

Brazil Output Gap and GDP: a Real Time Analysis
Hiato do Produto e PIB no Brasil: uma Análise de Dados em
Tempo Real

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Discussion

by

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Overview

- Goal of the paper:
 - Investigate the importance of revisions in GDP growth and output gap
 - Compare them with international evidence.
 - Construction of real time dataset for Brazil GDP
 - 51 quarterly vintages from 1996:1 to 2008:2. Sample starts in 1990:1

Methodology

- Construction of output gap based on: a) H-P filter, b) linear trend, c) quadratic trend, d) Harvey-Clark unobserved components
- Assuming that the last observation is the best estimate:
 - Decompose revisions in the output gap due to: i) revisions in the GDP series; ii) inclusion of new GDP observations in the sample
- Use several measures to study revisions:
 - RAM mean absolute revision; RRQM root of the mean squared revision
 - CORR correlation between GDP growth and in real time and GDP growth final; R/S proxy for the signal to noise ratio (RRQM/Stdev final Δ GDP); SIOP frequency in which Δ GDP in real time has opposite signal to Δ GDP final; FRMA frequency in which revision of Δ GDP is great than Δ GDP final; AR serial correlation of first order in the revision series.

Findings

GDP:

- Revisions of GDP growth are large
- Aggregation reduces importance of revisions

Output gap:

- All methods show that revisions are large, although revision indicators for Brazil compare favorably to international evidence.
- In 3 out of 4 methods revisions implied a frequency of sign change of the output gap $\geq 30\%$.
- The frequency in which the magnitude of revisions $>$ the magnitude of the output gap $\geq 50\%$.
- In general both revisions in the GDP series as well as increases in the sample are important sources of revisions in the output gap

Comments – Methodology

- Difference in dynamics of GDP trends, cycles, and in output gap, depending on models and assumptions. Different methods lead to different trend-cycle decompositions. Differences are often substantial when confronting models with data (e.g. very different output gap).
 - It is therefore important to carefully assess suitability of each method
- This paper: GDP trend is stochastic (CH, growth rate, HP) or deterministic (linear, quadratic)
 - Other methods: Beveridge-Nelson decomposition, Baxter and King Band Pass filter (1999)
 - Stochastic trend BN: most variation in the trend; little variation in the cycle
 - Linear trend, UC-CH: most variation in the cycle, little variation in the trend

Debate: Peron and Wada (2009) and Morley et al (2003)

- Traditional Beveridge and Nelson decomposition (negative correlation between trend and cycle); unobserved components (zero correlation between trend and cycle).
- Morley et al (2003) show that specifying a simple AR(2) process for the cycle it is possible to identify an unobserved component in which this correlation is a free parameter.
 - Upon estimation the data suggest high negative correlation. Methods yield similar trends and cycles when allowing their correlation to be negative (all trends and cycles look like BN).
- Peron and Wada: importance of considering structural breaks. Differences created by not considering change in the slope of GDP trend. Once this is considered all methods yield similar trend and cycle (look like UC-CH). No correlation between trend and cycle since the former is non-stochastic

