Financial Stability Notes

Measuring and mitigating cyclical systemic risk in Ireland: The application of the countercyclical capital buffer

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Abstract

Following a number of years where the activation of the countercyclical capital buffer was limited, it is now becoming an increasingly relevant and actively used macroprudential policy tool across Europe. Against this background, this Note describes the high-level approach taken by the Central Bank of Ireland in setting the countercyclical capital buffer rate applicable to Irish exposures. In addition, the Note discusses issues around the identification of cyclical systemic risk in Ireland, and in particular the role of the credit-to-GDP gap as an appropriate reference indicator for countercyclical capital buffer rate decisions. The Note introduces work within the Central Bank of Ireland to develop a potential alternative reference indicator for informing countercyclical capital buffer decisions. In particular, an alternative measure of the national credit gap which looks to account for structural shifts in the economy and informs the estimation of the cycle through additional variables. This semi-structural measure of cyclical systemic risk addresses some of the main drawbacks of purely statistical methods such as excessively persistent trends, a feature that is particularly desirable in post-crisis circumstances.

1. Introduction

The countercyclical capital buffer (CCyB), which is designed to allow macroprudential authorities increase capital requirements when cyclical systemic risk is considered to be growing, is an increasingly relevant and actively used policy instrument across Europe. The imposition of additional capital requirements during cyclical upturns looks to enhance the resilience of the banking sector with a view to maintaining the supply of credit to the economy during downturns when losses materialise. This Note sets out a high-level approach which frames thinking within the Central Bank of Ireland on the appropriate CCyB rate on Irish exposures. The overarching principle in this regard is that the primary objective of the CCyB is promoting banking sector resilience (i.e. its ability to withstand potential loses). In meeting this objective, it is acknowledged that the buffer should be positive sufficiently early in the cycle to effectively promote resilience, while

also accounting for the relative sensitivity of the Irish macro-financial environment to external developments.

The identification of the cycle and/or the emergence of cyclical vulnerabilities then plays a key role in informing buffer setting. Below we discuss issues around measuring the credit cycle in Ireland, and particularly the use of the credit-to-GDP gap as a reference indicator. An alternative approach to estimating the credit gap for Ireland is introduced which looks to acknowledge some of these issues. The methodology tries to account for structural shifts in the economy and informs the estimation of the ups and downs of the cycle through additional macroeconomic variables.

The Note proceeds as follows: in section 2 we discuss some of the topical issues of debate around the utilisation of the CCyB at this time; Section 3 describes the high-level approach to and objective of the CCyB as viewed within the Central Bank of Ireland; Section 4 discusses the role and limitations of the standard credit gap in informing CCyB policy and presents an alternative approach specific to the Irish economy; Section 5 concludes.

2. The CCyB: An increasingly relevant policy tool

The CCyB, which is the principal macroprudential policy tool within Capital Requirements Directive (CRD) IV aimed at mitigating cyclical risks, has been operational across Europe since 2016. Having been activated rather sparingly upon its introduction, the CCyB is coming increasingly into focus as a policy tool as indications point to the emergence of a financial cycle upswing, with an associated increase in cyclical systemic risk, once again across a number of European countries.

In the international literature the CCyB has been ascribed two potential objectives; building resilience and damping the financial cycle. While individual macroprudential authorities have placed differing emphasis on the balance between these two aspects, in many cases resilience is viewed as the primary aim (see ESRB 2018). The scope for the CCyB to play a role in mitigating the upswing of the cycle is generally, although not always, seen as a secondary benefit or potentially positive side effect. However, the scope for damping the downswing of the financial cycle is fully consistent with resilience being the primary CCyB objective.

There are now an increasing number of instances where a positive CCyB is being set across Europe (Figure 1). This in turn is bringing a greater focus to the rationale behind policy decisions. One of the aspects receiving attention is the role of credit developments and in particular, the mandatory reference indicator of the credit-to-GDP gap in the rate setting process.[2] Arising from research by the Drehmann *et al* (2010), which found it to be the best performing single early warning indicator variable for banking crises, the credit-to-GDP gap was given a prominent (although not dominant) role as a common reference point within the CCyB framework. Nonetheless, the over-arching modus operandi of the CCyB framework is one of guided discretion. Such an approach acknowledges the shortcomings, which are discussed further below, of the credit-to-GDP gap as a reference indicator. Hence within the European framework there is no mechanical link between the level of

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[2] The credit-to-GDP gap is calculated as the deviation of the actual level of the credit-to-GDP ratio from its estimated trend level.

the credit-to-GDP gap and the CCyB rate set. Furthermore, it is recommended that additional information, over and above the credit-to-GDP gap, should be incorporated into the decision making process so as decisions are based on a broad perspective of cyclical systemic risk.

