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BUILDING ON THE COUNTERCYCLICAL BUFFER CONSENSUS: AN EMPIRICAL TEST

Saurabh Ghosh

The South East Asian Central Banks (SEACEN) Research and Training Centre
Kuala Lumpur, Malaysia

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BUILDING ON THE COUNTERCYCLICAL BUFFER CONSENSUS: AN EMPIRICAL TEST[1]

Saurabh Ghosh[2]

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[1] This paper reports consolidated findings of a collaborative research led by Dr. Saurabh Ghosh, CFA, FRM, Ph.D., ASP, CAIIB. The sample set includes 8 SEACEN economies, namely, Cambodia, Chinese Taipei, Indonesia, Malaysia Papua New Guinea (PNG), Philippines, Thailand and Vietnam. While this paper presents the key findings; details of data, empirical analysis and conclusion can be found in the project team papers of the respective participating members in the research project which will be published in April 2015.

[2] Visiting Research Economist at The SEACEN Centre in FY 2014 and currently an Assistant Adviser in the Department of Economic and Policy Research at the Reserve Bank of India's Department of Economic and Policy Research. Views and opinions expressed in this paper are the author's, based on the sample set of the member economies analysed, and not of the institution that he is affiliated to. The author is grateful to all project team members for their inputs and cooperation. The usual disclaimer about errors and omissions applies.

Abstract

Countercyclical capital buffer (CCCB) has been incorporated in the Basel III framework with the aim of ensuring that banking sector capital requirements take account of the macro-financial environment in which banks operate. It is likely to address pro-cyclicality in the banking business and its adverse feedback effect on the real economy. The countercyclical capital buffer is designed to build-up buffer during good periods, which could then be used during the economic downturns. Unlike other components of capital requirements, the countercyclical buffer incorporates considerable judgment of the relevant authorities in the decision of the timing for the build-up, release and on the quantum of buffer implementation.

So far however, not many economies, including those of SEACEN, have implemented the CCCB initiative or even established a framework. In view of the various stages of economic development, institutional frameworks and emerging nature of the markets, this study was undertaken with the main aim of looking at processes for the smooth implementation of the CCCB as well as to encourage further research in this area. This study, therefore, analyses the progress made so far in advanced countries and in the participating SEACEN economies. It also highlights challenges such as data availability and methodological issues relating to CCCB, based on the empirical findings for each of the participating economies. It proposes steps and recommendations that could help smoothen the implementation of CCCB in these economies. This Working Paper is derived from the integrative report of the research project on "Building on the Countercyclical Buffer Consensus: An Empirical Test." The research project paper with the integrative report and project team papers by the participating SEACEN member central banks/monetary authorities (forthcoming) sets the stage for further debate and deliberation on crucial issues, which would facilitate the implementation of the CCCB in SEACEN economies.

JEL Classification Number: E44, E61, G21

Keywords: Basel III, Countercyclical Capital Buffer, Emerging Markets, Macroprudential Policy

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1. Introduction

Pro-cyclicality is an inherent character of banking business. Banks are exposed to the performance of businesses and corporates to which they extend credit. The business cycles impact the performance and profit of these companies cumulating in the pro-cyclical performances of the banking sector. Further, risk-based capital requirements of banks can decline considerably during good times and shoot up during downturns. This coupled with herding behaviour of economic agents, reinforces pro-cyclicality in the banking system. Credit demand is naturally pro-cyclical, and the literature (Reinhart and Rogoff, 2009) has unanimously documented that excessive credit growth during expansion phases lead to a build- up of systemic risk that impairs all or parts of the financial system and could have severe negative consequences for the real sector. During economic downturns, the same set of factors, e.g. low profitability, risk aversion, herding behaviour, leads to a low credit disbursement and a complex mutually reinforcing feedback process between the real and financial sectors that spills over across regions through capital flows and trade routes, leading possibly to a global financial crisis.

The global economic crisis of 2008 brought to fore two important issues, the inadequacy of capital in the banking system and the pro-cyclicality of risk based capital requirements. In its 2008 report, the Financial Stability Forum (FSF) explicitly noted that it would examine the forces that contributed to pro-cyclicality in the financial system and develop policy options to mitigate it. In April 2009, the FSF came out with its report on addressing pro-cyclicality in the financial system, where it emphasised the role of the Basel Committee on Banking Supervision (BCBS) to strengthen the capital framework so that the capital in the banking system could increase during good times and it could be drawn down during periods of economic stress. After rounds of discussions the oversight body of the Basel Committee on Banking Supervision finally introduced a comprehensive set of measures, to strengthen regulation supervision in the banking system by strengthening microprudential regulations and introducing macroprudential measures.[3]

Subsequently, the Group of Central Bank Governors and Heads of Supervision (GHOS) of Basel Committee issued a press release (September 2009), which noted its commitment towards raising the quality, consistency and transparency of the Tier one capital base, internationally harmonized leverage ratio and the minimum funding liquidity ratio. The same press release also indicated that GHOS is working on a framework of a countercyclical buffer (CCCB) over and above the minimum capital requirement of the banks to ensure that the banking system has an adequate capital buffer to protect against future potential losses. On 16 July 2010, the Committee issued a proposal for consultation on the CCCB, which will be imposed when, in the view of national authorities, excess aggregate credit growth is judged to be associated with a build-up of system-wide risk. In December 2010, the BIS released the Guidelines to national authorities for the practical implementation of the CCCB.

2. Objectives of Countercyclical Buffer (CCCB)

In theory, if banks hold sufficient buffers, accumulating them during good periods to withstand losses during downturns, it would help in the reduction of pro-cyclicality in credit. However, financial stability may not come free of cost, although the subsequent benefits are likely to far out-weigh the cost. As Steve Bartlett[4] puts it, every “dollar of capital is one less

[3] The decision was reached involving national authorities, the BCBS, BIS, Committee on Global Financial System (CGFS), International Monetary Fund (IMF), International Organisation of Securities Commissions (IOSCO), International Accounting Standards Board (IASB) and the US Financial Accounting Standards Board (FASB), the Group of Central Bank Governors and Head of Supervision (GHOS).

[4] Steve Bartlett, Financial Services Roundtable, 17 September 2010.

dollar working in the economy". The increase in buffer requirement, although acting as a shock absorber to financial shocks, could have negative influences on credit supply and thus on the GDP growth rate, which is an initial cost to society. The larger long-term benefits vis-a-vis short-term costs associated with such buffers call for appropriately designed prudential regulations in the implementation process. These will in all likelihood lead to the design of time varying buffers that will act as cushions between the financial sector and the real sector, thereby reducing the amplitude of financial and business cycles.

Time varying buffers can be effectively implemented through a combination of rule and discretion; while the rule part is likely to act as an automatic stabilizer the discretion part is designed to fine tune the automatic stabilizer to suit the underlying economic conditions. Among the time varying provisioning tools, dynamic provisioning and capital buffers are most often referred to in the literature. Dynamic provisioning, which depends on asset performance, has already been implemented in Spain, Peru and Columbia, mainly to absorb expected losses. Critics, however, argue that it does not take into account large unexpected losses that occur with small probability. In view of this, Basel III included two capital buffers, namely the conservation buffer (CCB henceforth) and the CCCB. Banks are required to add to the CCB during periods of high profit and use it during periods of low profit. This comes with an automatic capital-bucket wise restriction on banks' profit distributions (e.g., dividends, share buy backs etc.). Banks, on the other hand, are likely accumulate the CCCB during good times when excessive credit growth is judged by the national authority to be associated with the build-up in system wide risk. CCCB would, therefore, lean against the excess build-up in credit in an economy. However, as noted by Basel-III, the CCCB is not designed to be an instrument for managing economic cycles or asset prices but may be best utilised as a macroprudential indicator, involving the building up of a buffer (capital) in times of excess credit growth and providing security in terms of the availability of additional capital in times of crises.

While both the CCB and CCCB are instruments designed to add to the capital buffer, over and above the minimum requirement CET1, the most subordinate claim in the liquidation of banks, to meet unexpected loss and thereby maintain credit flows during the stress period, there are certain differences between these instruments. CCB is rule-based, which requires banks to add to its minimum capital requirement in a prescribed format while CCCB is largely discretionary, which is left to the national authorities. In particular, the build-up of the countercyclical buffer depends on an early warning indicator (credit-to-GDP gap suggested by BCBS) for economic cycles. However, the relationship between the early warning indicator and buffer capital is not mechanical. Although Basel III indicates a rule of thumb for the CCCB in its guide to national authorities, it allows for policy makers' judgement on how buffers are to be build-up and released.

3. Why CCCB Research for SEACEN Members?

The Basel Committee, while emphasising on the role of judgement in CCCB implementation, also noted that it should be firmly anchored to a clear set of principles to promote sound decision making (BIS, 2010). The role of judgement based on sound principles makes research a necessary input for the successful implementation of CCCB. So far, however, not many economies, including those of SEACEN have come out with explicit guidelines on CCCB However, as indicated in Table 1 (for selected group of the SEACEN economies), bank credit plays an important role in resource mobilisation in these economies with foreign, public and private sector banks co-existing and playing a crucial intermediation function in the region Also, the sectoral characteristic of credit indicate that certain sectors, e.g. manufacturing, household/retail, and SME sector dominate the credit allocation pie in these economies. In view of the different stages of economic development, institutional framework and emerging markets characteristics of the participating members (refer to Section 7 for details of challenges that member economies face), the SEACEN Board of Governors felt that an empirical assessment and consensus among the members would help

to address important policy issues related to the CCCB. In light of this, the study looks into the issues relating to the implementation of the CCCB in the SEACEN member economies. Questions that the study would attempt to address are as follow:

1. Availability of key macroprudential variable(s) in line with Basel recommendations that can serve as the basic input/anchor variable(s) to the CCCB framework for the SEACEN members.
2. Since no single indicator could perhaps provide a perfect guide to systemic risk, what could be supplementary indicators for CCCB? How would these variables behave (their lead-lag relationship with banking-variables) over the business cycles for member economies?
3. Based on the above two, an estimation of thresholds for CCCB accumulation during economic upturn and release of the same during economic downturns.
4. Seeking consensus among members in other related issues, e.g., buffer accumulation, release, communication and policy review requirements.

