THE COUNTERCYCLICAL CAPITAL BUFFER IN SPAIN:
AN EXPLORATORY ANALYSIS OF KEY GUIDING INDICATORS

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This paper describes the overall characteristics of the Basel III countercyclical capital buffer (CCB) framework, its implementation in the EU, and analyses a group of potential guiding indicators for Spain. Based on an empirical exploratory analysis of three stress events identified, we describe a number of practical and conceptual issues that may arise with the Basel benchmark buffer guide – the credit-to-GDP gap – and study a number of complementary indicators. We explore specifically some alternative specifications for the credit-to-GDP gap and additional indicators of credit developments where we propose a 'credit intensity' measure (the ratio of changes in credit to cumulated GDP). Further to this, we explore the performance of indicators of real estate property prices, external imbalances and private sector debt sustainability – including various transformations of the indicators when needed. In line with previous literature, we find that a broad but manageable set of indicators may help to improve decisions on the CCB.

1	Introduction

A number of macroprudential instruments have been proposed in the last few years. Most instruments thus far are based on banks' balance sheets, build on microprudential standards and are usually classified as structural or cyclical (time-varying). Among the latter, the countercyclical capital buffer (CCB) is perhaps the best known macroprudential instrument and one at a more advanced stage of operationalisation. Capital or liquidity requirements for systemic financial institutions are examples of structural instruments.[1]

The CCB's appearance in the international regulatory debate can be traced to the 2009 consultative paper on "Strengthening the Resilience of the Banking Sector" by the Basel Committee on Banking Supervision (BCBS). The BCBS proposes in this paper a series of measures to address procyclicality with four key objectives: i) dampen any excess cyclicality of the minimum capital requirement; ii) promote more forward looking provisions; iii) conserve capital to build buffers that can be used in stress; and iv) achieve the broader macro-prudential goal of protecting the banking sector from periods of excess credit growth.

The third and fourth objectives above served as a basis for the creation of a 'conservation' and a 'countercyclical' capital buffer, respectively.[2] Subsequently, the Basel III framework introduced these two requirements together with an additional capital buffer or 'capital surcharge' for systemically important financial institutions (SIFIs). The conservation, countercyclical and SIFIs buffers are all capital-based requirements. The numerator is Common Equity Tier 1 (CET1) and the denominator is Risk Weighted Assets (RWAs).[3] Regarding the selection of capital-based requirements, the BCBS (2010) paper provides long-term estimates of the expected economic benefits (reductions in the probability of banking crises and its output loss) and costs (decline in steady-state output) of introducing higher capital and liquidity requirements.

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1 Given practical difficulties to disentangle pure time varying vs. pure structural instruments, macroprudential instruments are also commonly classified according to the source of risk that they address (eg: excessive credit growth, maturity mismatches and market liquidity, concentration). This is the approach followed for example in the ESRB 2013 Recommendation on intermediate objectives and instruments of macroprudencial policy.

2 Drehmann *et al.* (2010) study different options for the design of countercyclical capital buffers also drawing on the experience with dynamic provisions (ie: the general loan loss provisions applied in Spain since mid-2000). Saurina (2009a, 2009b) and Trucharte and Saurina (2013) describe the Spanish dynamic provisions in detail and discuss their use for macroprudential policy.

3 BCBS (2011).

The implementation of the three requirements will be phased-in from January 2016 onwards, reaching their full effect in January 2019. Under these transitional arrangements the CCB can be activated at a maximum of 0.625% of RWAs from January 2016. After that, the maximum possible CCB level increases each year by 0.625 percentage points until reaching the level of 2.5% of RWAs on January 2019. National authorities can accelerate this period if their countries are experiencing excessive credit growth, and they can also choose to implement larger CCB requirements.[4] Authorities opting to activate or increase the CCB should make public their decision in advance by up to 12 months in order to give banks time to adjust their capital levels. Decisions to fully release or decrease the CCB, on the contrary, take effect immediately.

In addition to the Basel III framework, the BCBS (2010) "Guidance on operating the CCB" – a CCB specific companion document to Basel III – provides further information how the buffer is expected to work. The BCBS paper clarifies in particular the key aim of the regime, namely 'to ensure that the banking sector in aggregate has the capital on hand to help maintain the flow of credit in the economy without its solvency being questioned, when the broader financial system experiences stress after a period of excess credit growth'. The BCBS also sets out details for the calculations of a quantitative indicator – the credit-to-GDP gap – to be used as a common starting point when setting the buffer rates. Finally, the BCBS document provides for a set of principles to guide authorities in the use of judgement when taking buffer decisions.

Following the BCBS proposals, a number of countries have started to implement the CCB. In the EU, the new European legislation on banking regulation (CRR/CRDIV) introduces the CCB in Articles 130 and 135-140 of the CRDIV.[5] In addition, Article 135 asks the European Systemic Risk Board (ESRB) to provide guidance on a number of operational issues for the implementation of the CCB in EU countries. Backed by empirical work presented in its 2014 Occasional Paper, the ESRB recommendation on "Guidance to EU Member States for setting countercyclical buffer rates" achieves this task.[6,7] The recommendation extends the Basel principles, assesses the adequacy of the Basel gap and benchmark rule to set buffer rates, and provides guidance on other indicators to signal the activation and deactivation of the buffer.

Using as a background the BCBS framework for the CCB, the aforementioned ESRB recommendation and the EU legislation on the subject, this paper takes a first step towards analysing the performance of a set of quantitative indicators to guide the CCB in Spain. In particular, we study a short-list of what we considered the more auspicious indicators following a pre-selection process drawing on relevant literature and ongoing experiences in other countries.

In this exercise we focus on exploring the indicators informative value during those periods when systemic risks stemming from excessive credit growth are building up when the CCB is supposed to accumulate. Some tentative observations on the indicators potential ability

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4 In these cases, however, reciprocity arrangements are not mandatory where countries opt for additional amounts above 2.5% or earlier activations of the CCB.

5 CRR stands for Capital Requirements Regulation [i.e., Regulation (EU) No. 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No. 648/2012]. CRDIV stands for Capital Requirements Directive IV [i.e., Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms]. In Spain, Law 10/2014 of 26 June, on the organization, supervision and solvency of credit institutions, transposes the provisions in the CRR/CRDIV.

6 Detken *et al*. (2014).

7 ESRB (2014a).

to help guide the release of the CCB are made in a few cases, but a more comprehensive analysis on this area is left for future work.

This paper is organised as follows. Section 2 describes the overall characteristics of the CCB regime in Basel III and the key elements from the ESRB recommendation on the CCB. Section 3 explains the crisis events in Spain that we used to explore the performance of a set of indicators or 'sign posts' to help guide buffer decisions. Section 4 describes the set of indicators selected and explores their ability to identify periods of excessive credit growth in Spain. Section 5 extracts conclusions from the empirical exercise performed.

2 How does the CCB work?

The first thing that should be made clear-cut from the beginning is what the CCB is trying to achieve – and what it is not. Although its name may lead to different interpretations at first sight, the CCB's key aim is a narrow but important one. As explained in the introduction, the CCB is meant to ensure that the banking sector as a whole has an extra capital buffer which could be used to absorb losses in a downturn preceded by a period of excessive credit growth associated with the build up of systemic risks. Thus, the CCB aims to contribute to the broader objective of increasing resilience in the banking system and, in this manner, help to sustain the supply of credit to the economy in bad times.

The possible dampening of the build-up of excessive credit in boom times or the containment of exuberance are seen as potential positive side-effects but are not primary goals. In particular, the CCB has not been conceived as an instrument to manage economic cycles or asset prices. All the focus is on the credit cycle.[8] And all the emphasis is on resilience.

For this purpose the CCB should be accumulated during expansionary periods so that it can then be released when the downturn hits, allowing the capital buffer to absorb losses. A credible and enforceable release of the CCB is therefore as important as its accumulation. Failing to use the buffer when the systemic risks it is targeting materialise would reduce the CCB's effectiveness and increase procyclicality. Naturally, the release would only be possible if the CCB was correctly accumulated in anticipation to a downturn.

The countercyclical capital requirement is structured as an extension of the Basel conservation buffer. That is, both regulatory requirements have to be met jointly and are subject to the same conditions, eg: restrictions on dividend distributions during shortfalls. But whilst the minimum capital conservation buffer is constant, the minimum CCB level is allowed to vary over time.

The CCB is also a broad-based requirement. Its scope of action is aggregate domestic credit. This implies that the CCB targets system-wide cyclical risks stemming from credit exposures in a given banking sector. Yet, as banks from a given system may also be participating in other systems abroad, the bank-specific CCB rate is calculated as the weighted average of the CCB rates that apply in those countries where the relevant credit exposures of the bank are located.[9] Weights are given by the ratio of the capital requirements for credit risk in each country, divided by the bank's total requirement for credit risk.

The decisional framework for the activation and release of the CCB (i.e., usage of the CCB) follows what is known as a 'constrained' or 'guided discretion' approach. This framework comprises a common standardised quantitative indicator to be used as a benchmark (the

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8 Related to this, Jiménez *et al.* (2013) provides empirical insights on the effects of countercyclical buffers on credit cycles both in good and in bad times.
9 EBA (2013).

credit-to-GDP gap) and a set of principles to guide judgement when taking buffer decisions. Trade-offs between rules and discretion are long known in economics. Rules tend to boost predictability, avoid time-inconsistencies [Kydland and Prescott (1977)] and contribute to ensure transparency and accountability. But rules are also less flexible and adaptable to different environments or unexpected events. A guided discretion approach could be seen as a middle-ground solution between a rules-based and a discretion-based approach.[10]

Regarding the credit-to-GDP gap (i.e., the baseline 'Basel gap' or, in regulatory jargon, the 'benchmark buffer guide'), it is also important to clarify upfront what is the expected role for this indicator in the Basel framework. As stated, the baseline gap is a benchmark or common starting point for the analysis and discussion on CCB levels. It is not an end point for the analysis. As such, the gap should serve as a basis to explain deviations from the baseline specification, the reasons why other indicators may work better in some countries, or why the gap may fail to explain and justify certain decisions in given circumstances.

Since the Basel gap is a common benchmark, its components are standardised and its calculation and reporting are mandatory. In addition, there is a benchmark rule associated with the gap linking CCB levels with gap values. This provides a 'guide' to help decide when to activate or deactivate the CCB. And all this should also help to establish a common ground for discussions on the CCB.