BIS (2017) and ESRB (2018) include a summary of instances where the CCyB has been activated. Both note the fact that the credit-to-GDP gap and associated benchmark buffer rate have not been the primary basis for many of the decisions to set a non-zero CCyB rate to date. In fact, ESRB (2018) in particular note that for the European countries in question the credit-to-GDP gap is on average in negative territory.[3] As noted in Lang and Welz (2017), this is potentially partially related to the statistical properties of the indicator, whereby the prolonged period of credit growth in the pre-crisis era is tending to bias the gap downwards.

A second issue which is generating debate around the CCyB framework is the concept of a neutral CCyB rate. A neutral CCyB refers to the idea that the CCyB would be set at a rate other than zero in a normal or standard risk environment.[4] Where such a concept features explicitly in authorities' CCyB frameworks it has up to now also been linked with a buffer rate of 1 per cent being the appropriate rate for normal or standard risk environments. Explicitly linking 1 per cent as a neutral buffer rate also implies that this is akin to a steady-state or equilibrium level of the CCyB, and could be interpreted similarly to concepts of neutrality in monetary or fiscal policy frameworks.

At a more general level however, the practical implication of a neutral rate framework is consistent with an approach of building up the CCyB sufficiently early in the cycle to maximise the likelihood that a buffer is in place if and when required.[5] Such an approach takes into account the time lag in the implementation of the CCyB and can be seen as being prudent in the face of the inherent uncertainty involved in assessing the level and potential materialisation of cyclical systemic risks. In addition, by moving early in the cycle authorities potentially have the scope of implementing policy changes in a gradual manner, where necessary and appropriate, with a view to minimising potential (unwanted) impacts on the real economy.

3. The Central Bank of Ireland's use of the CCyB

The Central Bank of Ireland considers promoting resilience in the banking sector, with a view to facilitating a sustainable flow of credit to the economy through the financial cycle, as the primary objective underlying its CCyB rate decisions. With this objective in mind, it is considered important that a positive and appropriate capital buffer is available to be released, as and when required. The intention in such circumstances is the release of the capital buffer will limit the potential for regulatory capital requirements to act as an impediment to the supply of bank lending to the real economy.

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[3] At the time of the ESRB Report, 7 European countries has announced a positive CCyB rate. Since then a number of additional countries announced positive CCyB rates.

[4] To date this concept has become part of the frameworks used by the Bank of England and the Central Bank of Lithuania in setting the CCyB rate for the UK and Lithuania, respectively.

[5] This approach of moving early in the cycle has been adopted in Denmark for instance, where CCyB setting is based on an early and gradual phase-in, although without reference to a specific neutral rate. See Danish Systemic Risk Council.

Given this objective, it is considered appropriate that the CCyB would be activated (i.e. a positive rate implemented) early in the cycle. This would facilitate to the extent possible the build-up of a buffer prior to the materialisation of cyclical systemic risks. As mentioned previously, such an approach would also acknowledge the time lags within the CCyB framework and the inherent uncertainty over the systemic risk outlook.

This latter point may be especially relevant in a small open economy such as Ireland where events in the external environment, beyond the control of domestic policy makers, can have significant consequences for the domestic macro-financial environment and real economy. The responsiveness of the Irish macro-financial environment to external developments is also typically higher than other euro area Member States. Analysis of the volatility in a number of relevant macro-financial variables illustrates the relatively large amplitude of cycles in Ireland relative to European peers (Figure 2).[6] In addition, at present, the vulnerabilities that remain since the last crisis (e.g. the high level of indebtedness and non-performing loans) compound the sensitivity of the Irish financial system to cyclical reversals. Both aspects reinforce the importance of building resilience as a policy objective and provide a basis for why the response function of a policy maker in Ireland may need to be more sensitive than in other jurisdictions.