These research findings are intended to provide initial insights for the SEACEN supervisory authorities to decide on the CCCB based on sound principles and implementation in the respective jurisdictions.

Table 1
Characteristics of the Banking Sector in the Member Economies

	Percentage of Resource Flow			Ownership Group*				Important Sectors with Large Credit Flow			Crisis	Banking	Major Reforms
	Bank	Non-bank	Market	External	Public	Private	Foreign	Sector I	Sector II	Sector III	Year	Supervisor	Year
Column	1	2	3	4	5	6	7	8	9	10	11	12	13
Cambodia	2	98	-	-	3	24	73	Wholesale Trade	Retail Trade	Manufacturing	-	NBC	2002, 2008, 2009, 2010, 2011
Chinese Taipei	43.6	29.4	20.3	6.7	-	-	-	Real estate/ construction	Manufacturing	Wholesale/ retail	Card Crisis 2006	Competent Authority	Regulatory Capital Reforms
Indonesia	63	7	4	26	25	67	8	Manufacturing	Trading	SME	1997,2005, 2008	BI, IFSA^	Banking Reforms
Papua New Guinea	91.4	8.6	-	-	0	25	75	-	-	-	None	Bank of PNG	2000
Philippines	79.6	1.3	7.5	11.6	4.9	93.4	1.7	Real estate, renting business services consumer	Manufacturing	Wholesale /retail	1997-98	BSP	1993-94, 2000
Thailand	34.5	18.1	37.8	9.62	33.5	56	10.5	Consumer	Manufacturing	Wholesale/retail	1997-98	BoT	2008, 2004-08,2010-14
Vietnam	72.6	20#	6.2	1.2	40	43	17	Industry	Commercial	Construction	1997-99	SBV	1989-2008

#: Non credit Institutions; +: Physical network; ^Indonesian Financial Supervisory Authority.

4. BIS on CCCB - Highlights

The objective of the countercyclical buffer, as stated in the BIS Guidelines, is to protect the banking sector from the build-up of systemic risks, often associated with periods of excess aggregate credit growth. The relevant authorities, using the best available information, is required to make an assessment of whether a countercyclical buffer requirement is to be imposed, increased or decreased (in the broad range of 0-2.5% of risk weighted assets (RWA)). The BIS Guidelines list five principles that include objectives, common reference guide, risk of misleading signals, prompt release and other macroprudential tools, to promote a sound decision making process. They also include the credit-to-GDP ratio as a common reference point that national authorities can use for formulating buffer decision, since it relates directly to the objective and is widely available for a large number of jurisdictions. To take into account the financial systems at different stages of developments, BIS (2010) allows flexibility for the jurisdictions to choose variable(s) which they deem most appropriate for assessing the sustainability of credit growth and level of system-wide risk, taking into account domestic market conditions.

The main indicator suggested by the Basel Guidelines is the credit-to-GDP gap (i.e., the deviation of credit-to-GDP ratio from its long-term trend), as a large body of literature indicates that it can be a powerful predictor of banking crisis. The Guideline specifies that the CCCB buffer accumulation can be initiated when the gap variable crosses its lower threshold (L=2) in the range of 0-2.5% of RWA linearly until the gap reaches its upper threshold (H=10). However, the threshold values at which the buffer becomes active and reaches its maximum could vary from jurisdiction to jurisdiction, taking into account the underlying economic situations.

While Basel III envisaged a prompt release of the buffer in times of stress, the suggestion is for authorities to not depend solely on one indicator, as it is difficult for any single indicator to perform well during both the build-up and release phases. It highlights the possibility of misleading signals in the credit-to-GDP indicator and in any other variable, especially during the release phase. The Guidelines also list a large number of supplementary high frequency indicators (e.g., asset prices, CDS spread), while cautioning national authorities that these indicators could signal for the “too early” release of the buffer. In conclusion, the CCCB Guideline emphasise the importance of judgement for the release of the buffer when assessing the underlying economic conditions such as (a) losses to the banking system pose a risk to financial stability; and (b) problems elsewhere in the financial system that have the potential to disrupt the flow of credit and undermine the performance of real economy and banking system.

5. Literature on CCCB

Researches on macroprudential indicators in general and countercyclical buffer in particular are relatively new areas which are gaining momentum. This section briefly discusses the questions that research in this area have tried to address. These include the leading indicator of financial stress, debate surrounding the choice of a leading indicator, evidences of its application in advanced and emerging economies and the cost of building a capital buffer.

The global financial crisis has brought to fore the need to understand and implement policies to address the interaction between financial cycles and business cycles. Some of the stylized features of financial cycles include, much lower frequency than a typical business cycle and its peaks are closely associated with financial crises Borio (2012). Research also indicates that the length and amplitude of business cycles have increased markedly in recent times. It has, therefore, become important to analyze the interaction between the high-

frequency business cycle and slower moving financial cycle in designing and implementing macroprudential rules.

In this context, the first question to start with perhaps relates to whether conditioning variables are bank-specific or system-wide. Drehmann et al. (2010) indicates that the idiosyncratic component can be sizeable when a bottom-up approach is employed. Among the system-wide indicators, the credit-to-GDP gap as a leading indicator of financial stress was mentioned in Borio and Lowe (2002). The BCBS study considering a large number of indicators and a large panel of member countries indicates that the credit-to-GDP ratio tends to rise smoothly above the trend before most of the serious crises. Drehmann, Borio and Tsatsaronis (2012) support the above findings and Drehmann and Juseliu (2012) applying this criteria to a set of potential early warning indicators (EWIs) conclude that the credit-to-GDP gap is the best indicator of financial stress over the long horizon. Other studies by Alessi and Detken (2011) and Behn et al. (2013) applying different methods, find that the credit-to-GDP gap to be an excellent early indicator. Drehmann et al. also indicate that a strong performance of the credit-to-GDP gap before two or three years of a crisis has an operating advantage, as the Basel Committee (2010) requires regulators to announce additional capital build-up requirement before four quarters. The authors also mention that other indicators like credit spread perform better for the release phase, as they emit contemporaneous signals of banking sector distress.

The use of the credit-to-GDP ratio as a main indicator for CCCB did not go unchallenged. Repullo and Saurina (2011) show that the correlation between the credit-to-GDP gap and GDP growth to be negative. Therefore, the CCCB buffer build-up depending on the credit-to-GDP gap could signal for the reducing of banking capital requirement, when GDP growth is high and vice-versa, and thus end up exacerbating the inherent pro-cyclicality of risk based capital requirements, contradicting the mandate of the G-20. As an alternative, the authors propose a fully rule-based smoothing of the minimum capital requirement based on GDP growth. Edge and Meisenzahl (2011) note that ex-post revisions to the U.S. credit-to-GDP ratio gap are sizable; in presence of such revisions the gap could also lead to false signals and large volumes of lending may be inappropriately curtailed.

Drehmann and Tsatsaronis responding to Repullo and Saurina (2011) note that "closer examination of the data reveals that a negative sign is driven primarily by periods when the information from the indicator is of no consequence for the capital buffer; i.e., when the credit gap is low and the capital buffer would not have been activated, or periods following crises when the buffer would have already been released". If these periods are excluded, the authors argue that, the correlation between the gap and GDP growth are either positive or statistically insignificant. However, they note that the lack of coincidence between financial and business cycles does raise challenges – the timing to increase the countercyclical buffer may meet with stiff political resistance due to its impact on GDP growth.

The literature is not unanimous on the magnitude and directions of increase in capital on GDP growth. Noss and Toffano (2014)[5] indicate that an increase in 15 basis points in aggregate capital ratio lead to a reduction of around 1.4% in the level of lending after 16 quarters in the UK. Berrospied and Edge (2010), on the other hand, indicate that there exist a small effect of bank capital increase on loans. Recent studies (BCBS (2010)) put the median estimates for the impact of a 1 percentage point increase in capital requirements on GDP in the range of 0.1 to 0.2 percentage points.

Another question that is relevant for the present study relates to the application of such capital buffer for emerging market economies. In this context, Packer and Zhu (2012) show that many Asian economies adopted stricter provisioning requirement following the

[5] http://www.voxeu.org/article/impact-bank-capital-requirements-during-upswing.

Asian economic crisis. However, one potential problem of such an aggregate credit measure, as observed in the Reserve Bank of India's report, relates to the changes in credit growth as the financial system in the emerging markets absorb policy changes and adapt to financial deepening. It becomes a challenge to segregate the impact of such policy changes from the excess which is beyond the absorptive capacity of the emerging economy.

6. Cross Country Experiences in CCCB Implementation

Before analysing the performance of CCCB implementation in the SEACEN economies, we conducted a brief analysis of the experience of CCCB implementation in other (mostly advanced) economies. We started with a bird's eye view of Basel III implementations across the economies, as summarised in Annex Table 3, before moving on to the progress of the countercyclical buffer as at end-2014. The broad assessments in this section are based on responses to a questionnaire sent to national authorities, BIS' Regulatory Consistency Assessment Program (RCAP) documents and web searches. They reveal that economies could be broadly divided into two groups - those that have already implemented the CCCB and those that are close to implementing it (Table 2).

6.1 CCCB Already Implemented

Switzerland implemented CCCB in July 2012 and the official press release by the Swiss National Bank (SNB) was made on 13 February 2013 stating that the buffer size of 1% is to be fulfilled by 30 September 2013. The buffer is to be increased to 2% by 30 June 2014, as mentioned in a SNB press release on 23 January 2014. The implementation of CCCB in Switzerland is coordinated among the SNB, the Swiss Financial Market Authority (FINMA) and the Federal Council. The SNB has responsibility for conducting regular assessments to determine whether the CCCB should be activated or deactivated. In Switzerland, the buffer can be implemented on a broad basis or targeted for specific segments of the credit market (Article 44). Key indicators for Switzerland include domestic mortgage volume indicators (the ratio of mortgages to gross domestic product) and domestic residential real estate prices. Others include interest rate risk, interest rate margins, credit condition indicator, and leverage. Depending on the severity of the crisis, the timeframe for the CCCB in Switzerland varies between 3 to 12 months – the greater the imbalance, the shorter the implementation period. The process for deactivating the CCCB is similar to its activation.

