THE COUNTERCYCLICAL CAPITAL BUFFER IN PORTUGAL

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Contents

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Since January 2016, the Banco de Portugal, as the national macroprudential authority, may require institutions to build up a countercyclical capital buffer. This buffer is intended to increase the resilience of the financial system to adverse shocks, by requiring institutions to have an additional capital buffer during periods of cyclical systemic risk build-up. In periods when cyclical systemic risk materialises or abates, this buffer may be reduced so as to contribute to a greater ability of institutions to absorb losses without restricting the flow of credit to the economy. Hence, this buffer – being countercyclical – may also contribute to narrowing the amplitude of the financial cycle.

This document presents the context underlying the implementation of the countercyclical capital buffer in Portugal. It describes in particular the legal basis and operational features of this macroprudential policy instrument, as well as the quantitative analysis guiding the Banco de Portugal's quarterly decisions on the countercyclical buffer rate. This quantitative analysis is based on a set of macroeconomic and financial indicators that identify the stage of the financial cycle and includes, among others, the credit-to-GDP gap, calculated in accordance with the Basel Committee on Banking Supervision (BCBS) guidelines.

1   Countercyclical capital buffer

Purpose

In January 2016 the Banco de Portugal, as the designated macroprudential authority in Portugal, implemented the countercyclical capital buffer (hereinafter 'countercyclical buffer') in the macroprudential toolkit. The main purpose of the countercyclical buffer is to increase the resilience of the financial system to adverse shocks, by requiring institutions to accumulate additional capital in periods when cyclical systemic risk is building up.[1] When risks materialise or abate, this capital buffer is reduced, ensuring that institutions are more able to absorb losses and maintain the flow of credit to the economy. Hence, the buffer is of a countercyclical nature, and may also contribute to dampening the amplitude of the financial and economic cycles.

Legal framework

The countercyclical buffer is one of the macroprudential instruments provided for in the regulatory framework developed under Basel III, which has introduced a set of international regulatory reforms in the wake of the 2007/8 global financial crisis that started in. This set of reforms aimed mainly at reinforcing the banking system's resilience, by strengthening capital requirements, improving the quality of the required capital and introducing global liquidity requirements. In addition to microprudential regulation, these reforms have also introduced instruments of a macroprudential nature intended to prevent and mitigate the build-up of systemic risk in the banking system and reduce procyclicality in the build-up of these risks over time.

Basel III was transposed into European Union (EU) law through Regulation (EU) No 575/2013 (CRR) and Directive 2013/36/EU (CRD IV) in June 2013.[2] In addition, CRD IV was transposed into Portuguese law by Decree-Law No 157/2014 of 24 October 2014.[3] Directive (EU) 2019/878 (CRD V), amending the former Directive, has already been published and is pending transposition into national legislation. It does not introduce significant changes to this buffer's operationalisation.

In June 2014 the European Systemic Risk Board (ESRB) issued a Recommendation to national macroprudential authorities on the implementation of the countercyclical capital buffer in the EEA.[4] Specifically, this Recommendation proposes a series of principles aimed at guiding

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[1] Regulation (EU) No 1092/2010 of the European Parliament and of the Council defines systemic risk as a risk of disruption in the financial system with the potential to have serious negative consequences for the internal market and the real economy. In turn, cyclical systemic risk is based on the build-up of systemic risk over time, capturing the tendency of financial institutions to take excessive risks during favourable economic periods and to display considerable risk aversion in periods of economic recession in a way that considerably affects the supply of credit to the economy. For further details, see the June 2019 issue of the *Financial Stability Report*, in particular Box 3 entitled "A cyclical systemic risk indicator in Portugal".

[2] This regulatory package applies to the Member States of the European Economic Area (EEA), which brings together the EU Member States and three countries of the European Free Trade Association (EFTA), i.e. Iceland, Liechtenstein and Norway, as set out in the EEA agreement.

[3] This Decree-Law amends the Legal Framework of Credit Institutions and Financial Companies and also implements a number of provisions of the CRR.

[4] Recommendation of the ESRB (ESRB/2014/1) on guidance for setting countercyclical buffer rates.

macroprudential authorities' decisions and ensuring consistent application of the countercyclical buffer across the different EEA Member States.[5]

Banco de Portugal's decisions on the countercyclical buffer rate

In accordance with the legal framework presented above, the Banco de Portugal sets out the countercyclical buffer rate on a quarterly basis, applicable to all credit exposures to the domestic private non-financial sector of credit institutions and investment firms in Portugal that are subject to the supervision of the Banco de Portugal or the European Central Bank (ECB, Single Supervisory Mechanism), as applicable (hereinafter 'institutions').[6] The buffer rate should be set between 0% and 2.5% of the total risk exposure amount, calibrated in steps of 0.25 percentage points (pp) or multiples thereof.[7] In exceptional cases, the buffer rate may be set at above 2.5%, if the regular risk monitoring so warrants.

When the Banco de Portugal decides to set the countercyclical buffer rate above zero for the first time, or whenever it increases the buffer rate, institutions have a maximum of 12 months to comply with the decision starting from the date it has been published. Only under exceptional circumstances may the Banco de Portugal impose a shorter deadline.

In contrast, reductions in the countercyclical buffer rate are immediately applicable, so as to mitigate restrictions on the supply of credit to the economy. In addition, whenever the countercyclical buffer rate is reduced an indicative period should be decided on, during which the rate is not expected to increase. However, this indication is not binding and, if there is evidence of a build-up of cyclical systemic risk, the buffer rate may be raised sooner than previously decided on.

Institution-specific countercyclical capital buffer

Each institution's buffer rate, i.e. the so-called 'institution-specific countercyclical buffer rate' consists of the weighted average of the buffer rates that apply in the jurisdictions where the relevant credit exposures of the credit institution are located and should be calculated both on an individual and consolidated basis, as applicable. This additional requirement should consist of Common Equity Tier 1 (CET 1). The institution-specific countercyclical buffer rate is to be calculated as follows:

$$CCyB_j = \sum_{i=1}^{n} CCyB_i \times \frac{E_{j,i}}{\sum_{i=1}^{n} E_{j,i}},$$

where $CCyB_j$ is the countercyclical capital buffer rate that is specific of institution j operating in Portugal, n is the number of countries to which institution j is exposed, $CCyB_i$ is the countercyclical

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[5] In the first assessment on compliance with Recommendation ESRB/2014/1 (18 February 2018) the Banco de Portugal was graded by the ESRB as being fully compliant with the Recommendation. For further details see *ESRB Summary Compliance Report May 2019.*

[6] The private non-financial sector comprises non-financial corporations and households.

[7] The total risk exposure amount is calculated in accordance with Article 92(3) of Regulation (EU) No 575/2013.

buffer rate set by the relevant authority of country i and applicable to exposures to country i, and $E_{j,i}$ is the credit risk exposure amount to country i held by institution j.

