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# Countercyclical Capital Buffer: The Case of Uruguay

**Abstract**

*We study the countercyclical capital buffer introduced by Basel III and its complementarities with other regulation, particularly dynamic provisioning. We simulate different activation, adjust and deactivation rules for the buffer using historical data for Uruguay. The design and introduction of a countercyclical capital buffer following the principles in Basel III should complement current regulation and serve as an extra tool to mitigate systemic risk in the Uruguayan banking sector.*

*Keywords: Basel III, countercyclical requirement, macroprudential tools, Uruguay.*

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## 1. INTRODUCTION

Empirical evidence demonstrates the significant importance of excessive credit growth when determining the likelihood and severity of systemic financial crises.[1] The dynamic formation of systemic risk means that banking sector losses can be extremely large when a period of excess credit growth is followed by a recession. Loans granted during a period of excessive growth tend to be of lower quality than those granted during more stable periods, meaning the losses they generate can destabilize the banking sector and spark a vicious circle whereby financial system difficulties can contribute to a downturn in the real economy that then feeds back on to the banking sector.

These interactions between financial and real cycles have led to an important debate, among academics as well as financial regulators, regarding the macroprudential measures that should be adopted. In particular, there is apparent consensus on the importance of the banking sector strengthening its capital defenses during periods where risks of system-wide stress are growing markedly. Thus, the Basel Committee on Banking Supervision (2010a), in its regulatory framework for more resilient banks and banking systems (Basel III), has proposed introducing countercyclical capital buffers aimed at helping to protect banks from the effects of financial cycles. In order to ensure capital requirements, take into account the macro-financial environment in which banks operate, the proposal of the Basel Committee on Banking Supervision aims to accumulate capital reserves when imbalances start to build up and vulnerabilities increase in order to allow them to be used in times of crisis or financial instability.

The agreement proposed by the Basel Committee on Banking Supervision (2010a) (also known as Basel III) refers to a group of reform proposals motivated by the failures identified

[1] See for example Davis and Karim (2008), Drehmann and Juselius (2013), Drehmann and Tsatsoronis (2014) and the references provided therein.

during the recent international financial crisis. The agreement is based on a review of Basel II aimed at making further progress on strengthening the banking sector. The Basel Committee has reinforced the capital requirement framework, increasing both the quality and level of regulatory capital requirements. In particular, it introduces the requirement for accumulating a countercyclical capital buffer to be used by the banking sector during the trough of the financial cycle. The idea of the buffer is for banks to accumulate extra capital (up to 2.5% of risk weighted assets) during the high point of the financial cycle, for instance when bank credit is growing very rapidly as compared to the level of economic activity, and use it as soon as risks start to materialize.

This paper analyzes the main characteristics of the countercyclical capital buffer proposed by Basel III in light of related economic literature and recent international experience. It also makes a conceptual study of introducing the countercyclical requirement in Uruguayan regulation and its complementarities with other regulatory tools, particularly dynamic provisioning. Finally, we simulate different activation, adjust and deactivation rules for the buffer using historical data for Uruguay. It can be concluded from the analysis that the design and introduction of a countercyclical capital buffer following the principles in Basel III would complement current regulation and serve as an extra tool to mitigate systemic risk in the Uruguayan banking sector.

The remainder of this paper is organized as follows. Section 2 outlines the main characteristics of the countercyclical capital buffer. Section 3 briefly reviews the literature on countercyclical capital buffers. Section 4 analyzes coexistence of the new capital buffer with the current dynamic provisioning in Uruguayan banking regulations. Section 5 describes the results of the methodology proposed by the Basel Committee on Banking Supervision (2010a) with respect to different activation, adjust and deactivation rules for the buffer using historical data for Uruguay. Lastly, section 6 gives some final remarks.

## 2. THE COUNTERCYCLICAL CAPITAL BUFFER

The main objective of the countercyclical capital buffer set out by the Basel Committee on Banking Supervision (2010a) is to protect banks from financial cycle effects by enhancing their capacity to absorb losses (by accumulating capital) in periods when systemic vulnerabilities are growing (during periods of excessive credit growth for instance). The capital buffer built up in such periods can be deployed in the low point of the financial cycle to absorb losses and thereby help banks overcome periods of stress. A larger capital buffer in the high point of the financial cycle can also help to reduce excess supply of credit and risk-taking.

The proposed countercyclical capital buffer, which can vary between zero and 2.5% of risk weighted assets, is a system-wide prudential tool (macroprudential). Once activated, its scope of application is the whole banking sector, regardless of the potential contribution of individual banks to the excess supply of loans. The buffer is in addition to any other capital requirements that might exist, but unlike them, its activation, adjustment and deactivation is at the discretion of the bank regulator. The Basel Committee on Banking Supervision (2010a) suggests using the long-term trend of the aggregate private sector credit-to-GDP gap as a reference to inform regulatory authorities on the phase of the financial cycle and guide activation of the countercyclical buffer.[2]

Conceptually, the countercyclical capital buffer is a complement to other existing regulatory tools. For example, consider a regulatory tool classification of two dimension: *i)* according to which their aim and basis for application is institution by institution (institution specific prudential) or systemic (system-wide prudential), *ii)* where their objective is the static or

[2] Drehmann and Tsatsaronis (2014) suggest that this indicator fulfills an important role in signaling when it is necessary to activate the countercyclical buffer. However, Repullo and Saurina (2011) argue that using it would tend to exacerbate fluctuations rather than reduce them.

dynamic dimension of financial risks. In these two dimensions, the countercyclical capital buffer is a prudential tool that addresses the rapid build-up of system-wide risks (see table 1).

**Table 1**

**COUNTERCYCLICAL CAPITAL BUFFER AND OTHER PRUDENTIAL REGULATION**

| *Prudential dimension* | *Static* | *Dynamic* |
|---|---|---|
| Institution specific | Minimum capital and provisions requirement | Dynamic provisioning |
| System-wide | Systemic risk capital requirement | Countercyclical capital buffer |

The countercyclical capital buffer therefore complements other prudential measures for the system that address the static dimension of financial risks. For example, in some jurisdictions capital requirements for systemic risk take into account the size of banking institutions, their interconnections and importance in the payments system as relevant variables for demanding extra capital requirements from banks considered systemically important. The countercyclical capital buffer is also complemented by institution specific prudential regulation tools. In particular, it complements static capital requirements (be the minimum requirement or the conservation buffer) and credit risk provisions because they explicitly consider the dynamic dimension of credit risk. Moreover, it complements dynamic provisioning, given that the latter is based on the situation of each individual bank, while the countercyclical capital buffer considers the aggregate or systemic situation.

In some jurisdictions, practical application of the countercyclical capital buffer has deviated from the recommendations

of the Basel Committee on Banking Supervision (2010a). In the case of Switzerland, for instance, the countercyclical capital buffer is activated at the discretion of the authorities using as a reference a wide range of both aggregate and sectoral indicators and variables, as well as quantities such as prices. Meanwhile, both England and Switzerland base their countercyclical capital buffers on the behavior of certain sectors, particularly the mortgage sector. These types of measures therefore pursue the objective of controlling the rapid generation of systemic risk in sectors identified as particularly vulnerable, requiring additional capital buffers in banks that are most exposed to such sectors, while less exposed banks do not necessarily have to build such buffers.

