Optimism Indexes (IOI)	The Institute for the Economy in Transition (IET)	No
Leading GDP Indicator	Renaissance Capital - New Economic School (RenCap-NES)	Too short of a history. The indicator's form (GDP forecasts for a pair of quarters) rules out any ordinary comparisons with monthly cyclical indicators
Business Activity Index (BIF)	"Finance." (one of Russian business journals)	Irregular news-releases. Too large of a publication lag (up to 3 months).
Business Activity Index (The Barometer)	"Business Russia" Association ("Delovaya Rossiya")	Too tangled methodology. Incomparability of neighboring observations. Short history.
Business Activity Index	The Russian Managers Association & Kommersant Newspaper	Too tangled methodology. Discontinued in April 2009.

But only 5 out of 11 for Russia are meaningful for evaluation and comparison with each other:

- Purchasing Managers` Index (PMI) by Markit Economics
- Composite Leading Index (CLI) by OECD
- Composite Leading Index (CLI) by Development Centre (DC)
- Industrial Confidence Indexes (ICI) by Higher Schools of Economics (HSE)
- Industrial Optimism Indexes (IOI) by Institute for the Economy in Transition (IET)

Russian Cyclical Indicators: qualitative comparisons

- Calculation based on growth rate cycles

- Y-o-Y percent changes are considered as an indicator of growth rates

- Problems related to seasonal adjustment are avoided

- Basic Branches of Economy Index by Rosstat is used as proxy for coincident cyclical index (CCI)

- Time period for comparison: 2007-2010

- No real time comparisons for the previous Russian crisis (1998) are meaningful as 3 of 5 of those indicators were introduced after 2000