Reciprocity or recognition of countercyclical buffer rates set by other countries

In accordance with the applicable law, and for the purposes of calculating the institution-specific countercyclical buffer rate, buffer rates up to 2.5% set by an EEA Member State should be mutually and automatically reciprocated. If these are set by third-country authorities, they should be recognised, provided that the Banco de Portugal considers the framework underlying the setting of the third country's countercyclical capital buffer to be equivalent.[8] When buffer rates set by EEA Member States or third countries exceed 2.5%, the Banco de Portugal will decide on their recognition on a case-by-case basis.[9]

Banco de Portugal's decision on buffer rates for exposures to third countries

Under Recommendation ESRB/2015/1, the Banco de Portugal identifies material third countries for the Portuguese financial system on an annual basis. For that purpose, the Banco de Portugal follows the methodology developed by the ESRB to assess the materiality of third countries for the EEA's financial system.

For third countries classified as material, the Banco de Portugal monitors a set of macroeconomic and financial indicators that signal the build-up of cyclical systemic risk. Whenever the Banco de Portugal considers that cyclical systemic risk emerges in a material third country and that country's authority has not set a countercyclical buffer rate, the Banco de Portugal may set the countercyclical buffer rate applicable to exposures to that third country held by institutions. In addition, when the buffer rate set by the third-country authority is considered insufficient, the Banco de Portugal may decide to impose a higher buffer rate applicable to exposures to that third country held by institutions.[10]

Interaction with other authorities

The Banco de Portugal assesses the level of the buffer rate applicable to credit exposures to the domestic private non-financial sector on a quarterly basis. Prior to making a final decision, the Banco de Portugal formally notifies the ECB and consults the National Council of Financial Supervisors (*Conselho Nacional de Supervisores Financeiros* – CNSF). The Banco de Portugal also consults the CNSF in the event of recognition of buffer rates set at more than 2.5% in another jurisdiction and where it has to set the countercyclical buffer rate applicable to exposures to a material third country.

The ECB may object to the Banco de Portugal's proposed decision and/or apply a higher countercyclical buffer rate than the Banco de Portugal's proposal, provided this decision is duly justified.

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[8] A third country is any jurisdiction outside the EEA.

[9] For further details on the institution-specific countercyclical buffer rate, and on the methodology adopted by the Banco de Portugal on the identification and monitoring of the cyclical systemic risk of material third countries for the Portuguese banking system, see the methodological document *Institution-specific countercyclical buffer rate*.

[10] Decision ESRB/2015/3 on the assessment of materiality of third countries for the Union's banking system in relation to the recognition and setting of countercyclical buffer rates.

The Banco de Portugal notifies the ESRB of the final decision on the buffer rate after the decision has been published.

Additionally, the Banco de Portugal as well as the other designated national authorities across the EEA have been advised to coordinate the recognition of a buffer rate set above 2.5% by a material third-country authority among themselves through the ESRB. Finally, when the Banco de Portugal sets a countercyclical buffer rate applicable to exposures to a third country and if it considers that this decision should be coordinated across the EEA, it should communicate this to the ESRB.

2 Decisions on the countercyclical buffer rate

The Banco de Portugal's decisions on the level of buffer rates applicable to credit exposures to domestic counterparties are based on a combination of (i) the application of quantitative rules, some of which set forth in the applicable legislation, (ii) the monitoring of a wide-ranging set of macroeconomic and financial indicators and (iii) discretion ('guided discretion'). This approach provides macroprudential authorities with the necessary flexibility, stemming from national specificities, to respond to developments in cyclical systemic risk in the financial system, while facilitating the communication of decisions and the formation of economic agents' expectations.

The application of quantitative rules is a starting point for analysing the decision on the countercyclical buffer rate and does not aim to automatically set the buffer level or bind the macroprudential authority to a particular decision. The absence of an indicator allowing for an accurate and direct quantification of the level of cyclical systemic risk prevailing in the financial system precludes the exclusive use of formal rules to guide the build-up, maintenance or reduction of the buffer level. Hence, it is key to complement the risk assessment with an analysis of a set of indicators allowing for the monitoring of relevant cyclical developments for financial stability.

The countercyclical buffer rate should be set according to the stage of the financial cycle. In particular, the countercyclical buffer should be built up in periods associated with an increase in cyclical systemic risk. Thus, the set of indicators complementing the application of quantitative rules should make it possible to monitor the build-up of cyclical systemic risk in the financial system, and to identify the factors that may contribute to the developments observed. These indicators should be able to signal the build-up of financial system imbalances in advance, so as to enable the timely reinforcement of the financial system's resilience.

In addition, periods that are characterised by a gradual reversal of cyclical systemic risk and periods of abrupt risk materialisation should be associated with decisions to reduce the buffer in full or in part, or to maintain it at 0%, should it not yet have been built up. The reduction of the buffer immediately raises the financial system's loss-absorption capacity and is targeted at avoiding a sudden restraining of credit supply to the economy. Hence, the timing of the decision to reduce the countercyclical buffer is particularly important, given that late reduction of the buffer may reduce its effectiveness.

Thus, the analytical framework underlying the operationalisation of the countercyclical buffer should also consider indicators that are able to signal risk materialisation in the financial system in a coincident manner. In a context of gradual reversal of cyclical systemic risk associated with decisions to maintain or partly reduce the buffer, the risk assessment should be based on the set of all indicators presented in this document (items 2.1, 2.2. and 2.3), including those linked to the decision to build up the buffer, given that these may be important to signal a reversal in the financial cycle. Conversely, in a context of abrupt materialisation of cyclical systemic risk the risk assessment should favour the indicators presented in item 2.3.

The set of indicators that guide the Banco de Portugal's decisions to raise, maintain or reduce (in full or in part) the countercyclical buffer is presented below. These indicators will accompany every quarterly release of the decision on the countercyclical buffer rate.[11] The set includes indicators: (i) associated with the application of quantitative rules; (ii) to signal risk build-up periods; and (iii) to signal risk materialisation periods.

2.1 Indicators associated with the application of quantitative rules

Basel gap and buffer guide

The application of quantitative rules relies heavily on the deviation of the credit-to-GDP ratio from its long-term trend, calculated in accordance with BCBS guidelines (Basel gap), given its properties as an early warning indicator of systemic banking crises triggered by excessive credit growth in a group of European countries.[12] The Basel gap is calculated as the percentage point difference between the credit-to-GDP ratio and its long-term trend, where the trend is estimated by employing a one-sided Hodrick-Prescott filter with a smoothing parameter set to 400,000. This deviation is then used to calculate the so-called buffer rate guide in accordance with BCBS guidelines. In the event of the credit-to-GDP ratio exceeding the long-term trend by 2 pp, the buffer rate guide increases linearly from zero to the upper limit of 2.5%, which is associated with a credit-to-GDP gap of 10 pp. The buffer rate guide resulting from the application of this rule should be interpreted as a starting point for the discussion on the final level of the buffer rate and acts as a reference point for comparing decisions across countries.

