Chapter 6

BUILDING ON THE COUNTERCYCLICAL BUFFER CONSENSUS: AN EMPIRICAL TEST FOR THE PHILIPPINES

By
Roselle R. Manalo

1. Introduction

The global financial crisis that began in 2007 highlighted the weaknesses in the prevailing regulatory framework for banks. In particular, the crisis emphasised the need to address the procyclical nature of banks’ behaviour, with the financial system amplifying the business cycle by boosting credit in good times and contracting credit in bad times. Prior to a crisis, risks are deemed low and credit expanded rapidly which usually requires low amount of capital. During a crisis, the measure of banks’ riskiness climbs, prompting for higher capitalisation that is more costly and difficult to source during stress period. Against such environment, existing regulations on bank capitalization have somehow increased the pressure for banks to reduce the size of their balance sheets through sharp deleveraging and constriction of credit supply, which negatively affects overall economic activity.²

The recent crisis also showed that static capital requirements are not enough.³ Loan loss provisions and capital ratio requirements, which fail to increase in economic booms, contribute to the procyclicality of the financial system. Borio, et al. (2010) noted that financial stability will be enhanced if such provisioning will also increase in good times, tracking risks better and acting as a built-in

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stabiliser when capital is generally cheaper and easier to raise in normal times than in recessions.\textsuperscript{4}

In reducing the procyclicality of bank lending to improve bank’s capacity to withstand future losses and help maintain the continued flow of credit in the economy, the Basel Committee on Banking Supervision (BCBS) in 2010 finalised the third installment of the Basel Accords which include among others the establishment of a countercyclical capital buffer (CCCB).\textsuperscript{5}

In the Philippines, where the banking sector remains the core of the financial system and the primary source of credit for the economy (see Annex Table 1), the establishment of a CCCB appears beneficial. Banks in the country provide almost 80% of credit with the total loan portfolio amounting to ₱4,892 billion as of end-December 2013. Domestic banks capture the largest share of the physical landscape at 98% while the rest of the 2% are foreign banks. In 2013, bank funds are channeled to real estate, renting and business activities (RERBA) and financial intermediation sectors.\textsuperscript{6} The said sectors accounted for the highest shares in the total loan portfolio (TLP) of the banking system at 18.5% and 17.0%, respectively, followed by loans to the manufacturing at 13.7% and wholesale and retail trade at 12.8%. Loans extended to agriculture, on the other hand, comprised 4.4% of the banking system’s TLP.\textsuperscript{7}

With banks as the primary provider of funds in the Philippines, any failure to efficiently intermediate in the system can have significant adverse effect to the economy. This is evidenced by the substantial losses incurred by the public sector in periods where the government has to provide liquidity and guarantees to bring stability to the system. For instance, Gochoco-Bautista (2000) noted that when the Philippines experienced severe banking distress in the early 1980s, the crisis led to the contraction of the economy in 1984-1985. Prior to this crisis, the ratio of domestic credit to GDP recorded a sustained increase which only

\begin{itemize}
\item \textsuperscript{6} Inclusive of interbank loans, loans to BSP and reverse repurchase (RRP) transactions.
\item \textsuperscript{7} The Agrarian Reform Credit Act of 2009 (Section 6) states that all banking institutions, whether government or private, shall set aside at least 25% of their total loanable funds for agriculture and fisheries credit in general, of which at least 10% of loanable funds shall be made available for agrarian reform beneficiaries.
\end{itemize}

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shows the procyclical nature of banks’ behaviour in the country. Bank closures reached a peak in 1985 as 2 commercial banks, 6 thrift banks, and 35 rural banks closed. Closures continued in 1986 and 1987 as efforts to weed out the system with weak and inefficient banks became the main focus of the then Central Bank of the Philippines. By mid-1990s, the number of closed banks rose again particularly in 1997 as the Asian financial crisis tested the strength of the local banking system. In 1998, 40 banks closed, higher than the 14 banks that closed in 1997.

Since 1980s, the Philippine banking system had gone through several episodes of policy reforms which aimed to improve the capacity of banks to face adverse shocks and reinforce the institutional framework to deal with problem banks. After the crisis, the BSP embarked on an aggressive and wide-ranging reform process in order to promote a sound, stable and globally-competitive banking system geared towards greater commitment to risk management, strengthening of supervisory framework, restructuring of the local banking system and promotion of corporate governance. More recently, the banking reforms were focused on the implementation of macroprudential measures to enhance the economy’s resilience against systemic shocks and reduce the build-up of aggregate risks. In particular, on 1 January 2014, the Philippines implemented the capital requirements consistent with Basel III, which include the capital conservation buffer applicable to universal and commercial banks.

This paper aims to arrive at a consensus in terms of finding appropriate indicators and framework to be used in the establishment of a CCCB in the Philippines. The first part of the study (Sections 1-3) introduces the basics of the Basel III capital requirements, focusing on the motivation and mechanics in designing a countercyclical capital buffer component. A survey of literature on the challenges and cross-country experiences follows along with a brief survey on early warning indicators. The second part (Sections 4-6) focuses on the selection of appropriate indicators and threshold levels in the establishment of a CCCB mechanism in the Philippines. The rest of the paper discusses issues concerning the amount of optimal buffer to be used, indicator, mode and timing of release, and on the methods of communicating the CCCB measure.

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8. The number of rural banks closure rose drastically to 20 in 1980 and further to 30 in 1981 when a financial scam involving millions of pesos in debt owed to various financial institutions triggered a financial crisis and a spate of insolvencies in investment houses and finance companies.
2. Comparative Evidences

2.1 The Road to Basel III Reforms

The severity of the 2007 global financial crisis was traced to banks’ excessive build-up of on- and off-balance sheet borrowings while the level and quality of their capital base eroded significantly. Banks were holding insufficient buffers that made them incapable of absorbing the resulting trade and credit losses. The procyclical deleveraging process where banks constrain credit in bad times while becoming increasingly interconnected, amplified such losses which rapidly eroded confidence in the banking system, affecting overall liquidity and solvency condition of the financial system.9

This prompted the public sector to step in via liquidity injection, capital support, and credit guarantees while regulators examined the market failure unveiled by the crisis. It appears that existing capital requirements are not enough to address systemic risks that vary over time, and that the most efficient way to handle such risks is to let the capital requirement vary over time as well.10 The procyclicality of banks’ capital management led to the amplification of losses, which could have been addressed by appropriate buffers that adjust during the boom and bust cycles of the economy.

By building on the pillars of Basel II, the Group of Central Bank Governors and Heads of Supervision (the oversight body of the BCBS) introduced a comprehensive set of measures to strengthen the regulation, supervision, and risk management of the banking system with the aim of reducing the probability and severity of economic and financial stress. In September 2009, the group agreed to improve the Basel II framework by introducing macroprudential measures that shall address the risks arising from the increasingly systemic and interconnected banking system.

These measures include capital conservation tools such as constraints on capital distribution that are expected to result in “higher capital and liquidity requirements and less leverage in the banking system, less procyclicality, and greater banking sector resilience to stress and strong incentives to ensure that

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10. Borio, et.al., Procyclicality, p.1
compensation practices are properly aligned with long-term performance and prudent risk-taking.”

The following are the agreed measures in strengthening the regulation of the banking sector: 1) raise the quality, consistency and transparency of the Tier 1 capital base which should comprise primarily of common shares and retained earnings; 2) introduce a leverage ratio as a supplementary measure to the Basel II risk-based framework; 3) introduce a minimum global standard for funding liquidity that includes a stressed liquidity coverage ratio requirement, underpinned by a longer-term structural liquidity ratio; and 4) introduce a framework for countercyclical capital buffers above the minimum requirement.

2.2 The Countercyclical Capital Buffer under the Basel III Regime

To guide supervisors in the transition towards a higher level and quality of capital in the banking system, the oversight group endorsed the framework on building countercyclical capital buffer as part of the requirements of banks to strengthen their capital base.

The BCBS confirmed the framework in September 2010 with the CCCB as part of the reform package to global capital standards. In December 2010, the BCBS issued the procedure and guidelines for national authorities in operating the countercyclical capital buffer. The implementation of a CCCB, as part of the Basel III reforms on capital framework, aims to protect the banks from periods of excess credit growth that has often been associated with the build-up of a system-wide risk. More specifically, this macroprudential tool aims to ensure that the banking system as a whole has sufficient capital to help maintain the flow of credit in the economy in a period of great financial stress.

Table 1 shows the calibration of the capital framework under the Basel III regime. The minimum common equity capital ratio was set at 4.5% of risk-weighted asset, minimum Tier 1 ratio at 6%, and total capital at 8%. From these minimum requirements, a 2.5% capital conservation buffer is added to increase

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the ability of banks to absorb shocks in periods of stress. On top of these capital requirements, the Basel III recommends the activation of a CCCB when credit growth is perceived to be associated with the rise in system-wide risk.

<table>
<thead>
<tr>
<th>Capital Requirements</th>
<th>Common Equity Tier 1</th>
<th>Tier 1 Capital</th>
<th>Total Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>4.5</td>
<td>6.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Conservation Buffer</td>
<td>2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum + Conservation Buffer</td>
<td>7.0</td>
<td>8.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Countercyclical Buffer Range*</td>
<td>0 - 2.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: BCBS (2010a).

*Consistent with the conservation buffer, the Common Equity Tier 1 ratio in this context includes amounts used to meet the 4.5% minimum Common Equity Tier 1 requirement but excludes any additional Common Equity Tier 1 needed to meet the 6% Tier 1 and 8% Total Capital requirements.