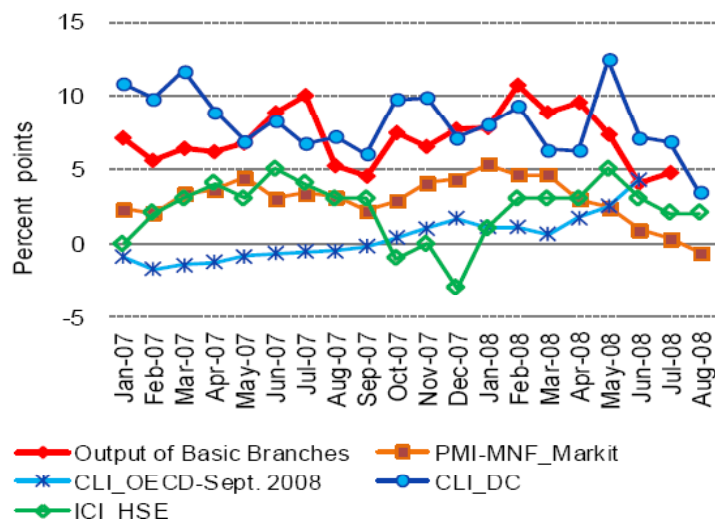# Dynamic of basic branches` output: critical points (Sept 2008, May 2009, May 2010)
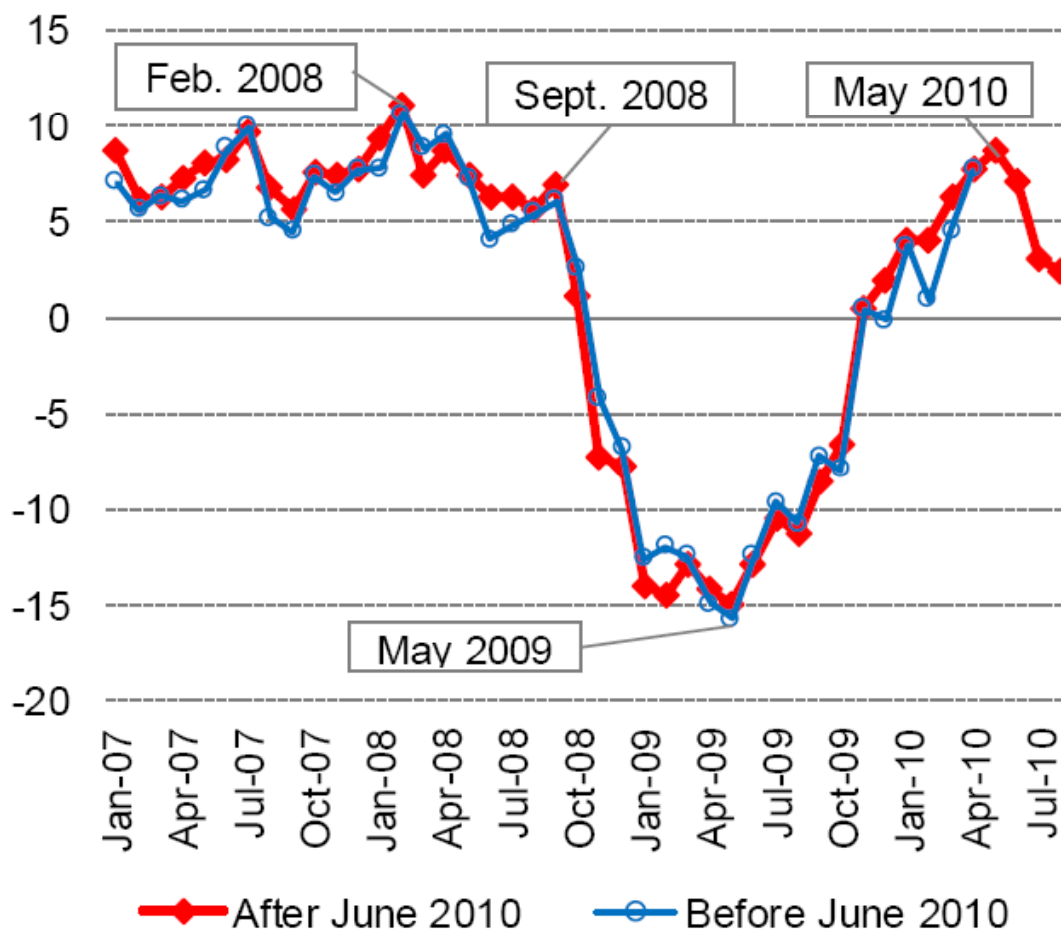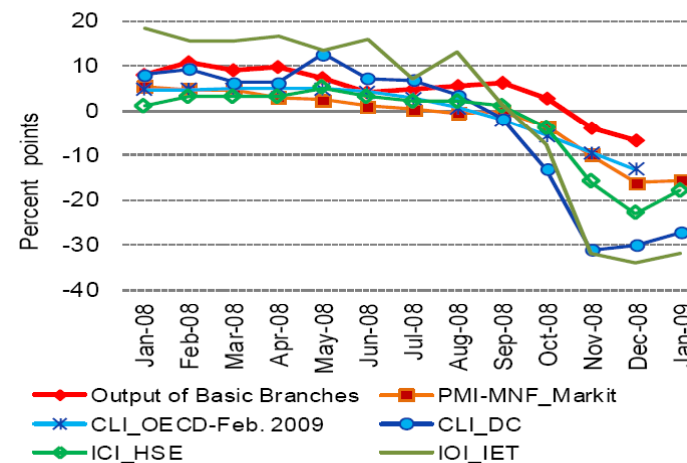

Source: Rosstat

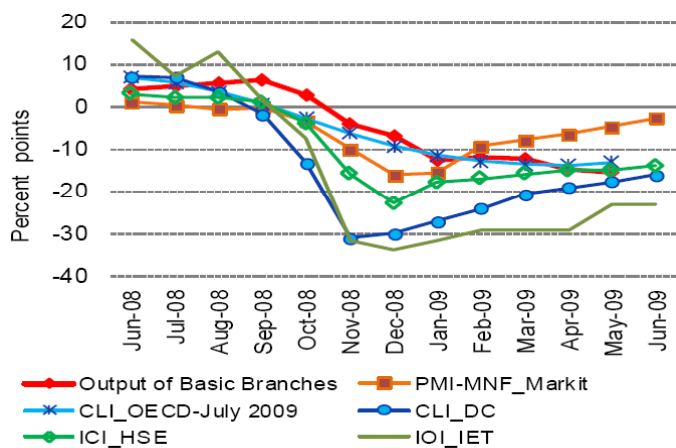# Comparison: 5 indicators and the output of basic branches
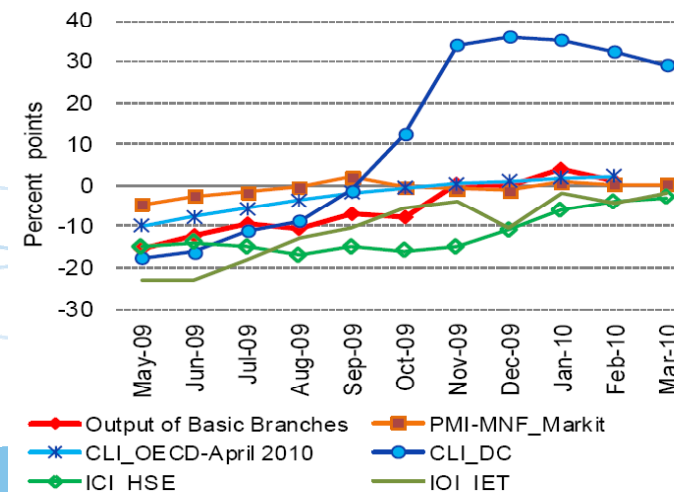
Considerations