Additional credit-to-GDP gap

In spite of the important role assigned by the relevant legislation to the Basel gap in determining the countercyclical buffer rate, this measure of the credit cycle is frequently criticised, in particular due to the bias in end-of-sample values: the latest values for the credit-to-GDP gap are substantially revised whenever additional data become available and this may lead to less precise policy decisions.[13] One way of mitigating the effects of this problem in decision-making is to calculate the gap exactly as previously described, but augmenting the series of the credit-to-GDP ratio with forecasts. This possibility has been explored by the Banco de Portugal, which concluded that calculating the gap by using the series of the credit-to-GDP ratio augmented with 28 quarters of forecasts from an integrated autoregressive model results in a more precise estimate of cyclical developments in the credit market compared to the Basel gap. Consequently, this additional credit-to-GDP gap has been adopted by the Banco de Portugal as an alternative measure of the credit cycle. The underlying analysis also suggested initially setting the number of lags of the forecasting model at three quarters. Chart 1 illustrates the two measures of the credit-to-GDP gap, as well as the upper and lower reference values, as set out by the BCBS.

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[11] The Annex presents the data sources and further details on each indicator's calculation methodology.

[12] See inter alia Drehmann and Juselius (2014), Behn et al. (2013), Bonfim and Monteiro (2013), and Dekten et al. (2014).

[13] See inter alia Lang and Welz (2017), Castro et al. (2016), Repullo and Saurina (2011) and Edge and Meisenzahl (2011).

Chart 1 • Basel gap and additional credit-to-GDP gap | In percentage points
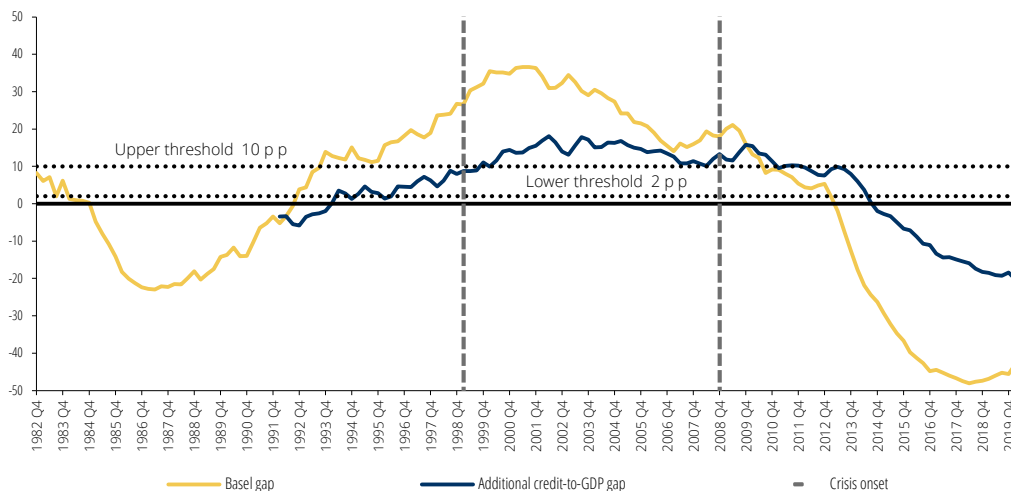
Sources: Banco de Portugal, Bank for International Settlements and Statistics Portugal (Banco de Portugal calculations). | Note: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database.

2.2 Indicators to signal risk build-up periods

These indicators should ideally provide information on developments in cyclical systemic risk and signal in advance the build-up of imbalances that may justify the increase in the countercyclical buffer. In this context, the initial choice of the indicators was based on the results obtained by Dekten et al. (2014) and Kalatie et al. (2015). These two empirical studies explore the behaviour of a wide-ranging set of indicators in the run-up to systemic banking crises for a panel of European countries. The second study also assesses whether these indicators are individually significant after controlling for the effect of the Basel gap.

Therefore, the Banco de Portugal has selected seven indicators which have good signalling properties for developments in cyclical systemic risk. This final set of indicators was chosen based on economic theory considerations and the indicators' timely signalling properties as regards historical periods of financial vulnerability and systemic banking crises in Portugal.[14] In addition, this set of indicators covers the six categories established in Recommendation ESRB/2014/1.

(a) Potential overvaluation of property prices

When monitoring the developments in cyclical systemic risk, it is important to identify periods in which the dynamics of property prices introduces procyclicality into credit growth, which may be associated with the accumulation of risk in the banking sector. Increases in house prices have a positive impact on economic agents' wealth, thereby reducing restrictions to indebtedness. This may lead to an expansion in credit demand, mainly for house purchase, which fosters house price growth and may generate a bubble in the real estate market. In periods of excessive price

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[14] Systemic banking crises as defined in the ESCB Heads of Research Group's banking crises database. For further details on crisis periods in Portugal, see Bonfim and Monteiro (2013).

appreciation, banks' resilience may be affected as they are exposed to fluctuations in real estate prices, either through real estate guarantees associated with credit or through exposures to credit granted to firms from the construction and real estate sectors, which depend on real estate market developments to maintain their creditworthiness and capacity to service debt obligations. Finally, banks may use loans secured by real estate to obtain market financing, which means that a negative sharp adjustment in house prices may increase financing costs for banks, or even prevent their access to liquidity.

Real house prices in Portugal did not increase considerably in periods prior to the two systemic banking crises shown in Chart 2, which confirms the view that, in Portugal, neither crisis was triggered by house price developments, despite the rapid credit growth observed. In mid-2013 house prices started to recover, interrupting the downward trajectory observed after the 2007/8 global financial crisis. Despite some evidence of price overvaluation in aggregate terms, this evolution of residential property prices was not accompanied by a marked recovery of the stock of credit for house purchase. This dynamic is justified by low interest rates and a high liquidity environment, which induces search-for-yield behaviour by economic agents, but also by investment from non-residents and the dynamism in tourism, particularly in local accommodation. Although the procyclical relationship between house prices and credit has not been observed in Portugal, there are a number of empirical studies that document the properties of house prices as a leading indicator of systemic banking crises in Europe.

Against this background, the indicators chosen correspond to the year-on-year rate of change in the real house price index and its four-quarter moving average, which eliminates short-term fluctuations in the original indicator.
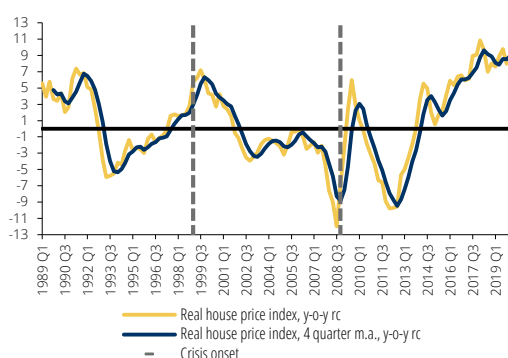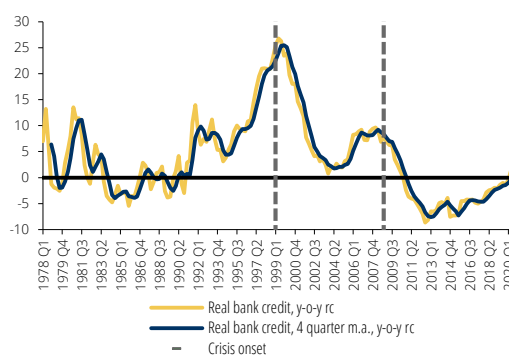
Chart 2 • Real house prices | Per cent

Real house price index, y-o-y rc
Real house price index, 4 quarter m.a., y-o-y rc
– Crisis onset

Chart 3 • Real bank credit | Per cent

Real bank credit, y-o-y rc
Real bank credit, 4 quarter m.a., y-o-y rc
– Crisis onset

Source: OECD. | Notes: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average and y-o-y rc for year-on-year rate of change.