In activating a CCCB, the buffer add-on is raised to the recommended 2.5% of a bank’s risk-weighted assets in normal times, which effectively extends the capital conservation buffer. When the CCCB is deactivated in period of distress, or when bank losses tend to deplete capital, the CCCB will return to zero for banks not to curtail the availability of credit in the system. Moreover, the activation of a CCCB should be preannounced 12 months in advance (or even shorter than 12 months) to give time for banks to meet the higher capital requirement. However, reductions in the buffer rate should be announced immediately to help reduce the risk of a credit crunch.

13. The 2.5% additional capital buffer that banks are required to hold above the regulatory minimum should be in the form of Common Equity Tier 1 capital, the higher quality form of capital. Operationally, the BCBS proposes that Common Equity Tier 1 must be first used to meet the minimum capital requirements (including the 6% Tier 1 and 8% Total Capital requirements, if necessary) before the remainder can be included to the capital conservation buffer. Capital distribution constraints will be imposed on banks when capital levels fall within this range.
The CCCB may vary between zero and 2.5% of total risk-weighted assets (RWA) depending on the judgment of the national authorities as to the extent of the build-up of system-wide risk. Banks must meet this buffer with Common Equity Tier 1 or other fully loss absorbing capital or be subject to the restrictions on the distribution of earnings such as dividends and share buybacks, in particular.

For banks with purely domestic credit exposures, they will be subject to the full amount of the add-on determined by the national authorities. For banks with international credit exposures, the buffer add-ons will be calculated for each of the jurisdictions in which they have credit exposures using the buffers implemented in each of these jurisdictions. Moreover, the national authorities should ensure that the CCCB requirements are calculated and publicly disclosed at least with the same frequency as their minimum capital requirement.

The CCCB is targeted to be implemented gradually in parallel with the capital conservation buffer from 1 January 2016 up to end-2018 and fully effective by 1 January 2019. Countries should begin to set-up their CCCB framework as the requirement for international reciprocity at 0.625% of RWA in 2016, which is subject to increase gradually to 2.5% in 2019. Should a country experience significant credit growth within this period, the establishment of their CCCBs can be accelerated while the reciprocity will still apply according to schedule.

2.3 Progress of Basel III Implementation in the Philippines

The Philippines officially implemented the capital requirements consistent with Basel III on 1 January 2014 which covers the enhancement of the risk-based capital adequacy framework and introduction of a capital conservation buffer. The adoption of the reform aims to strengthen the quality and level of capital and to enhance the risk coverage against financial and economic stress. It also seeks to improve risk management and governance and strengthen banks’ transparency and disclosure practices.

To give banks ample time to raise the higher capital requirements, the implementing guidelines on capital adequacy was released on 15 January 2013, a year before the target implementation under Circular No. 781 which applies

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to universal and commercial banks (U/KBs)\textsuperscript{15} and their subsidiary banks and quasi-banks.\textsuperscript{16} For foreign bank branches (FBBs), which operate under the U/KB license, a calibrated Basel III framework was issued under Circular No 822 dated 13 December 2013.

The 10\% minimum capital adequacy ratio (CAR) was retained which is higher than the minimum international standard of 8\%. However, the composition of eligible capital and the minimum sub-ratios that go into the 10\% CAR threshold were changed. Relative to Basel II, Tier 3 capital has been eliminated. A new form of Tier 1 capital is introduced and it is referred to as Common Equity Tier 1 (CET1).\textsuperscript{17} The CET1 is at the core of the capital reform and this is set at 6\% of RWAs at the minimum. Tier 1 capital as a ratio to RWA must be at 7.5\% at the minimum while Tier 2 capital makes up the rest of eligible bank capital.

To further ensure that banks have sufficient capital during periods of economic downturn, the BSP also adopted the 2.5\% capital conservation buffer which can only be complied with using CET1 instruments.\textsuperscript{18} Thus, when you consider the buffer, the CET1 minimum effectively is set at 8.5\% of RWAs. The Table 2 shows a comparison of the minimum ratios (with and without the conservation buffer) under the Basel III and BSP guidelines.

<table>
<thead>
<tr>
<th>Capital Requirement</th>
<th>Under Basel III</th>
<th>BSP guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum Ratios</td>
<td>Old Minimum Ratios</td>
</tr>
<tr>
<td>CET1 ratio</td>
<td>4.5</td>
<td>None</td>
</tr>
<tr>
<td>Tier 1 ratio</td>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>CAR</td>
<td>8.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Source: Bangko Sentral ng Pilipinas.

\textsuperscript{15} Banks operating in the Philippines are classified according to their authorities. The main bank categories are universal, commercial, thrift, rural and cooperative bank. Special types of banks include microfinance and Islamic banks (Section 3, General Banking Law of 2000 or Republic Act No. 8791).

\textsuperscript{16} Standalone thrift banks and rural banks are still under the Basel 1.5 regime.

\textsuperscript{17} For foreign bank branches (FBBs), a “Permanently Assigned Capital” is designated which is the CET1 equivalent for FBBs.

\textsuperscript{18} For the capital conservation buffer, it shall be applied on both solo and consolidated basis.
Banks that do not meet the 2.5% capital conservation buffer will be restricted from paying dividends, buying back shares and paying discretionary employee bonuses. The intention is to build up the required capital by retaining what otherwise will be distributed through dividends and bonuses. The restriction on the distribution shall be implemented as follows:

Table 3
Restriction on Distribution of Earnings
(in percent)

<table>
<thead>
<tr>
<th>Level of Capital Conservation Buffer</th>
<th>Minimum Capital Conservation Ratios*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1.25</td>
<td>100</td>
</tr>
<tr>
<td>&gt; 1.25 - 2.50</td>
<td>50</td>
</tr>
<tr>
<td>&gt; 2.50</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Bangko Sentral ng Pilipinas.
* Expressed as a percentage of earnings.

2.4 Progress of Basel III Implementation in Korea\(^\text{19}\)

As a member of the Basel Committee and a founding member of the G20, Korea is committed to comply with the implementation of the Basel III components. The rules and implementation of Basel III was finalised on 30 May 2013 and took effect on 1 December 2013. Banks are required to maintain a minimum common equity capital ratio of 3.5%, a minimum Tier 1 Capital Ratio of 4.5% and a minimum Total Capital Ratio of 8% in the first phase.

With the capital of most Korean banks comprised mostly of common equity and the amount of capital measured against their assets is relatively large, the impact of the Basel III rules is expected to be manageable. Despite the series of financial crises over the past 15 years, Korean banks were able to maintain their strong liquidity and high capital buffer positions. The exposure to securitised products is also not significant. As of end-2013, Korean banks’ CAR for common equity is at 11% with total capital at 14%, higher than the 10.5% required by 2019 under the Basel III regime. The Basel III leverage and liquidity standards will be implemented beginning 2015.\(^\text{20}\)

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Meanwhile, the implementation of CCCB in Korea remains a challenge. Business cycle differs from industry to industry, hence, depending on portfolio exposure, it will be difficult to assess whether to accumulate or use down a buffer. The accuracy of the implementation of the buffer will also be problematic since business cycles also differ from region to region (i.e., some parts of the Korean peninsula that rely on ship construction are in their early stage of development while in other regions, there are companies such as Samsung Electronics which are already booming).

3. Related Literature

The implementation of the new capital requirements under the Basel III regime is expected to benefit the economy by reducing the probability of a severe financial crisis from occurring. The reforms aim to enhance the resilience of banks and financial institutions, reduce economic volatility, and increase transparency. Even before the proposal for a CCCB by the BCBS was finalised in 2010, many banks in Asia have been practicing the principles behind the CCCB framework. Packer and Zhu (2012) noted that many economies in Asia adopted stricter provisioning requirements following the Asian financial crisis. Evidence from the 240 banks surveyed in 12 Asian economies suggests that countercyclical loan-loss provisioning has dominated throughout emerging Asia which made them resilient from the global financial crisis that started in 2007.

However, the benefits from these reforms come with a cost. It is expected to cause greater regulatory burdens, higher transaction costs, slower credit growth, and reduced innovations in the financial sector. KPMG (2011) highlighted that weaker banks will find it difficult to raise the required capital which can result in intense competition and to more mergers and acquisitions among banking institutions. Pressure on banks’ profitability will rise as the cost of funding increases with the higher capital requirement. Return to investors will likely drop in a time when firms need investors the most to build and restore the required buffers. Banks will have difficulty raising funds as debt and equity issuances will become less attractive to investors given that dividends are expected to be reduced to allow firms to build a stronger capital base. Finally, the higher provisioning requirement may curtail growth of lending and economic output.

A number of studies already quantified the impact of the higher capital requirement to gross domestic product (GDP). The BSBS and Financial Stability Board (FSB) in February 2010 showed that bringing the global common equity capital ratio to the set minimum plus the capital conservation buffer will cause GDP to decline by a maximum of 0.22% from the forecast baseline that will occur after 35 quarters. In a subsequent study where banks are assumed to complete the transition to new levels of capital and liquidity requirements, results reflected that a percentage point increase in the capital ratio results in a 0.09% drop in output while meeting the liquidity requirement will cause GDP to contract by 0.08%. Empirical studies on a country-specific basis also reflected similar results. Parcon-Santos and Bernabe (2012) estimated that an accumulated 1% change in capital requirement leads to a 0.01% drop in real GDP per annum in the Philippines. These studies imply that the impact of higher capitalisation on growth could be marginal.

On a granular perspective, the implementation of a CCCB, which uses the credit-to-GDP gap in determining the timing of the implementation of the buffer, has attracted numerous criticisms. Doubts on the use of the credit-to-GDP gap in identifying periods of excessive credit growth were raised by Edge and Meisenzahl (2011) and by Buncic and Melecky (2013) while Shin (2013) proposed the use of other macroeconomic variables as early warning indicators or anchors for the CCCB. Repullo and Saurina (2011) suggested the use of credit growth or the deviation of the growth of credit with its long-run average as a leading indicator of systemic banking crisis.