A key tenet of building-up the buffer early in the cycle is so its release has the potential to have a practical beneficial impact. The buffer could be released in a number of alternative scenarios. Where risks decline gradually, the buffer may similarly be reduced or partially released to acknowledge the reduction in cyclical systemic risk. The countercyclicality of the CCyB is of particular relevance however where there is a materialisation of systemic risk (i.e. a period of financial stress or instability). During such a significant downturn or where there is a materialisation of systemic risk, banks are likely to suffer losses which can reduce their capital levels. If bank capital reduces to levels closer to their minimum regulatory capital requirements, institutions may restrict the flow of credit during the downturn to reduce their leverage. Such a reaction can further depress economic activity in a pro-cyclical manner. The release of the CCyB, which takes immediate effect, looks to limit the potential that the interaction between higher losses and minimum regulatory capital requirements act as an impediment to the supply of credit to the economy.

While the primary focus of CCyB decisions relates to promoting resilience, this does not imply that the potential for the CCyB to limit the upswing of the credit cycle is not considered. It is acknowledged that increasing the CCyB may have a mitigating impact on the growth period of the cycle. However, as outlined in O'Brien & Ryan (2017), research points to the fact that this impact is often less certain and can be dependent on the reaction of individual institutions to the (change in the) CCyB rate. Therefore, there may be cases where a potential curtailment of the upswing of the financial cycle arising from CCyB decisions would be viewed by the Central Bank of Ireland as a positive in curbing the emergence of systemic risk. In general, this is not the primary motivation for such decisions. However, mitigating pro-cyclicality and curbing the downswing of the credit cycle is consistent with banking system resilience being the primary CCyB objective.

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[6] Volatility is measured as the standard deviation of the year-on-year growth rate over the period 1992Q1-2017Q4.

Overall, the high level approach of the Central Bank of Ireland to the utilisation of the CCyB can be summarised as follows (see Figure 3):

- The objective in using the CCyB is to build resilience in the banking system, so as to protect it against potential losses associated with a build-up of cyclical systemic risk, thereby supporting the sustainable provision of credit to the real economy throughout the financial cycle.

- The buffer should be positive sufficiently early in the cycle to effectively promote resilience, while also accounting for the relative sensitivity of the Irish macro-financial environment to external developments. Consequently, when there is a sustained trajectory in indicators related to emerging cyclical systemic risk the Central Bank of Ireland expects to maintain a positive CCyB rate.

- When that trajectory is persistent or reflects emerging imbalances, the buffer rate is expected to be above 1%. The level of the buffer will be informed by the level of resilience expected to be sufficient to support the sustainable provision of credit to the real economy in a subsequent downturn.

- When such a downturn or the materialisation of cyclical systemic risk is identified, the Central Bank of Ireland expects to reduce the buffer rate to a level consistent with mitigating pro-cyclicality, which includes reducing the buffer rate to zero if necessary to limit the impact of the downturn on credit supply.

4. The role of the credit-to-GDP gap and other quantitative indicators in CCyB decisions

Being able to recognise in a timely manner the build-up of cyclical risks is crucial to the implementation of the CCyB. Connected to the challenge of selecting the right point in time to activate or release the instrument, an appropriate CCyB policy framework requires reliable indicators of cyclical systemic risk.

In line with ESRB Recommendation 2014/1[7] the Central Bank of Ireland takes a broad perspective on cyclical systemic risk, drawing on a range of indicators to inform CCyB decisions. Indicators used to inform Central Bank of Ireland CCyB rate discussions broadly cover the following areas: credit developments, real estate developments, macro-economic developments, bank balance sheets, external imbalances and market indicators.

While within the framework of guided discretion there is no mechanical link between indicators and the rate chosen, authorities are required to calculate a buffer guide as a reference point when setting the CCyB rate. In order to have such a buffer guide a reference indicator is needed. This indicator should reflect the dynamics of the credit cycle in such a way to appropriately reflect the build-up and subsequent materialisation of systemic risks. Given the breadth of indicators to be considered in this context, some form of aggregation is necessary. In general this has been through the adoption of a single indicator as an appropriate "catch-all", or

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[7] ESRB Recommendation on guidance for setting countercyclical buffer rates.

by combining the various indicators through various statistical means to form a composite measure.[8]

Under CRD IV, the credit-to-GDP gap, is the chosen reference indicator for informing the buffer guide. The gap, which is measured as the difference between the actual and trend level of the credit-to-GDP ratio, falls within the set of indicators which try to identify the build-up of risks or imbalances by quantifing the deviations from underlying sustainable developments. To provide an element of consistency across countries, the CCyB framework provides for the calculation of the credit gap in a standardised manner. This standardised approach relies on the statistical method of the Hodrick-Prescott (HP)[9] filter to extract the trend credit-to-GDP ratio. The HP filter is calibrated to identify the credit cycle using a smoothing parameter (or lambda) value of 400 000.[10] This parameter choice is supported by literature that finds that financial cycles are generally large and asymmetric (Claessens *et al.*, 2012).

