Eurostat’s Business Cycle Clock: Methodology and Results

Rosa Ruggeri Cannata

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Outline

• Introduction
• Different economic cycles
• The $aAB\beta CD$ approach
• The BBC
• Methodological aspects
• Input variables
• Graphical output and assessment
Introduction

• Great interest of users in a detailed picture of the cyclical situation
• Growing attention to cyclical facts, especially after the global economic and financial crisis
• Cyclical features often hidden when looking at PEEIs and more generally to official statistics
  • Irregular component, trend, etc.
• Need of extracting cyclical signals from PEEIs
  • Constructing turning points coincident indicators
What is the Business Cycle Clock?

• The BCC is a visualisation tool provided on the Eurostat website to convey information about the cyclical situation in the euro area and its member states

• Turning points and coincident turning point indicators as the engine of the tool

• Different phases of economic activity are visualised using a clock-type graph

• Dynamic application
  • Evolution over the time
  • Cross-country comparison
The web application is composed of 3 elements:

- the upper part of the window displays a linear graph giving a global view of the evolution of the situation
- the lower left corner of the window is dedicated to the business cycle clock
- the lower right corner is used to present cycle statistics

The clock and graph representation are dynamic
Clock: graphical synthesis

The status of an economy is depicted using a **single hand** against the background of a clock with sectors for different cycle phases.

The clock is structured according to the so-called \(\alpha\mathbf{A}\beta\mathbf{B}\mathbf{C}\mathbf{D}\) approach.
Different cycles (I)

• **Classical Business cycle (Burns and Mitchell definition)**
  - Very relevant for detecting recessions
  - Not very informative during (possibly) quite long expansion phases

• **Growth cycle (Output gap)**
  - Very relevant to understand the position with respect to the potential output
  - More informative also during the expansion phases of business cycle
  - Anticipating business cycle peaks
  - Unable to detect the start and the end of recessions
Different cycles (II)

- **Growth rate cycle (Acceleration cycle)**
  - Highest number of fluctuations
  - High degree of volatility
  - Anticipating growth cycle peaks and business cycle troughs

- **Jointly monitoring several reference cycles (Anas, Ferrara 2004)**
  - Growth cycle and Business cycle (ABCD sequence)
  - Also including Acceleration cycle (αABβCD sequence)
  - Approach retained by Eurostat
**αABβCD approach**

The clock is structured according to the so-called αABβCD approach with six types of "turning points“ in the economic cycle:

- **α**: maximum of the GDP growth rate
- **A**: the growth rate slips below the trend
- **B**: the growth rate becomes negative
- **β**: minimum of the growth rate
- **C**: the growth rate becomes positive
- **D**: the growth rate surpasses the trend

where

- **α** and **β** are the turning points of the **acceleration cycle**
- **A** and **D** are the turning points of the **growth cycle**
- **B** and **C** are the turning points of the **business cycle**
And corresponding composite indicators

- **Growth Cycle Coincident Indicator (GCCI)** provides the probability of a slowdown in the economy signals the peaks and troughs of the growth cycle

- **Business Cycle Coincident Indicator (BCCI)** provides the probability of a recession signals the peaks and troughs of the business cycle

- **Acceleration Cycle Coincident Indicator (ACCI)** provides the probability of a deceleration in the growth rate signals the peaks and troughs of the growth rate cycle
A visual representation of the $\alpha AB\beta CD$ approach

$\alpha$: maximum of the growth rate

$A$: the growth rate slips below the trend

$B$: the growth rate becomes negative

$\beta$: minimum of the growth rate

$C$: the growth rate becomes positive

$D$: the growth rate overpasses the trend

phase
Combining the values of the cyclical indicators to compute the hand position in the BCC

Growth, Business and Acceleration cycle indicators give the hand position

Sector 1: Expansion, with decelerating growth
Sector 2 Slowdown
Sector 3 Recession
Sector 4 Recession, with accelerating growth
Sector 5 Recovery
Sector 6 Expansion, with accelerating growth

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Methodological aspects (I)

1) Which model? Multivariate Markov-Switching models to jointly estimate a pair of probabilistic coincident indicators of the classical business cycle and growth cycle
   - Euro Area as a whole (direct indicator)
   - Largest Member Countries
   - Unfeasible jointly modelling also of acceleration cycle for mathematical reasons

2) Ensure the correct sequence of peaks and troughs: MVMSM to satisfy, by construction, the ABCD approach

3) Model specification: comparison of a huge number of alternative coincident indicators obtained by considering
   - presence of heteroskedasticity
   - number of lags of the autoregressive part
   - number of regimes
   - endogenous variables
   - rules to associate regimes and economic cycles (threshold)
Methodological aspects (II)

• **Selected variables are used to identify and estimate a number of autoregressive Markov-Switching models (MS-VAR)**
  
  $MSIH \ (K) - VAR \ (L)$

• **Where $H$ indicates the presence of heteroskedasticity, $(K)$ is the number of regimes and $(L)$ the number of lags of the autoregressive part**

• **Number of regimes not smaller than 4**
Coincident indicators: input variables

**Input variables for the MVMS models BCCI and GCCI:**
- industrial production index
- unemployment rate
- manufacturing employment expectations for the months ahead
- financial situation of consumers over last 12 months

*The Acceleration Cycle Coincident Indicator (ACCI) is estimated using:*
- Economic Sentiment Indicator
Assessment of the performance of the coincident indicators

The behaviour of the coincident indicators is regularly benchmarked with historical dating chronologies obtained by means of non-parametric dating rules.

Statistics is computed as a goodness-of-fit measure to the reference chronology:

- the Concordance Index
- the Brier's Score defined by the quadratic probability score

The type-1 error and type-2 error associated to our indicators are also regularly monitored where:

- the type-1 error is defined as the inability of the model to signal an existing slowdown/recession/deceleration
- the type-2 error is defined as the identification by the model of false slowdown/recession/deceleration

Due to the trade-off between type-2 and type-1 errors, the simultaneous minimisation of both is unachievable. A conservative approach suggests privileging the minimisation of type-2 errors.
Benchmarking with historical dating chronologies
BCCI for the euro area

December 2019 Assessment

Recession Probabilities

MSVAR_BCCI  BC Chronology
Application of BCC

- Using the clock for a comparative study of the exit from the slowdown and the recession
- Useful information in terms of synchronisation and diffusion of turning points across euro area member countries
- Possibility of deriving synchronisation and diffusion measures based on the clock outcomes
BCC indications for the euro area
BCC - linear graph for the euro area

GDP growth cycle as a percentage of deviation from the trend

- Slowdown
- Recession
GDP growth cycle as a percentage of deviation from the trend

3rd quarter 2019
Thank you for your attention