Repullo and Saurina (2011) further stressed that the credit-to-GDP gap may trigger procyclical changes in the buffer that can prompt an increase in capital when GDP growth is high and a decline in period when GDP growth is low. Results showed that the minimum capital required is highly negatively correlated with the business cycle. Drehmann and Tsatsaronis (2014) counter-argued that the negative correlation between the credit gap and real GDP growth could only be partly correct and occurs during period “when credit gap was low and the capital buffer would not have been activated, or periods following crises when the buffer would have been released.” However, Drehmann and Tsatsaronis (2014) acknowledged the inconsistencies between financial and business cycles and should warrant further studies. Drehmann, et al. (2012) showed that the boom and bust periods in the financial cycle are more aligned with periods of banking crisis than fluctuations in the business cycle.

23. BIS Quarterly Review, March 2014.
In the Philippines, the credit-to-GDP gap and business cycle models have been used as anchors in bank provisioning behaviour, which has been observed to be highly procyclical. Leitner (2005) noted that despite the call of a countercyclical approach during the boom and bust cycle, the Philippines applied a procyclical stabilisation policy with the highly positive and strong correlation of government expenditures and money supply with output. The findings from Floro (2010) support further the procyclical behaviour of provisioning of banks in the Philippines, in particular, for low-capitalised banks.

The procyclical nature of provisioning in the country is evidenced by the rise in financial crisis assistance by the central bank to banks confronted with temporary liquidity problem during the Philippine banking crisis 1981-1987 as identified by Gochoco-Bautista (2000). Outstanding emergency loans reached ₱32.9 billion in April 1985 from a low of ₱2.5 billion in 1980. Outstanding bank overdrafts also increased significantly to ₱152.2 billion in March 1986 from ₱31.7 billion in December 1983. In addition, the central bank attempted to stabilise the system by infusing additional liquidity through the Industrial Rehabilitation Fund and Stock Financing Programme. During the Asian financial crisis in 1997, the BSP released ₱5.2 billion in emergency loans to banks with liquidity problems. Moreover, the BSP’s financial assistance to the Philippine Deposit Insurance Corporation (PDIC), which was primarily intended to rehabilitate ailing banks, grew dramatically to ₱177.0 billion in 1999 from ₱2.1 billion in February 1985. Meanwhile, the political crisis in 2000, led to a rise in emergency loans that reached ₱21.6 billion, attributed largely to the assistance extended to a bank faced with heavy withdrawals due to its involvement in the impeachment trial of former President Joseph E. Estrada. A year later, emergency loans increased further to ₱31.359 billion as the banking system suffered dwindling investors’ confidence.24

4. Empirical Analysis

This study aims to arrive at a consensus in terms of finding the appropriate indicator to be used in the establishment of a CCCB in SEACEN member economies, in the Philippines, in particular. While the BIS recommends the use of the credit-to-GDP gap (or the “GAP”) as the choice variable in taking buffer decisions, the guidelines suggest the need to assess a broad set of information

which include the use of macroeconomic, banking, and financial variables that can guide authorities in the buffer-decision making process in both the build-up and release phase of a CCCB.

This section begins with the selection of indicator variables that show properties of an early warning indicator (EWI). The assessment of the credit-to-GDP gap as the conditioning buffer guide for the Philippines follows by comparing the performance of the GAP series in signaling banking crises against other variables such as credit growth, GDP growth, stock market returns, and changes in residential capital values.

Using the credit-to-GDP gap as a choice variable, the gap series is calculated in accordance with the BIS framework of a rule-based CCCB guide. Further, the study extends the analysis by conducting a series of filter iterations in establishing the trend which can best fit the credit cycle in the Philippines. While the BIS suggests a one-sided Hodrick-Prescott (HP) filter analysis, the study explores the results from conducting alternative specifications from a two-sided HP filter with different smoothing parameters.

A series of robustness tests are employed in examining the strength of the variable as an EWI beginning with the conduct of a stepwise regression analysis between the credit gap series and the growth of non-performing assets (NPA) as well as its lag values. The selection of the threshold levels that can trigger the build-up and release of the buffer follows and is assessed on the basis of its noise-to-signal ratio and Sarel’s method of total fit combined with the BIS rule of an “L+8” band methodology.

Finally, for the release phase, a number of supplementary variables are likewise examined on how they impact the banking and macroeconomic variables and on their ability to timely signal a crisis. This is done through correlations analysis between the supplementary indicators and bank NPAs.

4.1 Data Description

The conditioning variables that can guide the accumulation and release phase of the CCCB are divided into three groups: macroeconomic indicators, banking data, and financial variables (see Appendix Table 4). The macroeconomic variables include: nominal and real GDP, real credit growth, and deviations of the credit-to-GDP ratio from its long-term trend. The measures of banking sector performance include the loss indicator or NPA of the banking system. In the financial indicator group, variables include growth in the Philippine Stock Exchange
index (PSEi) and residential capital values which serve as supplemental variables relevant in the release phase of the CCCB exercise.

The frequency and data coverage of the identified variables vary. The macro, banking indicators, and stock market data are on a quarterly basis from 4Q 1988 to 2Q 2014 with 103 observations. For financial indicators, the residential capital values cover data from 3Q 1995 to 3Q 2014 with 77 observations. The GDP and credit variables are both annualised and deseasonalised using the Census X12 methodology. The macro, banking and asset price variables are denominated in peso while the stock market data are in index points. Most of the macroeconomic and banking indicators are sourced from the Department of Economic Statistics of the BSP while the other financial variables are extracted from the Bloomberg while real capital values are from Colliers International.25

The descriptions of the major variables used are as follows:

In measuring aggregate macroeconomic condition and the country’s business cycle, the nominal GDP growth is used in this study. The nominal GDP forms part of the Basel-proposed conditioning variable, the credit-to-GDP ratio.

Credit is defined as the private domestic credit that includes all sources of private sector debt, even those debts funded or sourced abroad. Empirical works by Borio and Lowe (2002) and Kaminsky and Reinhart (1999) suggest that developments in the credit market may provide an early warning indicator of vulnerability in the financial system. As boom periods are characterised by rapid credit expansion and declines in overall credit are typically considered as symptomatic of a credit crunch, deviations of credit growth from a trend can be informative of an impending financial crisis.

Non-performing assets refer to the sum of non-performing loans (NPL) and real and other properties acquired (ROPA). Meanwhile, NPL refers to past due loan accounts whose principal and/or interest is unpaid for 30 days or more after due date while ROPA refers to real and other properties, other than those used for banking purposes or held for investment, acquired by the bank in settlement of loans through foreclosure or dacion in payment and/or for other reasons. In this paper, NPA is used as indicator of financial stress given the rise in loans that are likely to default which can impact the ability of a financial

25. See Annex Table 1 for the basic statistics of the sample data.
institution to intermediate effectively, causing credit channels to function inefficiently.

Financial data includes stock market returns which is measured by taking the growth of the PSEi which is a weighted aggregate index of 30 stocks representative of the six sector indices of the country’s stock market. These indices include the financial, industrial, holding firms, property, services, and mining and oil indices. Studies suggest that changes in the stress level in the global banking system became highly correlated with stock market returns.

Finally, in the absence of housing prices, residential capital values published by Colliers International are used as proxy for property price growth. The deviation of property prices from the trend can help identify crisis period which can be used in the activation phase of a buffer.

4.2 Identifying the Key Indicator

The BIS guidance framework posted a caveat on the use of credit-to-GDP gap as the common reference in operating a CCCB, noting that “the guide does not always work well in all jurisdictions.” Many authors have proposed the use of indicators other than the credit-to-GDP gap as anchor variable that can be used in designing a CCCB guide.

Drehmann and Tsatsaronis (2014) compared the performance of six indicators, which include the credit-to-GDP gap, credit growth, GDP growth, residential property price growth, debt service ratio, and non-core liability ratio. The indicators were assessed in terms of their strength as an EWI for banking crisis. The results showed that the credit-to-GDP gap is statistically the best single EWI indicator for forecast horizon between five and two years.

Meanwhile, Repullo and Saurina (2011) proposed the use of real credit growth, or the deviations of credit growth with respect to its long-run average, as the common reference variable for taking buffer decisions. The study showed that real credit growth appears to be a good signaling variable in the build-up of systemic risk and does not exacerbate the underlying procyclicality of Basel’s minimum capital requirements.

In this section the performance of different conditioning variables are analysed by visually inspecting the movement of these variables against the country’s historical banking crises. As discussed in Section 3, severe banking crisis in the Philippines occurred in 1980s which led to the contraction of the
economy in 1984-85. Another crisis followed in 1997 when a significant number of banks closed in the aftermath of the Asian financial crisis. Financial stress continued in the next five years with the BSP primarily supporting the banking system through emergency loans. During this period, non-performing loans reached its peak, reflecting the rapid decline in operational efficiency of the banking system which has been the main concern during the Asian crisis. The system was subject to more pressures arising from defaults of payments of banks’ corporate clients and rise in total expenditures were not translated into higher returns as their income generating activities were tempered by the slowdown in economic activity.

In this study, the crisis period captured by the available data includes only the 1997 Asian financial crisis. Charts 1.A to 1.C show the evolution of the selected variables around historical banking crisis. The charts reflect the ability of credit-to-GDP gap and credit growth variables in anticipating stress period as they rise strongly before a crisis worsens. On the other hand, developments of the property price gap indicator may not be conclusive in identifying a crisis period which can be due to the lack of long data series. For the stock market return, given its volatile behaviour, the indicator fails to appropriately signal a crisis period in advance as it rises rapidly in a stress event and subsequently falls after its peak. Given the above observations, the credit-to-GDP gap appears the best indicator in identifying banking stress.