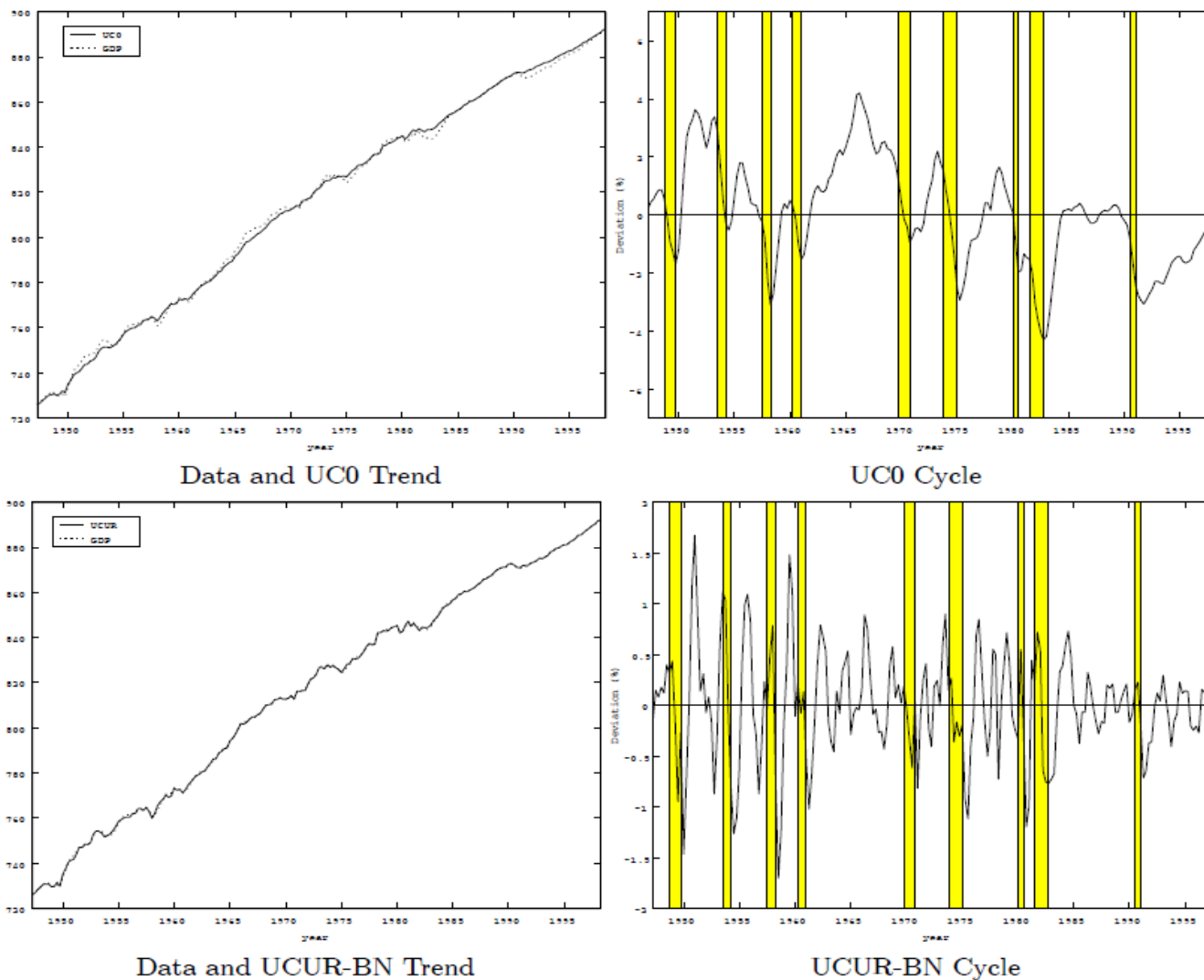


Figure 1: Trend and Cycle Decompositions of US log real GDP, 1947:1 -1998:2

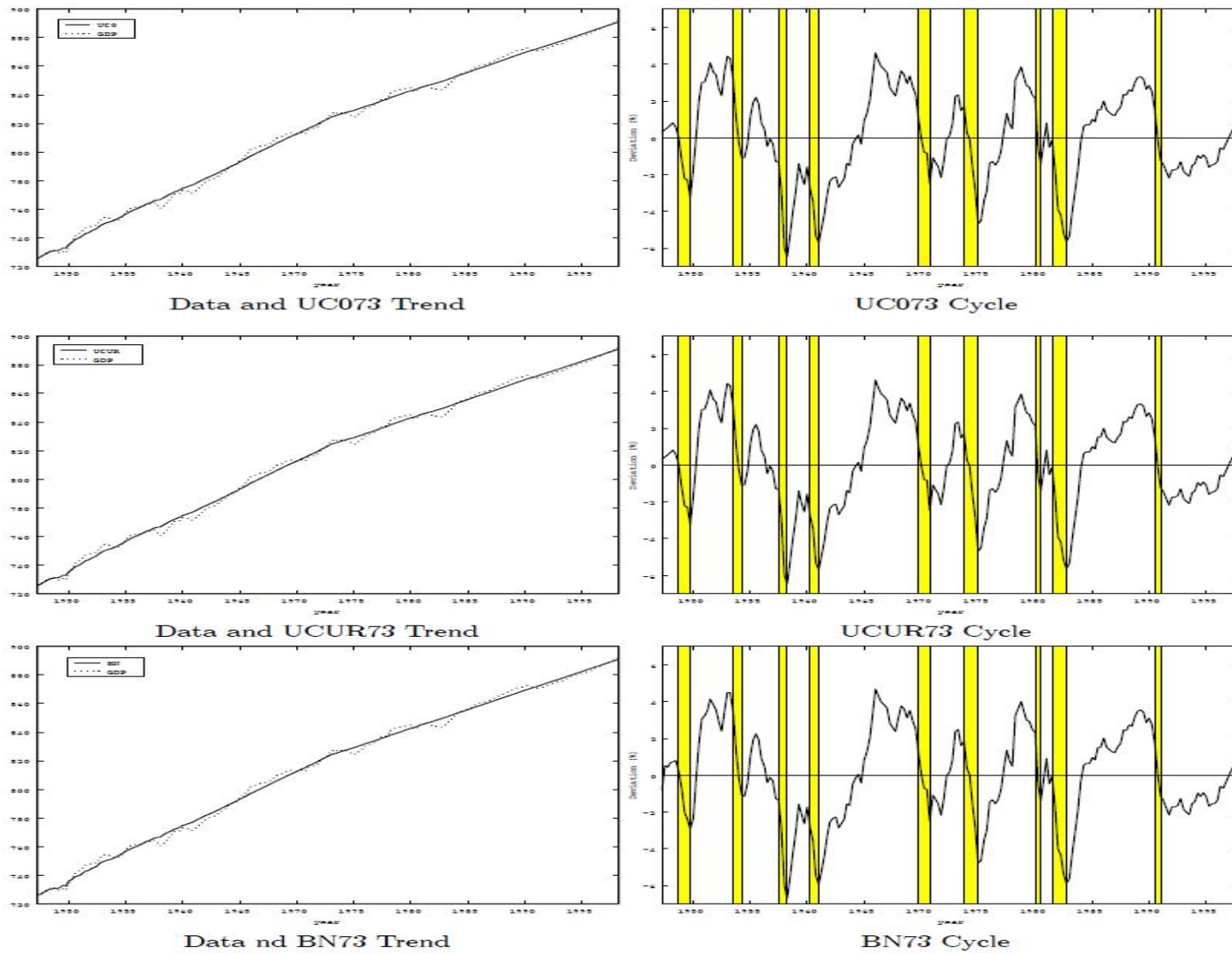


Figure 2: Trend and cycle decompositions allowing for a change in slope in 1973:1

Comments – Methodology

Suggestion for this paper:

- It considers decomposition for trend and cycle for output gap. Output gap estimated assuming that GDP trend is stochastic (CH, growth rate, HP) or deterministic (linear, quadratic). Output gap is the cycle part. Paper should make a bridge between literature on GDP cycles and GDP estimated as first difference in logs.
- Consider the possibility of correlated errors (Morley et al BN-ARIMA(2,1,2))
- Results obtained for output gap are very different across methods. Their differences should be discussed.
- Discuss and select the ones that better reflect the Brazilian economy. Compare with behavior of capacity and CODACE cycles