Methodological shortcomings of the HP filter approach have however been widely cited, although more frequently in the literature on the identification of the output gap or the business cycle. Hamilton (2017), for instance, provides a detailed critique of the HP filter and offers an alternative approach to estimating cyclical dynamics in economic time series. While the examples and proposed approach provided in the paper relate primarily to the business cycle, Hamilton suggests that it is general enough to be applied to cycles which could be considered to be much longer (such as credit or financial cycles).

Alternative parametric approaches such as unobserved-components models or the Beveridge–Nelson (BN) decomposition (1981) have been put forward for decomposing time series into permanent and transitory components.These model-based filters are not sensitive to the bias at the beginning or end of the samples which can be a drawback of purely statistical approaches. In addition, model-based methodologies allow for univariate and multivariate set-ups, the latter of which allows for the exploitation of information stemming from several economic time series (Forni, Hallin, Lippi and Rechlin (2000) and Stock and Watson (2002)).

As such, the standardised credit-to-GDP gap can have some undesirable properties and may therefore not be the most appropriate reference indicator in all circumstances. A particularly pertinent point at present is the impact of the filtering methodology on identifying an appropriate trend in periods of post crisis recovery and growth. In these circumstances, the trend can be heavily influenced by the relative dynamics of credit and GDP during the preceding boom, which can lead to excessively long periods of negative credit gaps that may not be appropriately identifying the build-up of new cyclical systemic risks. In addition, it is accepted, given the slow moving nature of the indicator itself, that the credit gap is an in-appropriate reference for the identification of the materialisation of systemic risk where the prompt release of the CCyB is necessary.

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[8] For a recent example of such a composite measure see Detken *et al* (2018). A calculation of the composite indicator proposed in that paper using appropriate Irish data yields results qualitatively similar to those discussed in section 4.1.

[9] See Hodrick and Prescott (1997).

[10] Lambda of 400 000 implies that credit cycles are about four times longer than business cycles, i.e. in the range of 25-30 years.

Aside from the methodological issues, the use of appropriate data for credit and economic activity is also highly relevant for Ireland. Given the influence of the activities of large foreign-owned multinational enterprises (MNEs) in Irish macroeconomic data, both the numerator and the denominator of the standard credit-to-GDP ratio are not reflective of the relevant factors for the domestic macro-financial environment.[11] It is well understood that the level of GDP in Ireland is influenced by the activities of foreign-owned MNEs. However, it is less well appreciated that the standard measure of credit in the credit-to-GDP ratio refers to the total liabilities of all Irish resident non-financial corporations. This includes the large intra-group positions that foreign-owned MNEs have with their non-resident counterparts, which are not ultimately related to the financing conditions facing Irish firms.[12] As a result, the Central Bank of Ireland refers to the credit-to-GNI* ratio as the national-specific alternative to the standard credit-to-GDP ratio. For the national-specific ratio, credit refers to the sum of total liabilities of the resident household sector and the outstanding amount of loans to Irish-resident non-financial corporations by Irish resident credit institutions. Similarly, modified gross national income (GNI*) is now used as the most appropriate measure of economic activity in the national specific ratio.[13]

4.1 A model-based approach to estimating the credit-gap for Ireland

The shortcomings of the standardised credit gap methodology can militate against its applicability as a policy reference indicator and support the case for assessing potential alternative approaches which could potentially inform a buffer guide while providing a greater underlying economic narrative. This is relevant in the Irish case with the Central Bank of Ireland exploring a number of alternative methodologies.

Figures 4 and 5 illustrate the two versions of the credit gap for Ireland, calculated in accordance with the HP filter approach. Figure 4 shows the standardised gap while figure 5 shows the national-specific alternative measure of credit-to-GNI*. In both cases the gap is well below zero.