Chart 1
Performance of Conditioning Variables and Banking Crisis
(in percent)

<table>
<thead>
<tr>
<th>A. Credit/GDP &amp; Property Prices</th>
<th>B. Real GDP &amp; Credit Growth</th>
<th>C. Growth in Stock Returns &amp; NPA</th>
</tr>
</thead>
</table>

Note: Shaded area represents crisis period. Credit-to-GDP ratio and property prices are deviations from its long-term trend using the highest smoothing parameter, while GDP and credit growth are in real terms. NPA is in billion pesos.
4.3 Using the BIS Framework

The BCBS has identified a common starting reference point to guide regulators in setting their appropriate CCCBs. The standard BIS framework, which was based on empirical evidence drawn from periods of more than 40 systemic banking crises in 36 countries, relies on the use of the credit-to-GDP gap as the key indicator in the accumulation phase of the CCCB. The empirics from the BIS framework showed that the credit-to-GDP gap has the most suitable signaling properties among the indicators.

Applying the BIS framework, the credit-to-GDP gap for the Philippines is calculated as follows:

\[ RATIO_t = \frac{CREDIT_t}{GDP_t} \times 100\% \] (1)

\( GDP_t \) is domestic GDP and \( CREDIT_t \) is private domestic credit which includes loans granted to the private sector and securities issued by private entities in period \( t \). Both \( GDP \) and \( CREDIT \) are in nominal terms and on a quarterly basis. The BIS recommends the use of such broad definition of credit which captures all sources of debt funds for the private sector in calculating the buffer guide.

The credit-to-GDP ratio is compared to its long-term trend. If the credit-to-GDP ratio is significantly above its trend (i.e., there is a large positive gap), this is an indication that credit may have grown to excessive levels relative to GDP. The gap \( GAP \) in period \( t \) is calculated as the actual credit-to-GDP ratio minus its long-term trend \( TREND \):

\[ GAP_t = RATIO_t - TREND_t \] (2)

The \( TREND \) is a way of approximating a sustainable average ratio of credit-to-GDP based on the historical experience of the economy. The BIS framework

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recommends a one-sided Hodrick-Prescott (HP) filter\textsuperscript{27} with a high smoothing parameter in establishing the trend ($TREND_t$). The smoothing parameter, referred to as the lambda, is set at 400,000 to capture the long-term trend in the behaviour of the credit-to-GDP ratio in each jurisdiction.

The credit-to-GDP gap is transformed into the guide buffer add-on. The size of the buffer add-on ($VB_t$), expressed as a percentage of risk-weighted assets, is zero when $GAP_t$ is below a certain threshold ($L$). It then increases with the $GAP_t$ until the buffer reaches its maximum level ($VB_{max}$) when the $GAP$ exceeds an upper threshold $H$. The BCBS work has found that an adjustment factor based on $L = 2$ and $H = 10$ may provide reasonable and robust specification based on historical banking crises.

Setting $L = 2$ means that when:

$$((CREDIT_t/GDP_t) \times 100\%) - (TREND_t)) < 2\%,$$
the buffer add-on is zero

Setting $H = 10$ means that when:

$$((CREDIT_t/GDP_t) \times 100\%) - (TREND_t)) > 10\%,$$
the buffer add-on is at its maximum

Operationally, the maximum buffer add-on ($VB_{max}$) is 2.5% of risk-weighted assets. When the credit-to-GDP ratio is two-percentage points or less its long-term trend, the buffer add-on ($VB_t$) will be 0%. When the credit-to-GDP ratio exceeds its long-term trend by 10 percentage points or more, the buffer add-on will be 2.5% of risk-weighted assets. When the credit-to-GDP ratio is between

\textsuperscript{27} A one-sided HP filter has the advantage of giving higher weights to more recent observations and deals more effectively with structural breaks. Technically, the HP filter is a two-sided linear filter that computes the smoothed series of s of y by minimising the variance of y around s, subject to a penalty that constrains the second difference of s. That is, the HP filter chooses s to minimise: $\sum_{t\leq i < t+1} (s_t - s_i)^2 + \gamma \sum_{t\leq i < t+1} (s_{t+1} - s_t) - (s_t - s_{t-1})^2$.

The penalty parameter $\gamma$ controls the smoothness of the series s. The larger the $\gamma$, the smoother the s. As $\gamma = \infty$, s approaches a linear trend. The original Hodrick and Prescott values for $\gamma$ using a power rule of 2 for quarterly data is 1,600, but the BCBS has set a larger lambda or $\gamma$ to smoothen a long-term series. Source: “Balance Sheet Approach in Determining the Countercyclical Buffer for Philippine Banks,” Bangko Sentral ng Pilipinas Financial Stability Report, 2012.

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two and 10 percentage points of its trend, the buffer add-on will vary linearly between 0 and 2.5%. This will imply, for example, a buffer of 1.25% when the credit-to-GDP gap is 6 (i.e., halfway between 2 and 10).

The results of the implementation of the BIS standard framework for the Philippines are presented in Charts 2 and 3. Chart 2 shows the development of the country’s credit-to-GDP ratio and its long-term trend during the period 3Q 1988 to 2Q 2014. The ratio is above the trend beginning 3Q 1990 and reached its peak at 50.6% in 2Q 1998. Since then, the ratio dropped to 26.1% in 3Q 2007 and trended below its long-term average. Following the decline, the ratio started to climb up in 4Q 2012 and has been above the trend in the last seven quarters, settling at 36.6% in 2Q 2014.

Chart 2
Credit-to-GDP Ratio and Trend
(in percent)

Note: HP1STREND 400K refers to the trend of the credit-to-GDP ratio derived from using a 1-sided HP filter with a smoothing parameter or $\lambda=400,000$. 

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Chart 3
Credit-to-GDP Gap and BIS L&H Threshold
(in percent)

Chart 3 shows the credit-to-GDP gap or the deviation of the ratio from its long-term trend along with the lower (L) and the upper (H) thresholds of 2% and 10%, respectively. Prior to the 1997 Asian financial crisis, the gap was positive as credit grew faster than the country’s GDP. Real credit grew at an average of 37.3% in the last 8 quarters since its peak in 4Q 1996 at 44.2%. After the gap reached its widest at 9.7% in 3Q 1997, the gap fell rapidly, dropping significantly to a low of minus 14.2% in 2Q 2002 and has remained negative for 56 quarters until 3Q 2012 which turned positive since then. Given the gap trend, the chart also shows periods when the gap is within the 2% and 10% thresholds as suggested by the BIS, capturing the 1997 crisis and recent quarters following the 2008 global financial crisis.

Note: HP1GAP400K refers to the trend of the credit-to-GDP gap derived from using a 1-sided HP filter with a smoothing parameter or $\lambda=400,000$. 

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Chart 4 shows the time series calculation of the credit-to-GDP gap and the historical performance of the buffer guide following the BIS guidance. The chart references a buffer build-up 12 quarters prior to 3Q 1997 when the buffer reached its high of 2.4%. A subsequent accumulation of capital buffer started in 3Q 2013, running 4 quarters to 2Q 2014, which may signal an impending banking crisis driven by the volatilities arising from adjustments in the interest rate environment in the external market.

Alternatively, Table 4 presents the development of the credit-to-GDP gap for 12 quarters prior to a crisis (i.e., Q-1 is the first quarter preceding the crisis). It is worth noting that the buffer guide was ‘off’ for the 12 consecutive quarters prior to September 2008 given that the Philippines did not experience a credit boom during this period.

<table>
<thead>
<tr>
<th>Gap</th>
<th>Q-1</th>
<th>Q-2</th>
<th>Q-3</th>
<th>Q-4</th>
<th>Q-5</th>
<th>Q-6</th>
<th>Q-7</th>
<th>Q-8</th>
<th>Q-9</th>
<th>Q-10</th>
<th>Q-11</th>
<th>Q-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian Financial Crisis: 1997Q3</td>
<td>9.7</td>
<td>9.0</td>
<td>9.1</td>
<td>9.1</td>
<td>8.9</td>
<td>8.9</td>
<td>8.5</td>
<td>5.4</td>
<td>4.5</td>
<td>4.2</td>
<td>4.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Buffer</td>
<td>2.4</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.0</td>
<td>1.1</td>
<td>0.8</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Global Financial Crisis: 2008Q3</td>
<td>(4.6)</td>
<td>(5.8)</td>
<td>(6.3)</td>
<td>(5.6)</td>
<td>(7.8)</td>
<td>(7.0)</td>
<td>(6.7)</td>
<td>(5.9)</td>
<td>(6.8)</td>
<td>(6.0)</td>
<td>(5.4)</td>
<td>(5.1)</td>
</tr>
<tr>
<td>Buffer</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Impending Crisis: 2013Q3</td>
<td>3.9</td>
<td>3.6</td>
<td>2.8</td>
<td>2.4</td>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffer</td>
<td>0.8</td>
<td>0.5</td>
<td>0.2</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
On the other hand, the double digit growth in real credit beginning 2Q 2013 to 1Q 2014, which averaged 10% (y-o-y), triggered a buffer accumulation in response to potential risks that may arise from such growth in private sector borrowings. During this period, borrowers were seen taking advantage of the relatively low interest rate environment prior to the adjustments in the monetary policy in the US, in particular. The rise in the credit-to-GDP gap triggered a build-up of capital buffer given the ensuing rise in volatility in interest and exchange rates and the expected increase in borrowing costs as monetary policy condition tightens. If such is the case, the buffer model is signaling an impending crisis in the next 9 quarters by building up buffer throughout this period.