In Norway, the Regulation on the CCCB was adopted by Royal Decree on 4 October 2013. The Ministry of Finance decided on 12 December 2013, that banks shall hold a countercyclical buffer of 1% from 30 June 2015. On 26 September 2014, the Ministry decided to keep the level of the CCCB for banks unchanged. While a Norges Bank Staff Memo that clarifies detailed information of the CCCB has been published[6], no lower bound or upper variable other than that recommended by the Basel Committee has been explicitly defined there. For Norway, the key indicators are not well suited for signalling whether the buffer rate should be reduced. Other information such as market turbulence and loss prospects for the banking sector, may be more relevant. Each quarter, the Norges Bank draws up a basis for the decision on the level of the CCCB and also provides an assessment and explanation for the level. The Norges Bank's decision is published in the Monetary Policy Report with financial stability assessments. The Norges Bank and the Finanstilsynet (the Norwegian Financial Supervisory Authority) cooperate by exchanging relevant information and assessments to arrive at the decision[7].

[6] http://www.norges-bank.no/en/Published/Papers/Staff-Memo/2013/Staff-Memo-132013/
http://www.norges-bank.no/en/Published/Publications/Norges-Bank-Papers/2013/12013-Criteria-for-an-appropriate-countercyclical-capital-buffer/

[7] Norges Bank's basis for the decision on the level of the countercyclical capital buffer is published in the quarterly Monetary Policy Report on financial stability in www.norges-bank.no. The decision of the

The CCCB was implemented in the United Kingdom (UK) on 1 May 2014. The Financial Policy Committee (FPC) of the Bank of England, is responsible for setting the CCCB rates for UK firms. Firms are required to use those CCCB rates when calculating their countercyclical buffers with supervisors' rules. The UK's first CCCB rate was set in June 2014 and thereafter in late 2014 (set at 0% on both occasions). The FPC looks at a number of 'core indicators' when setting the CCCB, which include the credit-to-GDP gap. The FPC also uses judgment in setting the CCCB, taking into account, core indicators as well as supervisory and market intelligence and information from stress tests. The FPC's approach to setting the CCCB is set out in its Policy Statement[8].

For South American economies, Galindo et al. (2013) notes that Colombia and Peru have been the most active in the implementation of countercyclical regulation. For instance, in Peru, the countercyclical rule is conditioned to the behaviour of GDP growth, which is different from the Basel III Guidelines. For the Peruvian Authorities, this choice is justified on the basis of Peru's low levels of financial intermediation, unlike the advanced economies (AE).

Among the SEACEN member economies, the Hong Kong Monetary Authority, as part of the implementation of the Basel III framework, announced on 27 January 2015, that the countercyclical capital buffer for Hong Kong will be 0.625% with effect from 1 January 2016. The decision on countercyclical buffer is based on a series of quantitative indicators and qualitative information including an "indicative buffer guide" (which is a metric based on the gap between the ratio of credit to GDP and its long-term trend, and between the ratio of residential property prices to rentals and its long term trend)[9].

The Reserve Bank of India (RBI) published the Final Guidelines on CCCB in July 2014, where the credit-to-GDP gap is to be used for empirical analysis, to facilitate decisions on the CCCB. However, it may not be the only reference point in the framework for banks in India. The lower threshold (L) where the CCCB is activated may be set at 3 percentage points of the credit-to-GDP gap, provided its relationship with GNPA remains significant, while the upper threshold (H) where the CCCB is at its maximum may be kept at 15 percentage points of credit-to-GDP gap. The Final Guideline (July 2014) note that the rate of increase of the buffer would be different based on the level/position of credit-to-GDP gap. In a notification dated 5 Feb 2015, the RBI announced that the framework for CCCB would take immediate effect in India. The activation of CCCB will take place when circumstances warrant, and currently, as mentioned in the notification, circumstances do not warrant CCCB activation[10].

Ministry of Finance on the level of the countercyclical buffer is published in www.regjeringen.no/en/dep/fin.

[8]http://www.bankofengland.co.uk/financialstability/Documents/fpc/policystatement140113.pdf; Prevailing CCB decisions is available in http://www.bankofengland.co.uk/financialstability/Pages/fpc/ccbrates.aspx

[9] http://www.hkma.gov.hk/eng/key-information/press-releases/2015/20150127-4.shtml

[10] http://www.rbi.org.in/scripts/NotificationUser.aspx?Id=9546&Mode=0

Table 2
CCCB Progress

	CCCB	Progress	Continuous	Threshold(s)	Other	Regulators	Reference
	Guideline	Anchor Variable	Discrete	Symmetry Add-variables	Observations	Supervisor Banking	Document
Australia	From Jan 2016 ADI may be required to maintain CCCB	Bal III in progress since Jan 1, 2013	Operational framework to be introduced		On track to meet the 2016 cap req.	APRA	Prudential Std. APS 110
Brazil	Incorporated in Macroprudential framework	To publish technical note with details of guidelines on activation release etc. before Jan 2016					
Canada	Not published	Credit-to-GDP gap is viewed as one useful indicator among many, and is regularly monitored			Bank capital under the CCCB has not been fully established and requires additional research		
China	CCB and CCCB incorporate in Capital Rule	To publish technical note			BIS RCAP China (Basel III) found capital CCB, CCCB compliant	PBoC CBRC	
Colombia*	Countercyclical Policy & DP (2007-08)	Loan quality	Continuous	Asymmetric from downturn			
Hong Kong	Press Release (Jan 2015)	Credit-to-GDP Gap Property Price/rent Gap	Mapping		0.625% of RWA from Jan 1, 2016	Hong Kong Monetary Authority	Press release
India	Final Guidelines issued in July 2014	Credit-to-GDP Gap	Rates would be different based on the level/position of credit-to-GDP gap	Stock Prices, C-D ratio, Housing prices, Business Conf. Index as supplementary indicators	Release to Depend on key supplementary high Frequency Financial Variables	RBI	Final report on CCCB Framework (IWG)
Japan	Guideline Expected in 2014/15	Compliant with Bal 2.5				JFSA	
Korea	In the process of Basel III implementation						
Norway	Buffer Size 1% RAW for June 30, 2015	Credit-to-GDP gap, other indicator of systemic risk	Monetary policy report or financial assessment	Housing price/disposable income; commercial property price; wholesale funding ratio		Norges Bank, Finanstilsynet, Ministry of Fin	Norges Bank Press Release
Peru*	Countercyclical Policy & also (DP-2008)	GDP Growth, Stressed RAW	Discrete		When deactivated, up to 60% of capital buffer can be used.		
Russia	Currently being assessed				Current capital adequacy is high	CBR	
Spain*	Follow EU Process CRD-IV also (DP-2000)	Credit stock and growth	Continuous				
South Africa	Credit-to-GDP gap remains well below its long-term average, suggesting that there is currently no need to consider a CCB add-on for South African banks (FSR).					SARB	
Switzerland	CCCB implemented	Mortgage Volume to GDP, property prices	Presently at 2% of RWA	Combination of judgement and high freq indicator	Deactivated under Normal Circumstances	SNB, FINMA	
UK@	Capital requirement and regulation directives; consultation paper	Credit-to-GDP gap	Quarterly disclosure with PRA and FCA as monitor	Bank and non-banks' B/s stress indicators	CRD IV Requirements; same as other EU Members	BOE, Financial Policy Committee (2012)	

US	In 2013		Starting in 2016 and phasing in through 2019,		Could require most complex US banks to hold additional 2.5 %	Federal Reserve and the other U.S. banking agencies	The Federal Reserve is currently considering how best to implement the CCCB

Table based on responses received from the questionnaire sent to different central banks and material available on web (up to end-2014). The author is grateful to Michelle Wright, RBA; Graydon Paulin (BoC), Mike Thornley (BoE), Sachiko Abby Suematsu (BoJ), Magdalena D. Riiser (NB) and Irina Pantina (BoR) for their responses.

* The dynamic provisioning rule has been used in many countries including Spain (2000), Columbia (2007), Bolivia (2008), Peru (2008), and Ecuador (2012). @: In line with the decision of European Union to adopt BASEL III, the CRD IV is published by European Parliament on 16 April 2013, and implemented by 1 January 2014 through national laws.

6.2 CCCB to be Implemented

Australia has a prudential standard in force that gives the Australian Prudential Regulation Authority (APRA), Australia's supervisory authority, the power to apply a CCCB from 1 January 2016. The Reserve Bank of Australia (RBA) will, however, continue its role in monitoring financial stability developments and APRA will likely draw on the RBA's analysis to aid its decision-making. While Australia does not yet have a framework for the buffer; work is currently underway to develop an operational framework by 2015.

The Bank of Canada (BoC) was actively involved in the international development of the CCCB, and remains active in the context of ongoing work by the Basel Committee. It believes that it is an important component of a broader tool set that is available to the authorities. While there have been discussions among the relevant authorities in Canada on the implementation of the buffer and anchor variable(s), the lower bound (L) and upper bound (H) have been identified, the specific guidelines have yet to be published. The Bank of Canada currently evaluates financial system risks in a comprehensive manner, using a framework to identify domestic vulnerabilities and potential triggers (domestic and international). An assessment is made of these risks using both judgement and a suite of models, including stress-testing and early warning indicator models. The credit-to-GDP gap is viewed as one useful indicator among many, and is regularly monitored. However, activation/release of the CCCB is unlikely to be based on threshold levels related to only a small number of indictors, but rather on a broader risk assessment by the authorities. The timing of the activation/release of the CCCB remains a challenge given BoC's lack of experience in using this tool, and the ongoing need to further develop its framework for the identification and analysis of financial system risks. The impact of time-varying changes in the level of bank capital for CCCB on financial system behaviour, and ultimately the economy, has not been fully established, requiring additional research.

The European Commission has proposed the Capital Requirements Regulation (CRR) and Capital Requirements Directive (CRD) to the European Parliament (CRD IV). CRR is a set of regulations that can be directly applied across the EU members, while CRD is a set of directions that has to be implemented through national law. Some EU members have already started to build the CCCB framework under CRD IV such as UK and Norway while other countries are working closely to develop a suitable framework.