The application of capital requirements based on the behavior of specific credit sectors and, therefore on the most exposed banks, is complementary to the application of capital requirements on an aggregate basis for all banks. The first approach addresses the need to recognize expected losses from the performance of individual banks in market segments where financial imbalances are being generated as a result of, for instance, substantial sectoral credit growth. In some jurisdictions, such as Spain and Uruguay, dynamic provisioning is employed in order to recognize such risks in advance and provide incentives for banks to reduce their exposure to them.[3] Thus, dynamic provisions, in their most common form, are an institution specific prudential tool. Meanwhile, a countercyclical capital buffer applied in aggregate form is a system-wide prudential tool aimed at raising the banking system as a whole's resilience to periods of stress and remain stable so it can continue providing its services to the rest of the economy.

Finally, the recommendation of the Basel Committee on Central Banking (2010a) does not take into account a key characteristic of the Uruguay's banking system: dollarization. If there were sharp differences between currency specific credit

[3] The regulatory tools of England and Switzerland do not include the possibility of implementing dynamic provisioning.

cycles, there would be a reason to consider data broken down by currency above aggregate data, given that the latter could be hiding important sources of systemic risk. Ultimately, the answer as to which series should be used as a reference is of empirical nature. Section 5 presents an analysis of credit series by currency and concludes that although their cycles have exhibited different behaviors during the recent history of Uruguay, the aggregate series appropriately captures the trend-cycle performance of the disaggregated series.

## 3. RELATED LITERATURE

Debate on whether the business cycle might be amplified as a consequence of the regulatory framework implemented by the Basel II agreements (see Basel Committee on Banking Supervision, 2005) began even before their approval. For instance, Kashyap and Stein (2004) argued that losses during a downturn erode bank capital, while risk sensitive capital requirements increase. If banks are not able to rapidly raise their capital they are forced to reduce their supply of loans, which contributes to a worsening of the downturn.

In light of the recent international financial crisis, reforms to the regulatory capital framework proposed by the Basel Committee on Banking Supervision (2010a) were aimed at raising both the level and quality of the regulatory capital base and, particularly, at reducing any kind of cyclical behavior in minimum capital requirements, as well as maintaining a capital buffer with the macroprudential goal of protecting the banking sector from the potentially negative impact of periods of excess credit growth.

This section provides a summary of the literature related to the financial cycle and the procyclical behavior of current capital requirements based on the Basel II agreement in order to demonstrate the potential impact of introducing countercyclical capital buffers under the Basel III framework.

Bergara and Licandro (2000) propose a microeconomic model for identifying what share of credit procyclicality

responds to bank behavior and what share to the prudential regulatory framework. They conclude that credit is procyclical even if there is no prudential regulation or if the latter is loose, because bankers' myopia and risk aversion affects their return-risk perception. They therefore conclude that prudential regulations do not exacerbate the credit cycle but actually manage to smooth it.

Repullo and Suárez (2008) link bank capital requirements with the credit rationing of some firms through an bridged generations model that assumes the existence of relational banking (banks have private information about their borrowers) and the inability of some banks to access the equity market. They find that, under Basel II regulations, although banks hold larger capital buffers during expansions, the arrival of recessions is usually associated with significant credit rationing. They set forth that some adjustments in the confidence level of Basel II can substantially reduce the incidence of credit rationing throughout the business cycle without compromising solvency targets. In particular, they propose modifying the confidence levels in a way that keeps their long-term average at 99.9%, but lessens the target in situations where credit rationing turns out to be the highest.

Another alternative for correcting the procyclicality of capital requirements is that suggested by the Committee of European Bank Supervisors (CEBS, 2009), consisting of a mechanism that adjusts probabilities of default estimated by banks in order to incorporate recessionary conditions. In particular, they propose two alternatives: applying an adjustment based on the gap between current probabilities of default and those corresponding to a recession, and using confidence levels that automatically adjust as the result of changing cycles.

Repullo, Saurina and Trucharte (2010) study the most important alternatives to the credit gap indicator for mitigating the procyclical effects of Basel II requirements. The analysis is based on an estimation of the one-year ahead probabilities of default of Spanish firms during the period 1986-2007 using data from Spain's Credit Register. They therefore obtain a risk

profile for each bank by calculating the corresponding Basel II capital requirements for each loan.

They compare different alternatives for adjusting capital requirements throughout the cycle, concluding that the best procedure is to use a multiplier of the economic cycle based on GDP growth. They analyze two alternatives proposed by Gordy and Howels (2006): smooth the inputs of the formula using through-the-cycle adjustment in the probabilities of default, and smooth the outputs of the formula by adjusting final capital requirements computed from probability of default estimates. The results show that the best procedure is to use a multiplier of the capital requirement. Such multiplier depends on the deviation of the growth rate of GDP growth with respect to its long-term trend.

Elekdag and Wu (2011) analyze the development of credit booms based on an event study with a panel of advanced and emerging countries covering the period 1960-2010. Among the main results of the paper stand out the association they find of credit *booms* with deteriorating bank and corporate balance sheets, as well as with symptoms of economic overheating. With respect to the referred indicator for correcting procyclicality, they suggest that the credit-to-GDP gap does not allow for contemplating the possibility that credit and output have different trends, and that a fall in GDP could give rise to decisions that might exacerbate the procyclicality instead of smoothing it.

Christensen, Meh and Moran (2011) compare the impact of bank leverage regulation with constant time-invariant requirements to that with requirements that change according to the cycle (countercyclical regulation). The outcomes suggest that the countercyclical buffer manages to keep the development of financial imbalances under control by inducing banks to alter the intensity with which they monitor their borrowers.

Gersbach and Rochet (2012) propose a formal rationale for imposing countercyclical capital ratios. They find that banks allocate too much borrowing capacity to good states and too little to bad states, creating excessive volatility in credit, GDP, asset prices and wages. Using a very simple model in which

financial frictions generate excessive fluctuations in the volume of credit, they demonstrate that the latter can be smoothed by regulatory countercyclical capital ratios.

Dewatripont and Tirole (2012) also use a formal model to analyze banking regulation, understood as a combination of self-insurance mechanisms, capital buffers and provisions, in the presence of macroeconomic shocks. Their results show that the combination of mechanisms such as dynamic provisioning, countercyclical buffers, as well as other forms of capital insurance, such as contingent convertible bonds (CoCos), is optimal for neutralizing the adverse effects of macroeconomic shocks of both deterministic and random origin.

Buncic and Melecky (2013) propose a new approach to macroprudential stress testing of the banking system. Stress tests used up until now have been mainly based on financial simulations where no formal links to the macroeconomy are established. The methodology they propose incorporates explicit links between the financial system and the macroeconomy, allowing for contemplating the possible emergence of systemic risks deriving from changes in macroeconomic conditions, as well as idiosyncratic risks originating from the different risk profiles of individual banks. The results are robust when the methodology is applied to a set of Eastern European banks during the recent international financial crisis.

Repullo (2013) concludes that when models incorporate a social cost of bank failure the regulator sets higher capital requirements as compared to a situation without banking regulation. However, there is a trade-off: Banks are safer but aggregate investment is lower. The paper also analyzes the impact of a negative shock to the aggregate supply of bank capital (equivalent to a downturn of the economy). If capital requirements are kept unchanged, the reduction in the supply of capital implies a significant fall in bank lending and aggregate investment (although banks are safer). In sum, the paper compares the costs and benefits of adjusting capital requirements to changes in the business cycle, concluding that the regulator should not only focus on the credit rationing that could arise

if capital requirements are not lowered during recessions, or on the greater likelihood of bank failures if they are.