While the credit-to-GNI* ratio substantially addresses the issue of using appropriate data in the Irish case, it is still subject to the shortcomings of the HP filter, especially in appropriately identifying post-crisis periods of emerging cyclical risks and in enabling an economic interpretation of the cycle. In developing an alternative approach to the estimation of the credit gap to address these issues, a semi-structural model is employed to decompose the credit-to GNI* ratio into its trend and cycle components. The approach draws on univariate trend-cycle decomposition models in a state space framework (see e.g. Clark (1987), Harvey (1989), Hamilton (1988)) as well as extensions to a multivariate framework (see e.g.Borio (2013), Azevedo et al (2006) and Lang and Welz (2017)). Estimating the credit gap in a multivariate approach could allow to better disentangle cyclical

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[11] The Report of the Economic Statistics Review Group discusses the impact of globalisation on national economic statistics.

[12] *Box 2: A decomposition of NFC debt and loans* of the Central Bank of Ireland Macro-Financial Review 2017:1 outlines the impact that debt held by these MNEs located in Ireland has on the level of NFC debt in Ireland. Creedon & O'Brien (2016) illustrate the implications of this for the calculation of the credit-to-GDP gap in Ireland.

[13] The CSO published initial estimates of GNI* as part of its macroeconomic releases for 2016 and 2017Q1. Since then the Central Bank of Ireland has been utilising this as its preferred measure of economic activity for the calculation of the national specific credit gap- see September 2017 CCyB release.

deviations from fundamental/structural developments and ultimately improve the early warning properties of the estimated variable. In our approach described in equations (1) – (3) we inform the estimation of the cycle by including two auxiliary variables. Here y_t is the credit-to-GNI* ratio which is estimated as the sum of the trend and the cycle. The trend is defined as a sum of its own lag and an error term (equation 2). Equation (3) describes the estimation of the cycle as an AR(2) process that additionally includes two lags of a pair of auxiliary variables.

$$y_t = \tau_t + c_t \quad (1)$$

$$\tau_t = \tau_{t-1} + v_t \quad (2)$$

$$c_t = \mu + \theta_1\, c_{t-1} + \theta_2\, c_{t-2} + \gamma_1\, AUX1_{t-1} + \gamma_2\, AUX1_{t-2} + \beta_1\, AUX2_{t-1} + \beta_2\, AUX2_{t-2} + u_t \quad (3)$$

The auxiliary variables included are the estimated misalignment in house pricess[14], and the Irish 10-year sovereign bond spread vis-à-vis the equivalent German bond. Drehmann *et al.* (2010) motivates the choice of a measure related to house price developments due to its early warning properties. Moreover, Lozej *et al.* (2017) conceptually assess the macroeconomic performance of different countercyclical capital buffer reference variables in a rules based framework, finding that the optimal reference variable relates to house prices. The sovereign bond spread is taken as a proxy for the general level of risk in the economy.

Kelly *et al.* (2011) study the steady-state relationship between private sector credit and GDP in Ireland. Their results suggest the presence of structural breaks in the credit-to-GDP relationship, for example around the introduction of the euro in the late-1990s and the financial crisis of 2007/2008 . This indicates that the underlying time series could suffer distributional changes over time that need to be incorporated into the analysis. While purely statistical approaches cannot account for structural shifts in an economy, methods developed by Kim (1992), Kim and Nelson (1999) allow regime shifts within a state space framework. Our semi-structural model for the credit gap allows for regime shifts in the intercept and standard deviation of the cycle and in the standard deviation of the trend. The model allows the gap to switch to a regime of high volatility and a higher level in the intercept, and the timing of these switches is broadly consistent with the economic narrative around the previous crisis (i.e. shift to an alternative regime in the mid-2000's).

Figure 6 displays the preliminary estimates of the credit-to-GNI* gap from this model-based approach, alongside the standardised and national specific gaps presented earlier. According to this alternative indicator, the downward trajectory in the credit gap turned in early 2016 and is on a faster path towards closing than stipulated by the HP filter estimates. Moreover, the alternative credit gap reaches its highest point in the period before the beginning of the economic recession (2007Q1). The fact that the alternative credit gap peaks earlier might be indicative of superior early warning properties to those estimates computed with the HP filter. In addition, the alternative gap estimate seems to represent more accurately historical developments in the Irish economy. For instance, as opposed to the HP

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[14] The estimated misalignment in house prices is the average misalignment implied across a number of statistical and model based approaches. The indicator is included in the Systemic Risk Pack published bi-annually by the Central Bank of Ireland.

estimates the gap does not turn positive until 2002/2003. This feature aligns with the hypothesis that growth up to that time in Ireland was consistent with the country converging to western European norms and hence not equivalent to a build up of financial imbalances as suggested by the two HP indicators.