But the Basel gap is not necessarily the sole indicator that authorities should consider when taking and communicating decisions on the CCB. Other quantitative indicators can also be used. Nor is the gap the only source of information available to authorities. Qualitative information – for example from experts' judgements – is also relevant. In addition, although a rule to map different gap values to CCB levels is also provided in the Basel framework, this is not a mechanical rule but rather a reference, as is the baseline gap itself.[11]

2.1 PRINCIPLES

On the principles guiding judgement – the first leg in the guided discretion approach for the CCB –, the BCBS has suggested five. The principles expand on the objective of the CCB, the role of the credit-to-GDP gap, the use of additional indicators – including those that may help to signal the release phase –, and on the possible use of other macroprudential instruments. They are reproduced in Appendix 1.

The ESRB recommendation on the CCB, in turn, also provides for a set of principles. The first five principles in the recommendation are largely based on the Basel principles. Slight adjustments are introduced to reflect some EU specificities and provide some further information on technical details. For example, to reflect the observation that, as may be expected in other contexts, the Basel gap in the EU tends to perform better in the build-phase rather than in the release one. Moreover, having considered their importance for the effectiveness of the CCB, the ESRB recommendation introduces two new principles on communication and reciprocity. These two principles are included at the end of Appendix 1.

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10 For a discussion on rules vs. discretion in macroprudential policy see Libertucci and Quagliarello (2010).

11 This expected role for the baseline gap is already anticipated on page 70 of the BCBS (2010) "Guidance on operating the CCB": 'The proposal [on the CCB] under development could not be implemented as a strict rules-based regime. Such an approach would require a high degree of confidence that the variables used would always, under all circumstances, perform as intended and would not send out false signals. This level of confidence will not be possible. Consequently, a benchmarking approach is being considered where the buffer generated is simply the starting point. The option will exist for authorities to increase or decrease the buffer as appropriate, taking into account the broader range of information which supervisors and central banks will be able to consider in the context of the circumstances which prevail at the time.' The same reasoning is then further developed under Principle 2 ("common reference guide") in the BCBS (2010) guiding document.

All these principles set common boundaries within which judgement can play a role when deciding on the buffer.

2.2 THE CREDIT-TO-GDP GAP   The credit-to-GDP gap – the quantitative indicator proposed as the benchmark buffer guide for the CCB – is calculated as the ratio of credit-to-GDP minus its long-term trend using the statistical method described below.

In line with the broad-based nature of the CCB, the credit metric for the numerator in credit-to-GDP ratio uses a broad definition of credit: total credit to the non-financial private sector (NFPS). This means that it comprises total credit to households and non-financial corporates, including credit from abroad. And it excludes exposures to other financial institutions (intra-financial lending) and public sector credit exposures. As the aim is to capture all sources of debt to the NFPS in a given banking system, credit from non-banks, debt securities issued to fund households and other non-financial private entities (including securitisations) is also included.

Having calculated the credit-to-GDP ratio first, the second step is largely mechanical. It consists in subtracting from the observed credit-to-GDP ratio its long-term trend calculated with a Hodrick-Prescott (HP) filter.[12] The HP filter is a statistical technique widely used by researchers and analysts to separate cyclical from long-run behaviours in economic series. The wide use of the HP filter is one of its main attractions. It is included in most commercial statistical packages – including add-ins for Excel – and is easy to calculate.

But why is it necessary to subtract the credit-to-GDP trend when constructing the Basel gap? This is because credit-to-GDP levels are likely to vary both between countries as well as within the same country at different points in time for structural reasons. As a result, different credit-to-GDP levels are hardly comparable without an anchor. This anchor is the trend.[13] Having this anchor is also useful when it is desired to calibrate reference values (or thresholds) for setting rules to determine the moment to increase or decrease the CCB. Conceptually, this means that there should be a sustainable or long-term credit-to-GDP level against which deviations from that level can be assessed empirically. These deviations are the 'imbalances' that may anticipate future materialisations of systemic risk.

Ideally, changes in the long-term sustainable level can be assessed by using a structural approach, where regression analysis is applied following specifications grounded in economic theory. As may be expected, this route is not free of obstacles either. Empirical and theoretical developments on macroprudential instruments are still in a quite early development stage. This also helps to illustrate the advantages of applying a widely used tool such as the HP filter which – though purely statistical – "has withstood the test of time and the fire of discussion remarkably well" [Ravn and Uhlig (2002)]. For the sake of comparability and for the purpose of the present analysis, we follow the same statistical approach when exploring guiding indicators for Spain in section 4.

Truly speaking, the HP filter defines a trend rather than extracting it from the data. The HP is based on an algorithm which seeks to minimise deviations of the actual series from their growth and changes in the trend growth rates. The weight of this second term in the minimisation depends on a positive and arbitrary parameter, lambda – a 'smoothing parameter' in the HP filter –. The value of lambda is set according to the data frequency.

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12 Hodrick and Prescott (1980).
13 In statistical terms, the anchor helps to make the credit-to-GDP series stationary.

The larger the lambda, the smoother the trend obtained. As a result of these features, the HP, though popular, is not free from criticisms – also from a statistical point of view –.[14]

A simple way to illustrate some of these criticisms is as follows. Unless a given economic series has absolutely no variation (i.e., it is a straight line), the algorithm is always able to define a cycle in the series for suitable values of lambda – even if such a cycle may actually not exist based on economic grounds –.[15] Of course, there are common practices in the field to guide the values chosen for the lambda relative to the expected length of the cycle, and different adjustments can be introduced to improve the filter. In any case, as with any statistical or econometric tool, the quality of the empirical estimations is expected to improve substantially when they are well supported by economic analysis and tested against experts' experience.[16]

Finally, the credit-to-GDP gap is mapped into a CCB buffer rate (ie: the 'benchmark buffer rate') by means of a simple rule built around a lower and upper threshold of gap values. The CCB activates when the gap is above 2 percentage points (lower threshold), the point from where the CCB starts increasing linearly until reaching its 2.5% maximum when the gap is at 10 percentage points (upper threshold). Whilst this simple rule has also been supported by empirical cross-country analysis – as has the gap itself – the rule is also meant to be used as a starting guide to authorities responsible for deciding on the CCB.

2.3 GUIDING INDICATORS IN THE EU

The BCBS and the ESRB have followed an 'early warning approach' to assess the empirical properties of the Basel gap and other potential indicators used to guide decisions on the buffer [e.g., BCBS (2010); and in the EU context, Behn *et al.* (2013); and Detken *et al.* (2014)]. This means that – motivated by the CCB's objective – the empirical performance of the indicators has been assessed in terms of their ability to predict (or forecast) systemic banking crises.

As a result of this analysis, the credit-to-GDP gap has been proposed as the indicator to be taken as a starting reference point for assessing and setting appropriate buffer rates. But empirical analysis on the CCB has also shown that the baseline specification for the credit-to-GDP gap may not work in all cases and may benefit from some fine-tuning adjustments in certain contexts, and that the decisions on the CCB can be enhanced with other indicators and information.[17] Consequently, using additional quantitative indicators – including alternative specifications for the Basel gap – and qualitative information is also recommended. This is pointed out, for instance, in Principle 2 – "Common reference guide" – of the BCBS principles underpinning the role of judgement in the CCB decisional framework (see Appendix 1).

The ESRB own empirical work has shown that the credit-to-GDP gap is the best single indicator for the EU as a whole for signalling the activation of the CCB [ESRB (2014a); Detken *et al.* (2014)]. Yet, the ESRB have also found that the gap does not perform well in

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14 Ahumada and Garegnani (1999).

15 Other common criticisms include 'end-point' problems (instability of the filter at the end of the sample) and the fact that it is not a fully forward-looking metric.

16 For further implications of using the HP filter for the credit-to-GDP calculations, see also Edge and Meisenzahl (2011).

17 Since the CCB was launched, a prolific stream of literature has emerged assessing the performance of the Basel gap and other indicators both at the country and EU level. For example, in addition to other empirical studies already mentioned for the EU, Kelly *et al.* (2013) examine the performance of the gap in Ireland; Kauko (2012) presents an analysis for Finland and a cross-section of EU countries; Bonfim and Monteiro (2013) for Portugal; Gerdrup *et al.* (2013) for Norway; Giese *et al.* (2014) for the UK; and Geršl and Seidler (2011) for a sample of central and eastern European countries, including the Czech Republic.

some countries for a number of reasons – as for instance, structural issues –. The ESRB recommendation on the CCB therefore suggests that, additionally to the Basel gap, some countries may also want to apply alternative methodologies or specifications for the gap calculations and for the rule to calculate buffer rates. The recommendation however does not provide guidance on these alternative methodologies as it explains that the empirical analysis is not sufficiently developed.

To facilitate communication with the public, national authorities should publish quarterly on their websites the 'standardised' credit-to-GDP gap and buffer rates (i.e., the Basel gap and buffer rates) alongside those alternative calculations of the credit-to-GDP gap and the corresponding buffer rate that best reflect their national specificities. This information will accompany the rest of the information required by the CRR/CRDIV for the announcement of the CCB rate each quarter – e.g., the date from which banks should apply any increases in the CCB rate –.[18]

Further to standardised gap and alternative specifications, the ESRB recommendation suggests another group of quantitative indicators which – in addition to qualitative information – may also help to guide the activation and release of the CCB. For the activation phase, the following indicators have been found informative for signalling the build-up of system-wide risks related to excessive credit growth:

— Measures of potential overvaluation of property prices. E.g., commercial and residential real estate price-to-income ratios, price gaps and growth rates.

— Measures of credit developments. E.g., real total credit or real bank credit growth, the deviation from trend in deflated M3.

— Measures of external imbalances. E.g., current account balances as a ratio to GDP.

— Measures of the strength of bank balance sheets. E.g., leverage ratios.

— Measures of private sector debt burden. E.g., debt-service to income ratios.

— Measures of potential mispricing of risk. E.g., real equity price growth.

— Measures derived from models that combine the credit-to-GDP gap and a selection of the above measures (i.e., combined or aggregated indicators).

On quantitative indicators for the release phase, ESRB empirical findings suggest that financial market prices are useful to indicate a prompt reduction or full release of the CCB when risks materialise. However, the ESRB recommendation explains that the empirical analysis of indicators for signalling the release phase has been less robust than for the activation phase due to data limitations – e.g., limited long-time series available –. The ESRB has also found it difficult to identify indicators to guide a progressive reduction of the CCB when risks from excessive credit growth do not materialise but gradually recede. As a result, the ESRB expects greater usage of judgement in the release phase of the CCB than during its activation phase. The ESRB suggests that this judgement could also be informed by market intelligence, supervisory assessments and stress tests.

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18   Art. 136 (7) of the CRDIV.

Having considered all these issues, the ESRB suggests monitoring the following indicators when having to decide on maintaining, reducing or fully releasing the CCB:

— Measures of stress in bank funding markets. E.g., the LIBOR-OIS (overnight index swaps) spread, bank CDS (credit default swap) premia.