Drehmann and Tsatsaronis (2014) respond to some of the criticism of the credit-to-GDP gap indicator. In particular, they offer counterarguments to the following observations: The credit gap indicator can lead to decisions that conflict with its objective, it is not the best early warning indicator for banking crises (especially for emerging economies), and it also has some measurement problems.

The first criticism argues that the relevant cycle for the instrument should be the financial cycle and not the business cycle. As mentioned above, Repullo and Saurina (2011) find a negative correlation between the credit gap and GDP growth, meaning a capital buffer determined according to such criteria could exacerbate the cycle it is attempting to smooth. However, Drehmann and Tsatsaronis find that, although it is negative, said correlation is very small and mainly determined by periods that are irrelevant in decisions for building a capital buffer.

To answer the second criticism, they use a panel of 26 countries over the period 1980 and 2012 to compare the performance of six indicators: The credit-to-GDP gap, GDP growth, residential property price growth, the debt service ratio and the non-core liability ratio. Among the variables considered, the credit-to-GDP gap ratio is statistically the best early warning indicator for two to five year forecast horizons.

As for the indicator's measurement problems, these relate to the now well-known limitations of estimating a trend with the Hodrick-Prescott (1981) filter: the most recent observations can considerably change the results. In this regard, simulated data estimations suggest using series with at least 10 years of available data to overcome this problem.

Wezel, Chan-Lau and Columbra (2012) make a brief comparison between countercyclical capital buffers and dynamic provisioning methods. They state that although dynamic provisioning considers fluctuations in the specific provisions of each loan, it does not take into account changes in the probabilities of default and losses, once default has taken place, used as

an input in the capital requirement formulas of Basel II. They conclude that both tools can complement one another as long as policies for provisions focus on bolstering the banking sector against expected losses, while capital measures focus on unexpected losses. In particular, they argue that although dynamic provisioning directly protects bank results, they have little capacity to restrain excessive credit growth, suggesting they should therefore be accompanied by other macroprudential measures aimed at mitigating systemic risks.

Finally, it is important to mention that this paper is based on an initial analysis of the impact of the new countercyclical capital buffers in aggregate terms, but banks can decide to hold different amounts of capital according to their individual characteristics, such as their appetite for risk, their size or access to sources of funding other than agents' deposits. Recent literature includes a series of papers analyzing the cyclical behavior of bank capital taking into account the diversity that could exist among banking institutions.

Jokipii and Milne (2008) analyze the cyclical behavior of capital buffers that European banks decide to hold above Basel I capital requirements, as well as the possible changes in such behavior across different countries and types or sizes of institution. Using a panel for the period 1997-2004, they find that although banks hold capital amounts above the minimum requirement, said decision varies according to the type and size of bank. They conclude that capital buffers of large institutions, commercial banks and savings banks exhibit negative cyclical comovement, while those of cooperative banks and smaller banks behave procyclically.

Fonseca and González (2010) work with a panel data of banks from 70 countries for the period 1995-2002 in order to study the factors that influence the decisions to hold bank capital buffers. In particular, they analyze how different regulatory and institutional designs across countries can lead to differing behaviors in bank market power and market discipline, these being two factors that play an important role in bank decisions to hold capital buffers higher than the minimum requirement.

García-Suaza *et al.* (2012), meanwhile, study the cyclical behavior of capital in the Columbian banking sector using a panel of banks for the period 1996-2010. They conclude that although bank capital buffers vary throughout the cycle, this behavior differs according to the size of the institution. In particular, they confirm countercyclical behavior for large banks, but do not find evidence of the same behavior for small banks.

Finally, Carvallo *et al.* (2015) study the cyclical behavior of capital buffers based on a panel of the banking sectors of 13 Latin American and Caribbean countries for the period 2001-2012. The paper is interesting because it focuses on capital buffer fluctuations over the business cycle only in emerging countries. They conclude that capital buffers are more likely to fluctuate pro-cyclically in countries where capital regulation is less stringent and the costs of adjusting buffer holdings are lower, while the larger the institution, the lower the capital buffer.

## 4. INTRODUCING THE COUNTERCYCLICAL BUFFER INTO URUGUAYAN REGULATION

The objective of this section is to discuss how far the countercyclical capital buffer proposed in Basel III can coexist with the statistical (or dynamic) provisioning currently in force in Uruguay's banking regulation.

As mentioned in Section 2, statistical provisioning conceptually has an institution specific prudential dimension given that the formula set out in regulations governing the growth of the statistical provisioning fund depends on idiosyncratic variables for each bank, especially, the growth of credit granted by each institution and the stock of credit granted.

In particular, the formula used for generating statistical provisions is as follows:[4]

[4] The regulations are described in *Comunicación,* number 2001/149 <www.bcu.gub.uy/Comunicados/seggco01149.pdf>; *Comunicación,* number 2012/004, *Actualización,* number 190 <www.bcu.gub.uy/Comunicados/seggco12004.pdf>; y *Comunicación* no. 2014/061, *Actualización,* no. 200 <www.bcu.gub.uy/Comunicados/seggco14061.pdf>.

$$\Delta FPE_t = \begin{cases} \left\{\left[\frac{1}{12}\sum_{i=1C}^{2B}\alpha_i\left[C_{i,t-1}-C_{1,t-13}\right]+\frac{1}{12}\sum_{i=1C}^{2B}\beta_i C_{i,t-1}\right]-\left\{\left[\sum_{i=1C}^{i=5}(\Delta E_{i,t})\right]-R_t\right\}\right\}\kappa_t & \text{if} \quad \sum_{i=1C}^{2B}\left[C_{i,t-1}-C_{1,t-13}\right]\geq 0 \\ Min\left[-\left\{\left[\sum_{i=1C}^{i=5}(\Delta E_{i,t})\right]-R_t\right\};0\right] & \text{if} \quad \sum_{i=1C}^{2B}\left[C_{i,t-1}-C_{1,t-13}\right]<0 \end{cases}.$$

Where:

- $\Delta FPE_t$ is the increase (positive or negative) in the statistical provisioning fund during month $t$.

- $\left[\frac{1}{12}\sum_{i=1C}^{2B}\alpha_i\left[C_{i,t-1}-C_{i,t-13}\right]+\frac{1}{12}\sum_{i=1C}^{2B}\beta_i C_{i,t-1}\right]$ is the statistical loss for defaulted loans corresponding to month $t$.

- $\sum_{i=1C}^{2B}\left[C_{i,t-1}-C_{1,t-13}\right]$ is the change between month $t-1$ and $t-13$ in the stock of computable risks.

- $\sum_{i=1C}^{5}\left[\Delta E_{i,t}\right]-R_t$ is the net result of defaulted loans once statistical provisions of month $t$ have been established, $i$ is the category of credit risk (risk rating), $\Delta E_{i,t}$ are net charges for specific provisions and $R_t$ represents recoveries of defaulted loans in month $t$.