4.4 Filter Selection Iteration for Credit-to-GDP Gap

The use of a credit-to-GDP gap as the anchor variable may be successful in predicting or identifying the 1997 Asian financial crisis as the gap peaks during the height of the crisis and fell rapidly after. The period of negative gaps coincide with the full effects of the Asian financial crisis as evidenced by the rise in the non-performing loans and decline in operational efficiency of banks. The political crisis in 2000 that affected the confidence of the public in the banking system may have exacerbated the impact of the financial crisis to the local financial market.

With the gap staying negative for 56 quarters, this may imply that the Philippine banking system experienced a severe financial crisis that lasted for about 14 years. However, it was not the case for the country. Evidence shows that some recovery has taken place when the level of NPA fell significantly from its peak in 1997 and has consistently remained low since then. It is worth noting that the regulatory reforms implemented by the BSP after the crisis contributed largely to the improvement in banks’ asset quality which tempered the emergence of another banking crisis.

Hence, the use of a 1-sided HP filter with a smoothing parameter or a lambda of 400,000, which the BIS guidance recommends, may not be the appropriate framework for the Philippines. The wider gaps exhibited by the model distinctively before and after the identified crisis may not coincide with the actual credit and business cycles in the Philippines which can impact the signaling ability of the choice variable as a buffer guide.

A number of literatures noted that the performance of the credit-to-GDP gap can be affected by measurement problems related to the calculation of the long-term trend of the ratio. Literature suggests that the lambda is set according
to the expected duration of the average business or credit cycle and the frequency of observations. For instance, Hodrick and Prescott proposed the use of $\lambda = 1,600$ as the standard for business cycle analysis when using quarterly data and a business cycle frequency of around 7.5 years. Ravn and Uhlig (2002) noted that an optimal $\lambda$ is set to 1,600 multiplied by the fourth power of the observation frequency ratio. Meanwhile, Borio and Lowe (2002) suggested the use of a one-sided, backward-looking HP filter with $\lambda$ set at 400,000. The BIS also specified the use of a much larger smoothing parameter given that credit cycles are, on average, four times longer than standard business cycles and crises tend to occur once every 20-25 years.

In this study, the use of other smoothing parameters that would fit the business cycle of the Philippines was explored. Following the assessment of Drehmann, et al. (2010) on the implications of the different lambdas in the performance of the credit to GDP gap, a comparison of the different choices of lambdas was calculated using one-sided and two-sided HP filters.

**Chart 5**

**Impact of Different Smoothing Parameters on the Credit-to-GDP Gap (in percent)**

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**Note:**
1. Vertical shaded areas indicate banking crisis period as discussed in the previous section.
2. HP1SGAP refers to the credit-to-GDP gap derived from using a 1-sided HP filter while HPGAP using a 2-sided HP filter with a smoothing parameter or $\lambda = 1,600$, $\lambda = 25,000$, $\lambda = 125,000$, and $\lambda = 400,000$.

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28. The implication of different lambdas for the performance of the credit-to-GDP gap with:
- $\lambda = 1,600 = 14 \times 1,600$, assuming that credit cycles have the same length as business cycles.
- $\lambda = 25,000 = 24 \times 1,600$, assuming that credit cycles are two times as long as business cycles.
- $\lambda = 125,000 = 34 \times 1,600$, assuming that credit cycles are three times as long as business cycles.
- $\lambda = 400,000 = 44 \times 1,600$, assuming that credit cycles are four times as long as business cycles.


Chart 5 shows the time series of Philippine credit-to-GDP gap using lambda of 1,600, 25,000, 125,000 and 400,000 under one- and two-sided HP filters. By visually inspecting gap movements around historical banking crisis, gaps with higher lambdas of 400,000 and 125,000, in both one-sided and two-sided HP filters, appear to have wider positive and negative gaps before and after a crisis. Eliminating the wider gaps, Chart 6 shows the less volatile credit-to-GDP gap time series, in particular, using lambda of 25,000 both in one- and two-sided HP filters.

5. Lag Length Determination

5.1 Credit-to-GDP Gap as an EWI for Banking Crises

Several empirical studies have already documented the ability of the credit-to-GDP gap to act as an EWI for banking crises. Drehmann and Tsatsaronis (2014), for instance, documented evidences when credit-to-GDP gap performs best as EWI based on certain criteria proposed by Drehman and Juselius (2014). The study suggests that an EWI must be able to provide signals in advance for policy measures to take effect. In the BIS guidance, “the indicator should breach the minimum critical threshold at least two to three years prior to a crisis.” Further, an EWI should be a stable indicator and should not signal periods without crisis to reduce uncertainty in the variable which serves as basis for policymakers in their decision making. Finally, an EWI should be easy to interpret and understand for both the regulators and the financial institution.

In this study, the EWI property of the credit-to-GDP gap was examined by comparing the gap series with the Philippine banking system’s indicator of financial distress or the NPA. Chart 6 shows the ability of the gap as an EWI given the lead time of the indicator to turn positive several quarters before a run-up in banks’ NPAs. In particular, the gap series, calculated by means of a one-sided HP filter with a lambda of 25,000, shows a lead lag of 40 quarters or gap turning positive before NPA reached its peak in 1Q 2002. After the crisis, the gap fell rapidly and turned negative for 39 quarters from 3Q 1998 to 1Q 2008 and turned positive again in 2Q 2008 and has consistently increased up to 2Q 2014.

Relative to a two-sided HP filter using a similar smoothing parameter, the lead lag is 25 quarters or the period when gap turned positive and rose consistently until the gap reached its widest in 4Q 1997. The gap fell after the crisis and reached the negative territory after 15 quarters, in contrast to the series using one-sided HP where the gap turned negative only in 6 quarters from its widest
in 4Q 1996. This may imply that using a one-sided HP filter, rather than the 2-sided HP, can give policymakers more time in announcing and implementing capital buffer add-ons especially during the accumulation phase.\(^{30}\)

**Chart 6**

Comparison of 1- and 2-Sided HP Filter with \(l=25,000\) and Banks’ Non-Performing Assets (NPA)

(Gap in percent, NPA in million pesos)

Note: HP1SGAP25K refers to the credit-to-GDP gap derived from using a 1-sided HP filter while HPGAP25K using a 2-sided HP filter, both with a smoothing parameter or \(\lambda=25000\).

To statistically assess if the key variable has the property of an EWI, a lead-lag relationship between a banking indicator of stress and the gap series was conducted. The regression analysis between the growth in the banking system’s NPA (dependent variable) and lagged values of the credit-to-GDP gap (independent variable) was estimated as described in equation 5.

\[
NPA \text{ Growth} = f(credit - to - GDPR gap \ (-1 \ to \ -20))
\] (5)

The results indicate a credit-to-GDP gap series with lag values of 8-10 quarters register statistically significant relationship with NPA growth (see Annex Table 5). A lag of 9 quarters has the highest coefficient and is statistically significant at 99% probability and can explain about 25% of the changes in NPA

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\(^{30}\) On this note, Drehmann and Tsatsaronis (2014) stressed that applying a 2-sided HP filter may not be practical for policymakers since future values of the credit-to-GDP ratio is unobservable, reducing the signaling ability of the credit-to-GDP gap.
growth. This means that NPA is expected to reach its peak level in about 9 quarters after the credit-to-GDP gap hit its highest point level, giving enough time for the policymakers to announce a potential accumulation of CCCB.

To further test the signaling ability of the choice variable, this study employed a signal extraction methodology in the assessment of the appropriate lambda values of the credit-to-GDP gap as the conditioning variable for CCCB. Kaminsky and Reinhart (1999) and Drehmann, et al. (2010) noted that an ideal indicator is generally chosen by their ability to signal all impending crises and not the crises that did not happen. The best indicator is chosen on the basis of the lowest noise-to-signal ratio (NTSR), or the fraction of Type II errors (a signal is issued but no crisis occurs) over 1 minus the fraction of Type I errors (no signal is issued but a crisis occurs). This is represented by equation 6.

\[ NTSR = \frac{\text{Type II error}}{1 - \text{Type I error}} = \frac{B \text{ risk}}{1 - \alpha \text{ risk}} = \frac{B}{B+D} = \frac{C}{A+C} = \frac{B*(A+C)}{A*(B+D)} \]  

(6)

Where:

Table 5

<table>
<thead>
<tr>
<th>True and False Crisis Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisis (within 8 quarters)</td>
</tr>
<tr>
<td>Signal</td>
</tr>
<tr>
<td>No signal</td>
</tr>
</tbody>
</table>

The equation also implies that the smaller the NTSR, the lower the noise. Using the same equation, the probability of an indicator correctly signaling a crisis is computed using equation 7.

\[ P(\text{crisis}|\text{signal}) = \frac{A}{A+B} \]  

(7)

The model assumes that a signal of 1 (0) is judged to be correct if a crisis (no crisis) occurs anytime within a two-year horizon. A range of threshold for the gap series using different lambda values 1,600, 25,000, 125,000, and 400,000 are assessed. Annex Table 6 summarises the result of the NTSR test. The analysis shows that a gap series based on lambda of 25,000 has the smallest NTSR and satisfies the condition that at least two-thirds of crises are predicted when setting the threshold at 5.
Further, using the same signaling extraction methodology employed in the credit-to-GDP gap, Annex Table 7 shows the NTSR results for other macroeconomic conditioning variables that are often used by literatures as EWI of financial crises. The results indicate that the credit-to-GDP gap still has the lowest NTSR and higher crisis predicted than other variables.

On the other hand, it is important to note that the conditioning variables identified should already signal a build-up in vulnerabilities 8 quarters or 2 years prior to the peak of a crisis. As stressed in the Drehman, et al. (2010) study, such signal will be counted as “false” despite the indicator providing a signal only in advance. This increases the likelihood of a Type II error and a higher NSTR results, implying that no single variable can provide the perfect signal for a banking crisis. Hence, there is a need for constant discretion from the regulators in managing the timing and degree of a CCCB.