— Measures that indicate general systemic stress. E.g., a composite indicator measuring stress in the national or EU financial system such as the ECB CISS (Composite Indicator of Systemic Stress) indicator.[19]

The ESRB recommendation provides that if the aforementioned complementary indicators for the activation and release of the CCB are available and relevant in member states, national authorities should publish quarterly on their website at least one of the indicators for the activation phase and one for the release phase in addition to the rest of the information described above.

The deadline for the follow-up of the ESRB recommendation on the CCB is 30 June 2016. National authorities are requested by that time to send to the ESRB, the EU Council and the EU Commission a report explaining the measures taken to comply with the ESRB recommendation. If a country decides to activate the CCB ahead of that date, all the recommended measures should apply from the date by which the country requires its credit institutions to maintain a CCB.

3	Stress events: the late 70's crisis, the Banesto crisis and the recent crisis

The CCB requirement to work countercyclically implies that it should increase at the pace that risks to financial stability from excessive credit growth accumulate. This occurs during what is known as the activation, accumulation or build-up phase. Following this first phase the CCB should be promptly reduced in the case of a banking crisis, or be progressively released when risks to financial stability recede. This is the deactivation, disaccumulation or release phase. In this paper we explore the performance of a set of potential guiding indicators for the CCB in three periods of stress in the Spanish banking sector.[20] As mentioned before, the focus is on the build-up phase of excessive credit growth ahead of the identified events.

The first period (1978Q1-1985Q3) and the third period (2009Q2-2013Q4) that we considered correspond to two systemic crises episodes in the Spanish banking system. The second period (1993Q3-1994Q3), by contrast, corresponds to an idiosyncratic event coinciding with the intervention and subsequent resolution of one large bank in Spain at that time, Banco Español de Crédito (Banesto).

The 1978-1985 crisis (the 'late 70's crisis') was the longest banking crisis and with highest costs in terms of GDP foregone in Spanish history thus far. It followed the collapse of the Bretton Woods monetary system, the oil shock and the deep recessionary period which characterised the early 70s in western economies. In Spain, the crisis affected a very large part of its banking system, including both small and large institutions. Martín-Aceña *et al.* (2013) estimate that around 52% of Spanish institutions were affected by the crisis.

The second event (the 'Banesto crisis') that we use for the empirical analysis is a relatively short stress period between 1993 and 1994 when one of the oldest and larger Spanish

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19 Holló *et al.* (2012).

20 For further details on the events considered see Martín-Aceña *et al.* (2013), Laeven and Valencia (2012), and Malo de Molina and Martín-Aceña (2011).

banks – Banesto – was put into resolution, recapitalised and then sold in a public offering. Though this episode cannot be considered strictly as a systemic banking crisis, i.e., it does not fulfil the commonly used criteria to define systemic banking crises in the literature, we include the Banesto crisis in the exercise as it may still be useful to analyse the performance of the indicators in different types of stress episodes. Furthermore, as suggested by Davis and Karim (2008), there is no unique variable to define banking crises and a degree of subjectivity is usually needed.[21]

Finally, the third stress event (the "recent crisis") corresponds to the latest financial crises which affected most of the financial systems around the world. As is well known by now, this financial crisis has been one of the deepest and most widespread in history. For the purpose of the empirical exercise, we date at mid-2009 the beginning of this third crisis period in Spain. This date coincides with the intervention of the Caja de Ahorros de Castilla-La Mancha (CCM) by the Banco de España. This was the first institution intervened during the recent crisis. Furthermore, the end-2013 reference point corresponds to the conclusion of the financial assistance programme agreed with the European authorities in 2012 for the recapitalisation of a portion of Spanish banks.[22]

4 Indicators to guide the CCB in Spain

Having defined three stress events, we explore in what follows the performance of a number of indicators to help guide buffer decisions. We divide the selected indicators into five categories: Basel gap, credit developments, real estate property prices, external imbalances, and private sector debt sustainability. We have selected these indicators based on their conceptual relevance and their empirical qualities.

Conceptually, all these indicators capture different aspects explaining the build-up of system-wide risks associated with credit expansions ahead of banking crises: relaxation of credit constraints, increased leverage of borrowers, appreciation of credit-financed assets and insufficient internal savings. In that sense, they are not necessarily specific to only one particular crisis. On the contrary, these are indicators – for example that for real estate – whose relevance has also been well documented in other banking crises in the past and in different countries. The indicators are sometimes related and can mutually reinforce each other, but they do not need to signal a warning simultaneously in all cases.

From an empirical perspective, given the exploratory nature of this paper and the focus on the build-up phase, the main broad features we would ideally require of the indicators if they are to be considered 'useful' complements to the Basel gap are twofold: i) indicators should peak only in advance of the stress events identified – otherwise, they would tend to send 'false signals' regarding potential stress events –; ii) the peaks should occur several quarters ahead of the stress event – to give enough time for the CCB to accumulate –.

In addition to the five abovementioned categories, the analysis of banks' balance sheet indicators can also be of interest from a macroprudential perspective. Preliminary work on this area (not reported in this paper) suggests that liquidity transformation metrics have good properties as potential leading indicators. Specifically, simple liquidity metrics – such for example a broad loan-to-deposit ratio – can provide useful information on the amount of liquidity transformation occurring ahead of stress events, potentially fuelling credit expansion at the aggregate level. However, this is still a developing area which is left for later work.

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21 Some conventional crisis classifications which have widely used in the literature on early warning systems include Caprio and Klingebiel (1996), Demirgüç-Kunt and Detragiache (1998) and Kaminsky and Reinhart (1999).
22 Banco de España (2013).

Finally, indicators based on equity prices and credit risk premiums can also be used to study possible misalignments in risk pricing which boost asset prices with an effect on credit growth. Data for valuation indicators – such as price-to-earnings ratios and market credit risk premiums – are however not readily available for the first two stress events considered in Spain, and therefore further analysis is needed to construct these series.

4.1 BASEL GAP

As explained above, whilst authorities in the EU should also consider other quantitative indicators and qualitative information, the baseline credit-to-GDP gap proposed by Basel is the common starting point in guiding decisions on the CCB. The BCBS and the ESRB propose a broad credit definition for the numerator in the Basel gap. On that basis, we have constructed a long time-series of households and non-financial corporations' total debt in Spain starting from 1962.[23] Similarly, for the denominator, the most recent GDP estimates are extended backwards using historical growth rates from previous statistical GDP bases (see details in Appendix 2).

Chart 1 shows the resulting credit-to-GDP ratio for Spain and the one-sided Hodrick-Prescott trend (also known as recursive or real-time HP trend).[24] The difference between the ratio and the trend will thus deliver the 'real time' Basel gap. That is, the gap which should have been considered at each point in time in the past, had the current regulation been in place. The three stress events identified above (the two systemic crises and the idiosyncratic event), are also shown as shaded areas in the Chart.

The credit-to-GDP ratio shows an upward trend before the three stress events. The Basel gap, however, would have failed to signal the first two events. This is clearer in Chart 2 which shows the Basel gap and the lower and upper thresholds. The CCB would have been zero (the gap is below the lower threshold) both in the run-up to the late 70s crisis and in the Banesto crisis. This means that, in the hypothetical case that the CCB were exclusively guided by the gap, the CCB would have not accumulated in the run-up to these two stress events. Alternative definitions of the debt-to-GDP gap do not alter this conclusion, although a gap in percentage terms (i.e., in deviations from the trend as a percentage of the trend), instead of in absolute differences, produces smaller fluctuations in the latter part of the sample, which seems desirable (see Appendix 3).

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23 Although there is some debate on whether inter-company loans should be included or not, here we decided to include them. We did this in an attempt to simplify calculations and make the results more comparable across countries, as separate data on inter-company loans are not always available in other countries.
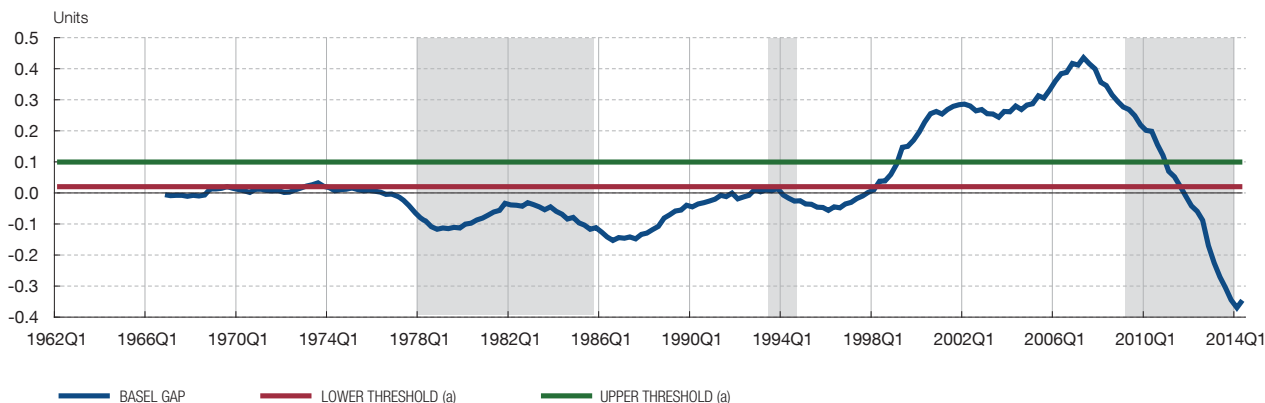
24 See Stock and Watson (1999).

CREDIT TO GDP IN SPAIN   CHART 1
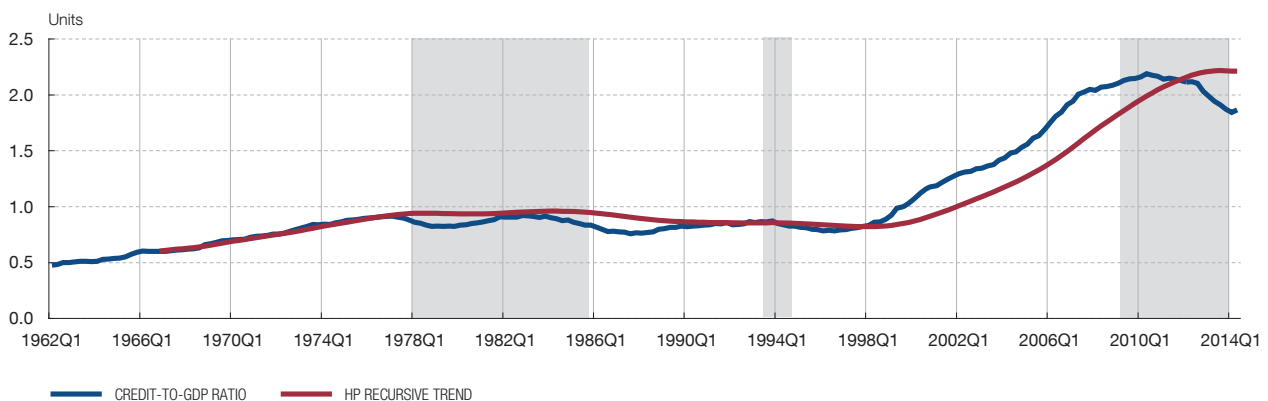
SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

a Banks have a one-year lag to comply with the required CCB when the gap exceeds the threshold.