In Japan, the main authority handling CCCB implementation is the Financial Services Agency (FSA) which promulgated the Basel III rules in March 2012. Draft regulations on the CCCB are expected in to be in place between the year 2014 and 2015.

In the context of the CCCB, the Federal Reserve and other U.S. banking agencies issued the final rule for Basel III implementation in 2013. These rules could require the largest

U.S. banks to hold additional capital of up to 2.5% of their RWA, if the US agencies deem it necessary for increasing risks. The Federal Reserve is currently considering the best modes for CCCB implementation[11].

Brazil has incorporated both the CCB and CCCB in its prudential framework. However, it has yet to publish the guidelines on the CCCB. The Banco Central do Brasil (BCB) is presently in the process of developing a technical note on the functioning of the CCCB, which is likely to be in place before 2016 (the Basel III timeline for both buffers by 1 January 2016)[12].

The CCCB is treated as part of China's macroprudential framework. The Regulatory Consistency Assessment Programme (RCAP) (BIS, 2014) find that the Chinese banking sector is compliant on capital buffer (CCB and CCCB), with no deviations from Basel requirements[13]. The China Banking Regulatory Commission (CBRC) is currently in the process of developing the operational modalities together with the People's Bank of China to be finalised before January 2016.

In South Africa, an assessment of total credit extension was made in its Financial Stability Report[14], aimed at considering the appropriateness of the current financial stability stance on the CCCB for banks. It showed that there is currently no reason to change the level of buffer capital that banks need to hold to influence the rate of credit extension. The South African Reserve Bank is, therefore, not yet considering the application of the CCB on the banking sector or specific loan categories[15].

The Financial Services Commission in consultation with the Ministry of Strategy and Finance, Financial Supervisory Service and the Bank of Korea, decided to put into effect the Basel III rules from 1 December 2013. The decision was made in light of other major Asian economies having adopted Basel III capital rules in 2013. A Bank of Korea (BOK) report stated that Korea needs to take into account risks of household debt in deciding the level of CCCB, along with the BCBS' recommendation of using a gauge for banks' credit exposure[16].

The Department of Financial Stability of the Bank of Russia (BoR) would coordinate the implementation process for the CCCB, expected to come into force by 2016. While the effects of CCCB implementation are currently being analysed, the standard European approach may not be applicable to Russia, and the BoR is expected to make some enhancements to the model.

7. Progress and Challenges in Implementing CCCB in SEACEN Member Economies

The cross country analysis indicates that only a handful of economies have actually implemented the CCCB, while in most other jurisdictions, the research, studies and guidelines have only been recently published or are still on-going. Among the 20 SEACEN member economies, India and Hong Kong have already put in place the framework for the CCCB implementations, while in other member economies, depending on their development stages, state of regulation and supervision and depth of the financial markets, research related to

[11] http://www.bis.org/review/r141208e.pdf
[12] BIS RCAP Brazil (2013)
http://www.bcb.gov.br/pec/appron/apres/RCAP_Brazil_assessment_report.pdf
[13] RCAP assessment of Basel III regulations, China (Basel 2014),
Http://www.bis.org/bcbs/implementation/l2_cn.pdf
[14] http://www.centerforfinancialstability.org/fsr/zaf_fsr_201403.pdf
[15]https://www.resbank.co.za/Lists/News%20and%20Publications/Attachments/6470/FSR%20Sept%202014(1).pdf
[16]http://english.yonhapnews.co.kr/fullstory/2013/03/05/77/4500000000AEN20130305002900320F.HTML

CCCB implementation is in progress. For comparison, this section looks at a snapshot of the progress of 8-participating SEACEN member economies in the CCCB implementation. The major parameters for the CCCB implementation have been summarised in Table 3, which clearly indicate that they are in still at the early stages. Among the eight economies considered, Basel II implementation is still in progress in three while others are in the process of Basel III implementation. Some of the members have an indicative timeline for Basel III or for the conservation buffer implementation, but for most, no guidelines on the CCCB have been issued so far, albeit with many conducting on-going research.

An attempt to analyse the broad factors that have posed challenges or constraints for a CCCB has surfaced certain common issues. The most obvious problem relates to the availability of long and uniformly defined/comparable time series data (Section 8). Some of the economies find that due to the emerging nature of their markets, the credit and GDP figures are too volatile for the implementation rules to be based on. The lack of developed financial markets, especially high frequency financial variables (e.g., credit spread, housing prices or commodity prices) as indicated in the BIS Guidelines are likely to be major constraints when making decisions on buffer capital release. For some economies, the banking sector is already adequately capitalised, far above the BIS prescribed limit, even after including for CCB and CCCB. For others, their banking sectors have never faced a major crisis for the last few decades, which therefore constrains the scope for calibration of limits based on historical data and crises experiences. Further, some economies such as Papua New Guinea and Vietnam are only starting to implement the Basel II framework. The participating members were unanimous in their opinion about the lack of available research for emerging markets, which was felt to be absolutely essential as part of analysis for CCCB framework implementation in this region.

The study makes an attempt to address some of these challenges and provides a roadmap for CCCB implementation in the SEACEN region. The following provides an integrated view of the SEACEN members participating in the project. While Annex Table 2 provides a brief summary of findings for these economies, details of their empirical findings, estimated trend and cycles, and other empirical details are in reported in the project team papers in the research report.

Table 3
CCCB Policy Progress (SEACEN Members)

	CCCB Guideline Published	Policy Measures Taken	Policy Variable Other Variables	Policy Hurdles	Proposed Implementation	Supervisory Authority	Other Obs.
Cambodia	No	Basel II	-	Data availability	-	NBC	-
Chinese Taipei	In Progress	Basel III in progress	-	Volatile Credit-GDP Gap	Conservation Buffer after 2018	Competent Authority, CBROC	-
Indonesia	Regulation for Capital Adequacy Ratio Based on BASEL III (PBI No. 15/12/PBI/2013)	Basel III in progress	-	-	2016	IFSA and BI	Two research papers on CCCB
Malaysia	-	Basel III in progress	-	-	-	BNM	Large loan and NPL share of household debt
Papua New Guinea	Not committed on the time frame	Basel II in Progress	-	Not implemented Basel II completely	-	BPNG	-
Philippines	No CCCB Guideline	Included capital buffer consistent with Basel III, conservation buffer included	-		No fixed timeline	BSP	1.Presently banks adequately capitalised 2.Future study on appropriate tools needed
Thailand	No CCCB Guidelines yet	Basel III in progress	-	More research required	-	BoT	Significant improvements in banking system after the crisis and ost reforms
Vietnam	No	Basel II in progress	-	Low capital adequacy and high NPL of Banking sector	-	SBV	Synchronised financial and business cycle

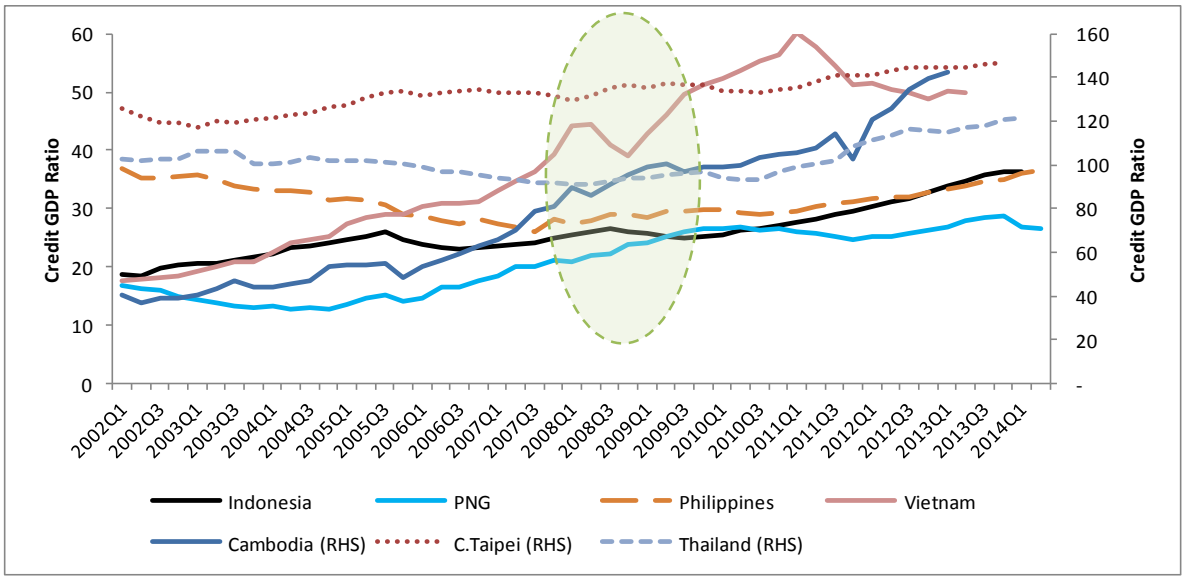
8. Data Availability and Gaps

As indicated in the Section 7, availability of long series data without significant structural breaks are perceived to be major problems. In view of this, a survey on data availability was made, the results for which are summarised in the Annex Table 1. As can be observed, among the three broad sets of indicators (namely, macro-indicator, banking sector and financial variables), data on financial sector variables are especially limited (e.g., Cambodia and Vietnam) as these sectors are relatively newly established and do not necessarily have deep and liquid markets. For the banking sector, while quarterly GNPA data are mostly available, in some cases, these have gone through definitional changes and appropriate adjustments have to be made for the changes. Among the macro-indicators, banking sector credit data is available for most economies. In the Basel guidelines for CCCB, the definition of credit covers both bank credit and non-bank credit to the commercial sector including bond and cross-border credit. For the participating members, however, it was not possible to use this all-encompassing definition of credit because of the paucity of sufficiently long series of data. In most cases, bank credit, which constitute the major portion of credit in these economies, is used as a proxy for the broad definition of credit as suggested by the Basel Committee. The exact definition of the credit variable used is mentioned in detail in the respective team project papers.