Comments – Methodology

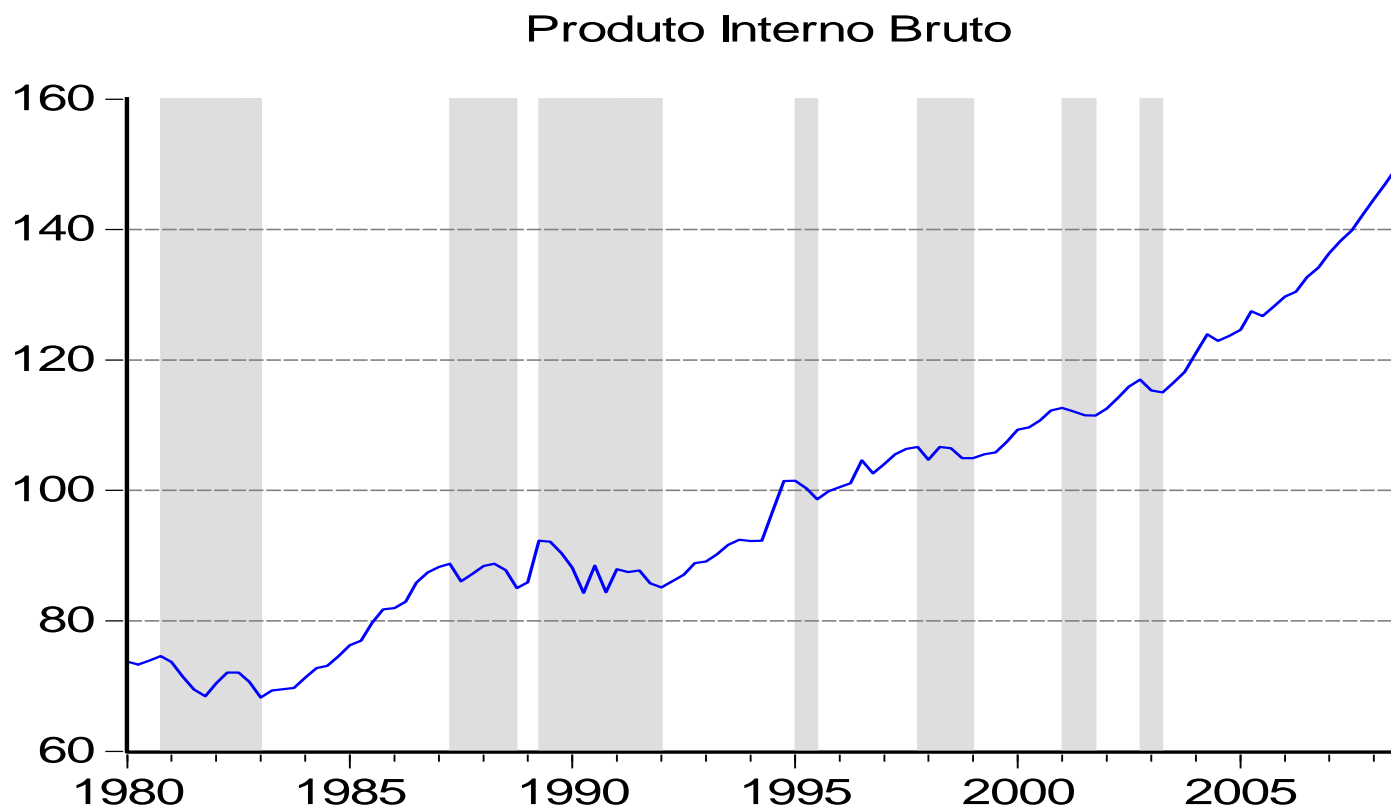
- Consider possibility of instability/breaks. Test for break in variance and/or mean and reestimate the models.
 - Discuss implied changes in the trend and cycle
- Paper assumes that last observation is the best estimate. Results of the indicators are sensitive to this assumption.
 - Since end point very important, consider different ones for robustness analysis. Also consider the possibility of breaks (and include them in the model if this is the case)

Comments - Findings

Patterns in the revisions

- Paper should identify periods in which there are changes in signals, when revisions are fairly large, and any other possible patterns in the revisions
- How are the revisions (sign, size, etc) around business cycle turning points. CODACE: Brazilian Business Cycle Dating Committee has established reference turning points for beginning and end of recessions/expansions that can be used to investigate possible patterns due to changes in the phases of the Brazilian economy
 - Swanson and Van Dijk (2006) find patterns in the revisions of IP and inflation in the US before, during, and right after recessions
- Recession vs expansion or any other patterns will signal to policymakers when they should be more concerned about real time data and future revisions

Brazilian Business Cycles



Comments - Findings

- Analysis of revisions in subcomponents of GDP can also shed light on patterns in the revisions:
 - Sources of revisions
 - Contributions of each subcomponent to the revisions
- Swanson and Van Dijk (2006): Rationality of the revisions vs predictability. They find that revisions are predictable (irrational) for the first 6 months.
- It will be interesting for the paper to investigate predictability of revisions. Revisions are very persistent, high serial correlation. If revisions are predictable, errors could be used in models to adjust for real time x revised differences in GDP and output gap
- Some parts in the paper connect correlation and proportion of variance explained between GDP in real time and revised. Not clear what was done in the paper. Correlation does not imply causation.