The $k$ parameter adjusts changes in the fund according to the relative distance of each fund with respect to its ceiling or limit, in such a way that $k$ tends towards zero as the fund nears the ceiling. Meanwhile, the countercyclical capital buffer set out in Basel III has a system-wide prudential dimension, given that the regulation

proposed for activating a higher capital requirement is based on the behavior of the financial system as a whole. The recommendation of the Basel Committee on Banking Supervision (2010a) is that the buffer should depend on the long-term trend of the aggregate private sector credit-to-GDP gap. Thus, from the point of view of the dimension or main focus, both instruments complement one another perfectly.

Another aspect that lends support to the coexistence of both instruments stems from the fact that statistical provisions are aimed at protecting banks against expected losses during the cycle, while the objective of the countercyclical capital buffer is to protect them against unexpected losses. Thus, the fact that both instruments are monitoring the business cycle gives them the character of dynamic instruments as they are constantly addressing the evolution of risk.

It should also be pointed out that statistical provisions in Uruguay, which are very similarly designed to those in Spain's regulation, have effectively fulfilled the role of buffer in addressing losses during recessions and smoothing the volatility of economic results. However, they have been largely ineffective in reducing the growth of credit.

In fact, empirically it can be seen how in the case of Spain the operation of dynamic provisioning did not influence to any great degree the rapid growth of credit observed during the phase preceding the recent crisis in its banking system, when credit grew at an annual average rate of 16%. However, dynamic provisioning did function adequately as a buffer against the large losses of the crisis period.[5]

Furthermore, it should be remembered that in Spain dynamic provisions are calculated in a similar way to in Uruguay, i.e.:

$$\textit{Dynamic provisioning} = \alpha \Delta \textit{Credit} + \beta \textit{Credit} - \textit{Specific provisioning}.$$

The great difference is that specific provisioning is guided by incurred loss criteria. According to the latter, a specific

[5] See these effect in BBVA (2011).

provision can only be registered if there is objective evidence of deterioration in the asset or loan. Thus, specific provisions, which are subtracted in the calculation of dynamic provisions, are very small at the time of a boom phase given that the objective evidence referred to in the regulation does not exist. This meant dynamic provisions grew sharply in Spain during the boom phase.

Given that specific provisions in Uruguay are guided by the principle of expected loss, they are much larger, meaning the statistical provisioning fund might not increase during the boom phase in the case of institutions that grow substantially. This situation has been corrected recently by introducing the following clause into current regulations: "If as a result of applying the preceding parameters at the end of month $t-1$ the statistical provisions fund does not increase –in total value and as a percentage of the maximum limit for computable risks– with respect to month $t-13$, having increased the stock of computable risks during said month, institutions may use higher statistical provision parameters in order for the fund to increase in line with that set out. The Superintendency of Financial Services can –in accordance with the observed evolution of the statistical provisions fund– issue instructions to the institutions requesting them to comply with the aforementioned objective".

Current regulations therefore ensure that the statistical provisioning fund will increase, in total value and as a percentage of the maximum limit, but it is evident that this could be insufficient for addressing expected losses during recessions, and it clearly does not perform a significant role in determining the speed of credit growth either.

In contrast, an increase in the capital requirement acts much more directly, effectively restricting credit as long as the increase in capital is demanding enough to ensure the amount of capital above the regulatory minimum is very low.

In sum, both instruments– statistical provisioning and countercyclical capital buffers– can coexist and are tools that complement one another for the following reasons:

- In general, statistical provisions have an institution specific prudential dimension and countercyclical capital a system-wide prudential dimension.

- Statistical provisioning is effective for facing expected losses, while countercyclical capital is useful for addressing unexpected losses.

- Even in the case of Spain, with a specific provisioning approach based on incurred losses, dynamic provisioning was not successful in restraining credit growth. In the case of Uruguay, with a specific provisioning approach based on expected losses, the role of dynamic provisioning in curbing credit growth becomes even more important.

- Countercyclical capital acts faster in reducing credit growth as the amount of capital above regulatory requirements becomes smaller.

Finally, one factor to take into consideration for introducing the countercyclical capital buffer concerns international standards on matters of financial institution regulation and supervision emerging from Basel III and international accounting standards issued by bodies such as the IASB (International Accounting Standard Board). The countercyclical capital buffer is a standard that has now been approved by Basel III, while dynamic provisioning, although considered within the recommended prudential tools, has still not been specifically enacted by Basel III.

In this respect Basel III establishes that the use of more forward-looking provisions should be promoted. It therefore advocates a change in accounting practices towards basing provisioning on an expected loss approach, and not one of incurred loss. To such ends it has published and made available to the IASB a set of principles aimed at modifying IAS 39. However, even if agreement is reached on the expected loss approach, the maximum horizon on which it could coordinate

with the IASB for assessing expected loss would be one year, and never one business cycle.

Thus, for better adjustment to the international standards mentioned above, it is also recommendable to introduce the countercyclical capital buffer.

## 5. ACTIVATION, ADJUST AND DEACTIVATION: AN EXAMPLE WITH HISTORICAL DATA FOR URUGUAY

This section describes the results of applying the methodology set out by the Basel Committee on Banking Supervision (2010b) for the activation, adjust and deactivation of the countercyclical capital buffer using historical data for Uruguay. The methodology is described first, together with the data used to apply it and assess the outcomes for the period prior to the banking crisis of 2002. Indicators are also proposed that could guide deactivation of the buffer, highlighting the main advantages and disadvantages of the methodology.

### 5.1 Methodology: Aggregate Private Sector Credit-to-GDP Gap as a Reference

The Basel Committee on Banking Supervision (2010a, 2010b) has suggested using the gap between the aggregate private sector credit-to-GDP ratio and its long-term trend as a reference for the phase of the financial cycle. To determine the size, activation and deactivation of the countercyclical capital buffer they suggest following a three step process:

Step 1. *Calculate the aggregate private sector credit-to-GDP ratio,* taking into account a broad measure of credit that captures all the sources of private sector borrowing and is applied equally to all banks with similar exposure without considering their individual contribution to excess credit growth.

Step 2. *Calculate the credit-to-GDP gap (the gap between the ratio and its trend) using* the Hodrick-Prescott (1981) filter with a *lambda*

parameter of 400,000 (Borio and Lowe, 2002) which reflects the prolongation of financial cycles as compared to traditional business cycles.[6]

Step 3. *Transform the credit-to-GDP gap into the guide buffer add-on* associating the size of the capital buffer with the magnitude of the gap calculated in step 2 according to the following approach:

$$\begin{cases} Buffer = 0\% & \text{if } Gap_t < 2\% \\ Buffer = 2.5\% * \left[ \dfrac{\left( Gap_t - 0.02 \right)}{0.08} \right] & \text{if } 2\% < Gap_t < 10\% \\ Buffer = 2.5\% & \text{if } Gap_t > 10\% \end{cases}$$

The size of the buffer varies linearly between 0% and 2.5% for gap values of between 2% and 10%. For values of less than 2% the buffer should not be activated, while for values of 10% or more it should be at its maximum level of 2.5%.