Extensions of this work are planned that aim to further analyse this approach in terms of its early-warning properties, the ability to further characterise the financial cycle, as well as how they differ across countries.

5. Conclusion

The countercyclical capital buffer is part of the policy toolkit of macroprudential authorities across Europe. It is aimed at mitigating cyclical systemic risk by allowing authorities to vary capital buffers over the course of the cycle. It has become an increasingly relevant policy tool recently with the more active use of the instrument across Europe bringing a greater level of focus to the implementation approaches used by authorities. This Note outlines the high-level approach of the Central Bank of Ireland as regards its setting of the CCyB rate applicable to Irish exposures. The Note also provides a discussion of some of the difficulties faced by policy makers in trying to the measure cyclical systemic risk and introduces a number of approaches being explored by the Central Bank of Ireland in this area. At the heart of the Central Bank approach to the use of the CCyB is the objective of promoting resilience in the banking sector to support a sustainable provision of credit to the economy throughout the cycle. In fulfilling this objective the Central Bank of Ireland considers the activation of the CCyB rate early in the cycle to be appropriate.

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Figures

Figure 1: Announced positive CCyB rates in Europe
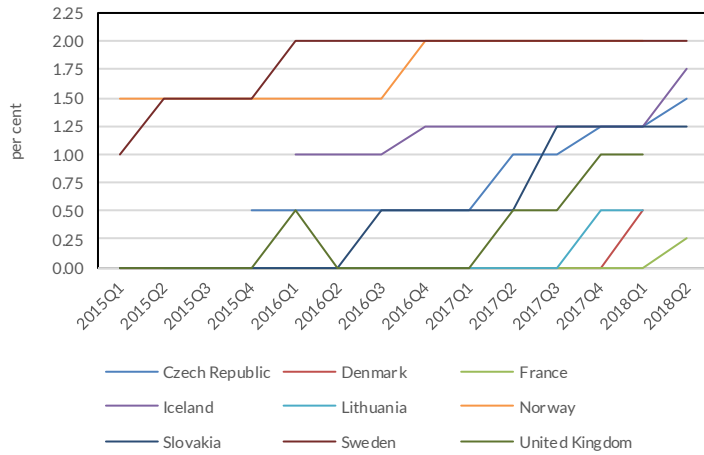
Source: ESRB & Haut Conseil de Stabilité Financière

Figure 2: Cross-country comparison of volatility in the growth of macroeconomic time-series
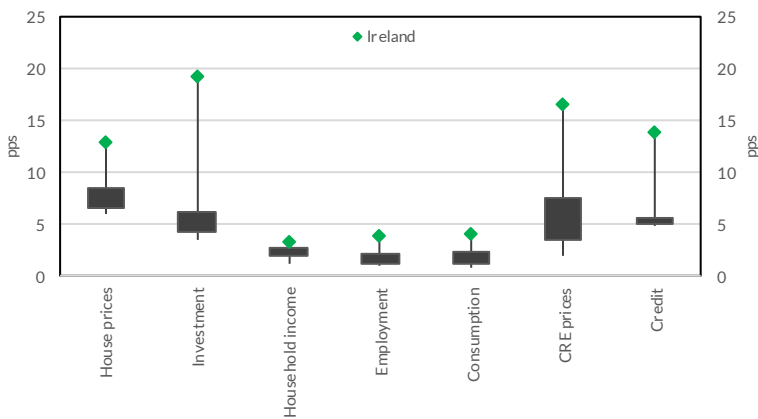
Source: Central Bank of Ireland calculations