The empirical results from the analysis in Sections 4 and 5 propose the use of a credit-to-GDP gap as a conditioning variable in the adoption of a CCCB metric in the Philippines. The choice of a 25,000 lambda in a one-sided HP filter appears to be the best smoothing parameter among the filter iterations performed as compared to the 400,000 specification suggested by the BIS.

As EWI for banking sector crises, the credit-to-GDP gap likewise shows significant statistical performance given its low noise-to-signal ratio and the ability to predict at least two-thirds of crises at a threshold of 5. Similarly, the variable exhibits a significant lag relationship with growth in NPA of the banking system at a lag of 8-10 quarters. The credit-to-GDP gap as the choice variable gives policymakers ample time in preparing banks especially for the accumulation phase of the CCCB.

5.2 Sarel’s Methodology

The mechanical use of the credit-to-GDP gap as a common reference point for taking buffer decisions is constantly challenged in terms of its ability to act as a leading indicator of systemic banking crisis. In this section, the strength of the credit-to-GDP gap is tested further with regard to how it may relate to the banking sector’s NPA at a particular threshold. The threshold level of the trigger variable was evaluated by using the model of Sarel (1996) which identifies the relationship of the growth in banking sector’s NPA (dependent variable) with the credit-to-GDP gap and a threshold variable Xi. Equation 8 estimates the regression:
\[ \text{GrowthNPA} = f(\text{Gap, } X_i) \]  \hspace{1cm} (8)

Where:

Variable (Xi) = Credit-to-GDP gap * Dummy
Dummy Variable = Credit-to-GDP gap > Threshold
Threshold = 0-9

Annex Table 8 summarises the results of the regression. It showed that the credit-to-GDP gap and the Xi variables are positively and significantly related with the growth in NPA given p-values at 0 and t-statistics of above 3. The best threshold that can explain the growth in NPA is at level 5 with the highest coefficient of 12.5 and lowest AIC of 8.1.

5.3 Calibration of Thresholds

The BIS guidelines set the thresholds, i.e., gap level L and gap level H, that determine when the buffer is turned “on” and “off.” The gap level L is the threshold which indicates that banks should start building up their capital buffers. The gap level H is when the buffer is at its maximum, i.e., the point that should be reached before the onset of a crisis. At this level, no additional capital will be required even if the gap will continue to increase.

As such, L should be low enough so that the banks are able to build up capital in gradual fashion before the potential crisis. Banks are given one year to raise additional capital which means that the indicator should breach the minimum at least 2-3 years prior to a crisis. In addition, L should be high enough so that it will not be breached during normal times when no additional capital is required. On the other hand, H should be low enough so that the capital buffer will be fully complied with before a major banking crisis.

In the case of the Philippines, the NTSR robustness test showed a threshold significant at level 5 while results of the Sarel’s methodology suggest a threshold of 5 to 6. If L should be low enough to give banks ample time to build up buffers and high enough so that the capital buffer may not be triggered in the absence of a crisis, an L equal to 4 or 5 can be considered. Meanwhile, in determining the upper bound threshold H, the BIS guidelines recommend an “L+8” rule. With L set at 4-5, the H can be set at around 12-13.
Given the above results, the lower threshold L, or the period when the buffer guide will start to indicate the need to build up capital can be set at 4 while the maximum H, at which the point where no additional capital is required even if the gap will continue to increase, can be set at 12. With L=4 and H=12, the buffer guide is turned “on” 12 quarters or 3 years prior to 4Q 1997, just enough time for authorities to announce and implement the accumulation phase of a CCCB. The buffer hit its highest level of 1.5% in 3Q 1997 when the gap is at its maximum. Further, the buffer declined immediately after the peak level, signaling the release phase which requires the reduction in the buffer to take effect at once to help reduce the risk of a contraction in the supply of credit as previously constrained by the buffer measure. In contrast with the results using the BIS framework, the buffer was turned “on” 18 quarters prior to the peak of the crisis which indicate that L=2 may be too low and translates to an earlier-than-recommended trigger when banks are supposed to start building up buffers.

Moreover, the calibrated threshold points to a build-up in buffer beginning 3Q 2011 and is set “on” in the next 12 quarters up to 2Q 2014. The buffer build-up is triggered by the increase in the credit-to-GDP gap brought about by higher growth in private domestic credit which started to register at a double digit rate of 15.4%. It is noted that during this period, the Philippines did not experience a banking crisis, although was not totally immune from the external headwinds
of the global financial crisis. The impact was largely through higher volatility in the financial markets, causing large fluctuations in domestic asset prices.

5.4 Buffer Level and Progression

The previous sections focused on the timing of the build-up and release of capital buffers in a CCCB model. However, the indicators do not necessarily indicate the optimal level of a countercyclical buffer. The above results were based on a maximum buffer add-on set at 2.5% of bank’s risk weighted assets. When the credit-to-GDP ratio exceeds its long-term trend by 12 percentage points or more, the buffer add-on will be 2.5% of risk weighted assets. When the credit-to-GDP ratio is four-percentage points or less its long-term trend, the buffer add-on will be 0%. When the credit-to-GDP ratio is between four and 12 percentage points of its trend, the buffer add-on will vary linearly between 0 and 2.5%.

It maybe recalled that the aim of a CCCB is to ensure that banks have sufficient capital in such a way that they can operate efficiently during periods of stress without limiting the supply of credit in the economy. Hence, it is important to identify the period where required capital is expected to fall in a stressed situation and the corresponding impact of the additional capital requirement on economic activity during normal times. The size of the buffer may depend on the amount of expected losses that banks may incur in periods of financial stress. In identifying the optimal level of the buffer guide, the use of stress testing tools can be employed or by directly examining the losses incurred by banks in past crises periods.31

In the case of the Philippines, the results from the previous exercise show that the maximum buffer reached was only at 1.5%. There may be a need to re-assess the application of a 2.5% buffer add-on for a CCCB. A lower buffer amount can be examined in terms of its applicability in the local banking system. There may be country-specific factors that warrant an optimal capital buffer amount which can efficiently balance the cost of higher capital requirements on economic growth in non-crisis times as well as the benefit of easing the required capital in periods of financial stress.

31. ibid., Riksbank, p.31.
6. Release Phase

The BIS was clear about the need to assess a broad range of indicators in taking decisions on buffer. The authorities should be mindful of how the choice variable moves with other factors especially in taking buffer decision both in the build-up and release phase.

For instance, Drehman, et al. (2010) noted that the credit-to-GDP ratio and credit growth indicators may perform well in anticipating crises as both variables increase consistently well above the trend before a crisis period but fall too late and too slow especially during the onset of a crisis. If used in the release phase of a CCCB, the timing can be late and the timing of the release may not be as immediate as what is required. Moreover, deviations of the property price indicators were also found to be helpful in the build-up phase but not in the release phase as difference from its long-term trend tends to narrow before a crisis emerge which can prompt an early release of the buffer. This can run counter to what a CCCB aims to achieve, in particular, in reducing the risk of contracting the supply of credit in crisis time by promptly reducing the amount of buffer during this period.

In the same paper, high-frequency financial variables such as credit spreads indicated strength in their usefulness as indicators for the release phase of a CCCB. These variables tend to perform well in a crisis period, rising faster as strains emerge after staying below their long-term average in normal times. They are good in capturing the current level of stress in the financial sector but less useful in signaling an impending crisis since they reflect the materialisation of risks rather than its build-up.32

Countercyclical buffer decisions should not only depend on the choice indicators such as the GAP ratio or credit growth variables. As reflected in the previous section, the credit-to-GDP gap alone was unable to fully anticipate a crisis from happening. The low R-squared values of around 20-25% reflect that the credit gap series can explain only a portion of the changes in banks’ NPA. In addition, the gaps remained high even after the crisis which could affect the timing of the release of the buffer.

32. ibid., Riksbank, p.21.
6.1 Supplementary Indicators

In this section, a number of supplementary indicators are examined in terms of their ability to signal in the release phase of the buffer. A simple correlation between the NPA growth and the lag of selected macroeconomic and financial market indicators was conducted. Annex Table 9 presents the correlation coefficients, t-statistics, and p-values between the main variables in our model. The results show that NPA growth and changes in residential capital values has the highest correlation coefficient and is significant at a lag of 1. Meanwhile, significant correlation between growth in NPA and growth in stock market returns is highest at lag 2. The negative and significant correlation between NPA growth and growth in capital land values and stock market return may imply a wealth effect that negatively impacts the collateral channel such that when growth in capital values and stock market returns decline, growth of banks’ NPA increases.

As an indicator of financial stress, the results show that the identified variables can be useful indicators in the release phase of the buffer as these variables tend to signal one or two quarters ahead of NPA. On the other hand, the correlation between NPA growth and real credit growth is significant at lag 8 which reflects the strength of the variable as an early warning indicator and not as indicator in the release phase.

With the indicators identified, the next step will be to look at the modalities in the release of the buffer, i.e., immediate or gradual drawdowns. A buffer should be released if various stress indicators are signaling a high level of stress on the financial sector. The BIS noted that the release should be in periods when banks are already incurring losses such that the buffer is depleted first before banks begin tapping their normal capital conservation buffer. If a buffer is released before losses have been incurred, there is a risk that the extra capital can be used to pay out dividends instead of lending it out. The release should be timely to allow banks to use the capital and thereby lessen the potential risk of a credit crunch. It is therefore important for regulators to be clear about the purpose of the buffer release in order to identify the appropriate modalities in easing buffer restrictions, which can be a choice between absorbing losses or in maintaining credit flow in the system. This study recommends a further analysis on this matter.