Sources: Banco de Portugal and Bank for International Settlements. | Notes: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average and y-o-y rc for year-on-year rate of change.

(b) Credit developments

One of the main criticisms of the Basel gap is by Repullo and Saurina (2011), who argue that it sometimes tends to increase when GDP declines. This means that banks could be required to build up capital buffers not only in the expansion phase of the credit cycle, as established in the countercyclical buffer's analytical framework, but also during the downturn phase of the credit cycle. These authors question the use of the Basel gap and propose monitoring credit growth,

which is positively correlated with GDP growth and considered to be a leading indicator of systemic banking crises in various studies.[15]

Chart 3 presents the year-on-year rate of change in real bank credit for Portugal. The rate of change grew sharply in the run-up to the first crisis event and peaked before the 2007/8 global financial crisis, showing leading indicator properties. In this context, credit developments will be communicated through the year-on-year rate of change in real bank credit granted to the private non-financial sector and the year-on-year rate of change in the four-quarter moving average of real bank credit.

To avoid restricting the analysis exclusively to the evolution of the numerator of the credit-to-GDP ratio, another indicator chosen within this category is the ratio of the one-year absolute difference of bank credit to the five-year moving average of GDP.[16] The use of the five-year moving average of GDP instead of the four-quarter cumulative sum as in the Basel gap renders the indicator more resilient to potentially considerable short-term falls in GDP. In addition, this indicator is considered jointly with its four-quarter moving average. For Portugal, the indicator has the desirable properties of a leading indicator, given that it peaks before the 2007/8 global financial crisis (Chart 4).

(c) External imbalances

A frequently proposed measure of external imbalances is the current account balance as a percentage of GDP. A negative ratio indicates an increase in the country's external indebtedness in relation to the domestic level of production capacity. An increase in economic agents' indebtedness may compromise their ability to service debt and therefore may have a negative impact on the banking sector, which is exposed to the private non-financial sector. In fact, several financial crisis-related studies suggest that an increase in the current account deficit may be associated with an increase in cyclical systemic risk and the potential materialisation of a systemic banking crisis, especially if this increase is persistent over time.[17]

The current account deficit as a percentage of GDP for Portugal is shown in Chart 5. The indicator shows an upward trend in the periods prior to both crisis events and a peak before the 2007/8 global financial crisis, suggesting signalling properties as regards banking crises.

The set of indicators to be analysed within this category includes the current account deficit as a percentage of GDP, jointly with its four-quarter moving average.

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[15] See inter alia Behn et al. (2013), Bonfim and Monteiro (2013), Drehmann and Juselius (2014) and Detken et al. (2014).

[16] This indicator was first suggested in Kauko (2012a). Castro et al (2014) suggest a similar indicator called 'credit intensity'. This indicator is defined as the ratio of the one-year difference in total credit granted to the private non-financial sector to the four-quarter cumulative sum of GDP.
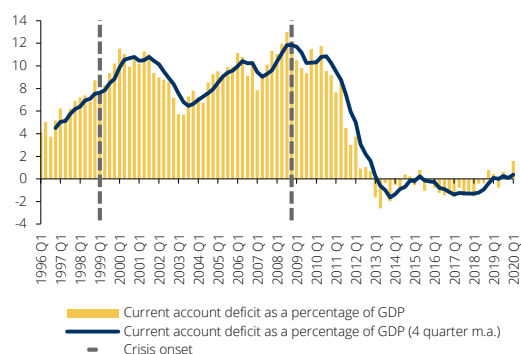
[17] There is extensive literature documenting the current account deficit's properties as a leading indicator of systemic banking crises. See inter alia Laeven and Valencia (2008), Lo Duca and Peltonen (2013) and Detken et al. (2014).

Chart 4 • Ratio of the one-year difference in credit to the five-year m.a. of GDP
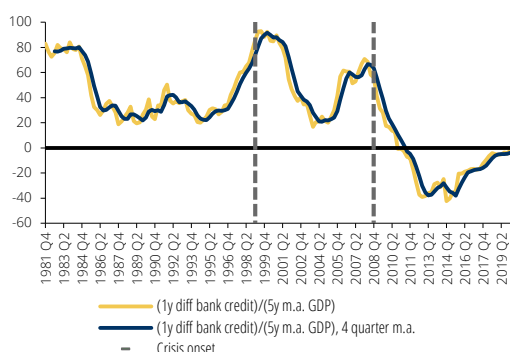
(1y diff bank credit)/(5y m.a. GDP)
(1y diff bank credit)/(5y m.a. GDP), 4 quarter m.a.
- Crisis onset

Source: Banco de Portugal. | Notes: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average and diff. for difference

Chart 5 • Current account deficit as a % of GDP | Per cent

Current account deficit as a percentage of GDP
Current account deficit as a percentage of GDP (4 quarter m.a.)
- Crisis onset

Source: Banco de Portugal. | Notes: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average.

(d) Strength of bank balance sheets

A banking system with high levels of capital has a greater ability to absorb asset losses and supply credit to the economy. However, the banks' financing structure also plays an important role in safeguarding the stability of the financial system.[18] During the upturn of the credit cycle, the rapid growth in credit demand is traditionally sustained by market financing at low cost, characterised by short maturities, which implies that at the risk materialisation stage banks that are heavily dependent on wholesale or interbank financing will be more vulnerable to a change in market sentiment, given that this type of financing suddenly becomes more expensive and more difficult to obtain. One of the indicators frequently used to assess the relationship between the banks' financing structure and their assets is the loan-to-deposit ratio.

Developments in the loan-to-deposit ratio in Portugal since 2000 are presented in Chart 6. The ratio increased significantly over the four years preceding the 2007/8 global financial crisis. This behaviour is also observed in many other countries prior to major banking crises. During this period, market–based instruments played a significant role in the funding structure of the banking sector, rendering the financial system vulnerable to changes in the risk perception of international investors. As of the second half of 2010, the ratio shows a downward trend that reflects a significant adjustment towards higher financing of the banking sector's lending activity by liabilities less sensitive to changes in risk perception by international investors. The growth in customer deposits was a determining factor for the observed evolution of the ratio.