- September 2008 (just before Lehman Brothers` collapse)

  dynamics have not yet showed clear indications of decline, the only indicator showing signs of approaching crisis is the PMI by Markit

- February 2009 (near the trough)

  decline of basic branches` output; CLI by DC (especially), ICI by HSE and perhaps IOI by IET showed a possibility of an approaching turning point

- July 2009 (shortly after the trough)

  growth rates of main branches output continued to fall (known only for May), almost all leading indicators showed ascending trends with the exception of CLI by OECD

- October 2010 (last month of vintages statistics available)

  only CLI by DC shows a turning points, all others indicate stabilization or further increase in growth rates

Good behavior of the Cyclical Indicators by DC during the crisis

Cyclical Indicators by DC
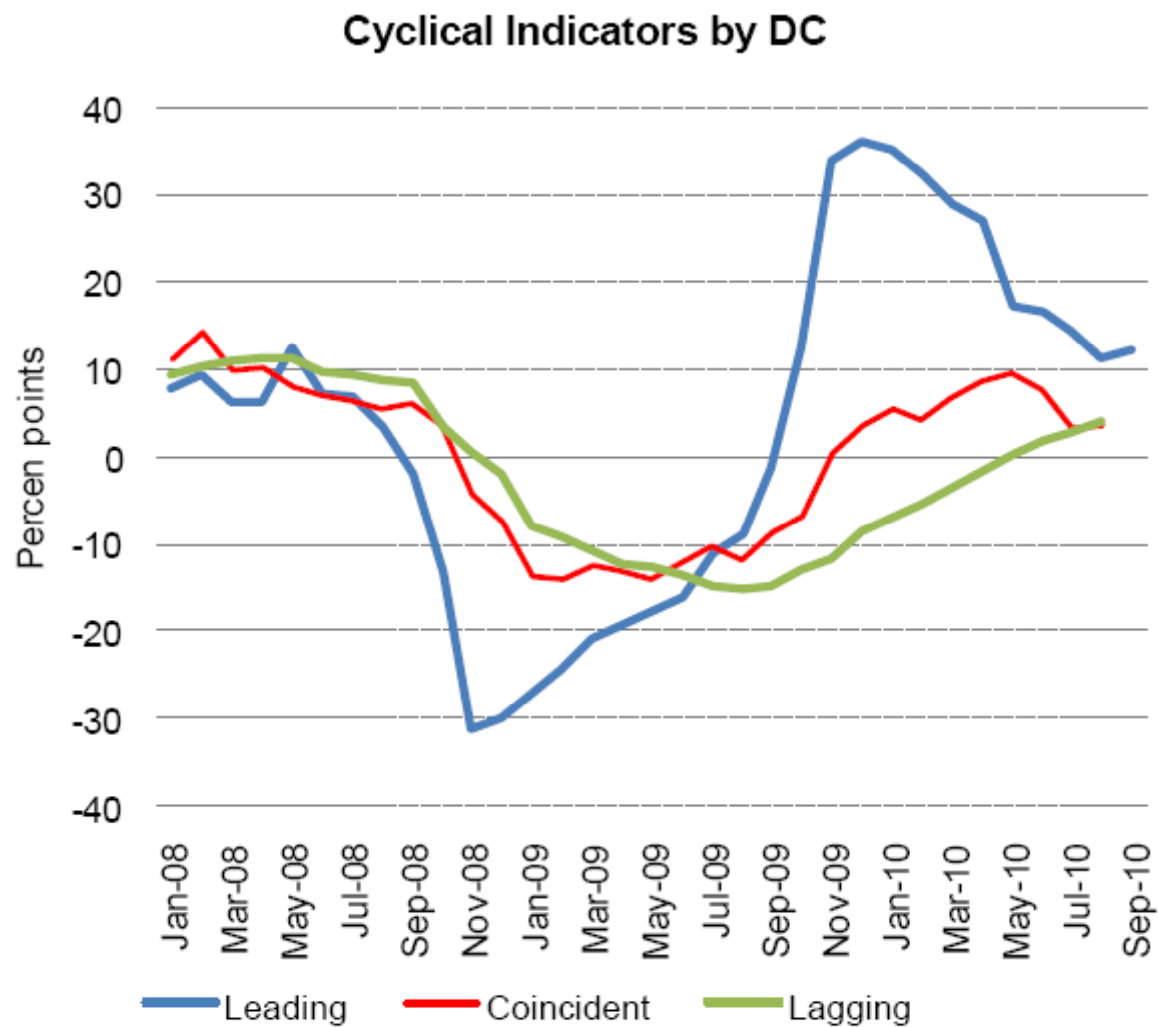
Simple quantitative comparison of composite cyclical indicators