An alternative approach to the one presented above has recently been introduced in Switzerland. The Swiss National Bank (2014) describes the methodology used by the institution. Activation and adjustment of the countercyclical buffer is based on an historical analysis of the relevant series, for instance the credit gap calculated in step 2 along with other variables. In particular, it identifies a past period of instability (or crisis) and, based on the historical evolution of the series, builds a buffer that adjusts gradually over three years up to a maximum of 2.5% 12 months before the relevant indicator reaches its maximum level (the time of greatest imbalance, such as, for instance, the outbreak of the crisis, $t^*$). The size of the buffer adjusts linearly in line with the size of the gap according to the following approach:

[6] Drehmann et al. (2010) provide empirical evidence revealing that trends calculated with this parameter perform well in describing the long-term behavior of the private borrowing series.

$$\begin{cases} Buffer = 0\% & \text{if } Gap_t < Gap_{t^*-16} \\ Buffer = 2.5\% * \left[ \dfrac{\left( Gap_t - Gap_{t^*\ 16} \right)}{\left( Gap_{t^*-4} - Gap_{t^*\ 16} \right)} \right] & \text{if } Gap_{t^*-16} < Gap_t < Gap_{t^*-4} \\ Buffer = 2.5\% & \text{if } Gap_t > Gap_{t^*-4} \end{cases}$$

### 5.2 Selecting Historical Data for Uruguay

The Superintendency of Financial Services publishes monthly aggregate data on gross loans to the private sector. The series contains data starting from 1999. In accordance with the suggestions of the Basel Committee on Banking Supervision (2010b), and given the characteristics of the Uruguayan banking sector, this series emerges as the best option to use. Nevertheless, due to the need for obtaining a longer historical series it was decided to bridge the aforementioned series with historical data taken from the Bank's internal sources and that includes loans to the private sector from public and private banks.[7] Figure 1 shows both series. The data is generally, but not precisely coherent. To carry out the final bridge it was decided to maintain the value of the public series and adjust the oldest series by differences. The right hand figure presents the final bridged series that will be used in the study.

The main disadvantage of this procedure stems from the arbitrary nature of the adjustment. The current series is used by the government and has passed through a monitoring process. For this reason, unchanged data is used. The previous series is from the internal source and has not undergone the same verification process.[8] In light of the aforementioned, it was decided to adjust this series in order to achieve an bridge consistent with the current series.

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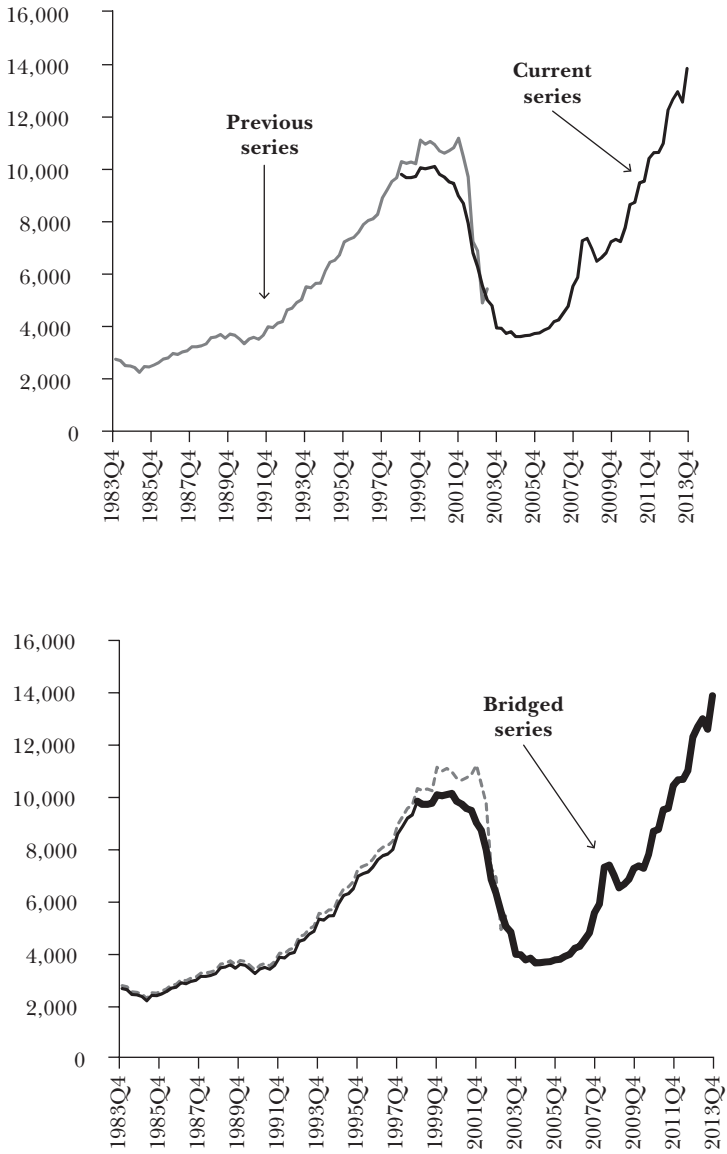
[7] Series from the Siste system, numbers 7251, 7384, 7390. Due to the fact that data was in thousand nuevos pesos the exchange rate series number 182 was used to transform it.

[8] In particular, data from state banks is of low quality for years before 1999.

Figure 1

**AGGREGATED CREDIT TO PRIVATE SECTOR**

(millions of dollars)



One specific characteristic of Uruguay's economy concerns the granting of loans in domestic as well as foreign currency. Figure 2 shows the performance of the trend-cycle component of the credit to the private sector series by currency and of the aggregate series. As can be seen, although the cycles of the series by currency have exhibited differing behaviors during Uruguay's recent history, the aggregate series properly captures the behavior of the trend-cycle component of the desegregated series. It therefore seems reasonable to use the aggregate credit series as the main reference for the authorities' decision-making, but complementing them with analysis of the disaggregated series.

The bridged GDP series provided by the Banco Central del Uruguay (BCU) are shown in figure 3.

The final series for aggregate private sector credit-to-GDP is shown in figure 4.

**Figure 2**

**TREND-CYCLE OF CREDIT TO PRIVATE SECTOR, BY CURRENCIES**

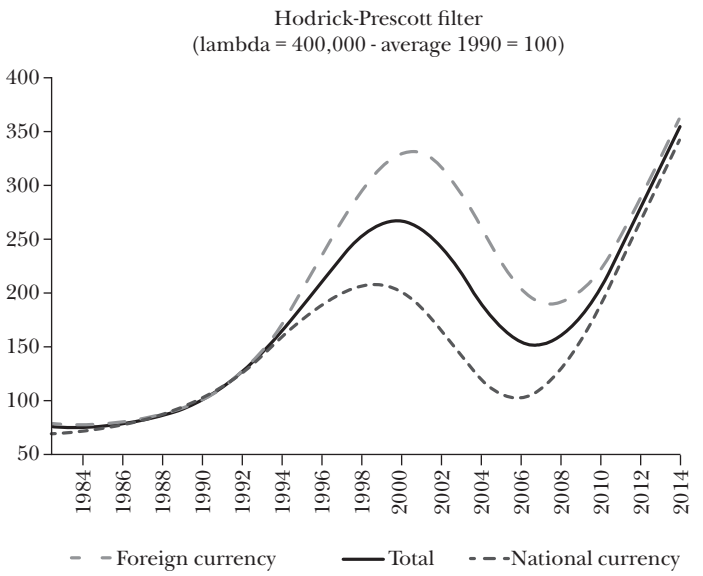
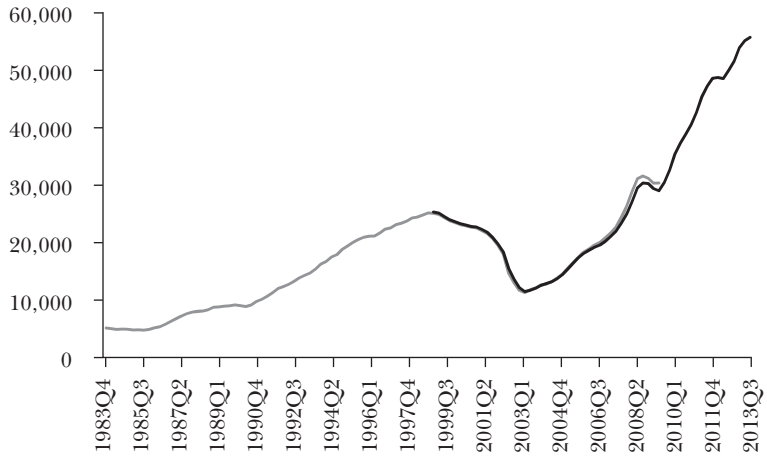


