The credit-to-GDP gap calculated according to the Basel Committee on Banking Supervision (BCBS) guidelines – the "Basel gap"[1] – is the reference indicator for the quarterly calculation of the countercyclical capital buffer (CCyB). The methodology proposed uses the Hodrick-Prescott statistical filter[2], seeking to estimate a long-term trend component of the credit-to-GDP ratio, in order to calculate the deviations from the observed ratio. These deviations represent the size of the gap. To apply this method, the value of a parameter that is directly related to the average duration of the financial cycle, and which therefore determines the memory of the trend component, must first be calibrated. Specifically, the Basel gap methodology proposes that a very high value (400,000) be used for this parameter, which implies assuming an average credit cycle duration of approximately 30 years. This is a very long duration compared with that observed both in Spain and in other countries. In the case of Spain, after analysing historical series since 1880, an average duration of 17 years has been estimated;[3] drawing only on more recent data, since 1960, the average duration would be 19 years.

Accordingly, assuming a 30-year duration results in an estimated long-term trend with excessive inertia. This means that the most recent changes in the ratio have very little impact on the estimation of the trend and, therefore, that the gaps generated are very different from the observed levels, especially when the ratio presents significant or relatively rapid and sustained changes. The main consequence is that the estimated

gap is too wide, resulting in the present high negative values estimated for Spain. This observed bias could hinder the gap's ability to act as a leading indicator of signs of credit cycle imbalance in coming years.

It is, therefore, important to study mechanisms that allow the BCBS methodology to be adapted to include average financial cycle duration assumptions that are more in keeping with the empirical evidence available for Spain. Specifically, alternative adaptations of the Hodrick-Prescott filter have been explored, reducing the value of this parameter and limiting the number of past observations used to estimate the trend.[4] The study shows that, in effect, assuming an average credit cycle duration of 15 years corrects the major deviations estimated by the Basel gap before and after each crisis and considerably enhances the indicator's capacity to predict systemic events.

---

1 Guidance for national authorities operating the countercyclical capital buffer, BCBS, December 2010.
2 First proposed in R.J. Hodrick and E.C. Prescott (1997), Postwar U.S. Business Cycles: An Empirical Investigation, Journal of Money, Credit and Banking, Vol. 29, pp 1-16.
3 M. Bedayo, A. Estrada and J. Saurina (2019), Bank capital, lending booms, and busts. Evidence from Spain in the last 150 years, Banco de España Working Paper 1847.
4 J.E. Galán (2019), Measuring credit-to-GDP gaps. The Hodrick-Prescott filter revisited. Banco de España Occasional Paper 1906.

Chart A
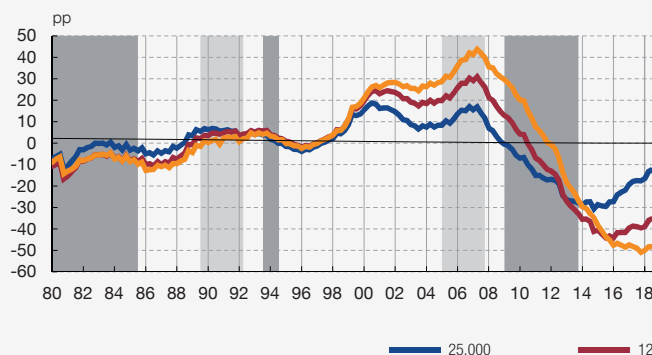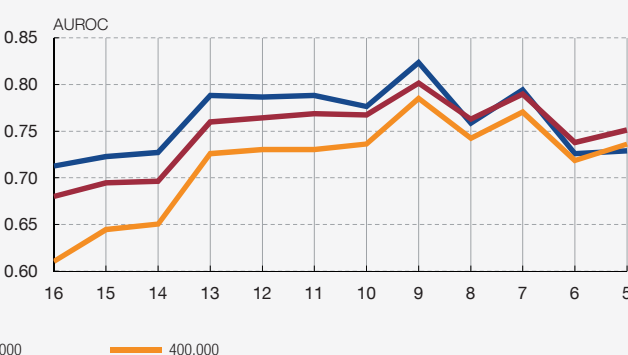**CREDIT-TO-GDP GAPS ADAPTED TO CREDIT CYCLES LASTING BEWEEN 15 AND 20 YEARS (a)**

Chart B
PREDICTIVE CAPACITY OF CREDIT-TO-GDP GAPS ADAPTED TO CREDIT CYCLES LASTING BETWEEN 15 AND 20 YEARS (b)

— 25,000   — 125,000   — 400,000

SOURCE: Banco de España.

a The lines represent estimates of the gaps assuming a credit cycle of 15, 20 and 30 years, approximately corresponding to smoothing parameter values of 25,000, 125,000 and 400,000. The latter was adopted by the Basel methodology. The dark grey shaded area represents the three systemic periods identified in Spain from 1970, namely two periods of systemic banking crises (1978 Q1 to 1985 Q3 and 2009 Q1 to 2013 Q4) and one idiosyncratic event (1993 Q3 to 1994 Q3). The light grey shaded area represents the periods between five and sixteen quarters prior to the occurrence of the systemic events, during which it is advisable to identify signs of cyclical risk in order to adopt measures sufficiently in advance.
b Predictive capacity is compared by means of the AUROC (Area Under the Receiver Operating Characteristics Curve). This criterion represents the relationship between the rate of false positives and the rate of true positives for all the possible binary classification thresholds of a model. An AUROC value equal to 1 would indicate a perfect prediction model. By contrast, a value of 0,5 would indicate that the model is unable to predict better outcomes than those arising from a random assignment. The "y" axis represents the AUROC value. The "x" axis represents the periods between five and sixteen quarters prior to the occurrence of the systemic events, during which it is advisable to identify signals of cyclical risk in order to adopt measures sufficiently in advance. The lines represent the AUROC for gaps assuming a credit cycle of 15, 20 and 30 years, approximately corresponding to smoothing parameter values of 25,000, 125,000 and 400,000. The latter was adopted by the Basel methodology.

Chart A depicts the estimated credit-to-GDP gap using smoothing parameters that assume shorter credit cycle durations. Specifically, parameters equal to 25,000 and 125,000 are used, which assume credit cycle durations of approximately 15 and 20 years, respectively. In general it is observed that the lower the parameter, the narrower the gap and the speedier its response to changes in the trend of the ratio. It is also observed that, compared with the estimates made using the Basel gap methodology, the two others using lower parameters correctly identify the systemic event that occurred in Spain in the 1990s. Turning to the present, the estimates made using a smoothing parameter equal to 25,000, consistent with a credit cycle duration of approximately 15 years, point to a clear change in trend in the gap over the last two years. Although these estimates still have negative values, they are less negative in absolute terms and this would seem to be more consistent with the current stage of both the credit and the economic cycle.

In addition, calculating the credit-to-GDP gap using lower parameters enhances the indicator's predictive power. This effect can be seen in Chart B, which compares the capacity of the different indicators to serve as a leading indicator of credit cycle imbalance. The chart shows that the gap calculated using the parameter equal to 25,000 has the best predictive capacity. It also shows that the difference compared with the Basel gap, which uses a parameter equal to 400,000, is especially significant between two and four years before a crisis. This means that the build-up of cyclical systemic risk can be flagged better and earlier. Accordingly, despite the constraints imposed by the statistical methods, by improving the way in which they are calculated it is possible to transform them into useful measures for detecting cyclical systemic risk. In particular, considering calibrations consistent with an average credit cycle duration of 15 years enhances the indicator's predictive power and produces estimates more in keeping with the present upswing in the financial cycle in Spain.