6.2 Communication

The need to pre-announce buffer requirements with a lead time of two to three years to give banks ample time to adjust their capital position warrants the
development of an appropriate communication strategy from the regulators. The BIS stressed the necessity of communicating buffer decisions in a timely manner to promote accountability from the regulators and sound decision making from financial institutions. In the build-up phase, planning the timing of the announcement can help reduce the risk of the buffer not being in place before the credit cycle turns. In the release phase, communicating the immediate deactivation of the buffer is essential so as not to contract the supply of credit in periods when banks needed the reprieve the most.

Since there are limited number of central banks that have already adopted the measure and with most of these banks from advanced economies, there is a need to design a communication plan that can work for economies like the Philippines. This should be aligned with the appropriate analytical tools that allow for an efficient announcement of an entry and exit decision by regulators. The communication strategy should form part of regulator’s periodic assessment of macroeconomic and financial condition to determine whether the CCCB should be activated, adjusted or turned off. Pronouncements should be reviewed and updated on a regular basis so that any changes in the authorities’ outlook can be publicly announced in a timely manner. This can help smoothen out the expectations and give banks enough time to adjust and plan their capital positions. The BIS suggests that the authorities should revisit and comment on potential changes and updates in the model at least once a year using the various communication tools available.

Should the Philippines implement a CCCB, the assessment as well as the announcement can form part of the BSP’s Financial Stability Report (FSR). With the FSR providing a comprehensive assessment of the robustness as well as vulnerabilities of the domestic financial system against the emerging economic and financial developments both in the global and domestic environment, the assessment for the build-up and release of a CCCB can leverage from the results of the FSR report.

The semi-annual frequency of the publication of the FSR by the BSP will keep the market well informed with regard to the developments of financial risks and exposures that can potentially impact the overall stability and efficiency of the economy which can subsequently trigger the activation of additional capital buffer. Overall, communicating CCCB decisions through the FSR will help:

33. As of writing, the FSR is published by the BSP internally since 2007.
improve the understanding of risks to financial intermediaries in the economy; 2) alert financial institutions and market participants on the possible collective impact of their individual actions/decisions; and 3) build a consensus for financial stability and the improvement of the financial and regulatory infrastructure.\(^{34}\)

7. **Consensus, Recommendations and Conclusions**

The study aims to arrive at a consensus in terms of finding the appropriate indicator to be used in the establishment of a CCCB in SEACEN member economies. For the Philippines, the empirical results suggest the use of the credit-to-GDP gap as a choice variable in taking buffer decisions especially in the build-up phase of a CCCB. The study highlights the ability of the GAP series to signal a financial stress event compared with other variables such as credit growth, GDP growth, stock market returns, and changes in residential capital values.

With the credit-to-GDP gap as a choice variable, the calculation of a rule-based CCCB guide using the BIS framework showed the need to recalibrate some assumptions that will best fit the Philippine credit cycle. The results of the filter iteration exercises in establishing the trend of the GAP series showed that a lower smoothing parameter or a lambda equal to 25,000 using a one-sided HP filter can best capture stress events in the domestic financial system. In examining the strength of the variable as an EWI, the results of the stepwise regression indicate a credit-to-GDP gap series with lag values of 8-10 quarters register statistically significant relationship with NPA growth. This means that NPA is expected to reach its peak level in about 2.5 years after the credit-to-GDP gap hit its highest level, giving enough time for the policymakers to announce a potential accumulation of the CCCB. In selecting threshold levels that should trigger the build-up phase of the buffer, the results of the robustness tests on the basis of the lowest noise-to-signal ratio and from Sarel’s method of total fit suggest the use of a lower and upper bound thresholds of 4 and 12, respectively, different from the L=2 and H=10 thresholds proposed by the BIS.

The study also highlights that countercyclical buffer decisions should not only depend on a single choice indicator such as the GAP ratio or credit growth variables. In this study, the correlation analysis of supplementary indicators and banks’ NPA suggest that high frequency financial variables such as growth in

\(^{34}\) 2013 BSP Financial Stability Report.
stock market returns and changes in capital land values can be useful indicators in the release phase of the buffer as these variables peak one or two quarters ahead of NPA. On the other hand, since these are just two of the financial market data available, there may be a need to examine further other quantitative and qualitative indicators of banks’ risk taking behaviour such as banks’ credit default swaps and financial stability index as supplementary indicators in the release phase of the buffer.

On the other hand, the study raises some issues in the conduct of a CCCB measure in the Philippines. First, the guide may be successful in “predicting” the Asian financial crisis and in signaling the appropriate buffers amount but this is only one event. There may be a need to lengthen the series of the choice variables to capture other banking crisis and the development of the choice variables during these events. Second, while the study focused on identifying the timing of the build up and release of capital buffers in a CCCB model, the indicators do not necessarily reflect the optimal level of a countercyclical buffer. There may be a need to re-assess the 2.5% maximum buffer add-on as suggested by the BIS. There can be country-specific factors that warrant an optimal capital buffer amount which can efficiently balance the cost of higher capital requirements on economic growth in non-crisis times as well as the benefit of lower capital in periods of financial stress. Finally, there is a need to develop an appropriate communication strategy should regulators start to implement a CCCB. Since there are limited number of central banks that have already adopted the measure and with most of these banks coming from advanced economies, there is a need to design a communication plan that can work for economies like the Philippines. This should be aligned with the appropriate analytical tools that allow for an efficient announcement of the entry and exit decisions by regulators.
References


### Annex Table 1
Characteristics of the Banking Sector in the Philippines

<table>
<thead>
<tr>
<th>Country</th>
<th>Bank</th>
<th>Non-Bank</th>
<th>Market</th>
<th>External</th>
<th>Public</th>
<th>Private</th>
<th>Foreign</th>
<th>Agri</th>
<th>Metro</th>
<th>SME</th>
<th>Year</th>
<th>Supervisor</th>
<th>Banking</th>
<th>Major Refers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philippines</td>
<td>75.6</td>
<td>15.0</td>
<td>7.5</td>
<td>11.4</td>
<td>4.0</td>
<td>50.4</td>
<td>1.7</td>
<td>7.6</td>
<td>13.8</td>
<td>6.6</td>
<td>1990-2001</td>
<td>2008</td>
<td>BSP</td>
<td>1995, 1996</td>
</tr>
</tbody>
</table>

*In percent, less than 1% rounded

### Annex Table 2
CCCB Policy Progress in the Philippines

<table>
<thead>
<tr>
<th>Country</th>
<th>No. Policy Measures Taken</th>
<th>Policy Gap</th>
<th>Policy Hurdlers</th>
<th>Proposed Implementation</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philippines</td>
<td>none</td>
<td>none</td>
<td>-</td>
<td>-</td>
<td>No target timeline</td>
</tr>
</tbody>
</table>

1. Banks are highly capitalized at the moment.
2. Further study is needed on the appropriate tools needed to implement the countercyclical buffer.

### Annex Table 3
Descriptive Statistics

**Sample: 12/01/1988 6/01/2014**

<table>
<thead>
<tr>
<th></th>
<th>CREDIT_SA</th>
<th>GDP_ANNUAL_SA</th>
<th>NPA_SA</th>
<th>RLAND_VAL</th>
<th>STOCKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>152138.3</td>
<td>4688797</td>
<td>285061.1</td>
<td>74906.92</td>
<td>2476.563</td>
</tr>
<tr>
<td>Median</td>
<td>1458870.0</td>
<td>3810077.0</td>
<td>254200.3</td>
<td>66996.13</td>
<td>2036.970</td>
</tr>
<tr>
<td>Maximum</td>
<td>4406917.7</td>
<td>12049390</td>
<td>456663.6</td>
<td>127114.8</td>
<td>6850.210</td>
</tr>
<tr>
<td>Minimum</td>
<td>138082.7</td>
<td>884237.4</td>
<td>527153</td>
<td>54808.63</td>
<td>610.5200</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>1035722</td>
<td>3176227</td>
<td>108516.7</td>
<td>20950.71</td>
<td>1461.63</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.704666</td>
<td>0.703530</td>
<td>0.122861</td>
<td>1.429753</td>
<td>1.306414</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.142360</td>
<td>2.322064</td>
<td>2.202348</td>
<td>3.843632</td>
<td>4.263939</td>
</tr>
<tr>
<td>Jarque-dera</td>
<td>8.659594</td>
<td>10.48081</td>
<td>2.03182</td>
<td>28.51724</td>
<td>36.13476</td>
</tr>
<tr>
<td>Probability</td>
<td>0.013170</td>
<td>0.009299</td>
<td>0.362071</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>Sum</td>
<td>1.57E+08</td>
<td>4.83E+08</td>
<td>19954276</td>
<td>576783.3</td>
<td>250986.0</td>
</tr>
<tr>
<td>Sum Sq. Dev.</td>
<td>1.09E+14</td>
<td>1.03E+15</td>
<td>8.13E+11</td>
<td>3.34E+10</td>
<td>2.18E+08</td>
</tr>
<tr>
<td>Observations</td>
<td>103</td>
<td>103</td>
<td>70</td>
<td>77</td>
<td>103</td>
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</table>
Annex Table 4
Summary Findings for the Philippines

<table>
<thead>
<tr>
<th>Key Variable</th>
<th>Filter</th>
<th>Supplementary Indicators</th>
<th>Lead-lag I. H</th>
<th>Level 0-2.5%</th>
<th>Accum.</th>
<th>Release</th>
<th>Purpose</th>
<th>Comm</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit-to-GDP gap</td>
<td>1-sided HP with lambda-25,000</td>
<td>Growth of stock market returns &amp; Growth in residential capital values</td>
<td>8-10 qtr</td>
<td>4 12</td>
<td>0-2.5%</td>
<td>Linear</td>
<td>Supplementary indicators and judgment</td>
<td>Sustain supply of credit</td>
<td>FSR</td>
</tr>
</tbody>
</table>