For some members, GDP data is available only on an annual frequency basis. In such cases, common lower to higher frequency conversion methods are used to convert the GDP data into uniform quarterly frequency. For trend estimation, it is essential to use sufficiently long time series (at least 10 year) to arrive at meaningful estimates. Keeping in view the importance of the time span, data for the longest available time period are used by the project team members to achieve reliable estimates. The credit-to-GDP ratio is annualised in line with the Basel Guidelines[17]. Even with these adjustments, the dataset indicates different trends and underlying characteristics due mainly to the emerging nature of the respective economies and different time periods for crises and reforms. Chart 1 plots the credit-to-GDP ratio for the sample set of member economies for a common sample period. Chart 1 clearly indicates that the credit-to-GDP ratio had built-up prior to the global financial crisis (shaded region 2008-09) for selected member economies, which coincides, with the Basel observation of the variable.

[17] Credit-to-GDP Ratio for Q_i= {Q_i credit stock /sum(GDP(Q_{i-3}):GDP(Q_i))]*100, i.e., credit in each quarter divided by rolling GDP sum of last 4 quarters, commonly referred it as annualized credit-to-GDP ratio. Any departure from this definition are noted in the members' research papers (subsequent chapters).

Chart 1
Credit-to-GDP Ratio of the Sample Set of Member Economies
(Credit-to-GDP ratio generally high and rising before Crisis 2008-09)



9. Methodologies for Empirical Analysis

This section examines the methodologies used for estimating the credit-to-GDP gap, evaluates the early warning properties of the selected key (gap) variables, calibrates the threshold values (L and H) and evaluates the performance of supplementary variables. As the team project papers delve in detail the specifics, this section only briefly highlights the methodologies used and economic rationale for their application.

9.1 Credit-to-GDP Gap

As shown in Section 5 (on literature), the credit-to-GDP gap has been identified by the Basel Committee to be the main indicator for the countercyclical capital buffer considering its properties as an early warning indicator. However, the quality of the gap estimation depends on the appropriate segregation of the cyclical component from the trend. This in reality poses considerable challenges, as the movement fluctuates around the trend while the trend itself changes, leading to possibilities of deviation from the cumulative equilibrium (Landau, 2009). Moreover, applications of different filter methodologies lead to different gap outcomes. The available literature offers a large number of filters which include purely statistical process e.g. Hodrick Prescott filter (HP), (Geršl and Seidler (2011)), time series filter (Harvey's unobserved components), frequency domain (Bandpass) filters and structural model filters. The Basel Committee suggests the use of the HP filter for de-trending, considering its large scale use in estimation of business cycles, ease of implementation, statistical properties (as it gives more weight to recent observations) and capability to efficiently deal with structural breaks. However, it has been argued that HP filter outputs crucially depend on the selection of the smoothing parameter (λ) and algorithms used for estimations[18].

[18] In the generic form HP filter estimate trend by

$$\min \sum_{t=1}^{T} \{[CTG_t - Trend_t]^2 + \lambda[Trend_{t+1} - 2Trend_t + Trend_{t-1}]^2\}$$

Where λ is the smoothing parameter.

The value of the smoothing component, λ, is crucially important for the segregation of trend and cyclical component of the estimation. A high value λ makes the trend component linear and incorporates more cyclical variation in the estimate. Ravn and Uhlig (2002) specify a power rule to determine the λ values[19]. In this context, it may be mentioned that the credit-to-GDP ratio incorporates variables representing the financial cycle (credit) and business cycle (GDP). Ravn and Uhilg also indicate that the credit cycle is generally three to four times longer than the business cycle. The Basel Committee recommends λ =400,000 to capture the long-term trend in behaviour of the credit-to-GDP ratio. The empirical analysis by Drehmann et al. (2010) indicates that the trend calculated using λ at 400,000 performs well in picking up the long- term trend in private sector indebtedness.

Another criticism of the HP filter relates to the end-sample bias, which makes it sensitive to data revisions, a common feature for macroeconomic data across regions. One possible way out of this problem is using an one-sided HP filter, which considers data up to the particular point in time series for which the trend value is being estimated, while the commonly used two-sided filter uses the entire sample. The BCBS endorses the use of the one-sided HP filter when estimating the credit-to-GDP gap for the CCCB. However, in using the one-sided filter, the sample size is increased by one point for each iteration resulting in (a) varying size for each point and (b) initial estimates being based on a small sample size. Given the data availability problem in the emerging market economies, especially for quarterly GDP series, the use of the one-sided HP filter may have its limitations. The trend component is also not observed, which naturally gives rise to some uncertainties in using gaps in policy making (Swanson, 2000). In the case of estimating the credit-to-GDP gap for the CCCB, interactions of (a) the financial and business cycles; (b) the possibility of data revision; and (c) the choice of algorithm in estimating the HP filter, intensify the degree of uncertainty for the SEACEN economies. As a way out, the credit-to-GDP gap is estimated using different lambda values (λ=1600; 125,000; 400,000) and using both the one-sided and two-sided HP algorithms. From the six estimates, the credit-to-GDP gaps are selected for the participating members, based on their performance as early indicators, 'noise to signal' ratios and their correlations with the banking sector's non-performing asset growth.

9.2 Early Warning Indicator (EWI) Property of Credit-to-GDP Gap

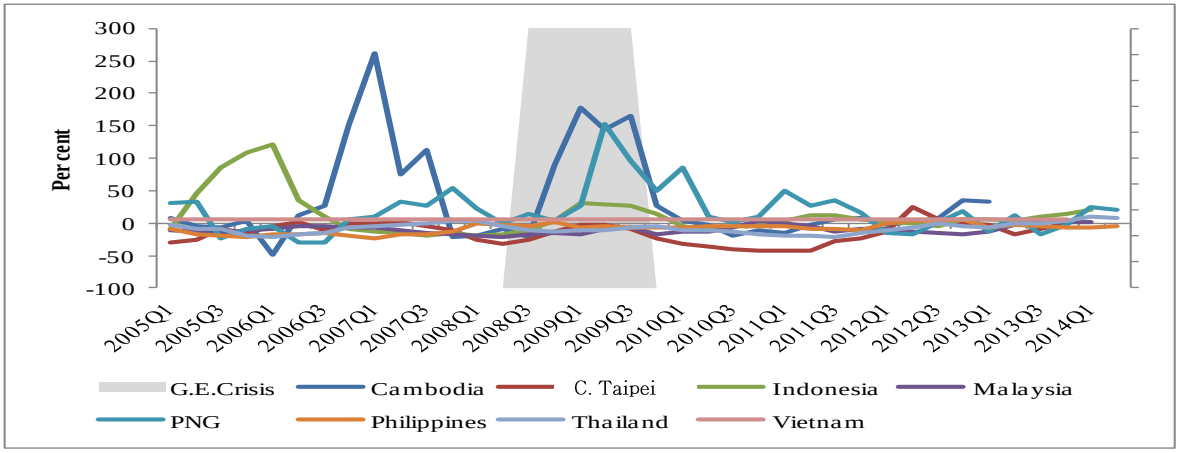
The Basel Committee requires national authorities to announce the capital requirement for the countercyclical capital buffer four quarters in advance, so that banks have sufficient time for preparation and implementation. This implies that the credit-to-GDP gap, in order to act as an effective indicator variable, has to signal the build-up of systemic risk in the member economies at least 4 quarters ahead. This section will delve into the empirical evaluation of the lead-lag relationship between the banking sector stress variable (proxied by year-on-year NPA growth) and the lead indicator, i.e., the estimated gap series for member economies. Empirical evidences generally suggest that non-performing loans (NPLs) increase sharply during the onset of a major banking sector crisis (Laeven and Valencia (2008)). Nkusu (2011) indicates that adverse macroeconomic developments are associated with rising NPLs which in turn play a central role in linkages between credit market frictions and macroprudential vulnerability. Therefore, including NPA growth as a banking sector stress indicator in the regression equation is as follows:

$$NPA\ Growth = f\big(credit - to - GDP\ gap\ (-1\ to - i)\big) \quad (1)$$

[19] Where λ = (observation frequency ratio)^4*1600, (for quarterly data). Assuming credit cycle is three time longer than business cycle λ = (3)^4*1600=129,600, and assuming credit cycle is four time longer than business cycle λ =(4)^4*1600=409,600.

Where the selection of 'i' (>4) depends on the availability of data points (degrees-of-freedom in the regression analysis) for the economies. The early indicator property of the variable has been identified considering *'t-stat', 'F-stat' the AIC, SBC and* R^2 values from equation-1 for the respective economies (regression results in respective team project papers).

Chart 2
The NPA Growth Rates for Sample Set of Member Economies
(generally indicates increase in NPA growth during GFC)



9.3 CCCB Thresholds (L, H) Estimation

In the Basel Framework, the lower thresholds (L) corresponds to the gap value when the banks would be required to accumulate the CCCB capital, and the upper threshold 'H' corresponds to the gap value when the buffer reaches its maximum value (thereafter additions to capital under the CCCB will be zero until further announcement). L and H play crucial role, as they determine the time and speed for capital accumulation. While the Basel Guidelines recommend L=2 and H=10, they note that these threshold values provide only a starting guide for the relevant authorities responsible for deciding on buffer add-ons. The Guidelines allow for authorities' judgement for implementing different buffer add-ons depending on underlying economic conditions. The broad criteria set out by BCBS for the selection of L and H are as follows:

- "L should be low enough, so that banks are able to build up capital in a gradual fashion before a potential crisis. L should be high enough, so that no additional capital is required during normal times.
- H should be low enough, so that the buffer would be at its maximum prior to major banking crises."

