

METHODOLOGICAL NOTES

This document clarifies the methodological aspects of the business cycle dating work done by the Committee. It serves as a technical note complementing the Committee’s reports.

# APPROACH

The Committee bases its decisions on a subjective, multidimensional strategy, using a set of monthly and quarterly economic activity indicators, different computer algorithms and the assessments of its members. Each member of the Committee monitors developments in the Portuguese economy and it is then up to them to propose the assessment of an inflection point to be discussed by all of them at meetings.

The benchmark used to analyse the cycle is the GDP. The assessments also take the labour market, economic sentiment and changes in foreign trade into account, as well as many other factors, but it is mainly on the GDP that the precise dating of peaks and troughs depends.

Assessments are carried out every quarter and the Committee does not take any stance on the point in the quarter where a recession peak or trough is situated.

The Committee makes decisions on the calibration of peaks and troughs with some time lag, in a retrospective exercise, not making predictions or projections about the Portuguese economy.

## COMMITTEE DECISION REVIEW POLICY

The goal of the Committee is to create a reference chronology and, as such, to avoid reviewing past dating in the future. However, the work of the Committee is subject to the availability of the data and, most importantly, revised data. Although improbable, the dating may be changed retrospectively.

## COMMITTEE DECISION RELEASE POLICY

The Committee will meet periodically to make its assessment of the status of the business cycle. Its conclusions will sometimes be released even if peaks or troughs are not calibrated.

# KEY CONCEPTS

## PEAK

With the quarterly dating used by the Committee, the quarter defined as a peak is the one where economic activity reaches its highest point in a given business cycle, marking the end of a period of expansion.

## TROUGH

With the quarterly dating used by the Committee, the quarter defined as a trough is the one where economic activity reaches its lowest point in a given business cycle, marking the end of a recession.

## RECESSION

The Committee defines a recession as a significant decline broadly affecting all economic activity. A recession begins immediately after a peak and ends at a trough. It can last for just a few quarters or several years, and even include periods when there is a positive variation in GDP indicators but the Committee does not believe this has the magnitude or the scope to indicate expansion.

## EXPANSION

In the same way, an expansion is defined as a significant and extensive increase in economic activity levels. Expansion begins immediately after a trough and ends at a peak. It can last for just a few quarters or several years, and even include periods when there is a negative variation in GDP indicators but the Committee does not believe this has the magnitude or the scope to indicate a recession.

## BUSINESS CYCLE

A business cycle, by definition, encompasses a full expansion and recession, and can also be defined as the period between two consecutive troughs.

## ECONOMIC ACTIVITY

The GDP perspective is emphasised in the measurement of economic activity. Therefore, although the real GDP per capita (quarterly) and a coincident indicator (monthly) are the reference series for the Committee, it does not use a single or unidimensional measure of economic activity. Thus, the Committee’s analysis combines aggregate indicators (such as the components of the GDP from the perspective of expenditure or employment) with sector indicators (such as the industrial production index) and qualitative indicators (such as the economic sentiment index). Together, these contribute to measuring economic activity and, consequently, the calibration of peaks and troughs. The Committee systematically and comprehensively analyses its own database, with hundreds of quantitative indicators, as well as several sources of qualitative information.

# SOURCES

## DATA

The Committee has its own database, consisting of monthly, quarterly and annual series from the following sources: Banco de Portugal (BdP), Statistics Portugal (INE), Eurostat, Organisation for Economic Co-operation and Development (OECD) and the Portuguese Public Finance Council (CFP).

Notwithstanding the many series used to provide information for the Committee’s analysis, two of them are deemed to be reference series, according to the chosen perspective (GDP):

* Quarterly real GDP per capita – calculated based on the Long Quarterly Series for the Portuguese Economy provided by Banco de Portugal (real GDP series) and on the annual Resident Population series provided by INE; linear interpolation is used to calculate the quarterly population (not available before 2011). The Committee closely monitors both the real GDP per capita and the real aggregate GDP, as well as a set of demographic series. It is therefore attentive to the trends that could affect both the numerator and the denominator of the real GDP per capita.
* Monthly coincident indicator – a coincident indicator of Portuguese economic activity based on the annual rate of change of the coincident indicator from Banco de Portugal, announced since January 1978. The value for January 1977 is indexed to 100 and the values for the remaining months in 1977 are calculated based on the OECD leading indicator for the same period. The annual rates of change published by Banco de Portugal are applied successively for its coincident indicator.