The HP filter is a statistical procedure designed to analyse cyclical time-series with slowly changing long-term trends. It thus requires, first, at least one complete credit cycle to correctly identify the trend. And second – as with most statistical tools – the filter has problems in dealing with structural changes in the long-term trend or in the series level.

On the first of these issues (complete credit cycles), having used data for Spain since 1962 – which is already quite a long time span – it would be necessary to wait until around the mid-1980s to describe a full credit cycle. Over the years before the late-1970s banking crisis, the credit-to-GDP ratio almost doubled, suggesting a very fast pace of credit growth. Yet, due to the absence of historical data for the period before (and after) the expansionary phase, the one-sided HP gap did not signal this period as an unsustainable development associated with excessive credit growth.[25] Afterwards, during the 80s and 90s, the credit-to-GDP ratio stopped growing and even declined somewhat, but did not return to the early-1960s levels, indicating that part of the increase was structural or sustainable. As a consequence of the delayed reaction in the trend, the one-sided HP gap remained negative for a long period after the start of the 1978-1985 crisis. Thus, by the time of the next stress event (in 1993-1994), the trend was still too high, contributing to explain the absence of any warning signal in advance.

Regarding the second issue (structural changes), the evidence shows some sharp changes in the long-term trends by the end of the 90s in Spain. These changes create some hurdles for the functioning of the CCB ahead of the recent crisis. The trend for the Basel gap is backward looking. It thus only feeds on historical data and adjusts only very gradually to new structural developments, especially at high values of the smoothing parameter lambda. The Basel gap in this case would have started signalling symptoms of excessive credit growth since mid-1998 and it would have very rapidly implied a 2.5% CCB since

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25 As during previous years there was a continuous upward trend in the ratio, the filter 'memory' assumes this trend will also continue in the future. Thus, a stabilisation in the ratio generates a negative gap during some years until the filter 'learns' there has been a change in the trend. Arguably, a two-sided HP filter augmented with forecasts may help to get more precise estimates of the trend and its possible changes [see Gerdrup *et al.* (2013)]. This is because a two-sided HP filter uses all available information – possibly also including forecasted data – rather than just vintage information as in the one-sided filter. However, this approach would rely on the ability to capture the underlying economic developments in the series. In general, purely statistical methods do not produce good forecasts when there is insufficient data or when facing structural changes.

end-1999 (see Chart 2). This is ten years in advance of the 2009-2013 banking crisis. Moreover, from mid-2004 the gap became really high (above 25), suggesting even higher CCB levels in the years immediately before the crisis. Thus, the doubts are as to whether the gap may have been sending signals far too early in this case.

On the one hand, this would have been the case if, for instance as a result of Spain joining the euro area, the 'sustainable' debt-to-GDP ratio had increased. The HP trend fails to fully assess what could be a sustainable or equilibrium credit-to-GDP. From this perspective, therefore, at least part of the credit growth observed from the mid-1990s to 2007 would not be seen as a signal of excessive credit supply, but rather as an adjustment to a new equilibrium (a structural change). Some support for this hypothesis can be found in the fact that the level of credit-to-GDP in Spain during the 80s and 90s (below 100%) was relatively low when compared to the level of financial intermediation in other advanced economies.

On the other hand, it should also be recognised that structural changes are difficult to assess in real time. Given the perils of underestimating procyclical risk during expansionary periods and in the absence of better a knowledge of the structural determinants of the debt-to-GDP ratio – or more generally on the sustainable size for different banking systems and business models – a carefully balanced policy is warranted.[26]

The type of dynamics just described may also be illustrative for other countries which did not suffer such a marked change in the credit-to-GDP trend as did Spain in the late 90s, but were still 'cycling', along their historical series, with a relatively steep credit-to-GDP trend beyond what could be considered as sustainable. When applied in these scenarios, the Basel gap is less likely to signal excessive credit growth processes – even though systemic risks may actually be hatching and developing underneath –. This can occur for the same reason as that responsible for the gap failing to send signals ahead of the late 70s crisis in Spain.

Similar situations may also occur in the coming years. But now because of the strong credit-to-GDP growth experienced ahead of the recent crisis. This difficulty is illustrated in Chart 3 using two arbitrary simulations of the future behaviour of the ratio. These simulations assume that part of the large increase observed in the first decade of this century was an overreaction. Consequently, the credit-to-GDP ratio would fluctuate in the future around a somewhat lower level. However, due to the 'memory' of the HP trend, it would take quite some time for it to adjust to the new equilibrium level, making it more difficult to identify potential future excesses in credit growth with the Basel gap. In the absence of other indicators – for example on the intensity of credit growth – or sound estimates of sustainable credit-to-GDP levels, a comparison of the two simulations shows that this kind of issues can impair to some extent the gap's ability to identify future expansionary periods – for example in a hypothetical and at the moment still unlikely scenario of a very intense credit expansion in the next few years –.[27]

Solving these issues is challenging, but they are not new. For example, similar problems arise when estimating potential output to be used in output gap estimations. There are at least three strategies which could be followed to try to alleviate these problems. First, using a broad set of complementary indicators – as for example also suggested in Giese

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26 ESRB (2014b) provides some first insights and discussion on the size of the European banking system, but further work in this very challenging area is much needed.

27 This would also be the case even if we assume there is not an overreaction in the credit-to-GDP growth observed in the first decade of this century. Simply a change in the trend, from the steep upward sloping one observed up to 2009 to a flatter one, would be enough to generate statistical problems for the one-sided HP gap.
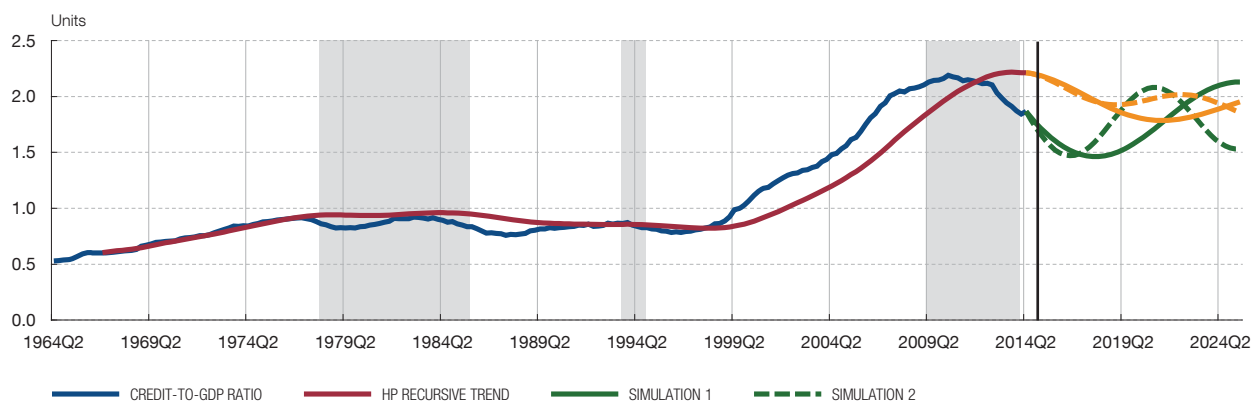
SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

et al. (2014) – can help to unmask possible sources of systemic risk associated with excessive credit growth. These indicators include metrics on credit growth intensity such as the ratio of changes in credit to cumulated GDP proposed in the next section, which could complement metrics focused on the amount of excesses such as the Basel gap. Second, econometric estimations of long-term equilibrium levels for the credit-to-GDP ratio can help to inform on structural factors affecting credit developments. The econometric estimates, in turn, should benefit to a great extent from progress made in treating financial stability issues in general equilibrium models. Finally, other different methodologies and approaches – for example, stress-tests – can be also used to identify relevant endogenous and exogenous factors when guiding buffer decisions.
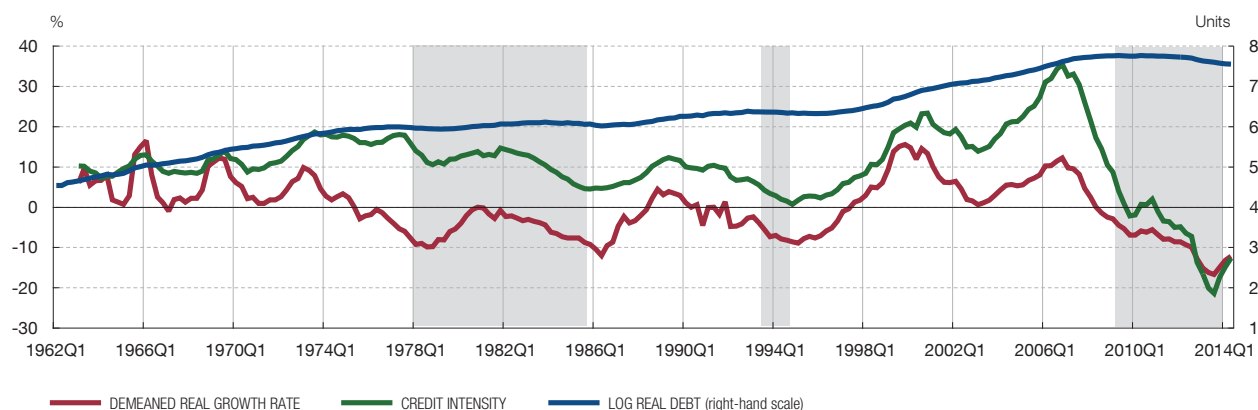
4.2 CREDIT DEVELOPMENTS

Given the CCB's objectives, it is clear that credit developments are crucial to guide the buffer. The relevant issue is to what extent they are important and informative beyond what is already included in the credit-to-GDP gap.

For example, Repullo and Saurina (2011) report a negative correlation between the Basel gap and GDP growth, which would make the gap questionable as a countercyclical indicator. As an alternative, therefore, they propose using credit growth as the macroeconomic variable driving the behaviour of the CCB.

The negative correlation between the gap and GDP growth is likely to be most relevant during recessions or following a crisis, when a fall in GDP typically materialises sooner than a fall in credit, making the credit-to-GDP a less effective indicator when deciding on the right moment to release the CCB [see Kauko (2012) and Drehmann and Tsatsaronis (2014)]. Consequently, as suggested in the BCBS (2010) and ESRB (2014a) guiding documents, complementary indicators to signal the release of the buffer may be needed. Although assessing indicators for the release phase is still a developing area and beyond the scope of this paper, GDP growth and 'fast moving' indicators such as equity prices or credit default swap (CDS) premiums have been found to be promising guiding indicators [see for example Detken *et al.* (2014)].