Figure 3

**GROSS NATIONAL PRODUCT**

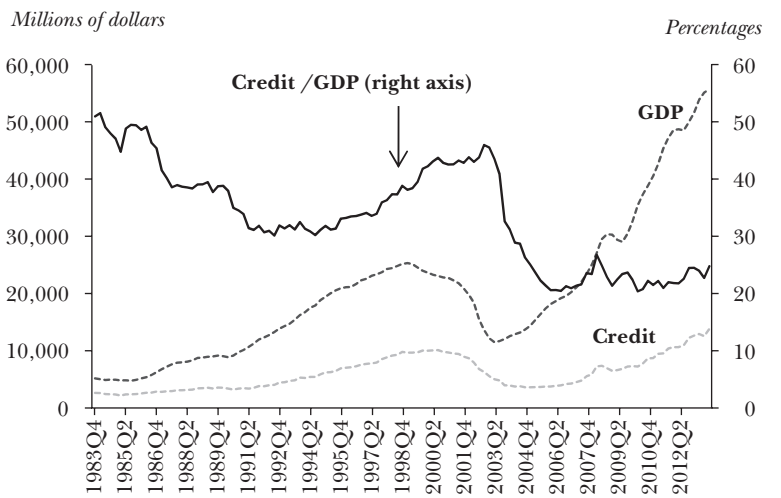
(millions of dollars)




Note: bridged series provided by BCU.

Figure 4

**AGGREGATED CREDIT TO PRIVATE SECTOR AND GDP**



### 5.3 Constructing the Credit-to-GDP Gap

To select the indicator that best adjusts to episodes of systemic risk in Uruguay's financial system, various alternatives were assessed using different adjustment values for the cycle (the classic $\lambda$ value of 1,600 and the 400,000 proposed for financial series), the methodology suggested by the Swiss National Bank and an *ad hoc* measure of 35% for the credit-to-GDP ratio as a fixed reference (corresponding to the average of the historical series). The outcomes were analyzed and the capacity of these early warning indicators for anticipating the financial difficulties experienced in 2002 was assessed. Figure 5 summarizes the outcomes of applying the Hodrick-Prescott (1981) filter with $\lambda = 400,000$ (for the bridged series as well as the current series) and $\lambda = 1,600$ for the bridged series. The estimated gap corresponds to the grey curve named *Cycle*. As we can see, the outcome is very sensitive to the $\lambda$ parameter as well as the length of the data. Periods in which the ratio is above trend correspond to periods of strong credit growth. In particular, calculation of the gap with $\lambda = 400,000$ gives reasonable results, with a less volatile cycle, and clearly identifying the episode of instability in 2002.

### 5.4 Determining the Countercyclical Buffer

To compare the outcomes and extract conclusions on the indicators employed, the countercyclical capital buffer was calculated according to the following approaches:

*1)* In line with the methodology set out by the Basel Committee on Banking Supervision (2010b), using the three series described previously:

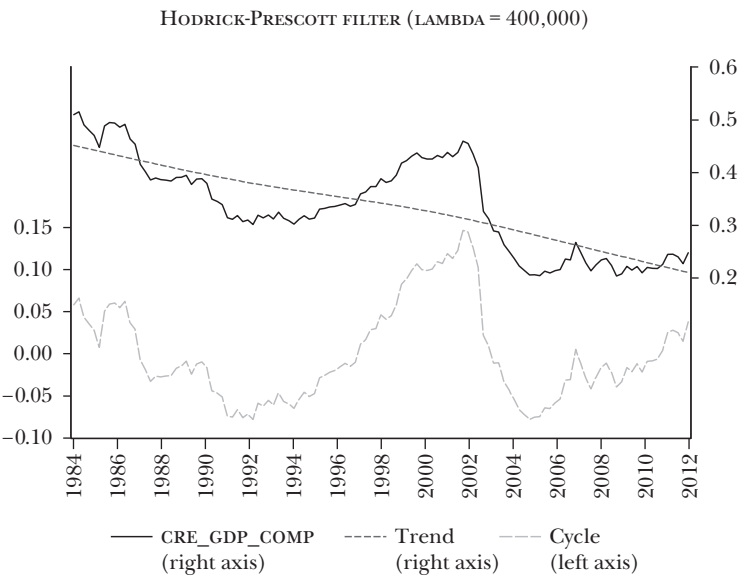
   a. Bridged series 1983Q4-2013Q4 with $\lambda = 400,000$.
   b. Current series 1999Q1-2013Q4 with $\lambda = 400,000$.
   c. Bridged series 1983Q4-2013Q4 with $\lambda = 1,600$.

*2)* Calculating the gap over and ad hoc trend fixed at 35%.

*3)* In line with the methodology proposed by the Swiss National Bank (2014).

## Figure 5

**CREDIT GAP TO GROSS NATIONAL PRODUCT**
(percentages of GDP)



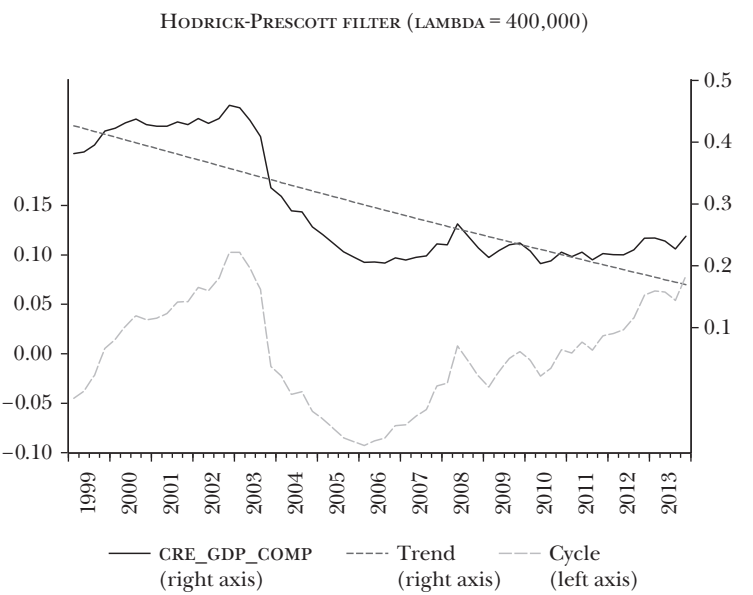



Figure 5 (cont.)