Constructing Coincident and Leading Indices of Economic Activity for the Brazilian Economy

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Discussion

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Overview

- Goal of the paper:
 - Reconstruct series of employment and income
 - Construction of coincident indicator of the economic activity in Brazil
 - Chronology of recessions
 - Construction and evaluation of many leading indicators of economic activity for Brazil

Overview –Methodology

- Coincident indicator built using Conference Board methodology on four series: industrial production, sales, income, and employment. Index is weighted average of the series (equal weights after normalizing for differences in variance)
- Leading indicator using same methodology: weighted average of leading series
- QPS – quadratic probability score proposed by Brier (1954) and popularized by Diebold and Rudebusch (1989) – used to select leading indicators

Methodology

Variables included in the coincident index:

- Industrial production, production of corrugated paper as a proxy for sales, total number of persons 10 yo or older that have a job, labor income proxy for income (monthly employment survey).
- The last two series only available from 2002 on. Paper back-cast these series using Kalman filter: a) variables were selected based on co-variates, which could potentially explain variations in income and employment; b) co-variates are then used in the state-space regression.
- Auxiliary regressors: industrial production, output in the process industry, energy production, car production, steel production, corrugated paper production, cement production, monthly real GDP estimated in Issler and Notini (2008). Also included: 11 seasonal dummies

Results

- Employment is built from monthly GDP series and energy production as co-variates
- Income is built from paper production series and cement production
- Coincident index is then build from: industrial production, production of corrugated paper (proxy for sales), and the two proxies above for employment and income.

Comments

- In building (back-casting) the employment and income series:
- Seasonal dummies were included. Why variables were not first seasonally adjusted in the selection of covariates?
- Major instability in the 1990s across series. Since these dynamics are common across some variables they could be driving their correlation. This is especially for income and its covariates used in the backcasting.
- Robustness analysis should be implemented: sub-sample analysis, tests for outliers, treatment of outliers.
- Selection of covariates and back-casting for sub-sample analysis and with treatment for outliers

Comments

- Although statistically the covariates chosen might deliver high R^2 , the series for employment (monthly GDP series and energy production) do not reflect labor conditions but aggregate fluctuation and production of energy.
- Similarly for income, which is built from paper production series and cement production. Paper and cement production do not reflect income.
- Coincident index is composed of industrial production, production of corrugated paper (proxy for sales), and the two proxies above for employment and income.
- Other series should be considered instead that reflect more closely labor market conditions and income (see discussions and variables considered by the CODACE).
- Corrugated paper, coincident or leading indicator?

Industrial Production

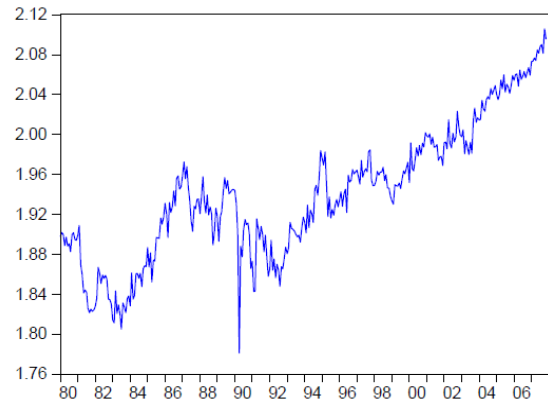
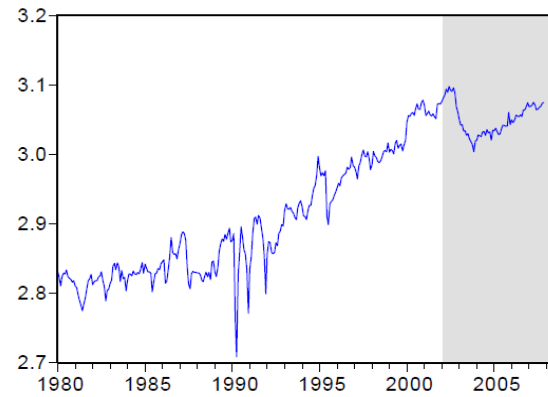