During credit booms, a general tendency for credit to grow faster than GDP would be expected. This makes the gap more likely to send the right activation signals during these periods when risks are building up. Nonetheless, possible conflicts between the business (GDP) and credit cycle may still arise. This is pointing in two directions in our view. First, in addition to monitoring the credit-to-GDP gap, there are reasons for tracking credit

TOTAL DEBT OF HOUSEHOLDS AND NON-FINANCIAL CORPORATIONS IN SPAIN

CHART 4

DEMEANED REAL GROWTH RATE —— CREDIT INTENSITY —— LOG REAL DEBT (right-hand scale)

SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

developments which can be captured by complementary credit-based indicators, such as for instance credit growth measures or the variant we propose further below, namely the ratio of changes in credit to cumulated GDP. And second, there is a need to not lose sight of the ongoing interrelationships between the credit and business cycles to guard against a conflict between them arising at some point.

Let us focus on the first point, additional credit-based indicators. For the construction of these additional indicators, we use as the credit metric the same metric as for the numerator of the credit-to-GDP ratio. This means we include total debt from households and non-financial corporations in Spain (see Chart 4).

Real credit growth should be a good signal when lenders are underestimating risks and consequently credit is growing steadily and rapidly over time. In fact, in the three identified pre-crisis periods in Spain, the annual growth of debt was above its long-term average for at least some quarters. And this was more so in the cases of the two most serious crises (the first and third ones). However, this indicator shows too much volatility, which could be alleviated by some form of smoothing (e.g., moving average).

A possible alternative is what we have called a "credit intensity" indicator, defined as the annual change in non-financial private-sector debt divided by four-quarter cumulated GDP. This measure is included among the indicators to follow in the EU Macroeconomic Imbalance Procedure (MIP) and gives an idea to what extent expenditure in the economy is being supported by new credit. Therefore, a high value of the indicator should point to unsustainable expenditure levels. Also important, after the proposed transformations, both the numerator and the denominator of the ratio are now capturing annual flows.

More specifically, there is some conceptual attraction in combining credit-based indicators capturing 'excess' credit in terms of domestic economic resources (proxied by GDP) and long-term values (proxied by a trend), with credit-based indicators capturing the 'intensity' (or velocity) of the build-up of credit excesses – such as for example the ratio of changes in credit to cumulated GDP proposed above –. Note that – from an economic point of view – changes in credit could also be interpreted as a proxy for that part of consumption and investment that households and non-financial corporations are getting financed. Absent structural changes, this part should be a stable proportion of their income (GDP) in a model of balanced growth.

CHART 5

%

Quarters before/after the banking crisis

— 1978Q1   — 1993Q3   — 2009Q2
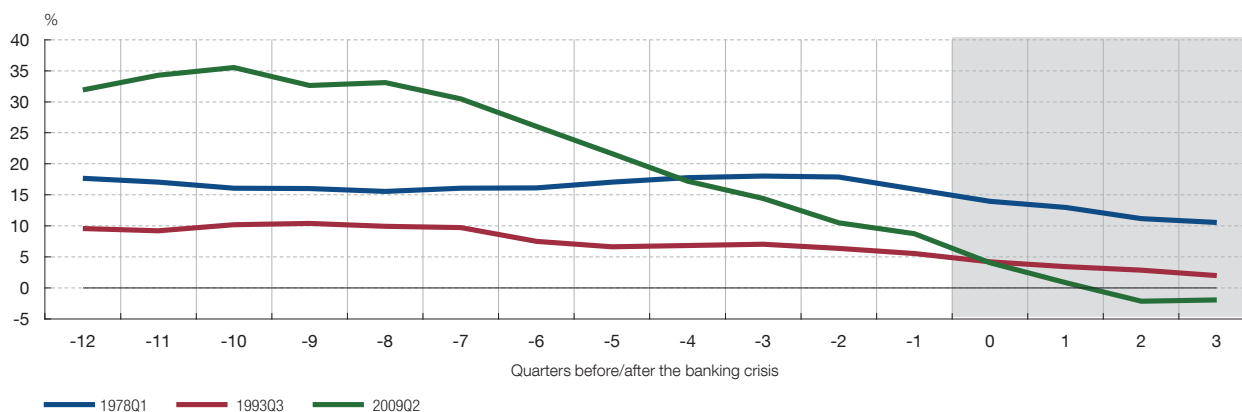
SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

Moreover, the suggested approach could help to detect rapid credit growth processes which may still not produce large deviations with respect to the trend; cases where excesses accumulate during long time periods, at a slow but steady pace; and more perilous cases where credit excesses accumulate very rapidly in few years.

Chart 4 shows that the 'credit intensity' indicator peaks well ahead of the three-identified events, with a very marked increase from the beginning of 2004. Although it is difficult to say with certainty, it appears there is no long-term trend in this measure (i.e., it is stationary) and therefore thresholds values for guiding the CCB accumulation could eventually be calibrated without using any statistical filter.[28] As an illustration, a 15% level was not exceeded in the period before the 1993-94 crisis, but it was ahead of the other two (from 1972Q3 and 1999Q2, respectively). A more conservative 10% level would have also signaled the intermediate crisis from 1988Q3. These insights are confirmed when zooming in at the three-year period prior to the stress events identified in Spain (Chart 5).

4.3 REAL ESTATE PROPERTY PRICES

It is well-known by now that a combination of strong growth in credit and in property prices is a clear early-warning signal of potential systemic banking crises [see for example, Borio and Drehmann (2009), Barrel *et al.* (2010) and Behn *et al.* (2013)]. Both variables tend to move in tandem because of the role of credit in supporting house purchases and the role of housing wealth (as collateral) in decisions on loan supply. Hence, unusually high property prices or rapid increases in them can be a signal confirming the existence of excessive credit growth. And, at the same time, they point to additional sources of systemic risks since those elevated property prices may be unsustainable.

Chart 6 shows three potential indicators to assess developments in the real estate sector in Spain: real house prices, price-to-income ratio and price-to-rent ratio for Spain.

Real house prices grew strongly ahead of all the identified stress events and fell afterwards, suggesting this is an informative indicator for guiding CCB activation. However, they also show a long-term upward trend. This trend should thus be removed to get an appropriate signal for the CCB. Normalising house prices using housing rents as denominator is

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28 Simplicity is always an advantage in regulation, as put it by Calomiris (2012): "Only simple rules can avoid dependence on regulatory discretion, which is subject to political manipulation; automatically enforced, transparent rules are incentive-robust for regulators".
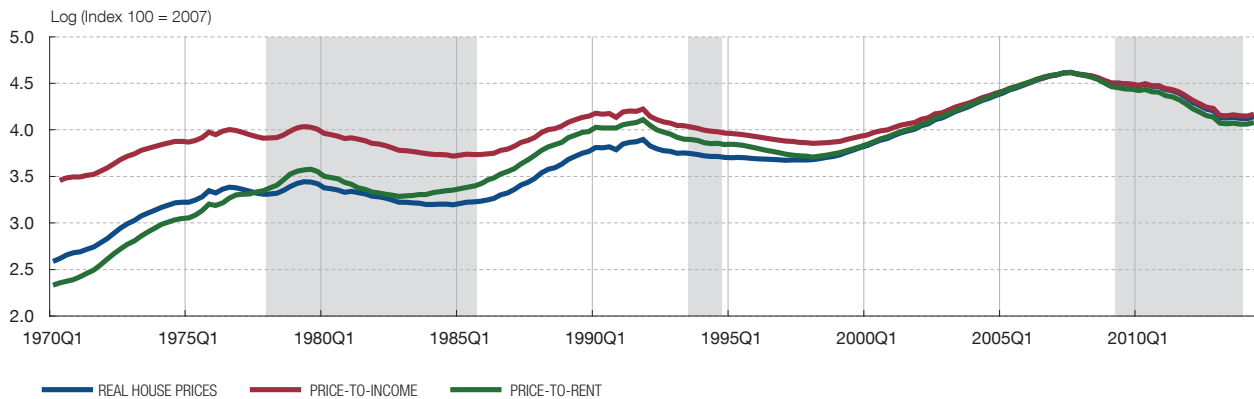
CHART 6

Log (Index 100 = 2007)

REAL HOUSE PRICES   PRICE-TO-INCOME   PRICE-TO-RENT

SOURCES: Banco de España, Instituto Nacional de Estadística, Ministerio de Fomento and own calculations.