These thresholds are empirically estimated for each of the members in the sample. The Sarel (1996) methodology is used, employing a single regression equation with iteration over different threshold cut-offs (e.g., L=1, 2...) for the explanatory variable in the sample. Thresholds are then decided on the basis of the explanatory power of the equation (i.e. R^2 value) and the significance of the coefficients in question (for a particular gap threshold). In this context, the explanatory variable is the credit-to-GDP gap (as estimated in Section 9.1), and an interactive dummy variable incorporating different threshold values. Gaps and the dummy variable based on the same are as follows:

$$dummy(i) = \begin{cases} 0, & credit\ gap\ < threshold(i) \\ 1, & credit\ gap \geq threshold(i) \end{cases}$$

Interactive dummy variable X(*i*)= $dummy(i) \times credit\ gap$

The dependent variable is the bank NPA growth rate (y-o-y) and the OLS regression equation is given as below:

$$NPA\ Growth = f(Gap, X_i) \quad (2)$$

It should be mentioned that while Sarel's method was originally used for inflation threshold estimation in 1996, the above algorithm has been used for estimating the CCCB thresholds by the Reserve Bank of India (2013, 2014).

9.4 Noise to Signal Ratio

At times, regression analysis can produce mixed results due to the lack of data points, presence of structural breaks or deviation from some classical assumptions. To complement the regression analysis results, we further use the "noise to signal" (NS) ratio as pioneered by Kaminsky and Reinhart (1999) and later used by Drehmann et al. (2011) in analysing systemic banking crisis,

The credit-to-GDP gap is first estimated as described in Section 9.1 while a signal variable (S=S(gap)) that takes the value 1 is considered, whenever it is above the threshold (i=1, 2,....) otherwise zero. A signal (S=1) is considered to be correct, if a crisis occurs within the next three years (12 quarter) rolling window. Otherwise this observation is classified as a Type II error, i.e. when a signal is issued but no crisis occurs. On the other hand, depending on the gap and when the threshold S=0, this is an indication of no occurrence of crisis for the next three years. If the following three-year rolling window indeed has no crisis, it is then a correct signal. Otherwise, in the presence of a crisis (conditional upon no signal), it gives a Type-I error. The trade-off between these two types of errors is that if the threshold value 'i' is low, depending on the value of the underlying gap, the signal variable indicates large number of crisis (S=1), and the chances of a Type II error (signal but no crisis) goes up. If, on the other hand, the threshold is high, then depending on the gap, the total number of no-crisis signals (S=0) go up. In case of a crisis in such a period, the chances of a Type I error go up. While a regulator will try to minimise a Type I error, the optimal indicator has to have the right trade off, which will depend on the relative cost of these two types of errors (Borio and Drehmann, 2009). Attempts are, therefore, made to minimise the loss function, L, as follows:

$$Min\big(L(i = 12,..18)\big) = Min\left(\frac{T2}{1-T1}\ subjected\ to\ (1 - T1) > X\right) \quad (3)$$

The combined effect of these to error is summarised in the NS ratio, which is computed as a ratio of Type II error to 'one minus Type I error'[20]. Based on this specification, the lower the NS ratio, the better is the EWI property of the variable and the threshold selection (Kaminsky and Reinhart). However, the mixed approach is mostly used, i.e., minimising the NS, subject to predicting a minimum number of cases 'X' consistent with Borio and Lowe (2002) and Borio and Drehmann (2008).

20

	Crisis (within *j* quarters)	No Crisis (within *j* quarters)
Signal	A	B
No signal	C	D

$$NS\ Ratio = \frac{Type\ II\ error}{1-Type\ I\ error} = \frac{\frac{B}{B+D}}{1-\frac{C}{A+C}} = \frac{B*(A+C)}{A*(B+D)}$$

Where *j=8,12*

Following the above specification, the EW-properties is analysed (9.2) for the gap variable. The NS ratio is also calculated for different thresholds (9.3) of the gap variable to identify the optimal threshold levels for the participating SEACEN economies. To attain a minimum success rate, the success ratio[21] is also examined, which is the probability of identifying and signalling a crisis correctly. Following Drehmann (2011), we do not consider signals immediately in two years, after the beginning of a crisis. One shortcoming of this methodology is that it requires well defined crises in the member economies and relevant data for about 3 years prior to the crisis.

9.5 Identification of Supplementary Variables

In its Guidelines to national authorities, the Basel Committee indicated the role of high frequency data in identifying the build-up of systemic risk in the banking system, especially during the buffer release period. However, our survey of data for the member economies reveals a paucity of deeply liquid financial markets, which limits the availability of high frequency financial market indicators. Notwithstanding this limitation, available financial market variables of the members were evaluated for the lead-lag correlation with the variable indicating banking sector systemic risk (i.e., NPA growth rate). These correlations and their statistical significance have been used to determine the time and speed for buffer release during the crisis phase.

9.6 Panel Data Analysis

While the analysis so far has only considered members' data individually, this section attempts to stack together data for members for a common sample period to acquire a balanced panel. The panel data analysis, although poses a considerable challenge in face of heterogeneous cross-section data, is nevertheless commonly used for cross country analysis as it allows for large degrees of freedom. The early warning properties of the credit-to-GDP gap, with NPA-growth as a dependent variable, is analysed and the fixed effect specification of the panel equation is estimated as below:

$$NPA\_Growth_{it} = \alpha_i + \lambda_t + \sum b(i) * gap_{t-i} + \varepsilon_{it} \quad (4)$$

Where *'i'* represents the members and 't' is the time (quarters), while ε_{it} is assumed to follow a normal distribution. Similarly, we attempt to estimate thresholds with the panel framework. The estimate panel data model and the fixed effect equation is specified as below:

$$NPA\_Growth_{it} = \alpha_i + \lambda_t + b_{1*}Gap_t + b_{2*}X_{it} + \varepsilon_{it} \quad (5)$$

Dummy =1 if credit-to-GDP gap > threshold value (i), where i=1,2.....20
=0 otherwise
Interactive dummy variable X_i= Credit-to-GDP gap * Dummy(i);
The panel data regression results and the test statistics for selecting among the pool, random and fixed effect models are reported in Section 9.

9.7 Judgement

The Basel Committee has emphasised the role of relevant authorities' judgements in setting the buffer level and its release. Therefore, while emphasising on sound quantitative techniques in this research, the participating members were encouraged to use appropriate judgment, wherever necessary, to arrive at reasonable and implementable indicator(s),

[21] the probability of an indicator correctly signalling a crisis is given by

$$P(crisis|signal) = \frac{A}{A+B}$$

threshold values and release phase. The findings of the empirical analyses with some degree of judgement are summarised in Table 4. Annex Table 2 summarises the major findings for each of the participating members. The detailed estimates, NS ratio, other analyses are found in the respective project papers.

Table 4
Summary Findings for the Participating SEACEN Members

	Key Variable	Filter	Supplementary Indicators	Lead	L	H	Level 0-2.5	Accm.	Releases	Purpose	Communication	Review
Basel III	C- GDP Gap	HPOS,400000	Asset prices	4q	2	10	Max 2.5	Linear	Judgment Immediate	Absorb losses	At least once a year	Regular Interval
Cambodia	C-GDP Gap	HPOS 1600	Credit and GDP growths (For release phase)	6q	5	11	0-2.5	Linear	Judgement based on relevant market indicators	Absorb losses and reduce the risk of the supply of credit	At least on annual basis	Regular Disclosure
Chinese Taipei	C- GDP Gap	HPOS 1600	Credit growth and housing price gap	6q	2	13	0-2.5	Judgement, Volatile Gap	Judgement	Prevent systemic risk	When necessary	Regularly
Indonesia	C- GDP Gap	HPOS, 25000	Property Price Index Inflation Index Return on Asset	8 q	3	6	Max 2.5	Linear	Judgment Immediately or Gradually (depends on the situation)	Maintain credit growth and absorb unexpected losses	At least once a year	Regular Interval
Malaysia	Credit Growth Gap	Two sided perform better	Equity price gap Housing prices gap	Needs further investigation					Exercise of Judgement	Help banks to absorb losses		
PNG	C- GDP Gap	HP0S,400000	Asset price	7q	2	7	Max 2.5	Linear	Judgement	Absorb losses	Annually	Annually
Philippines	C- GDP Gap	HPOS, 25000	Growth of stock market returns & growth in residential capital values	8-10q	4	12	0-2.5%	Linear	Supplementary indicators and judgment	Sustain supply of credit	FSR	Annual
Thailand	C- GDP Gap	HPOS 400,000	NPL Ratio	5q	8	16	Max 2.5%	Linear	Immediate	Absorb losses	At least once a year	Regularly
Vietnam	C- GDP Gap	HPOS 1600	VNindex (stock index)	2q,4q	3	13	0-2.5	Linear	In steps	Absorb losses, Maintain credit flow	Bi-yearly	At least once in year

Note: C-GDP gap is Credit-to-GDP Gap; HPOS, 25000 is HP 1-sidefd with lambda-25,000; similarly for others; Accm. Accumulation of buffer, Brief findings for the participating members are reported in Annex Table II, details of empirics can be found in the team project papers.

10. Empirical Findings and Their Policy Implications

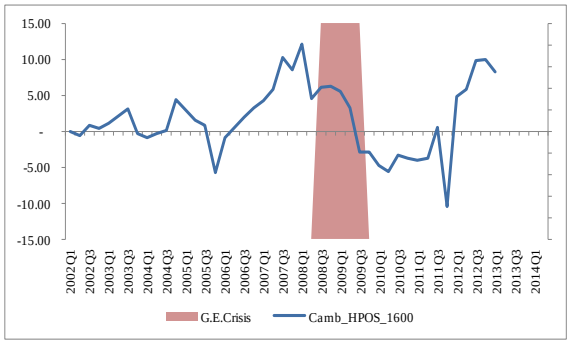
10.1 A Main Indicator

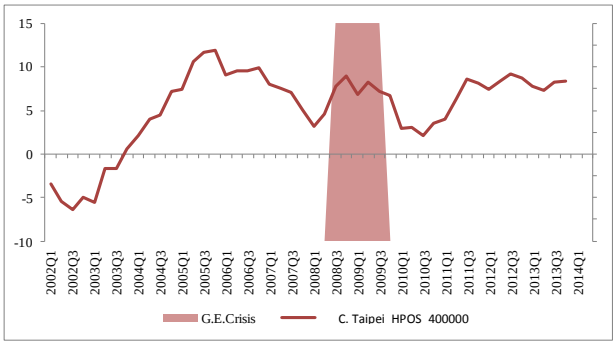
After calibrating with a large number of indicators, most of the members[22] find that the credit-to-GDP ratio and the credit-to-GDP gap derived from the same, may be considered as a key/starting point indicator for countercyclical capital buffer estimation. As indicated in the Table 4 (column 2), the gap variable is found to be suitable for seven economies. However, member economies are encouraged to analyse other indicators such as the credit growth gap, GDP gap etc., as alternative variables. For instance, in Malaysia, the credit growth gap appears to have better indicative properties for the CCCB during the sample period.