The indicator chosen within the category under analysis is the loan-to-deposit ratio and its four-quarter moving average.

[18] See Kamin and DeMarco (2012) and Lainà et al. (2015).

(e) Non-financial private sector debt burden

A negative evolution of the debt repayment ability of the private non-financial sector may compromise financial stability, given that households and non-financial corporations may fail to meet their commitments, namely to financial intermediaries.[19] If private non-financial sector indebtedness grows more quickly than its disposable income, then economic agents will have to spend more of their future income to pay their loans. The ability of economic agents to meet debt obligations is also affected by changes in interest rates. An increase in interest rates implies an increase in debt servicing costs which may become unsustainable and jeopardise the ability of the most indebted and/or lower-income economic agents to meet debt obligations, thus increasing the probability of default on their liabilities. This risk is particularly important when the prevailing interest rate regime is the floating rate regime and/or when the level of indebtedness of the non-financial private sector is high. Thus, keeping everything else constant, an adverse shock in income and/or in the interest rate increases the probability of default, thus creating vulnerabilities for the financial system.

One way of assessing the private non-financial sector's ability to absorb losses is using the debt service-to-income ratio, which measures the share of income used to pay debt and meet interest payments. In the run-up to the 2007/8 global financial crisis, the year-on-year rate of change in the debt service-to-income ratio in Portugal accelerated (Chart 7). Although debt accumulation may be linked to the period of economic expansion and structural changes in previous years, the 2007/8 global financial crisis showed that such indebtedness levels were unsustainable.

The indicators chosen within this category include the year-on-year rate of change in the debt service-to-income ratio of the private non-financial sector and its four-quarter moving average.

Chart 6 •   Loan-to-deposit ratio | Per cent

- ▬ Loan-to-deposit ratio
- ▬ Loan-to-deposit ratio, 4 quarter m.a.
- -- Crisis onset
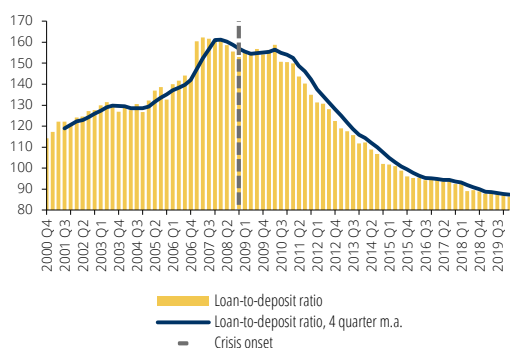
Source: Banco de Portugal | Note: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average.

Chart 7 •   Debt-service-to-income ratio | Per cent

- ▬ Debt-service-to income ratio, y-o-y rc
- ▬ Debt-service-to income ratio, y-o-y rc, 4 quarter m.a.
- -- Crisis onset
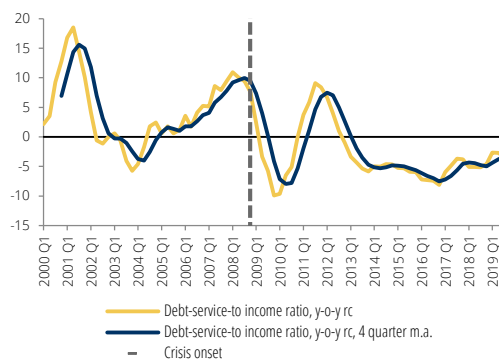
Source: Bank for International Settlements. | Note: Date for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average and y-o-y rc for year-on-year rate of change.

[19] See inter alia Büyükkarabacak and Valev (2010), Drehmann and Juselius (2014), Detken et al. (2014) and Giese et al. (2014).

(f) Potential mispricing of risk

Market sentiment and economic agents' perception of risk tend to be strictly linked to the state of the economy and the financial system. In periods of financial stability, economic sentiment tends to improve, which may lead banks to ease credit standards and consequently amplify credit and economic cycles. In turn, this behaviour may lead to excessive credit growth that is not desirable from a financial stability point of view. The mispricing of risk in bank credit granted to the private non-financial sector may be assessed through the spreads on interest rates charged by banks when granting loans to households and non-financial corporations. In fact, the existing literature shows that the spread on loans granted to non-financial corporations has a certain predictive power as regards banking crises.[20]

This indicator for Portugal is shown in Chart 8, and it is evident that during the years prior to the 2007/8 global financial crisis spreads were relatively narrow compared to those seen during the crisis. In fact, spreads widened considerably over this period, reflecting adjustments in market sentiment. This behaviour of the indicator warrants the choice of the spread applied by banks on new loans granted to non-financial corporations as an indicator to be analysed within this category of indicators. However, a joint period of fast credit growth and low spreads is not necessarily an indicator of mispricing of risk if the credit is granted to enterprises with high creditworthiness, or if other credit risk mitigants are present (namely State guarantees). Finally, and similarly to other indicators described above, the analysis of this indicator should also not be dissociated from the prevailing macroeconomic and financial environment and from expectations for the economy.

Chart 8 • Spreads on new loans to non-financial corporations | Percentage points

Bank spreads on new lending to non-financial corporations — Crisis onset
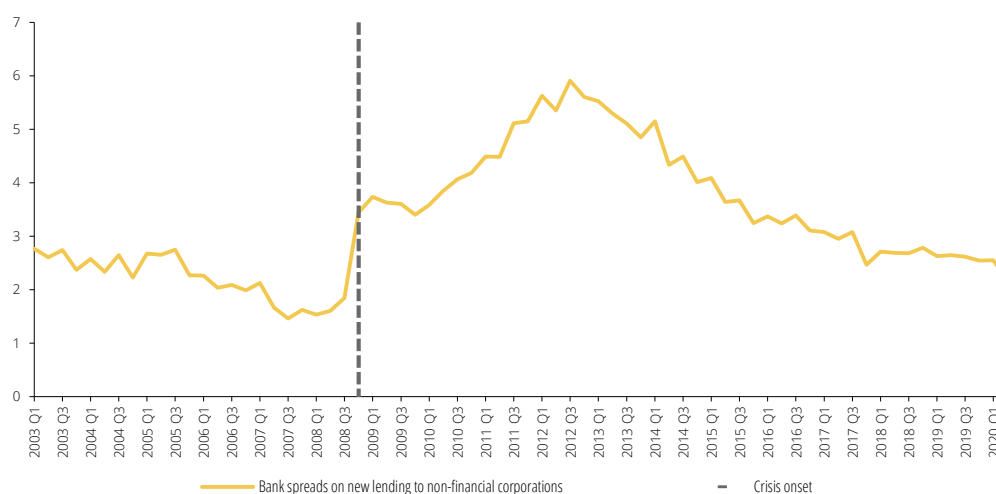
Source: Banco de Portugal; Datastream. | Note: Date for crises onset as defined in the ESCB Heads of Research Group's banking crises database.