REAL HOUSE PRICES IN SPAIN
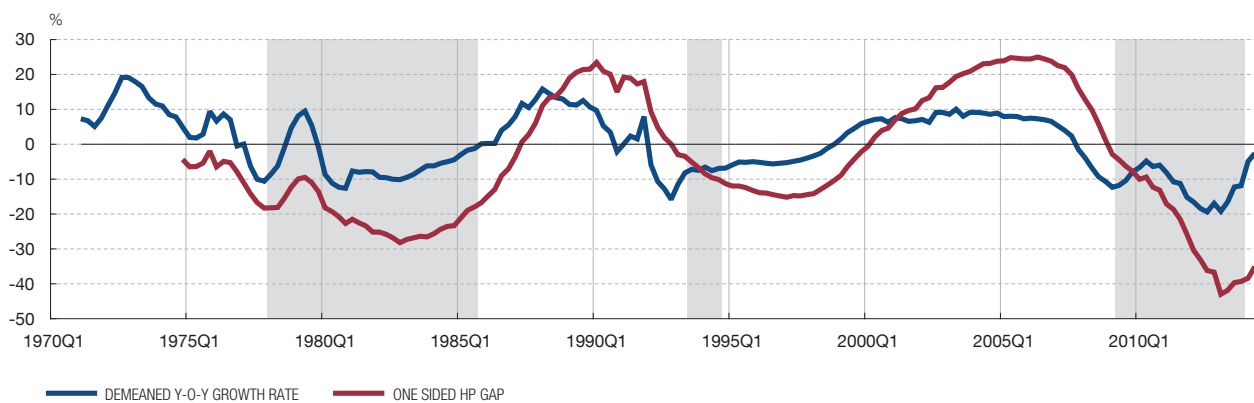
CHART 7

%

DEMEANED Y-O-Y GROWTH RATE   ONE SIDED HP GAP

SOURCES: Banco de España, Instituto Nacional de Estadística, Ministerio de Fomento and own calculations.
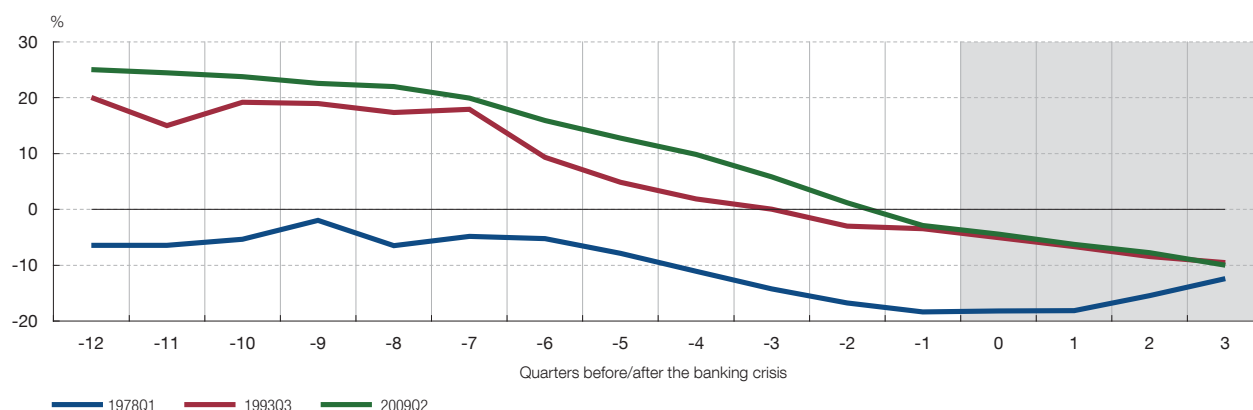
however not very useful in Spain as it fails to remove the observed trend (see the price-to-rent ratio in the Chart 6). This is probably because of the nature of the Spanish rental market, which is quite small and has been subject to important regulatory restrictions on prices.[29] All this makes housing rents a poor indicator of fundamental house prices.

The results are somewhat better when adjusting for potential GDP per capita (price-to-income ratio). Nonetheless, there is still an upward trend in prices, which suggests the existence of other fundamental factors (and/or structural changes) affecting the long-term sustainable price level. Ideally, a structural analysis could be carried out in order to obtain a more accurate indicator for the CCB. However, for the sake of comparison, we will follow the same non-structural approach we have already used for previous indicators. We thus use growth rates and detrended series with the HP filter (see Chart 7).

Gap measures tend to perform better than growth rates.[30] The latter are more volatile, go higher earlier in the expansion and decline sometimes well ahead of the actual crisis, making it difficult to extract a specific level above which the CCB could be activated.

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29 For example, between 1970 and 1979, real rents fell by 33%, in a context of high inflation and regulated rents.
30 The growth rate is also demeaned by subtracting the average growth rate for the whole period.

%

30
20
10
0
-10
-20

-12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3

Quarters before/after the banking crisis

———— 1978Q1   ———— 1993Q3   ———— 2009Q2

SOURCES: Banco de España, Instituto Nacional de Estadística, Ministerio de Fomento and own calculations.

The one-sided HP gap (ie: the 'real time' gap) does not work in the first stress event, but this is mainly due to a lack of enough historical data for that period.[31] In the other two events it works properly. As an example, a 5% threshold would have resulted in an activation and gradual accumulation of the CCB by 1987Q4 and 2001Q1, respectively.[32] The same pattern is also clear in Chart 8.

An explanation for the better behavior of the HP filter in this case, compared to the credit-to-GDP analysis above, is that real house prices appear not to show abrupt changes in long-term trends (compare Charts 1 and 6). This makes it more likely that the procedure will also work in the future, although it cannot be ruled out that this will fail to hold if there are future structural changes. Structural models of house prices will also be needed in that case.

It is worth mentioning two additional aspects. First, real house prices, including their gap transformations, tend to decline ahead of the identified systemic banking crises, theoretically pointing to a release of the CCB. This may or may not be optimal, but it has to be analysed in the context of the indicators for the release of the CCB, which are distinct from those applicable to its build-up. Second, the house price gap fails to identify the severity of the subsequent crisis. The maximum level of the gap is similar ahead of the 1993-1994 and 2009-2013 stress events, whereas the severity of these two crises, in terms of financial sector turmoil and real sector implications, was quite different. Notice that, housing prices only are not able to capture other risks which can accumulate during expansions on the 'real side' – for example excessive growth in residential construction –. As such, indicators based on housing prices can be used to confirm or complement messages from other indicators capturing the real side of the expansionary period, as for example the gap itself. Yet again, as per other indicators, information from other sources of qualitative and quantitative information should help to get a complete picture of the issue.

Despite the limitations described above, real estate price indicators show very good qualities as a complement to the Basel gap. The real time gap estimations clearly pick up

31 This is confirmed when a two-sided HP filter is applied instead of the one-sided one in the gap calculation. The gap using a two-sided filter would also pick up the first stress-event. The two-sided filter, by using all available information rather than just vintage information as in the one-sided, overcomes the lack of data at the beginning of the series in this case. Yet, as explained before, the one-sided filter is used in this the paper as it simulates policy decisions when they would actually be made in real time.

32 With a 10% threshold those dates would have been 1988Q1 and 2001Q4.

the two stress-events identified for which enough data is available. The dynamics preceding the last two events were also similar to those observed in the run up to first stress event (i.e., rapid growth in house prices). This suggests that these indicators would have also sent correct informative signals during that period.

4.4 EXTERNAL IMBALANCES

The indicators analysed above capture directly the behaviour of credit or are closely linked to it. Other promising indicators for the purpose of signalling excessive credit growth periods are those that indirectly react to it. In that respect, it has been generally observed that when credit grows well above GDP, consumption and investment increase, and domestically generated savings are not enough to finance the credit expansion. As a result, resources have to be 'imported' from abroad and this is recorded in the balance of payments as a deficit in the current account. For this reason, the current account balance of the economy as a whole can be a useful leading indicator of financial distress, notably when deficits of a certain size are recorded over a sustained time period. Following this rationale, we include external imbalances and international capital flows in our analysis. Assessing these aspects is particularly important for a country like Spain, where most of these flows are intermediated by the banking sector.

Chart 9 shows that taking into consideration external imbalance indicators is indeed relevant for Spain. The stress events identified were preceded by a sustained current account deficit of around 4% of GDP. It should be noted, besides, that this ratio fluctuates around a stable level, so, as with the credit intensity indicator, no statistical or economic transformation of the indicator is needed – at least in this first approach – to assess its usefulness as a complementary guiding indicator for the CCB.

There were other two periods when the current account deficit stood at 4% for a certain period of time (1980-1984 and 2000-2003). But during 1980-1984 the late 70s crisis was still ongoing. And in 2000-2003, the process ended up five years later in the recent crisis after having reached deficits at around 10% of GDP.

It should also be remarked that sources of the observed current account deficits were very different. In the 70s the oil price shocks played a leading role; in the 90s not enough saving was the key; and in the 2000s excessive investment in the real estate sector was at the heart of the observed events. Also, the commercial and financial openness in Spain was very different in each case. However, in all the cases considered a stress event was recorded some time later.

CURRENT ACCOUNT BALANCE IN SPAIN

CHART 9
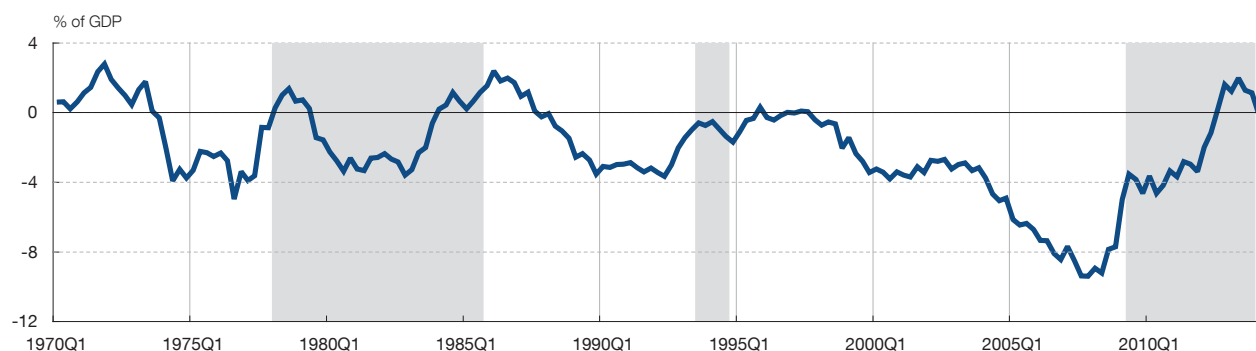
% of GDP

SOURCES: Banco de España, Mineco, Instituto Nacional de Estadística and own calculations.

% of GDP

Quarters before/after the banking crisis

■ 1978Q1   ■ 1993Q3   ■ 2009Q2
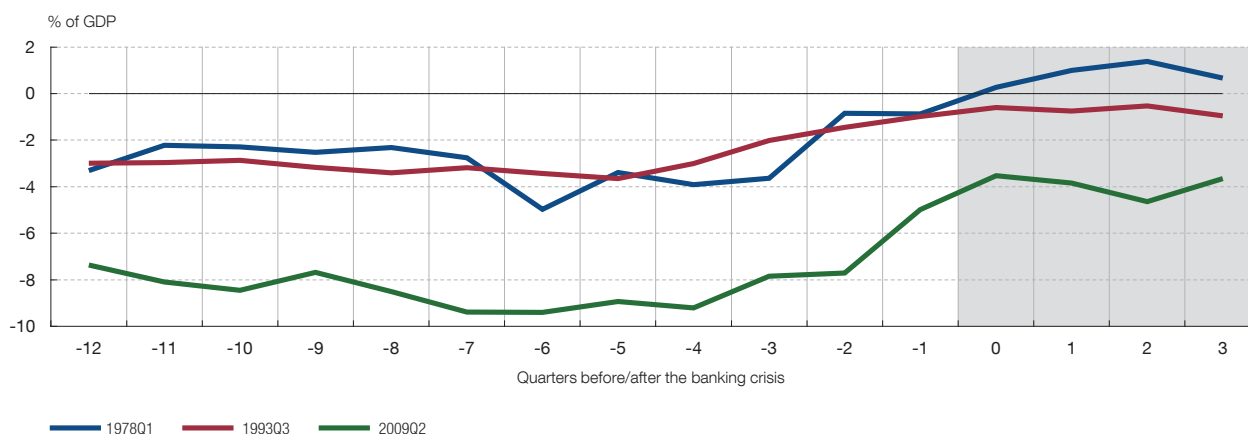
SOURCES: Banco de España, Mineco, Instituto Nacional de Estadística and own calculations.

The aforementioned behavior of the current account balance around the the time of stress events identified is well reflected in Chart 10. Current account deficits over 4% are observed well in advance of the stress, and they remain in that mode for a sustained period. As a result, the current account balance sent informative signals ahead of the three stress-events identified and its dynamics are also consistent with the concepts underlying this indicator.