Figure 3: Stylised representation of the Central Bank of Ireland's high-level approach to the implementation of the CCyB relative to the stage of the financial cycle
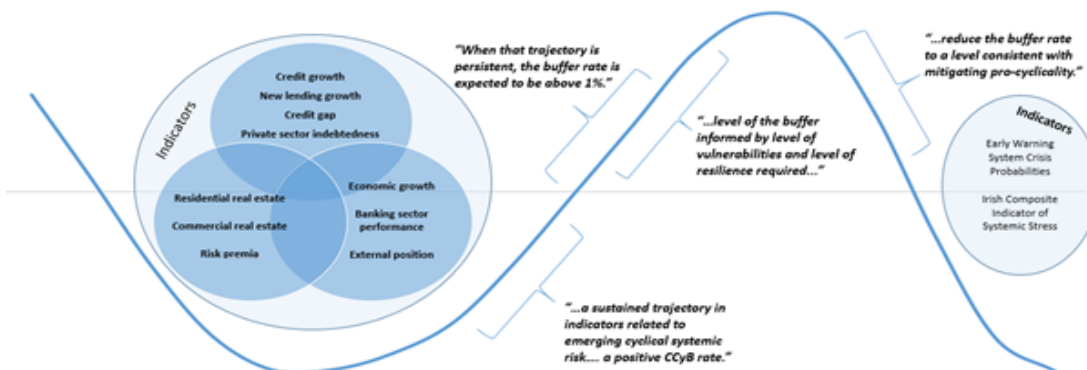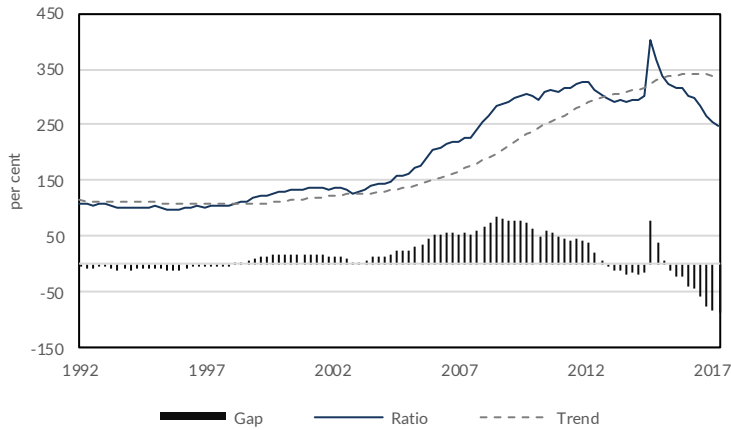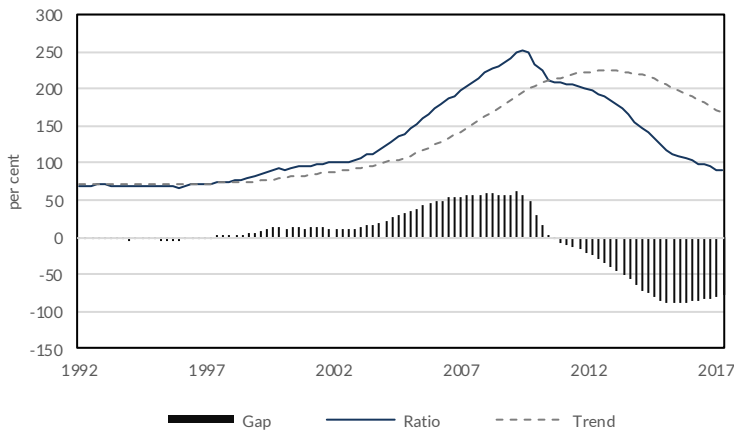
Figure 4: Standardised ("Basel") credit-to-GDP ratio and gap for Ireland
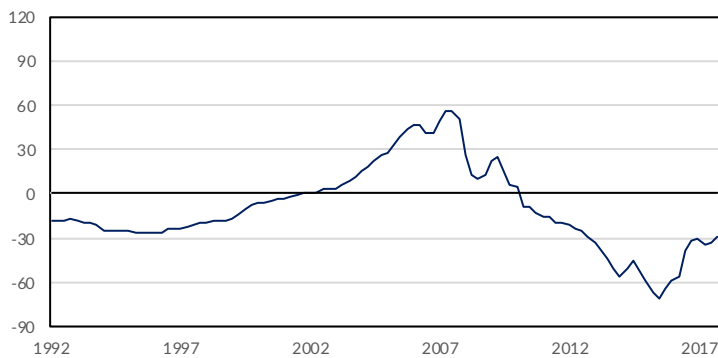

Source: Central Bank of Ireland calculations

Figure 5: Irish national specific credit-to-GNI* ratio and gap

Source: Central Bank of Ireland calculations

Figure 6: Alternative (model-based) estimate of national specific credit gap

Source: Central Bank of Ireland calculations