2.3 Indicators to signal risk materialisation periods

The set of macroeconomic and financial indicators included in the analytical framework for operationalisation of the countercyclical buffer in Portugal is targeted at detecting risk materialisation in a timely manner, and is more oriented towards justifying decisions to reduce (in

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[20] See inter alia Kalatie et al. (2015).

full or in part) or to maintain at 0% the countercyclical buffer rate, should it not yet have been built up.

According to the analysis in Detken et al. (2014), high-frequency market-based indicators and forward-looking indicators/expectations related to the real economy display good coincident signalling properties as regards periods of abrupt risk materialisation. Taking into consideration Recommendation ESRB/2014/1, the assessment of the performance of various indicators in the identification of financial stress periods presented by Detken et al. (2014), as well as international experience, the Banco de Portugal has selected three indicators to detect risk materialisation periods.
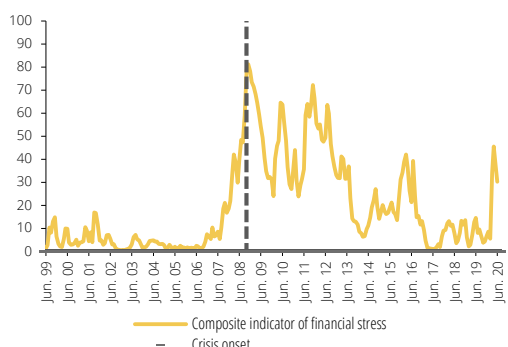
Composite indicator of financial stress

Risk materialisation periods can be characterised by a significant level of financial stress that reflects the sudden stop of the normal functioning of the financial intermediation of the economy. The difficulty in accessing financing puts further pressure on non-financial corporations and households and may result in losses for the financial system. This effect is particularly relevant in the context of an economic recession, given that a disruption in financial markets tends to amplify the effect of adverse shocks on the economy. Hence, indicators with the ability to signal the stress level in the financial system play a role in guiding decisions to reduce or maintain the countercyclical buffer.

The Composite Indicator of Financial Stress (Portuguese acronym: ICSF) presented in Braga, et al. (2014) aims at measuring the aggregate level of stress in Portuguese financial markets.[21] Financial stress is a multidimensional phenomenon as it tends to be reflected in increasing instability across various segments of the financial market. Hence, the ICSF is constructed on the basis of a set of indicators, such as measures of losses or volatility that can be used to monitor stress signals in the main financial market segments in Portugal, thus summarising the aggregate stress level in a single indicator.

Chart 9 presents the ICSF for Portugal and shows that the main stress events in the financial system coincide with the considerable increase in this indicator. The indicator appropriately identifies the period of high instability in the financial system stemming from the global financial crisis that started in 2007/8, as well as the sovereign debt crisis period in the euro area in 2011. Finally, the indicator clearly signalled the start of the crisis triggered by the COVID-19 pandemic, increasing abruptly in March 2020. The evolution of the indicator in different risk materialisation periods warrants the choice of the ICSF as an indicator to be analysed in the context of the decision-making process for the countercyclical buffer rate.

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[21] This indicator is based on the similar financial stress indicator for the euro area (the Composite Indicator of Systemic Stress – CISS) developed by the European Central Bank. The analysis in Detken et al. (2014) suggests that the CISS is one of the best performing indicators to signal financial stress periods.

Chart 9 • Composite indicator of financial stress | Quantile

Chart 10 • Economic sentiment indicator | Index (2000-2019 average = 100)

Source: Banco de Portugal. | Notes: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database; m.a. stands for moving average.
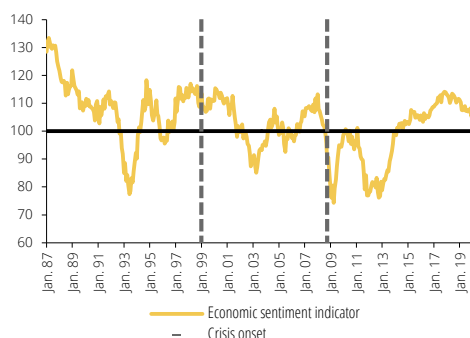
Source: European Commission. | Notes: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database.

Economic sentiment indicator

A sudden sharp drop in economic activity has a negative impact on households' and non-financial corporations' debt servicing ability and may translate into an increase in losses in the financial system. Hence, monitoring economic developments provides important information to signal periods of cyclical systemic risk materialisation in a coincident manner.

The economic sentiment indicator calculated by the European Commission was selected for this purpose. This indicator measures the level of household and non-financial corporations' confidence relative to the economy on a monthly basis, making it possible to monitor the dynamics underlying economic activity in a coincident manner.[22] Chart 10 shows that as of 2000 the periods when the indicator signals an abrupt drop in economic sentiment coincide with the 2007/8 global financial crisis, the euro area sovereign debt crisis and the crisis associated with the COVID-19 pandemic in 2020. The latter coincided with the lowest figures for the indicator since the start of the series, interrupting a period of optimism towards the Portuguese economy lasting since the second half of 2014. Taking this analysis into account, this indicator seems to have the ability to detect risk materialisation periods in Portugal in a timely fashion.

Spread of Portugal's ten-year government bond yield vis-à-vis Germany

The cost of State financing through public debt reflected in bond yields is also a useful measure to ascertain financial market conditions. A reassessment of the sovereign debt risk premium tends to be accompanied by a reassessment of the risk premium required for debt issued in financial markets by non-financial corporations and by the financial sector itself. The deterioration in non-financial corporations' financing conditions may have an adverse effect on their debt servicing capacity, which may translate into losses in the financial system. The indicator adopted to monitor

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[22] GDP is the most representative measure of economic activity, although it presents various inconveniences, given that it is only published on a quarterly basis, being generally subject to revisions, which may be significant.

developments in public debt risk is the spread of Portugal's ten-year government bond yields vis-à-vis Germany's ten-year government debt.

Chart 11 presents this indicator, which markedly signals the period associated with the sovereign debt crisis in the euro area in 2011. This indicator is influenced by a broader group of factors, including monetary policy actions, and thus not all financial stress periods are reflected in a sharp increase in spreads on government bond yields, such as for example during the COVID-19 pandemic period, during which the timely intervention of monetary policy mitigated the effects on euro area countries' financing costs.