4.5 PRIVATE SECTOR DEBT
     SUSTAINABILITY

Borrowers' debt levels have been found to be pivotal factors explaining the recent financial crisis. For example, Mian and Sufi (2009, 2011) describe the importance of the household debt and household balance sheet channel in the US crisis. In this regard, metrics capturing excessive private sector debt – such as for instance the debt-to-income and debt service ratios – have also been widely supported in the recent literature on guiding indicators for the CCB [see for example, Drehmann and Juselius (2012, 2014); Detken et al. (2014); Giese et al. (2014)]. Consistently with these findings, the ESRB recommendation on the CCB includes a category on measures of private sector debt burden for authorities to be considered when assessing quantitative information for the build-up phase.

Measures of debt expenditures and income capture the burden imposed by higher debt in terms of available resources on the demand side of credit. Higher levels of these ratios are associated with less sustainable debt dynamics and thus higher probabilities of default. Different perceptions or estimations on these risk factors can in turn boost credit availability in good times and credit constraints in bad times. All told, fluctuations in real estate prices and different levels of private sector debt play an important role in the behaviour of credit.

The Basel gap has already embedded in its design some notions on credit sustainability. First, credit is assessed in terms of economic resources at a given point in time which is captured by the GDP. Second, the credit-to-GDP ratio is assessed in terms of its trend value. From this perspective, the indicators explored in this section can be seen as refinements to the information on credit sustainability embedded in the Basel gap. Key factors explaining credit sustainability are interest rates and debt maturity. These factors are jointly explored as part of a 'debt burden' ratio.[33]

33 On the usefulness of the debt service ratio as an early warning indicator of systemic banking crises, see Drehmann and Juselius (2012, 2014).

The Basel gap provides a view on the indebtedness of the non-financial private sector. However, while debt is an inter-temporal concept – in the sense that debt maturity is usually higher than one quarter – the GDP is the income generated in one quarter. In this respect, the ratio may miss some information on the income drain due to the debt load in a specific period. This drain could act as a default trigger.

The share of income devoted to debt reimbursements can be divided into two parts. The first is the payment of accrued interest; the second is the fraction of debt principal that is repaid. As debt burden metrics incorporate information on interest rate and debt maturity, they can be used as comprehensive indicators of agents' financial conditions. This is valuable information, as interest rate payments are a determinant of debt sustainability and, traditionally, lower maturity is associated with higher vulnerabilities.

To our knowledge, there are no official statistical sources on an aggregate basis containing this information; these indicators thus have to be constructed from partial metrics. In particular, we calculate a debt burden (db) as in the following expression:[34]

$$db_t = \frac{i_t}{[1 - (1 + i_t)^{-m_t}]} \frac{D_t}{(Y_t + i_t D_t)} \qquad [1]$$

Where i is the outstanding debt interest rate, D is the total credit analyzed before, m is the debt maturity and Y is private agents' disposable income. The numerator of the first term captures accrued interest and the denominator the debt principal repaid. The second term is just the debt-to-income ratio (including interest payments, since disposable income discounts these payments). These ratios are calculated separately for households and non-financial corporations, using their respective disposable incomes. When they are aggregated, the GDP is the denominator of the ratio. As Chart 11 shows, the debt burden for the non-financial private sector hovers around 14% of GDP until the mid-2000s. It then increases considerably before the recent banking crisis and diminishes afterwards – although it is still above the previous levels –. Notice that this indicator also rebounded before the mid-90s crisis, but not in the 70s crisis. In fact, unlike in the other two crises the debt burden increased during that crisis.

This general aggregate profile is repeated in the two sectors but with two major differences between households and non-financial firms. First, the debt burden level for firms is much higher than that for households. This is a consequence of assuming that the outstanding debt will be repaid using exclusively out of disposable income. However, debtors can also sell assets or refinance their debt. This is probably the case for non-financial firms, as debt not only finances investment projects but also day-to-day activities. The second difference is that households' burden debt presents more inertia, probably as a consequence of a higher debt maturity.

A difficulty with this indicator is that it is influenced by the business cycle through its effects on disposable income and interest rates.[35] Yet, as debt is an inter-temporal concept, we should consider a cyclically-free concept for income and interest rates. Besides, there is some evidence showing that business and credit cycles reinforce each other. We would thus favour calculating a debt service ratio based on potential disposable income (derived

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34　This expression is slightly different from that of Drehmann and Juselius (2012) as the denominator of this expression also includes interest payments. Note that disposable income of households and non-financial corporations is net of these payments.

35　On the effects of monetary policy on risk taking and credit supply see Jiménez *et al.* (2012, 2014).
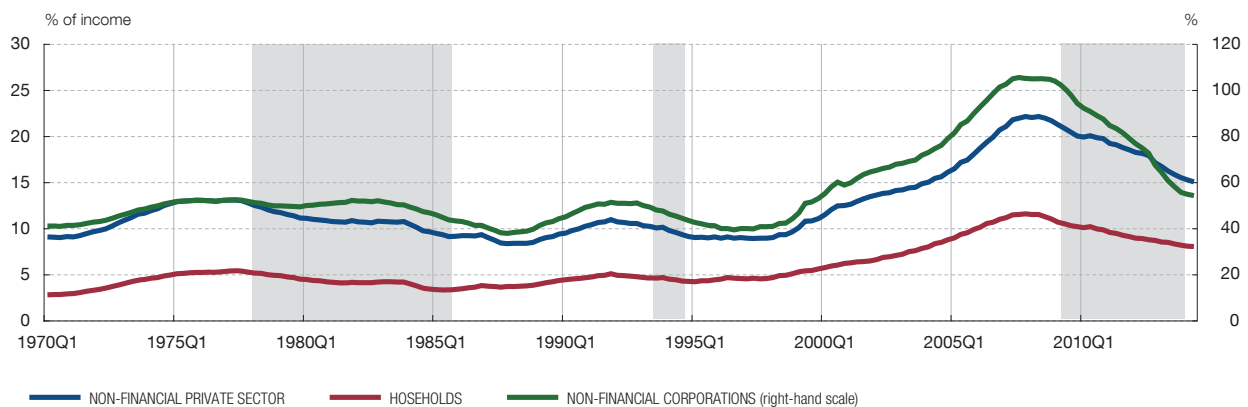
NON-FINANCIAL PRIVATE SECTOR DEBT BURDEN

CHART 11

% of income   %
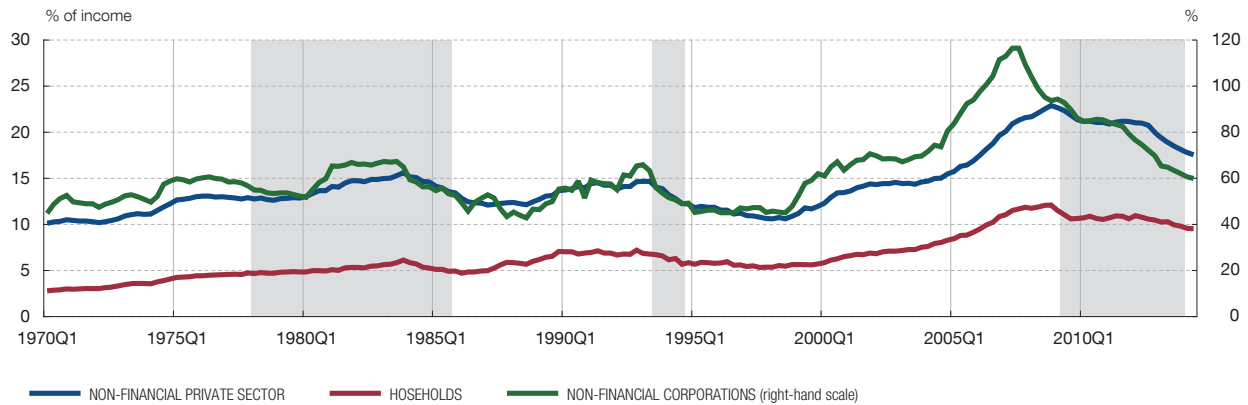
SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

ALTERNATIVE NON-FINANCIAL PRIVATE SECTOR DEBT BURDEN

CHART 12

% of income   %

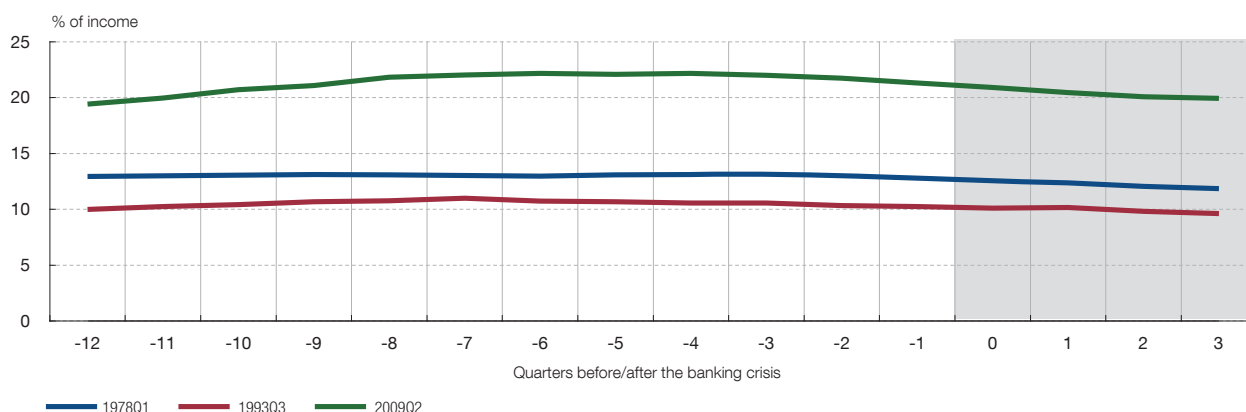SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

from potential GDP)[36] and natural interest rate.[37] Chart 12 shows the results when using these inputs.

The indicators for all sectors are very similar to the previous ones assessed, but they also show some improvements. First, now the ratios tend to fluctuate more closely around a stable mean. Second, for the three sectors considered the indicator reached a peak before each of the three stress events. The observed increase before the nineties is a minor one, and in line with the non-systemic nature of this stress event. Finally, in all cases a decline is observed just before the stress event, which suggests these indicators may also be of some help for the release phase.

The informative value of the debt burden indicator can also be checked in Chart 13 for the non-financial private sector. The debt burden ratio is always above the level observed in the first quarter of the stress events, although only in the last crisis does the deviation appear to be of some size. All in all, as with the three previous categories of indicators

36   Potential disposable income is obtained smoothing the observed ratio of disposable income over GDP and multiplying by potential GDP.
37   Natural interest rate is obtained by adding potential growth to target inflation.