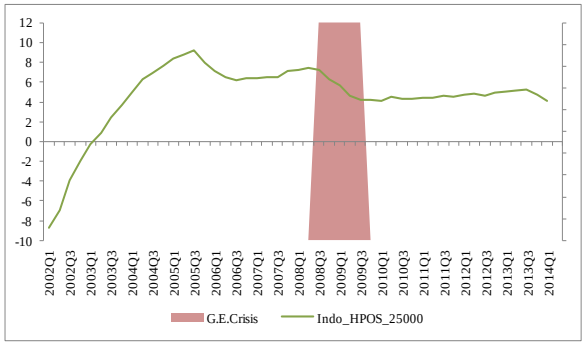
The analyses with different lambda (λ=16k, 25k, 400k) values and one-sided vis-a-vis two-sided estimations, however, disclose some interesting results. Between the one-sided and two-sided, the former is found to be more robust in terms of data. Concurring with the Basel Guidelines, the one-sided filter seems to perform better for most of the members, except for Malaysia, where the two-sided filter registers a better performance. However, when the performance of the credit-to-GDP gap is evaluated in terms of the different lambda values, the members find that different λ values are more appropriate for the different economies (Table 4, column 3). For instance, PNG and Thailand find that λ=400k performs better, Indonesia and Philippines, it is λ =25k and for Cambodia, Chinese Taipei and Vietnam, λ=1600 seems to exhibit better EWI properties. The suitability of different λ-values for member economies is consistent with the theory, (e.g., Ravn and Uhlig) as it crucially depends on the relative length of the financial and business cycles, which can differ between members. It is, therefore, recommended that members calibrate with different λ parameters for the appropriate gap selection. In general, gaps, as plotted in Chart 3 indicate an upward trend for the majority of member economies before the 2008 Global Financial Crisis (GFC).

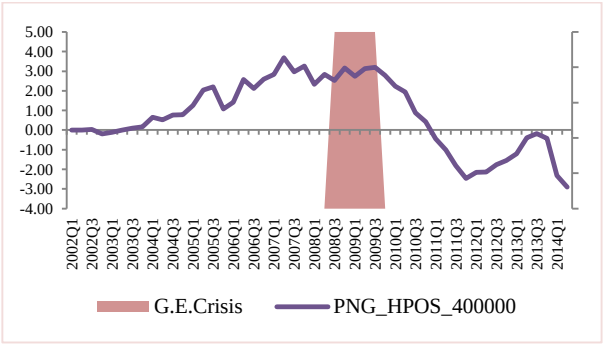
[22] Here and henceforth “members” refer to the 8 economies that participated for this study, and not the Group of 20 SEACEN members, unless otherwise explicitly stated.

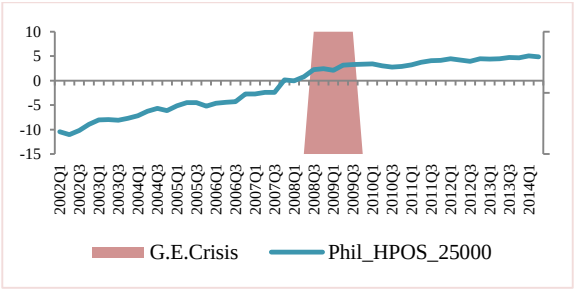
Chart 3
Credit-to-GDP Gap for the Sample Set of Member Economies[23]
(Gap indicator generally picked up before GFC)

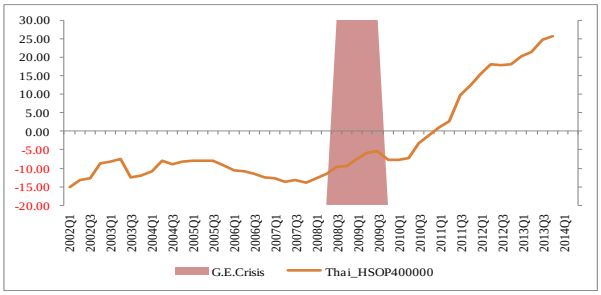


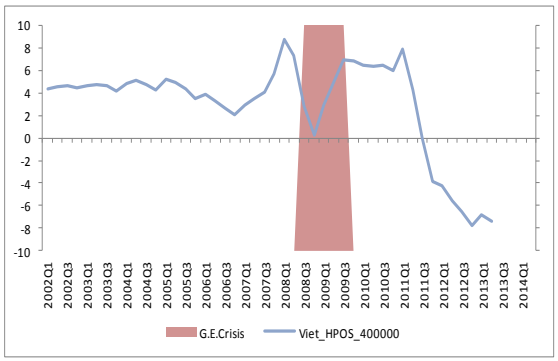


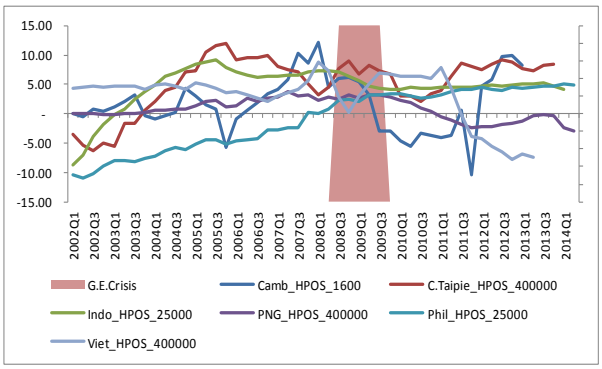










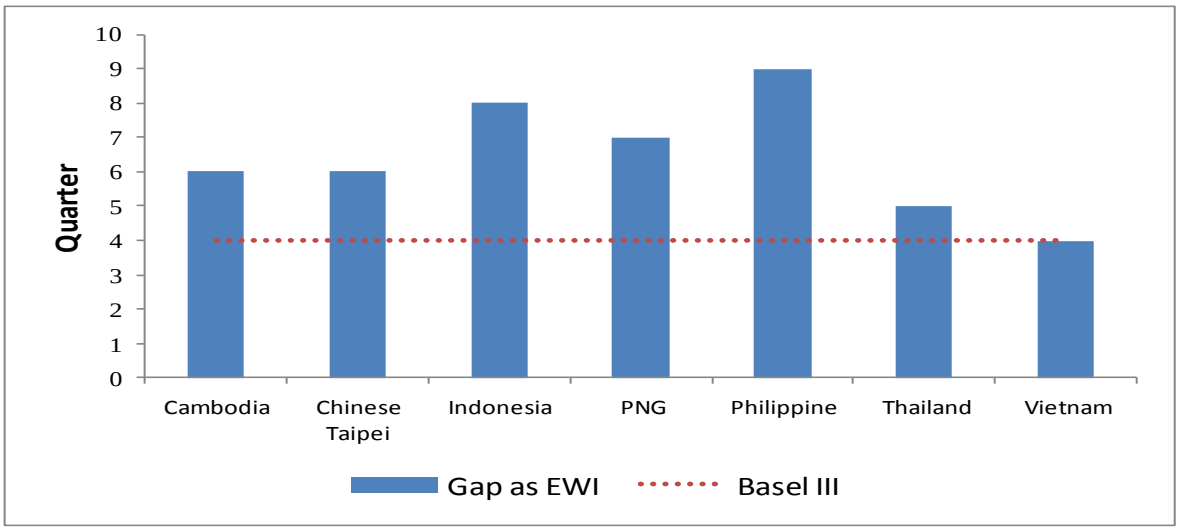


[23] In Chart 3, 4 and 5, Malaysia is not plotted as credit growth gap is found to perform superior compared to the credit-to-GDP gap.

10.2 EWI Property

The objective of this section is to evaluate whether the credit-to-GDP gap can provide an indication for the build-up of systemic risk sufficiently in advance so that the banking sector has enough time to build up the required buffer. The lead time is summarised in Table 4 (column 5) and Chart 4. These are presented as estimated coefficients of equation (1) and results as shown by the NS ratio. For most of the members, it can be seen that the time between the pick-up in the credit-to-GDP gaps and any systemic risk build-up is more than 4 quarters, giving supervisory authorities sufficient time to implement the CCCB.

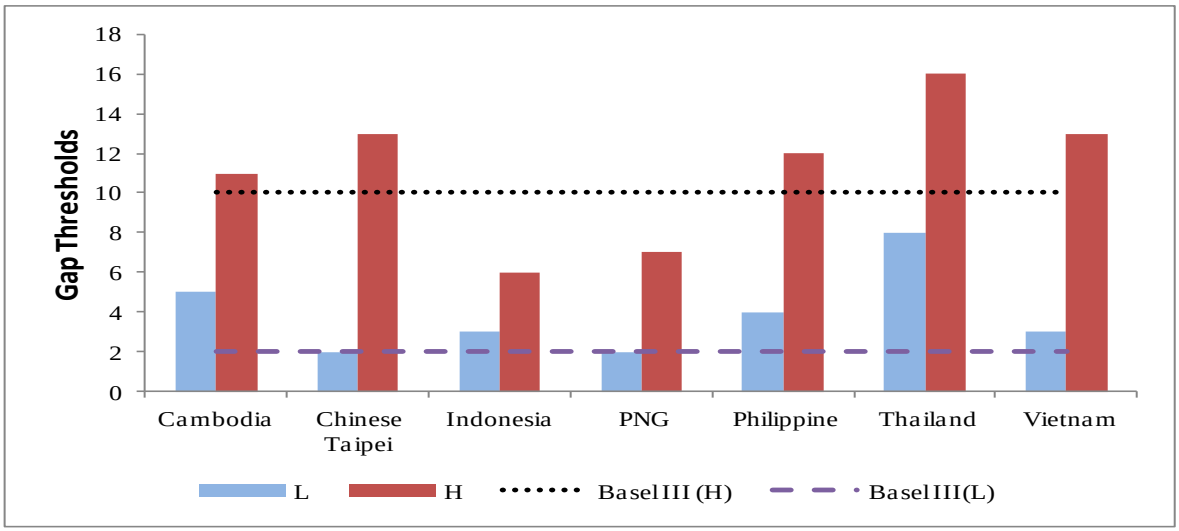
Chart 4
Early Warning Indicator Property of Credit-to-GDP Gap
(Credit-to-GDP gap indicates lead indicator property)



10.3 Threshold Levels

Estimations of thresholds are crucial to the whole exercise and we have endeavoured to derive them using the R^2 value from the step-wise regression equation (2) or Sarel's method for identifying thresholds, the NS ratio obtained from the non-parametric test and judgement where appropriate. The results tend to suggest that for all members, the lower bounds are greater than or equal to two (L>=2)). The upper bound (H), that will halt further capital accumulation, is found to be more than 10 for most of the members. However, the upper bound for Indonesia and PNG is less than 10 (the Basel recommendation for H). On average, the L and H values were both higher than the Basel Guidelines. It must be mentioned that the Basel Guidelines do specify these values (L=2, H=10) as a starting rule for national authorities. These higher thresholds are consistent with the emerging nature of the participating members, where credit growth plays a crucial role in economic development and where it is more characteristic of progressive financial inclusion and deepening rather than the build-up of systemic risk.