**CREDIT GAP TO GROSS NATIONAL PRODUCT**
(percentages of GDP)

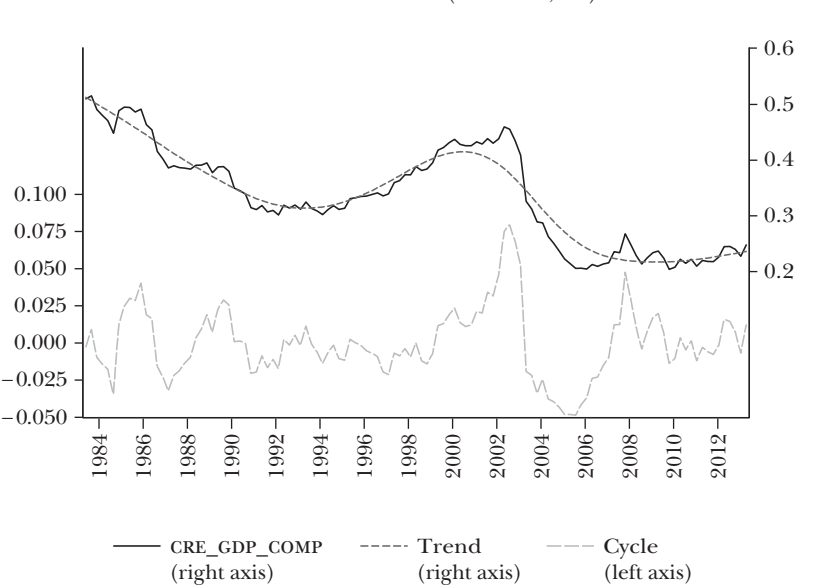
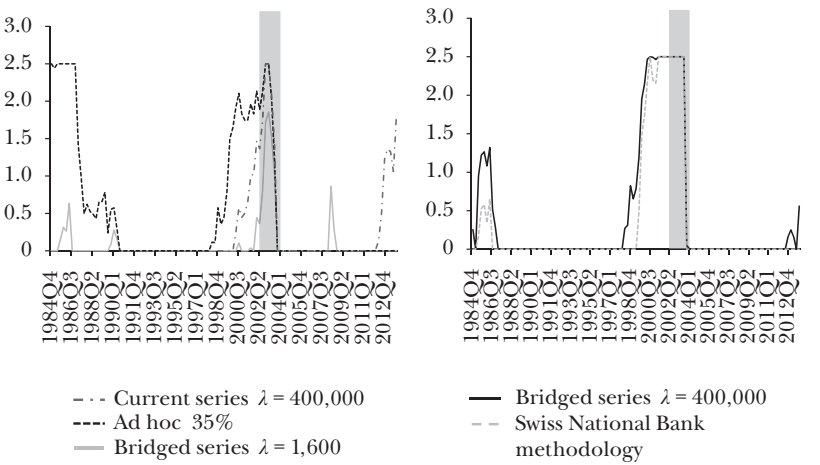



Figure 6 shows the countercyclical capital buffers resulting from the five cases described above. The analysis focuses on the capacity to anticipate the crisis of 2002 (shown with a vertical line) and the issuing of false alarms. All five indicators anticipate the period of instability to a certain degree. However, in the case of the relatively short data series (since 1999) with $\lambda = 400{,}000$, the buffer does not reach the maximum until after the outbreak of the crisis. The length of the series is therefore insufficient because it does not manage to anticipate the emergence of risk far enough in advance to allow capital reserves to be built up. The gap derived from this series would also be indicating an increase of systemic risk in the Uruguayan economy at present, which does not coincide with an assessment of the current situation in Uruguay's financial system. Moreover, the gap calculated with the bridged

Figure 6

**COUNTERCYCLICAL CAPITAL BUFFER**

(percent)




series and $\lambda = 1{,}600$ identifies significant deviations during the international crisis of 2008 that coincide with periods of turbulence in the international environment, but do not correspond with periods of financial instability, thereby constituting a false alarm. Its anticipation of the 2002 financial problems is also poor. On the other hand, the ad hoc approach of 35% as ratio trend, appropriately anticipates the crisis of 2002, but produces a significant false alarm in the first quarters of data, casting doubt on its efficiency. The buffer that emerges from using $\lambda = 400{,}000$ for the bridged series, meanwhile, seems to provide appropriate signs for the timing and magnitude of the 2002 crisis (see the right hand panel of figure 6). It starts generating signals four years before the crisis, reaching the maximum countercyclical capital buffer six quarters prior to the outbreak of the crisis. Finally, good results are also obtained with the approach proposed by the Swiss National Bank. The indicator begins to produce signals 10 quarters before the crisis, reaching the maximum value 12 months prior to the start

of the crisis (by construction). It does not give any false alarm during the period considered either. The main disadvantage of this approach is that it is designed to capture crisis of the same type and size as that of 2002, but not necessarily periods of instability in general. Its principal advantage stems from the ease and practicality of its calculation.[9] [10]

In sum, the bridged series filtered with value $\lambda = 400{,}000$ represents the most appropriate indicator to use as a guide for determining the countercyclical buffer. It is also recommended that the methodology proposed by the Swiss National Bank be used as a complement in order to give a more complete assessment.

Drehman and Tsatsaronis (2014) argue in favor of using this indicator as a guide for setting the countercyclical capital buffer. They also answer the criticism of Repullo and Saurina (2011)[11] by finding a positive or insignificant correlation between the credit gap and GDP in relevant periods for implementing the countercyclical buffer, when the latter would have had a positive impact for smoothing financial cycles.

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[9] The model estimated shows that the buffer should have been activated in the second quarter of 1998. In fact, Newsletter 1613 of 29/09/98 raised the minimum capital requirement for financial institutions from 8% to 10%. This measure is comparable to the activation of a countercyclical capital buffer because it was triggered by the excessive growth of credit during the four preceding years. It could therefore be stated that a countercyclical capital buffer guided by the referred activation and deactivation criteria would have operated in a similar way to the measures taken in 1998.

[10] Drehmann and Tsatsaronis (2014) suggest using the methodology of AUC and ROC for evaluating different early warning indicators. Nevertheless, as they themselves argue, these methodologies present problems in small samples given that statistical evaluation of one country in particular is complicated due to the limited number of crises (in the case of Uruguay the data covers just one crisis period). It is therefore not applicable to this case.

[11] Repullo and Saurina (2011) argue that the credit gap is countercyclical to the growth of GDP and, therefore, would tend to exacerbate rather than smooth fluctuations in GDP.

To determine the capacity of the indicator in the case of Uruguay's economy we carry out the assessment according to the approaches proposed by Drehmann and Juselios (2014): timing, stability and interpretability. As we saw previously, the credit gap constructed based on the bridged series meets these three requirements: *i)* it produces signals four years prior to the period of instability and reaches the buffer maximum at least one year in advance, *ii)* the signal is stable and increases as the period of instability draws nearer, and *iii)* it can be directly interpreted given the simplicity of constructing the indicator and its direct connection with financial cycles and the functioning of the financial system.