Figure 3: Income - In log and Seasonally Adjusted



Shaded areas depicts the actual sample

Figure 2: Sales - In log and Seasonally Adjusted

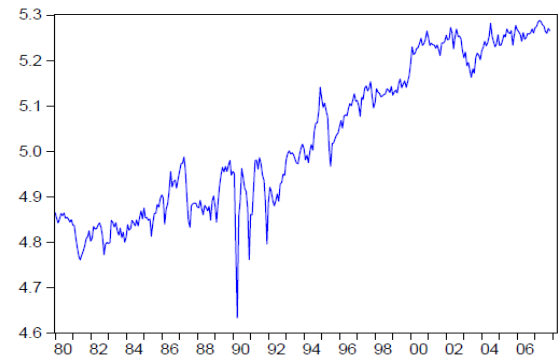
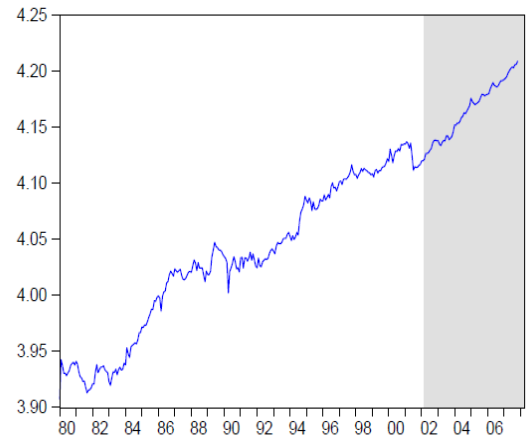
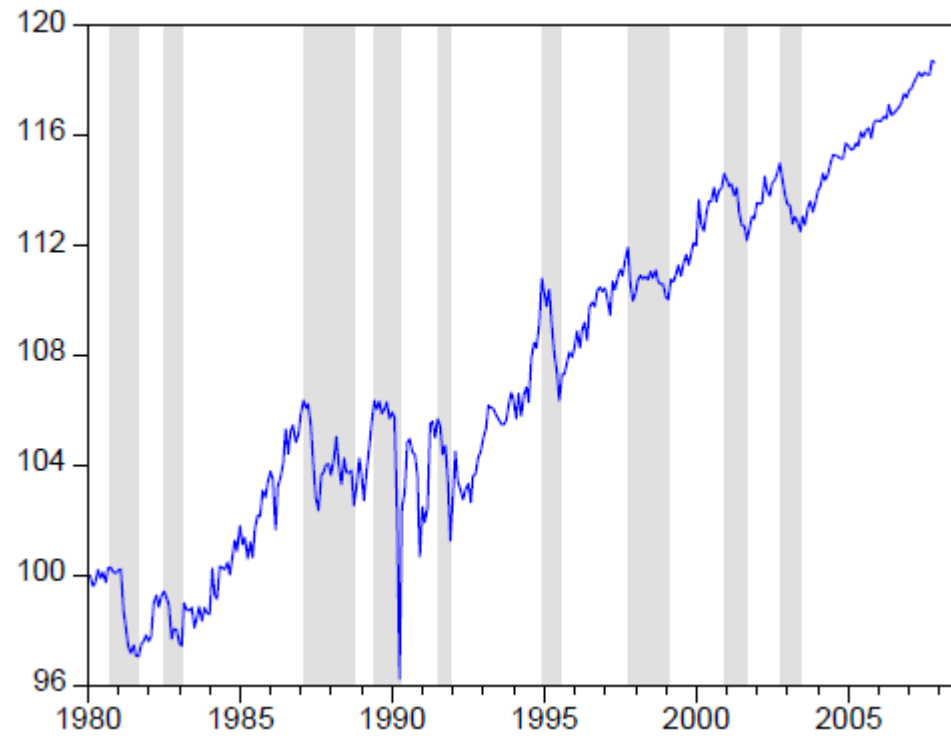