Chart 11 • Spread of Portugal's ten-year government bond yield vis-à-vis Germany | Percentage points

Spread between Portuguese and German 10-year government yields — Crisis onset
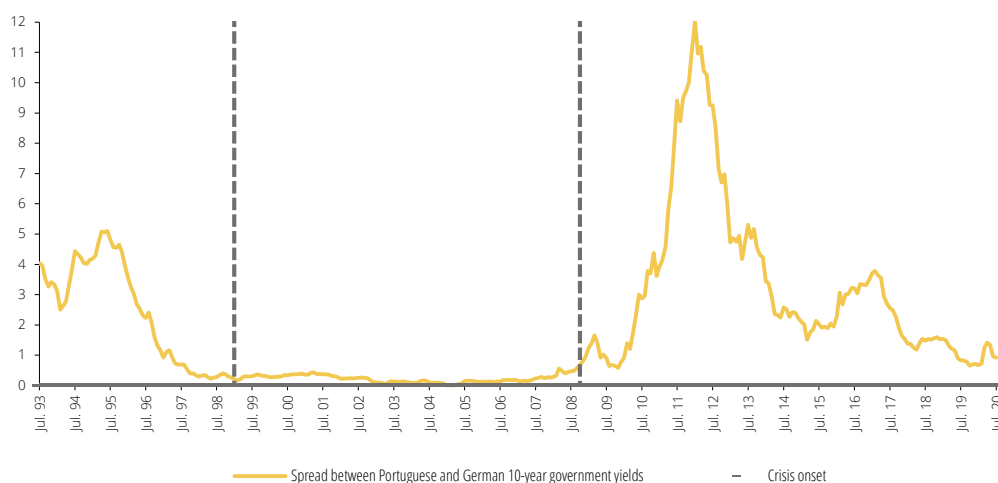
Source: European Central Bank. | Note: Dates for crises onset as defined in the ESCB Heads of Research Group's banking crises database.

Thus, in a context of abrupt materialisation of cyclical systemic risk, the three indicators described above will be favoured. However, these indicators are generally more volatile, and for this reason might be less robust in identifying periods of risk materialisation.

In a context of a gradual reversal of cyclical systemic risk, the risk assessment should be based on all indicators presented in this document, including those associated with the decision to build-up the countercyclical buffer, as these may be relevant to signal the inversion of the financial cycle.

There is a significant degree of uncertainty in the identification of the appropriate timing to reduce the countercyclical buffer and to distinguish between situations where the buffer should be gradually or fully reduced. In this context, discretion assumes a particularly important role, given that indicators, albeit informative, have a number of limitations.

In sum, the Banco de Portugal will regularly publish the set of 12 indicators presented in this document, given that they provide a picture of developments in cyclical systemic risk.[23] Additionally, the risk analysis guiding decisions on the buffer rate considers monitoring a much

[23] Some of these indicators have been published by the Banco de Portugal since 2015. However, the crisis triggered by the COVID-19 pandemic has led to an update of the analytical framework and the addition in this version of the document of three indicators targeted at detecting periods of risk materialisation in a timely manner.

wider set of indicators than that discussed in this document, and that discretion plays an important role throughout the whole decision-making process. Finally, it is important to note that the methodologies and indicators may be revised over time.

3 Communication

The Banco de Portugal publishes on its website each quarterly decision on the countercyclical buffer rate applicable to exposures to a domestic counterparty. This publication includes, inter alia, information on: (i) the level of the applicable buffer rate; (ii) the credit-to-GDP ratio and its deviation from its long-term trend, calculated in accordance with BCBS guidelines (Basel gap); (iii) the additional credit-to-GDP gap; and (iv) the justification for the buffer rate. In addition, the Banco de Portugal publishes the set of indicators described in the previous section selected according to the guidelines in Recommendation ESRB/2014/1.

When the buffer rate is set above zero for the first time or raised, the Banco de Portugal should also publish the date from which the buffer rate is applicable. If it is under 12 months, it publishes an explanation on the exceptional circumstances justifying the shorter deadline for compliance with the buffer by institutions. When the buffer rate is reduced, the Banco de Portugal should also announce the indicative period during which no increase is expected in the buffer rate.

In addition, when the buffer rate for exposures to a third country is set for the first time or raised, the Banco de Portugal should publish on its website information on: (i) the level of the applicable buffer rate; (ii) the third country to which it applies; (iii) a justification for the buffer rate; and (iv) the period from which institutions should comply with the buffer. When the buffer rate is reduced, the period during which no increase is expected in the buffer rate is announced.

If the Banco de Portugal decides to recognise a buffer rate above 2.5%, it should publish the decision on its website, regardless of it having been set by another EEA Member State or by a third country. In particular, the Banco de Portugal should publish: (i) the applicable buffer rate; and (ii) which (country) exposures this buffer rate applies to. In addition, the deadline for institutions' compliance with the requirement will be announced, which under normal circumstances should not exceed 12 months from the date of the announcement.

Finally, the Banco de Portugal also provides on its website information on the countercyclical capital buffer rates of EEA countries and third countries so as to facilitate the calculation of the institution-specific countercyclical buffer rate.

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Annex

Details on the indicators associated with the application of quantitative rules

Credit-to-GDP ratio

Data sources for credit: Banco de Portugal, National Financial Accounts Statistics (ESA 2010) and Bank for International Settlements, *Database on credit to the non-financial sector.*

Data sources for GDP: Banco de Portugal, "Quarterly long series for the Portuguese economy: 1977 – 2014" and Statistics Portugal, National Accounts (ESA 2010, base 2016).

Description: Credit includes loans granted to the domestic private non-financial sector and debt securities issued by the domestic private non-financial sector. Total credit consists of credit granted by banks, non-banks, and domestic and foreign debt markets. Credit data for the 1977 Q1-1994 Q4 period correspond to data from the Bank for International Settlements and from 1995 Q1 onwards to data from national financial accounts statistics. GDP data for the 1977 Q1-1994 Q4 period correspond to data from the Banco de Portugal, and from 1995 Q1 onwards to National Accounts data. Nominal GDP is adjusted for seasonal and calendar effects. The credit-to-GDP ratio is calculated as follows:

$$ratio_t = \frac{credit_t}{\sum_{i=0}^{3} GDP_{t-i}} \times 100.$$

The ratio has been available since 1977 Q4.

Credit-to-GDP gap or Basel gap

Description: The gap is calculated as the percentage point difference between the observed credit-to-GDP ratio and its long-term trend ($gap_t = ratio_t - trend_t$), where the trend is estimated by employing a one-sided Hodrick-Prescott (HP) filter with a smoothing parameter set to 400,000. More specifically, the long-term trend estimate results from the resolution of the following minimisation problem:

$$\min_{\{trend_t\}_{t=0}^{T}} \left\{ \sum_{t=0}^{T} (ratio_t - trend_t)^2 + \lambda \sum_{t=0}^{T-1} [(trend_{t+1} - trend_t) - (trend_t - trend_{t-1})]^2 \right\}$$

where parameter λ determines the smoothing of the trend component. BCBS and ESRB guidelines recommend a smoothing parameter set to 400,000, under the assumption that the duration of financial cycles is approximately four times that of economic cycles ($1,600 \times 4^4 \cong 400,000$).

Additional credit-to-GDP gap

Description: The additional credit-to-GDP gap is computed as the percentage point difference between the credit-to-GDP ratio augmented with forecasts from an integrated autoregressive model over 28 quarters and its long-term trend, where the trend is estimated by employing a one-sided HP filter with a smoothing parameter set to 400,000. Until 2015 Q1, the optimal lag order (p) of the forecasting model is recursively determined. From 2015 Q2 onwards, p is set to three quarters, which is the optimal lag length when using data until 2015 Q1.