- N. of months when a cyclical indicator changed in proper direction
- Average of all observations: if equal to 1, indicator always changes in proper direction; if equal to 0, indicator never changes in proper direction

Proportion of Changes in 'Proper' Direction Before Turning Points

Indicator	Sept. 2008 (peak)	May 2009 (trough)	May 2010 (peak)	Average
Output of Basic Branches	3	0	2	0.28
PMI by Markit	6	4	4	0.78
CLI by OECD	1	0	0	0.06
CLI by DC	5	5	4	0.78
ICI by HSE	4	4	0	0.44
IOI by IET	-	4	2	0.50

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Conclusions

- Two years after the Russian crisis, no certainty on which leading composite indicators is worthy to be trusted

- On the other hand, some composite cycle indicators do contain useful leading information

- More efforts on the construction and calibration of leading indexes

Construction of a Composite Leading Indicator for India

T.Rajeswari, Central Statistical Office, India

Construction of a Composite Leading Indicator for India
T.Rajeswari, Central Statistical Office, India

- **Aim:**
  Construction of Composite Leading Indicator for tracking GDP growth in India

- Reference variable: non agricultural GDP

- Selection of leading indicators: from Central Statistical Office and Reserve Bank of India

- Composite Index constructed by:
  - Regression (regression parameters will be CI weights)
  - Principal Component Analysis

- CLI performance evaluation (predicted VS actual) : forecasts accuracy by RMSE (Root Mean Square Error) and MAE (Mean Absolute Error)

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Selection of leading indicators

- Initially 33 indicators chosen from 5 sectors:
  monetary, banking, financial market, real sector, external sector

- Sample: Q1 1994-95 to Q4 2009-10

- Preliminary exercise in exploring relationships between the cyclical
  components of reference series with possible leading indicators:

**Cross-Correlation in growth rates of leading indicators with the reference series, Cross correlation of
cyclical components estimated by the Hodrick-Prescott filter**

Variable	Growth rates	HP-Filter
IIPBG	0.63	0.43
IIPCG	0.70	0.67
IIPCONG	0.51	0.33
IIPGEN	0.76	0.57
IMP	0.56	0.39
BSE SENSEX	0.63	0.61
BC	0.69	0.67
DEP	0.56	0.51
CP	0.38	0.48
MO	0.56	0.63
M1	0.72	0.73
WPI ELEC	-0.61	-0.62
WPIMANU	0.24	0.30

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■ Composite index constructed by regressing target series on a few principal components chosen on out-of-sample forecast performance of the PCs

■ The PC based CLIs have been constructed based on different set of indicators

Model I : Indicators used are IIP CG, IIPCONG, IIPGen, BC, IMP, Mo, M1 and WPI MANU, CP

Model II: indicators used are IIPBG, IIP CG, IIPGen, IMP, Mo, WPI ELEC and DEP

Model III: Indicators used are IIP CG, IIPGen, IMP, BC, CP , M1, WPIMANU

Model IV: Indicators used are IIP BG, IIPCG, IIPGen, IMP, M1, WPIELEC

PCA approach: some results

Actuals Vs Forecasts

	FORECASTS				
	Model 1	Model 11	Model 111	Model IV	Actuals
2008-09Q1	9.5	9.1	9.3	9.5	8.8
2008-09Q2	9.3	9.0	9.3	9.3	8.6
2008-09Q3	8.3	8.2	8.6	8.4	7.7
2008-09Q4	7.3	8.3	7.8	8.7	6.4
2009-10Q1	6.5	7.3	6.1	7.4	6.9
2009-10Q2	6.1	6.1	6.2	5.7	9.0
2009-10Q3	6.6	7.3	6.9	7.0	7.8
2009-10Q4	8.3	8.1	8.7	7.4	9.2
2010-11Q1	10.0	9.6	10.2	9.0	9.1