Annex Table 5
Regression Results of Credit-to-GDP gap and NPA growth (Gap using 1-Sided HP Filter with I=25,000)

<table>
<thead>
<tr>
<th>Lag</th>
<th>Coef</th>
<th>T-stat</th>
<th>R-Sq</th>
<th>Ad R-Sq</th>
<th>AIC</th>
<th>SBC</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2.178</td>
<td>2.652</td>
<td>0.100</td>
<td>0.086</td>
<td>10.133</td>
<td>10.200</td>
<td>0.010</td>
</tr>
<tr>
<td>5</td>
<td>2.556</td>
<td>3.239</td>
<td>0.143</td>
<td>0.129</td>
<td>10.085</td>
<td>10.152</td>
<td>0.002</td>
</tr>
<tr>
<td>6</td>
<td>2.818</td>
<td>3.711</td>
<td>0.179</td>
<td>0.166</td>
<td>10.041</td>
<td>10.108</td>
<td>0.000</td>
</tr>
<tr>
<td>7</td>
<td>2.997</td>
<td>4.081</td>
<td>0.209</td>
<td>0.197</td>
<td>10.004</td>
<td>10.071</td>
<td>0.000</td>
</tr>
<tr>
<td>8</td>
<td>3.135</td>
<td>4.416</td>
<td>0.236</td>
<td>0.224</td>
<td>9.969</td>
<td>10.036</td>
<td>0.000</td>
</tr>
<tr>
<td>9</td>
<td>3.243</td>
<td>4.704</td>
<td>0.250</td>
<td>0.248</td>
<td>9.938</td>
<td>10.005</td>
<td>0.000</td>
</tr>
<tr>
<td>10</td>
<td>3.111</td>
<td>4.655</td>
<td>0.256</td>
<td>0.244</td>
<td>9.943</td>
<td>10.010</td>
<td>0.000</td>
</tr>
<tr>
<td>11</td>
<td>3.139</td>
<td>4.522</td>
<td>0.245</td>
<td>0.233</td>
<td>9.958</td>
<td>10.025</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Note: NPA growth is the dependent variable and credit to GDP gap as independent variable

Annex Table 6
Comparison of Different Choices of the Credit-to-GDP Gap Lambda Values

<table>
<thead>
<tr>
<th>Lambda Values</th>
<th>Threshold</th>
<th>Type I error</th>
<th>Type II error</th>
<th>Predicted</th>
<th>Noise-to-signal ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Sided HP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\lambda=1,600)</td>
<td>3</td>
<td>0.27</td>
<td>0.01</td>
<td>0.89</td>
<td>0.02</td>
</tr>
<tr>
<td>(\lambda=25,000)</td>
<td>5</td>
<td>0.18</td>
<td>0.01</td>
<td>0.90</td>
<td>0.01</td>
</tr>
<tr>
<td>(\lambda=125,000)</td>
<td>5</td>
<td>0.18</td>
<td>0.02</td>
<td>0.82</td>
<td>0.03</td>
</tr>
<tr>
<td>(\lambda=400,000)</td>
<td>4</td>
<td>-</td>
<td>0.02</td>
<td>0.85</td>
<td>0.02</td>
</tr>
</tbody>
</table>

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### Annex Table 7
Comparison of Macroeconomic Conditioning Variables

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Threshold</th>
<th>Type 1 error</th>
<th>Type 2 error</th>
<th>Predicted</th>
<th>Noise-to-signal ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit-to-GDP gap using $\lambda=25,000$</td>
<td>5</td>
<td>0.18</td>
<td>0.01</td>
<td>0.90</td>
<td>0.01</td>
</tr>
<tr>
<td>Real Credit Growth</td>
<td>25</td>
<td>0.09</td>
<td>0.03</td>
<td>0.77</td>
<td>0.04</td>
</tr>
<tr>
<td>Real GDP Growth</td>
<td>3.5</td>
<td>0.31</td>
<td>0.65</td>
<td>0.37</td>
<td>0.95</td>
</tr>
<tr>
<td>Residential Capital Values Growth Gap using $\lambda=25,000$</td>
<td>4</td>
<td>0.57</td>
<td>0.60</td>
<td>0.07</td>
<td>1.40</td>
</tr>
</tbody>
</table>

Note: $X_5$ is the interactive dummy variable with threshold level equals 5.

### Annex Table 8
Summary of Regression Results

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Coefficient $X_i$</th>
<th>P-values</th>
<th>T-stat</th>
<th>R-sq</th>
<th>AR-sq</th>
<th>AIC</th>
<th>SBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>X2</td>
<td>11.84</td>
<td>0.00</td>
<td>5.07</td>
<td>0.74</td>
<td>0.73</td>
<td>8.91</td>
<td>9.01</td>
</tr>
<tr>
<td>X3</td>
<td>9.26</td>
<td>0.00</td>
<td>5.03</td>
<td>0.74</td>
<td>0.73</td>
<td>8.92</td>
<td>9.02</td>
</tr>
<tr>
<td>X4</td>
<td>10.36</td>
<td>0.00</td>
<td>6.81</td>
<td>0.79</td>
<td>0.79</td>
<td>8.70</td>
<td>8.80</td>
</tr>
<tr>
<td>X5</td>
<td>12.53</td>
<td>0.00</td>
<td>11.87</td>
<td>0.89</td>
<td>0.89</td>
<td>8.07</td>
<td>8.17</td>
</tr>
<tr>
<td>X6</td>
<td>11.72</td>
<td>0.00</td>
<td>9.76</td>
<td>0.86</td>
<td>0.85</td>
<td>8.33</td>
<td>8.43</td>
</tr>
<tr>
<td>X7</td>
<td>11.72</td>
<td>0.00</td>
<td>9.76</td>
<td>0.86</td>
<td>0.85</td>
<td>8.33</td>
<td>8.43</td>
</tr>
<tr>
<td>X8</td>
<td>10.30</td>
<td>0.00</td>
<td>6.92</td>
<td>0.79</td>
<td>0.79</td>
<td>8.69</td>
<td>8.79</td>
</tr>
<tr>
<td>X9</td>
<td>10.30</td>
<td>0.00</td>
<td>6.92</td>
<td>0.79</td>
<td>0.79</td>
<td>8.69</td>
<td>8.79</td>
</tr>
</tbody>
</table>

Note: $X_5$ is the interactive dummy variable with threshold level equals 5.

### Annex Table 9
Correlation Coefficient of Selected Variables

<table>
<thead>
<tr>
<th>Lag</th>
<th>Growth in Residential Capital Land Values</th>
<th>Growth in Stock Market Returns</th>
<th>Credit Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.74***</td>
<td>-0.45***</td>
<td>-0.22**</td>
</tr>
<tr>
<td>2</td>
<td>-0.64***</td>
<td>-0.50***</td>
<td>0.02</td>
</tr>
<tr>
<td>8</td>
<td>0.24**</td>
<td>-0.07</td>
<td>0.73***</td>
</tr>
</tbody>
</table>

*** Significant at the threshold of 1%, ** at 5%, * at 10%.
Growth in residential capital land values and credit are in real terms.
Annex 10

Using Other Conditioning Variables

The BIS guidance framework posted a caveat on the use of credit-to-GDP gap as the common reference in operating a CCCB, noting that “the guide does not always work well in all jurisdictions.” Many authors have proposed the use of indicators other than the credit-to-GDP gap as anchor variable.

Drehmann and Tsatsaronis (2014) compared the performance of six indicators, which include the credit-to-GDP gap, credit growth, GDP growth, residential property price growth, debt service ratio, and non-core liability ratio. The indicators were assessed in terms of their strength as an early warning indicator (EWI) for banking crisis. The results showed that the credit-to-GDP gap is statistically the best single EWI indicator for forecast horizon between five and two years.

Meanwhile, Repullo and Saurina (2011) proposed the use of real credit growth, or the deviations of credit growth with respect to its long-run average, as the common reference variable for taking buffer decisions. The study showed that real credit growth appears to be a good signaling variable in the build-up of systemic risk and does not exacerbate the underlying procyclicality of Basel’s minimum capital requirements.

In this study, the use of real credit growth as an alternative conditioning variable for the CCCB was also examined. The GDP deflator was used to get the real credit from the existing nominal values. Chart 6 shows the series of real private sector credit with respect to the country’s GDP growth. The dotted line shows credit for the period 4Q 1989 to 1Q 2014 and exhibits peak levels in 4Q 1996, 3Q 2008, and 3Q 2013 while showing negative values in 3Q 1991, 4Q 1998, 2Q 2002, and 2Q 2006. The solid line represents real GDP growth. The chart reflects the positive correlation between the two variables with real credit growth lagging behind GDP growth in two periods, in 3Q 2008 and in 2Q 2010.
When compared against a banking sector variable or the NPA, Chart 7 shows that the real credit growth peaked in 4Q 1996 which represents a lag of 8 quarters prior to 3Q 1998 when NPA reached its highest growth. However, the relationship weakened after the crisis as the growth in NPA decelerated while the growth in real credit exhibited a rising trend. The weakening ability of the indicator to act as a signaling variable for a banking sector crisis could be a result of the series of regulatory and prudential measures implemented by the BSP after the crisis that resulted in improvements in the banking system’s asset quality (i.e., lower NPAs amid rising growth in credit).

Chart 8
Real Private Sector Credit versus GDP growth
(in percent)

Chart 9
Real Private Sector Credit versus NPA growth
(in percent)