The analysis supporting the choice of the additional credit-to-GDP gap tested the credit-to-GDP ratio augmented with forecasts from seven different models: random walk, moving average model,

linear trend model, moving linear trend model, integrated autoregressive model ARIMA(p,1,0), integrated moving-average model ARIMA(0,1,q) and integrated moving-average autoregressive model ARIMA(p,1,q). Four forecast horizons were considered for each model: 16, 20, 24 and 28 quarters. In addition, the performance of each alternative in relation to the Basel gap was assessed using the following performance measures: relative mean square error, root mean square error and relative mean absolute error.

Details on indicators to signal risk build-up periods

Real house price index

Data source: OECD, Housing prices database.

Description: The house price index (2015=100) is adjusted for inflation using the private consumption deflator (2016=100) taken from the National Accounts (ESA 2010, base 2016) released by Statistics Portugal.

Quarterly data have been available since 1988 Q1.

Real bank credit granted to the private non-financial sector

Data sources: Banco de Portugal, monetary and financial statistics (ESA 2010) and Bank for International Settlements, Database on credit to the non-financial sector.

Description: Credit includes loans granted to the domestic private non-financial sector and debt securities issued by the domestic private non-financial sector. Bank credit consists of credit granted by resident monetary financial institutions. Data for the 1977 Q1-1979 Q3 period correspond to data from the Bank for International Settlements and from 1979 Q4 onwards to data from monetary and financial statistics. The credit variable is adjusted for inflation using the consumer price index (2012=100) released by Statistics Portugal. Figures for the second, third and fourth quarters of 2019 and for the first quarter of 2020 were adjusted for the effects of the statistical reclassification of a set of Portuguese branches of credit institutions located in other European Union countries that were previously registered outside the monetary and financial institutions sector and are now considered in the same sector as their parent institution.

Data have been available since 1977 Q1.

Ratio of the one-year absolute difference of bank credit to the five-year moving average of GDP

Data source for bank credit: Banco de Portugal, monetary and financial statistics (ESA 2010).

Data sources for GDP: Banco de Portugal, *Quarterly long series for the Portuguese economy: 1977-2014* and Statistics Portugal, National Accounts (ESA 2010, base 2016).

Description: Credit includes loans granted to the domestic private non-financial sector and debt securities issued by the domestic private non-financial sector. Bank credit consists of credit granted by resident monetary financial institutions. Figures for the second, third and fourth quarters of 2019 and for the first quarter of 2020 were adjusted for the effects of the statistical reclassification of a set of Portuguese branches of credit institutions located in other European Union countries that were previously registered outside the monetary and financial institutions sector and are now considered in the same sector as their parent institution. GDP data for the 1977 Q1-1994 Q4 period correspond to data from the Banco de Portugal, and from 1995 Q1 onwards to National Accounts data. Nominal GDP is adjusted for seasonal and calendar effects.

The ratio has been available since 1981 Q4.

Current account deficit as a percentage of GDP

Data source for the current account: Banco de Portugal, balance of payments statistics (ESA 2010).

Data source for GDP: Statistics Portugal, National Accounts (ESA 2010, base 2016).

Description: Seasonally adjusted current account deficit divided by seasonally adjusted nominal GDP.

The ratio has been available since 1996 Q1.

Loan-to-deposit ratio

Data source: Banco de Portugal, supervisory database.

Description: Loans and deposits refer to values reported on a consolidated basis for supervisory purposes. Data for the 2000 Q4-2004 Q4 period correspond to aggregate banking system values reported according to Generally Accepted Accounting Principles (GAAP). Data for the 2005 Q1-2006 Q4 period correspond to values for the six major banking groups reported according to International Financial Reporting Standards (IFRS). Data for 2007 Q1 onwards correspond to aggregate banking system values reported according to IFRS.

The ratio has been available since 2000 Q4.

Debt service-to-income ratio

Data source: Bank for International Settlements, debt service ratios database.

Description: For further details on the ratio calculation method see BIS website.

The ratio has been available since 2000 Q1.

Spreads on new loans granted by the banking sector to non-financial corporations

Data source for interest rates on new loans: Banco de Portugal, monetary and financial statistics (ESA 2010).

Data source for the Euribor rate: Datastream.

Description: Average of spreads weighted by the corresponding outstanding loan amounts at the end of the quarter. The spread is calculated against the three-month Euribor rate. Only interest rates on new loans granted by other monetary financial institutions to residents with initial rate fixation up to one year are considered.

This indicator has been available since the first quarter of 2003.

Since data are monitored on a quarterly basis, the following formulas were used to calculate the following:

One-year absolute difference: $x_t - x_{t-4}$

Four-quarter moving average: $\frac{1}{4}\sum_{i=0}^{3} x_{t-i}$

Five-year moving average: $\frac{1}{20}\sum_{i=0}^{19} x_{t-i}$

Year-on-year rate of change: $\left(\frac{x_t - x_{t-4}}{x_{t-4}}\right) \times 100$

Details on indicators to signal risk materialisation periods

Composite indicator of financial stress

Data source: Banco de Portugal

Description: The ICSF is constructed on the basis of a set of indicators referring to the five market segments that are most important to the Portuguese financial system, namely: money market, bond market, equity market, financial intermediaries and foreign exchange market. For each of these market segments, three variables are taken into account on a daily basis that make it possible to capture different risk dimensions affecting the financial stress level, such as volatility measures or accumulated losses. These variables are aggregated to create five sub-indices for each market segment. The five sub-indices are then aggregated to create the final composite indicator of financial stress. The aggregation of the sub-indices considers not only the correlation between the different market segments, but also their relative importance in relation to economic activity in Portugal. The result is an indicator ranging between 0 and 100, whose figures can be interpreted as the historical quantile of financial stress since 1999. Hence, figures over 50 indicate financial stress periods above the historical median since 1999.

For further details on the indicator, see Braga, Pereira and Reis (2014), "Composite Indicator of Financial Stress for Portugal", *Financial Stability Papers,* No 1, Banco de Portugal.

This indicator has been available since April 1999.

Economic sentiment indicator

Data source: European Commission

Description: The indicator is constructed through the weighted average of the balance of responses to business and consumer surveys, considering the industry, services, consumption, retail and construction areas. This indicator is constructed in such a way that 100 represents the long-term average with a standard deviation of 10. Hence, figures above 100 indicate an economic sentiment above average and vice versa.

For further details on how to calculate the indicator, see *Business and consumer surveys.*

This indicator has been available since January 1987.

Spread of Portugal's ten-year government bond yield vis-à-vis Germany

Data source: European Central Bank

Description: Spread of Portugal's (ten-year) Treasury bond yield vis-à-vis Germany. The calculation of the spread uses monthly series obtained as the average of daily figures observed over each month. The identifiers for (ten-year) Treasury bond yield for Portugal and Germany in the European Central Bank's Statistical Data Warehouse are IRS.M.PT.L.L40.CI.0000.EUR.N.Z and IRS.M.DE.L.L40.CI.0000.EUR.N.Z respectively.

This indicator has been available since July 1993.