Forecast Performance

Forecast Performance Criteria	Model 1	Model 11	Model 111	Model IV
RMSE	1.24	1.27	1.25	1.55
MAE	1.01	0.98	1.03	1.10

PCA approach: some results 2

Estimation of CLI: Actual and Fitted values
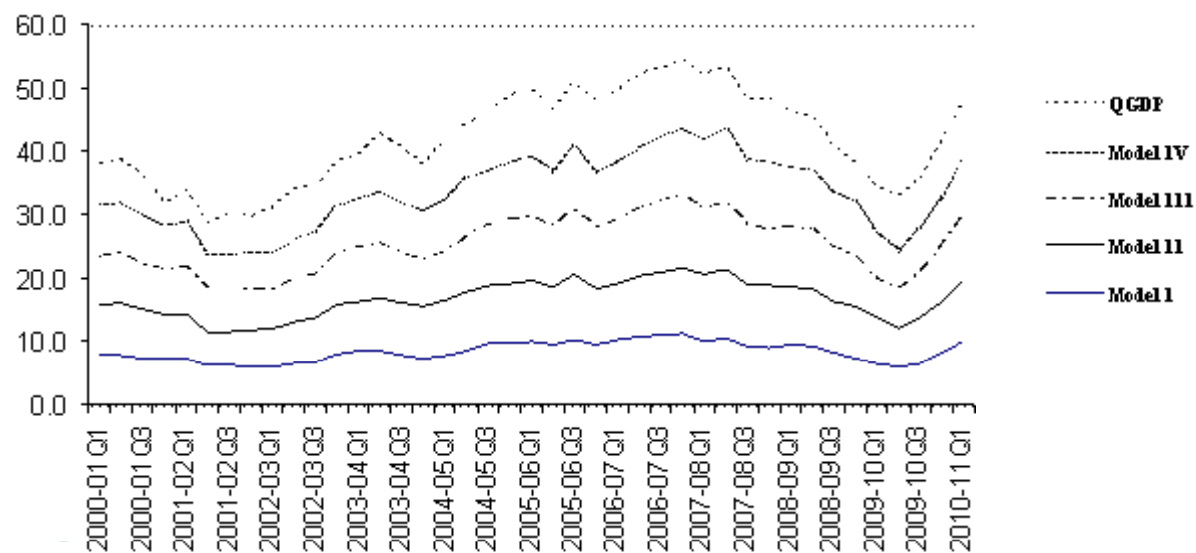
- Model IV closely mimics the reference series. Also the signs of coefficients of indicator series in this model are consistent with economic theory

Regression approach

- For the application of regression model, indicators need to possess stationary property, verified by the Augmented Dickey Fuller test

Augmented Dickey-Fuller Unit Root Test

Variable	DF statistics
IIPCG	-4.130***
IIPBG#	-3.057**
IIPCONG#	-3.505**
IIPGEN	-4.278***
IMP	-3.013**
BC	-3.403**
CP	-2.731*
M1	-4.464***
WPI ELEC #	-3.643***
WPIMANU	-2.783*

- Two models presented (based on the efficiency of performance of the leading indicators). Variables considered in Model 1 are the same as in Model IV of PCA based CLI

  Model 1 : Indicators used are IIP BG, IIPCG, IIPGen, IMP, M1 ,WPIELEC (model IV of CLI based on PCA)

  Model II: CLI based on OLS Regression. Indicators used are , IIP CG, IIPGen, IMP,BC CP , M1 ,WPI MANU