Figure 4: Employment - In log and Seasonally Adjusted



Coincident Index

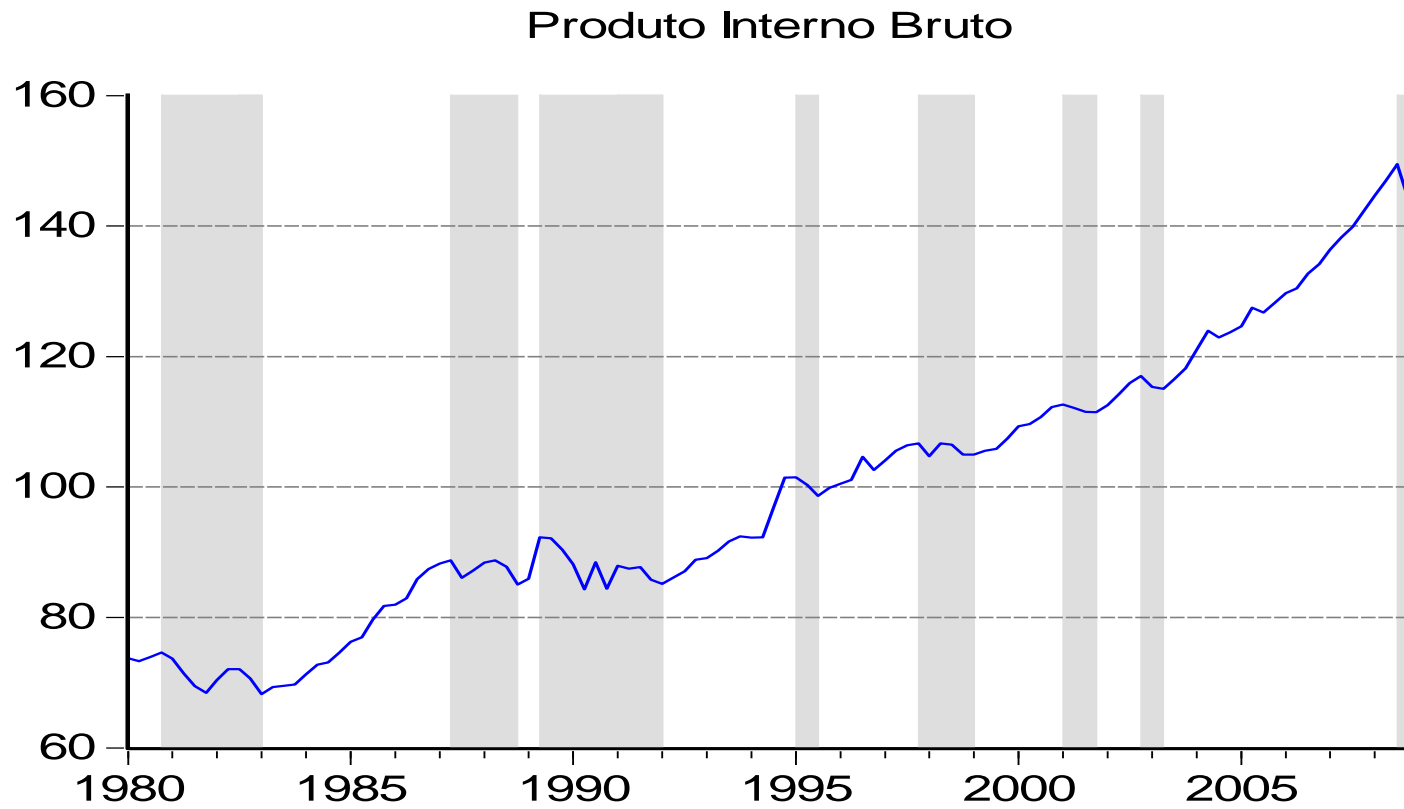


Comments

- Compare dating with CODACE turning points – Brazilian Business Cycle Dating Committee has established chronology of Brazilian business cycle since 1980. Dates announced for quarterly GDP in May 2009, and for monthly BC in January 2010.
 - Committee used two methods: dating then aggregating as well as aggregating and dating, with different weights/importance assessed for each individual recession.
 - Use two coincident indicators (Chauvet 2001 dynamic factor with MS, and Issler and Notini 2008), two monthly indicators of GDP (Chauvet principal component and dynamic factor combined; Issler and Notini 2008), several aggregate and disaggregate series on employment, industrial production, sales, and income.

Ciclos de Negócios Brasileiros - Datas e Durações, em Trimestres					
Picos	Vales	Recessão	Expansão	Ciclos	
		De pico a vale	De vale anterior a este pico	Vale ao vale anterior	Pico ao pico anterior
4º trimestre de 1980	1º trimestre de 1983	9	-	-	-
2º trimestre de 1987	4º trimestre de 1988	6	17	23	26
2º trimestre de 1989	1º trimestre de 1992	11	2	13	8
1º trimestre de 1995	3º trimestre de 1995	2	12	14	23
4º trimestre de 1997	1º trimestre de 1999	5	9	14	11
1º trimestre de 2001	4º trimestre de 2001	3	8	11	13
4º trimestre de 2002	2º trimestre de 2003	2	4	6	7
3º trimestre de 2008		-	21	-	23
Duração média		5.4	10.4	13.5	15.9

Brazilian Business Cycles



Comments – Business Cycle

- Recent changes in the US business cycle:
 - Recessions in Brazil have changed since mid 1990. Recessions are shorter and milder.
 - Instability/breaks.
- NBER BCDC – weights/importance given to variables in determining TP change for peaks and troughs, and for each recession