However, there are some limitations concerning the construction of the series, and the methodology of the filter, that should be taken into account when using this indicator as a guide. First, the *end-point* problem of the Hodrick-Prescott (1981) filter is a weakness of this methodology and, therefore, estimation of the gap for the later periods is subject to a significant standard deviation. Second, the problem of the *starting-point* of the series: as Gersl and Seidel (2012) point out, the trend calculation can depend significantly on the starting point of the series, particularly in short series. This criticism applies to the case of Uruguay. As stated previously, the outcome varies considerably when using the bridged series. Moreover, we found false alarms in the first periods, which could be due to the lack of preceding data (especially data from the crisis of 1982). Drehmann *et al.* (2014) recommend using at least 10 years of data in order to minimize this problem. Third, the Hodrick-Prescott filter is a backward-looking filter and therefore calculates recursively as new data is incorporated. This can generate changes in the results, which should be studied more deeply by the analyst. Fourth, the most effective indicator emerges from using the bridged credit-to-GDP series. The bridge is carried out arbitrarily and the series prior to 1999 has not been exposed to a verification process similar to that of the current government series.

### 5.5 Deactivation of the Countercyclical Capital Requirement

The next step consists of selecting the indicators to signal deactivation of the countercyclical capital buffer. The Basel Committee on Banking Supervision (2010b) sets out the following principles for identifying said indicators:

*1)* When there are losses in the banking system that pose a risk to financial stability.

*2)* When there are problems in other sectors or areas in the financial system that could potentially disrupt the normal flow of credit and threaten financial system stability.

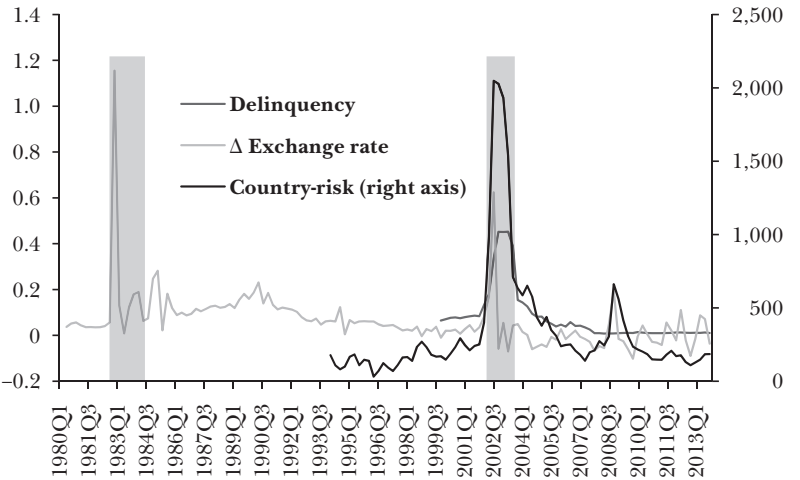
The Basel Committee on Banking Supervision suggests three indicators: profits before tax, credit spreads and TED spreads. Given the characteristics of Uruguay's banking system and the availability of data three others are also proposed: delinquency in the banking system, the exchange rate and sovereign default risk. These three indicators are closely linked to past episodes of financial instability and are relevant for identifying systemic risk. Figure 7 shows the evolution of these variables.

Historical evidence shows that the three series produce appropriate signals coinciding with the period of instability. They therefore correctly capture the start of the crisis and could be monitored together to guide the decision for deactivating the countercyclical capital buffer. Other suggested indicators that could be incorporated refer to credit conditions, although the data currently available is not sufficient to assess the capacity of such series for producing appropriate signals. Indicators associated with loan portfolio quality could also be included, such as, for instance, the percentage of loans with the lowest risk ratings (loans with ratings of 3, 4 or 5),

Although it is important that the regulator uses this information for deciding on buffer deactivation, it is also important that they are willing to do so faster or even immediately once risks have materialized. By deactivating the countercyclical capital buffer immediately the authorities allow banks to

Figure 7

**INDICATORS FOR THE DEACTIVATION OF THE COUNTERCYCLICAL CAPITAL BUFFER**




make use of it to cover losses incurred during times of stress, reducing the need to affect minimum capital requirements or other buffers. Thus, immediate deactivation of the countercyclical buffer immediately helps to reduce the risk of the supply of credit being severely constrained by regulatory capital requirements and, thereby, helps the banking sector to continue providing its services to support the rest of the economy.

In sum, the aggregate private sector credit-to-GDP gap overlapped since 1984 and calculated using a $\lambda = 400{,}000$ parameter fulfills the principal characteristics we look for in an indicator for guiding countercyclical capital buffer adjust and activation decisions. It also manages to answer the main criticism of the indicator by being relatively stable, exhibiting positive properties as an early warning indicator (detects the crisis and does not produce false alarms in the period studied) and easy to measure and calculate. Notwithstanding the aforementioned, it should be used with other indicators, particularly those suggested by the Swiss National Bank.

## 6. FINAL COMMENTS

This paper analyzed the main characteristics of the countercyclical capital buffer and studied its inclusion in Uruguayan regulation, paying special attention to how it complements other regulatory tools such as statistical provisioning. It concludes that designing and introducing a countercyclical capital buffer in accordance with the principles of Basel III would complement existing regulations for the following reasons: *i)* it introduces a dynamic dimension that depends on the phase of the business cycle to static capital requirements (or minimum requirements such as the capital buffers established by Basel III); *ii)* statistical provisions, in their current calculation formula, have an institution specific prudential dimension whereas the countercyclical capital buffer has a system-wide prudential dimension; *iii)* by definition, statistical provisions address expected losses in the financial cycle whereas the countercyclical capital buffer addresses unexpected losses; *iv)* although it is not its main objective, the countercyclical capital buffer is more effective in restraining credit growth than dynamic provisioning, as demonstrated during the recent crisis in Spain's financial system and even in Uruguay towards the end of the 2000s.

Although activation, adjust and deactivation decisions for the countercyclical capital buffer should be at the discretion of the regulatory authorities, these should also be guided by the appropriate data. In the case of Uruguay, the aggregate private sector credit-to-GDP gap overlapped since 1984 and calculated using a $\lambda = 400{,}000$ parameter fulfills the most important characteristics needed from an indicator for guiding countercyclical capital buffer decision-making. Nevertheless, it is recommended that said reference indicator be complemented by other indicators for specific sectors and the banking system as whole.

Although the countercyclical capital buffer can be deactivated gradually in accordance with the behavior of risks present in the system, the possibility of faster or even immediate release should be included. Immediate deactivation of the countercyclical capital buffer helps to reduce the risk of the supply of credit

being severely constrained by regulatory capital requirements and, thereby, helps the banking sector to continue providing its services to support the rest of the economy.

Thus, design and implementation of a countercyclical capital buffer following the principles in Basel III would complement current regulation and serve as an extra tool to mitigate systemic risk in the Uruguayan banking sector. From the point of view of the institutional distribution of responsibilities for applying this requirement, the fact that it is a prudential regulation tool means it should be handled by the Superintendency of Financial Services. However, given the systemic nature of the risk it is aimed at, it would be recommendable for activation, adjust and deactivation decisions to take into account the vision of systemic risk arising from deliberations under the framework of the Financial Stability Committee.

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