All the series represented in the reports are available on the Committee’s webpage.

## REFERENCE CHRONOLOGIES

Whenever there is mention of another economy in recession for a certain period of time, the Committee bases this on the business cycle dating provided by the following bodies:

* Spain – *Comité de Fechado, Asociación Española de Economía (AEE),* <http://asesec.org/CFCweb/archivo-> historico-del-ciclo-economico-espanol/.
* USA – Business *Cycle Dating Committee, National Bureau of Economic Research (NBER),*

[http://www.nber.org/cycles/cyclesmain.html.](http://www.nber.org/cycles/cyclesmain.html)

* Euro Area – Euro Area Business Cycle Dating Committee, Centre for Policy Research (CEPR) and Euro Area Business Cycle Network (EABCN), https://eabcn.org/dc/chronology-euro-area-business-cycles. In accordance with the language used by this body, the “Eurozone” refers to the 11 founding countries of the Euro Area and Greece between 1977 and 1998; from 1999, the same term is used to refer to the Euro Area as a whole during the recession in question.

# DATA PROCESSING

## TRENDS/STRUCTURE

To estimate trends (for example, GDP or employment trends), the Committee uses stochastic parameter filtering, namely the filter proposed by Baxter & King (1999). The filtering is based on a bandpassalgorithm which removes the cyclical component of the structure in each series, based on movable weighted measurements and on oscillation bands predefined for non-seasonal variations. To this end, the Committee uses a filter with 12 quarters of order (unilateral), a lower limit of 3 and an upper limit of 20.

## SEASONALITY

Whenever the data series have not been seasonally adjusted by the source, the Committee applies the standard methodology used by statistical bodies to break them down, removing the seasonality factor through a semiparametric approach based on X-13-ARIMA SEATS software. Unless otherwise specified, all of the monthly series graphs produced by the Committee are presented with seasonal correction (but not calendar adjustment).

## INFLECTION ALGORITHMS

At the first stage of its analyses, the Committee uses univariate methods to produce indicative dating. Using the Committee’s database and considering series both in level and logarithmic scale, whether aggregate or per capita, these are filtered first of all: as the Portuguese economy has gone through changes in GDP growth trends and in the population in the last 50 years, ignoring such changes could prejudice the detection of the inflection points. Six different filtering techniques were taken into account: (i) Hodrick-Prescott filter, with a parameter of 1600; (ii) Rotemberg filter (2003); (iii) the Baxter & King bandpass filter (1999), maintaining fluctuations between 6 and 32 quarters; (iv) estimating trends using a time polynomial, with the choice of the polynomial degree based on information criteria; (v) estimating linear trends with breaks, chosen based on information criteria; (vi) no filter (gross series). Next, each one of the series resulting from the filtering is submitted to a set of five different inflection point (peaks and troughs) detection algorithms: (i) Bry & Boschan (1971), with two versions; (ii) Harding & Pagan (2002); (iii) a statistical method proposed by Chauvet & Hamilton (2005), based on Markov chains; (iv) a statistical method based on two ARMA processes of the same order, but with different coefficients for when the economy is above or below a certain threshold (expansion or recession). Thirdly, given the multitude of filter-algorithm combinations for each original series, the Committee has adopted a set of appropriate exclusion criteria1. This review results in hundreds of admissible datings which inform the start of the Committee’s work.

1 For example, for the 1977- 2017 historical review, the following types of series were not considered: (i) those identifying less than three recessions; (ii) those identifying more than ten recessions; or (iii) those implying that the Portuguese economy was in a recession for more than one third of this period.

# DATA REPRESENTATION

## PEAK INDEXING

For the purposes of graphic representation, many of the series in the reports are indexed at 100 on the peak, making it easier to read the dynamics during a recession. In particular, if the series in question is quarterly, the point that represents the peak for the quarter is assigned the value of 100; in turn, if the series in question is monthly, it is the point that represents the second month of the quarter that takes the value of 100.

## RECESSION BARS

In order to represent grey recession bars on the graphs to be produced by the Committee, the midpoint method was adopted, through which the shaded area begins at the intermediate point of the quarter defined as the peak and ends at the intermediate point of the quarter defined as the trough. The Committee would like to point out that this is merely a convention and does not convey any stance by the Committee as to the moment in each quarter where the peak or trough is situated.

## BIBLIOGRAPHY

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