Regression approach: some results

Estimation of CLI: Actual and Fitted Values

Legend: QGDP — Model 1 — Model 11
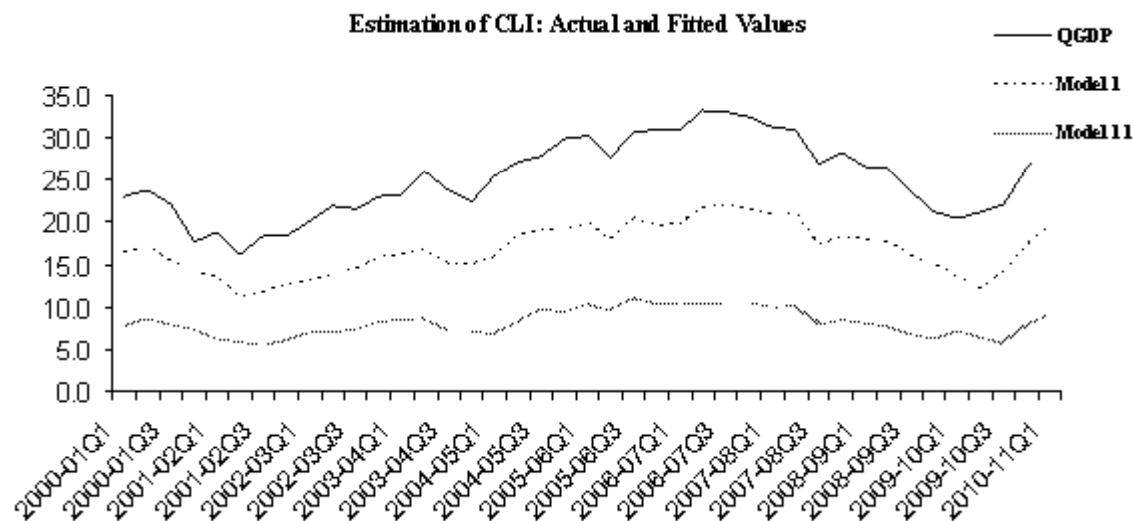
Actuals Vs Forecasts

	FORECASTS		
	Model 1	Model 11	Actuals
2008-09Q1	9.5	8.3	8.8
2008-09Q2	9.7	8.0	8.6
2008-09Q3	8.9	7.0	7.7
2008-09Q4	8.3	6.5	6.4
2009-10Q1	6.2	7.4	6.9
2009-10Q2	5.6	6.6	9.0
2009-10Q3	8.3	6.0	7.8
2009-10Q4	9.2	8.0	9.2
2010-11Q1	10.4	9.4	9.1

Forecast Performance

Forecast Performance Criteria	Model 1	Model 11
RMSE	1.53	1.15
MAE	1.21	0.90

- Model 1 closely mimics the reference series as in the case of PCA based CLI

Conclusions

- RMSE and MAE is quite low in the case of PCA based CLI as well as regression based CLI

- Forecasts for 2009-10 Q2 exhibited a large variation from actuals (turnaround in the growth momentum in the Indian Economy in Q2 2009-10)

- Both the methods adopted have yielded CLI which is quite efficient in generating out of sample forecasts

- Predicted values estimated by all the models move in the same direction as the reference series

- It could be concluded that the constructed composite indicator can be used to generate forecasts of QGDP 2-quarters in advance

- further improvement may be achieved by examining more leading indicators

- In fact, Indian economy is continually evolving and far too complex to be summarized in a single reference series (need to identify other series also for determining reference cycle turning points)

Annex: Variables

Variable Name	
Index of Industrial Production(IIP) Basic Goods	IIPBG
IIP Capital Goods	IIPCG
IIP consumer Goods	IIPCONG
IIP Gen	IIPGEN
Imports	IMP
BSE SENSEX	SEN
Bank credit	BC
Aggregate Deposit	DEP
Currency with public	CP
Broad Money	M3
Narrow Money	M1
Reserve Money	Mo
Wholesale Price Index (All Commodities)	WPIALL
WPI Manufactured Products	WPIMANU
WPI Industrial Raw Material	WPIRM
WPI Electricity	WPIELEC
IIP Electricity	IIPELEC
Non-food credit	NFC
Production of Cement	CEMPRD
Consumer Price index(Industrial Worker)	CPIIW
Call money rate	CMR
Exchange rate (Dollar Vs. Rs.)	EXR
Exports	EXP
Inventory Manufacturing	INVMANU
Gold Price	GP
WPI Food Article	WPIFD
Fiscal deficit	FDEF
Investment in government securities	INVG
Investment in other approved securities	INVA
Investments by FIIS in the Indian capital market	FIIINV
Cash with Banks	CB
Yield of SGL transactions in treasury bills for residual maturities	Yield 19-51
Private Final Consumption Expenditure	PFCE