- Time-varying weights might be important to predict future economic conditions

Lead-Lags of the Coincident Series relative to the NBER TP

	NBER		IP	Sales	Payroll	Income	Employ
P,I, E	1960:4	P	-3	-3	0	0	0
P,IP	1961:2	T	0	-1	0	-3	2
	1969:12	P	-5	-2	3	9	4
IP,I,S,P	1970:11	T	0	0	0	0	-5
IP,I,S	1973:11	P	0	0	8	0	8
E	1975:3	T	2	1	1	1	0
I	1980:1	P	1	-10	2	0	1
IP,P,I	1980:7	T	0	-1	0	0	-1
P	1981:7	P	2	-6	0	2	-3
	1982:11	T	1	-1	1	-1	-1
I	1990:7	P	2	1	-1	0	-4
IP	1991:3	T	0	-2	2	-1	2
I,E	2001:3	P	-6	-6	-1	0	0
	2001:11	T	1	-2	12	10	2
IP,P	2007:12	P	0	-1	0	-3	-1

Comments – leading indicator

- *QPS* is used to select leading variables. *QPS* compares predicted state (continuous series) with state variable (0/1 dummy). Paper uses modified version of *QPS* and compares 0/1 leading TP with 0/1 target (BC dating)
- Suggestion:
 - Use standard *QPS*
 - Use also Yates decomposition or some other measure that takes into account both calibration and discrimination
- Entire analysis of leading indicator: selection of variables, selection of indicators were based on in-sample performance.
 - Out-of-sample analysis might be essential in order to assure good performance of the indicators to predict future economic conditions

Literature

- Chauvet and Silva (2004) use standard Probit model to build leading indicators of recessions in Brazil (work developed for Banco Central do Brasil).
- Chauvet and Morais (2008) use dynamic probit with time-varying parameters to build leading indicators of business cycles in Brazil.
- Chauvet and Morais (2009) use dynamic probit model and probabilities of hitting time to construct leading indicators of the manufacturing industry in Brazil
 - Series were selected based on turning point analysis: Markov switching, probit, and Bry-Boschan; QPS and other mean squared error measures
 - Analysis/selection based on out-of-sample performance