CHART 13

% of income

Quarters before/after the banking crisis

— 1978Q1   — 1993Q3   — 2009Q2

SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

considered (credit developments, property prices and external imbalances), the indicators of private debt sustainability peak ahead of the stress events identified and do not appear to be sending significant wrong signals.

5 Conclusions

Sound policy rules are very much needed to ensure predictability and avoid time inconsistency problems. Yet designing and implementing simple, comparable and effective countercyclical policy rules are not easy jobs. This has also been the case for fiscal and monetary policy for example. Macroprudential policy is not an exception, particularly given the still-incipient knowledge of this field.

EU legislation requires setting a countercyclical capital buffer starting on the basis of the credit-to-GDP gap (as defined in Basel) and complementing it with other specifications or indicators if needed. Drawing on empirical evidence in Spain we suggest a number of issues to be kept in mind when applying this benchmark guide. In particular, a fully automatic application of the credit-to-GDP gap has limitations when dealing with incomplete credit cycles and in the presence of structural changes in the data. The consequences of these issues can be observed when analysing how well the gap would have performed in the past. But these consequences are also relevant for the future as some simple simulations show. Further work on equilibrium estimations and more fleshed-out theoretical models, for example, should help to alleviate these issues in the future.

In the meantime, a broad but still manageable set of complementary indicators in conjunction with the credit-to-GDP gap can serve as useful 'sign posts' to guide buffer decisions. Conceptually, all the indicators analysed in this paper capture different factors explaining the build-up of system-wide risks associated with credit expansions ahead of banking crises (relaxation of credit constraints, increased leverage of borrowers, appreciation of credit-financed assets and insufficient internal savings), whose effects the CCB aims to alleviate. The selected indicators are sometimes related and can mutually reinforce each other, but they are not necessarily specific to just one particular crisis. From an empirical perspective, suitable indicators in all the categories considered sent informative signals ahead of the stress events identified in Spain. And their maximums tended to occur several quarters ahead of those events.

More specifically, we find that indicators of 'credit intensity', such as the one proposed in this paper – the ratio of changes in credit to cumulated GDP – can add informative value

to metrics capturing 'credit excesses'. Further, indicators of property prices (detrended real house prices), external imbalances (current account as a percentage of GDP) and private sector debt sustainability (debt burden ratio for the non-financial private sector) can also help to identify periods of excess credit growth associated with an increase in systemic risks. In the quest for simplicity, it is worth noting that no statistical transformation was needed for the credit intensity and the current account balance indicators.

We hope that, despite differences in countries' historical data and the very rapid developments in the financial sector, this analysis will also be useful in other contexts and in the future.

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Appendix 1: Principles for the CCB

Basel principles:

— *Objective:* Buffer decisions should be guided by the objectives to be achieved by the buffer, namely to protect the banking system against potential future losses when excess credit growth is associated with an increase in system-wide risk.

— *Common reference guide:* The credit/GDP guide is a useful common reference point in taking buffer decisions. It does not need to play a dominant role in the information used by authorities to take and explain buffer decisions. Authorities should explain the information used, and how it is taken into account in formulating buffer decisions.

— *Risk of misleading signals:* Assessments of the information contained in the credit/GDP guide and any other guides should be mindful of the behaviour of the factors that can lead them to give misleading signals.

— *Prompt release:* Promptly releasing the buffer in times of stress can help to reduce the risk of the supply of credit being constrained by regulatory capital requirements.

— *Other macroprudential tools:* The buffer is an important instrument in a suite of macroprudential tools at the disposal of the authorities.

Additional principles suggested by the ESRB:

— *Communication:* A good communication strategy for the buffer decisions contributes to managing public expectations plays an important role in the coordination mechanism between designated authorities and is essential for the credibility, accountability and effectiveness of macro-prudential policy. Transparent, stable processes and well defined channels of communication between authorities and key stakeholders constitute the basis of a good communication strategy.

— *Reciprocity:* Designated authorities should recognise the buffer rates applied in other jurisdictions, where appropriate. Designated authorities should consider potential cross-border implications when not recognising a buffer rate for exposures to another Member State and when setting or not recognising a buffer rate for exposures to a third country. The relevant designated authorities and the ESRB should be notified of these decisions.

Appendix 2: Database and sources

Total debt of households and non-financial corporations

Since December 1994, it is total loans and debt securities of households and non-financial corporations, including inter-company loans, from the Spanish Financial Accounts according to SEC 2010. This data is extended backwards, up to March 1980, using growth rates of Financial Accounts according to SEC 1995, and up to March 1962, using growth rates of total bank loans to "other resident sectors".[38]

Gross Domestic Product

We first construct annual series for nominal and real GDP compatible with the new definition of SEC-2010. The official series from the National Statistic Institute (1995-2013) are extended backwards using growth rates of GDP Base 2000.[39] Data for the years before 1970 is taken from the database BDMACRO from the Ministry of Finance.

Then quarterly series are obtained interpolating annual data using as indicators quarterly GDP Base 2000, up to 1970, and electric energy consumption and CPI, before 1970. Data for 2014Q1 and Q2 are extrapolated on the basis of quarterly GDP Base 2008.

Potential GDP is calculated as the simple average of: two-side HP filter with lambda 1600, two-side HP filter with lambda 20000, European Commission output gap and IMF output gap. The last two indicators are interpolated to obtain quarterly data using a two-sided HP filter with lambda 20000.

House prices

Since 2007, it is the Housing Price Index produced by the National Statistics Institute (INE).[40] This data is extended backwards using growth rates of housing price statistics from the Ministerio de Fomento (up to 1987), house prices in the capital from Tecnigrama (up to 1977) and the residential investment deflator (up to 1970). Annual data series were

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38 "Other resident sectors" include all residents except credit institutions and General Government.
39 Investment on R&D is estimated and added separately.
40 This is an hedonic index that adjust for changes in housing quality.

interpolated and adjustments were made to take into account the different variability of the various series considered.

Housing rents

An index based on the housing rent component of CPI.

Current account balance

Since 1989 it is obtained from the Spanish Balance of Payments (2000-2014, sixth edition of the IMF's *Balance of Payments Manual*; 1989-1999, fifth edition of the IMF's *Balance of Payments Manual)* and, between 1970 and 1988, from the old methodology of balance of payments.

Average interest rate on households' and non-financial companies' debt

Since 2003, interest rates on outstanding amounts are taken from harmonized Eurosystem statistics (table 19.12 of the *Statistical Bulletin* of the Banco de España). Before that, they are derived from internal estimates of available measures on interest rates applied by banks on new loans.

Average maturity of households' and non-financial companies' debt

Average maturity of households' and non-financial companies' debt is obtained from the breakdown of debt levels by maturity in the Spanish Financial Accounts. It is assumed that the average maturity of short-term debt is two quarters and in the case of long-term debt, 58 quarters for households and 46 quarters for non-financial companies. The latter difference reflects the fact that most long-term households' debt has a maturity of more than 5 years, whereas most long-term non-financial companies' debt has a maturity between 1 and 5 years. Up to 1980, average maturity is kept constant.

Disposable income of households and non-financial companies

Since 1980, these variables are taken from the database of the Banco de España´s Quarterly Macroeconometric Model of the Spanish Economy and extended backwards, up to 1970, interpolating National Accounts annual data.

Appendix 3:
Alternative definitions of
the credit-to-GDP gap
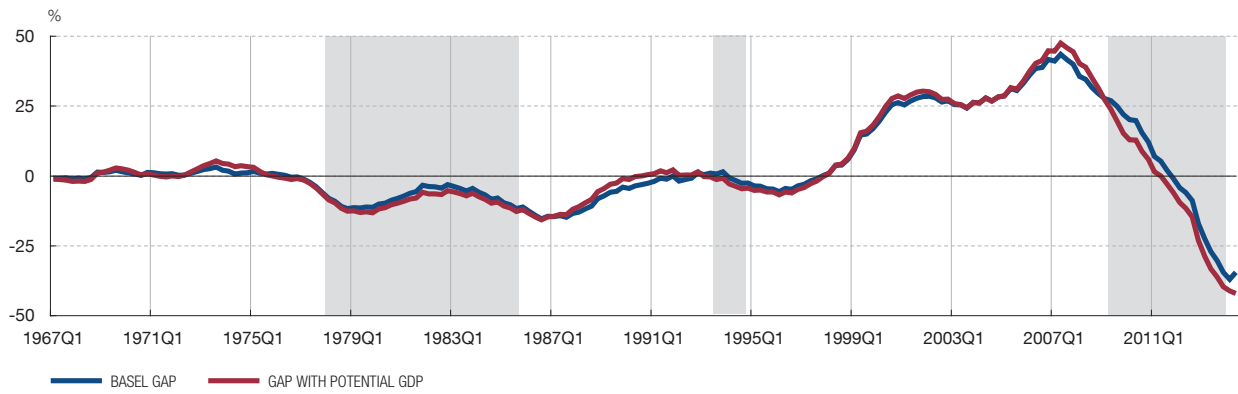
GAP IN PERCENTAGE OF CREDIT-TO-GDP

%

— BASEL GAP — GAP IN %
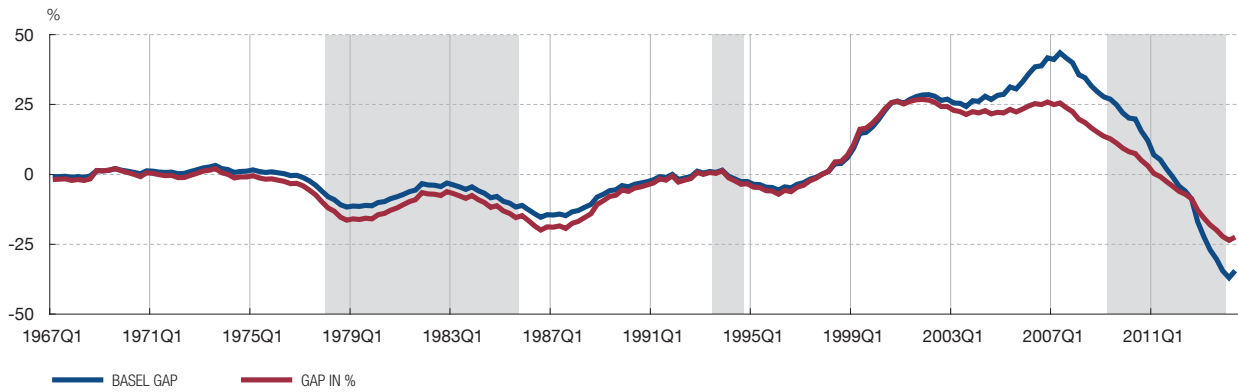
SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.

GAP WITH POTENTIAL GDP

%

— BASEL GAP — GAP WITH POTENTIAL GDP

SOURCES: Banco de España, Instituto Nacional de Estadística and own calculations.