Chart 4
Threshold Levels for Countercyclical Capital Buffer
(On average, L and H higher than Basel Guidelines)



10.4 Panel Regression Results

Notwithstanding the heterogeneity among the members, an analysis is made using stacked data together with a panel data exercise, as indicated in equation-(4) [24]. NPA growth y-o-y as a dependent for cross-section of members and lagged GAP variables as independent set of variables are used. For this exercise, 4 to 8 quarter lags are applied as per Basel suggestion that national authorities has to announce the CCCB buffer accumulation at least four quarters ahead. Table 5 shows the coefficient estimates in a pooled regression, which has a low R-square value. Time and cross section specific effects on member economies are depicted with a random effect panel model, however the Houseman test strongly indicates that the random effects are correlated. We, therefore, use the different fixed effect models (with cross section dummies, time dummies and both cross-section and time dummies), and based on the redundant fixed effect test (cross-section and period specific F-test and Chi-square test) fixed effect model with cross-section and period specific effects is selected. The estimated parameters, Prob-values and R-square value of the fixed effect model reveal that the gap variable 6-quarters ahead is significant at 5% level. We also perform a redundant variable likelihood ratio test for the GAP(-6) series with both the F-Test and the likelihood ratio test strongly rejecting the Null that the GAP(-6) is a redundant variable. This result generally supports the early warning property of the gap variable for the members in combination.

[24] Seven members were considered for this analysis, as they had comparable data during the time of the analysis. Period 2005Q1-2012Q4 was considered as data for all the seven members were available during the period, and occurrence of the global economic crisis in the sample period. Malaysia is not considered in this group, as the credit growth gap (rather than credit-to-GDP gap) performs better as the key CCCB indicator for Malaysia.

Table 5
Panel Regression Results

Variable	Pooled Model		Random Effect		Fixed Effect	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	5.11	0.11	5.06	0.24	2.50	0.40
GAP(-4)	1.46	0.36	1.66	0.28	2.52	0.07
GAP(-5)	-4.19	0.08	-4.32	0.06	-4.48	0.08
GAP(-6)**	5.52	0.03	5.34	0.04	5.46	0.02
GAP(-7)	-3.20	0.23	-3.41	0.19	-3.37	0.14
GAP(-8)	1.08	0.57	1.42	0.44	1.92	0.28
Time Dummy	-		-		Included	
Cross Section Dummy	-		-		Included	
R-Sq	0.06		0.05		0.48	

We also attempt to estimate a threshold figure for the seven members, by estimating equation (5), which is a panel application of Sarel's approach for threshold determinations. Equation (5) was estimated using several methodology, (i.e., pooled, random effect and fixed effect models) for different threshold levels (i=2, 3, 4, 5, 6). However, only the fixed effect model find that the coefficient of *X(L=3)* is significant, at about 10%, with a very low R-square value. This result is not surprising, given the divergence in the respective member's estimate of the L and H values, as reported in Chart 5. It also perhaps re-emphasises the importance of economy specific estimates and judgement in setting the (L and H) threshold values.

10.5 Accumulation and the Buffer Target

Regarding accumulation of the capital buffer, the members observe that the build-up could be linear between the thresholds (L and H) as suggested by the Basel Guidelines. On the exact percentage of capital build-up (in the range of 0-2.5% RWA), it is generally felt that appropriate decisions can be taken by each jurisdiction after closely evaluating the underlying economic conditions and using due judgement. It must be mentioned in this context that countries that have already implemented the CCCB generally took a call on the CCCB capital level based on the underlying economic conditions (refer to Section 6.1 for more details).

10.6 Supplementary Indicators

Due to the emerging nature of the participating economies, the availability of high frequency financial market variables is a challenge. However, a correlation (lead-lag) analysis with the available set of financial indicators and growth rate of NPA of the banking sector, have shown that some of these financial variables can be considered as systemic risk indicators along with the credit-to-GDP ratio as summarised in the Table 4, column 3. It shows that the return on equity can be used as an indicator for PNG, Philippines and Vietnam while it is the property (housing prices) for Indonesia Malaysia and Philippines, and the NPL level for Thailand.

10.7 Release of Buffer

There is generally a consensus that the judgement of the relevant authorities and the underlying economic conditions are major considerations for the release of buffers. These should be complemented by the main CCCB indicator and supplementary set of indicators. The participating members further emphasised the role of judgement in deciding whether the buffer release should be immediate or taken in stages.

10.8 Review and Communication

Regular reviews and research related to the CCCB are essential given the emerging market nature, volatility of the key CCCB indicator and the role of judgement for the participating economies. It is suggested that, in line with Basel recommendation, a review, at least once in a year, is absolutely essential while a more frequent review would be preferable for this region. The review and the recommendations should be communicated to the banking sector and market participants at regular intervals, and could be incorporated in the regular release of financial stability reports or monetary policy statements.

10.9 Key Findings

The key findings of this analysis and policy implications are as follows:

- The starting point of the CCCB analysis for the participating members can be the credit-to-GDP gap, as most of the economies have found it to be appropriate. However, other variables such as the credit growth gap and the output gap may also be considered as they may provide a better signal for some economies. In line with the Basel recommendations, most of the members find that the one-sided HP filter to be suitable for estimating the gap. However, in view of the data limitation, the use of the two-sided HP filter to evaluate gaps is also recommended.
- The choice of the 'lambda' variable (HP filter) differs considerably among members due to perhaps differences in the relative amplitude and duration of the financial cycles vis-a-vis the business cycle, consistent with the theory. The general consensus is that the choice of the key variable(s) should depend on whether the selected variable(s) is able to reliably signal good and bad times so that sufficient buffer is accumulated in good times to absorb subsequent expected losses and at the same time robust for regulatory arbitrage and is difficult to manipulate.
- The empirical estimates of the threshold indicate that 'L' is generally found to be higher than the Basel recommendation (L=2). This could be due to the emerging nature of the member economies, where credit growth also incorporates the effect of financial deepening. The average value of the upper threshold is higher than that for Basel (H=10), although there are some members which find that a lower (than 10) threshold more suited to their economies.
- Empirical results have indicated that use of variables such as the return on assets, equity returns, NPA ratio, housing prices, to be useful supplementary indicators for decisions on the CCCB.
- As for early warning properties of the anchor variables, it is observed that CCCB decisions may be pre-announced with a lead time of 3-4 quarters. Many of the members prefer a linear build-up of the buffer; but the possibilities of in-step (non-linear) build-ups cannot be ruled out. It is felt that the exact value of the CCCB buffer as a percentage of RWA (in the range of 0-2.5%) is best decided, contingent on the underlying economic conditions during the buffer announcement or subsequent revisions, as in the case of Switzerland, Norway and U.K.
- Although the variable used for signalling activation may be employed for the release phase of the CCCB, this study strongly advocates the use of judgement in the decision for the time and speed of the buffer release, depending on the nature and voracity of the economic crisis. The buffer may be released to absorb losses and/or to maintain credit supply during crisis periods.
- In view of the emerging nature of the participating economies and volatility of the variables taken into consideration, it is recommended that CCCB decisions be subjected to reviews, research and empirical testing at least once a year, if not more, for their efficacy and for considerations of possible new indicators.

11. Way Ahead

For many of the member economies, this study is an early research initiative for implementing the CCCB in the future. For some, regulatory authorities are only presently in the process of implementing Basel II recommendations while for others, the extreme volatility of the credit-to-GDP gap make it a challenge to implement the CCCB at this juncture. In light of this, some of the difficulties and challenges are discussed in the following sections. It is felt that appropriate policy measures in response to the challenges would benefit future research analysis and policy implementations on CCCB in the member economies.

- There is a need to examine the quantitative and qualitative nature of the main variables, namely quarterly GDP, credit and banking stress indicators, etc. The Basel Guidelines use a broad definition of credit that captures all sources of debt funds for the economy. As data on the variable may not be available at present, economies may have to use a close proxy and back-date the data for a minimum of a 10-year period to facilitate research analysis and decision making related to the CCCB.
- Reporting more financial data derived from relatively deep and relevant financial markets is imperative for analytical indications on the build-up of systemic risk, which would help authorities to make judgements on the CCCB accumulation and release phases.
- Besides broad credit, sectoral credit data could also be monitored in the CCCB framework. For instance, in Switzerland, domestic mortgage volume indicators (the ratio of mortgages to gross domestic product) and domestic residential real estate price indicators are the main indicators for the CCCB.
- In some member economies, particular sectors, e.g., the retail and housing sectors play major roles in bank credit. Considering the importance of retail and housing in the region, national authorities may consider compiling and monitoring the housing price index or consumer confidence index. Further, Borio and Lowe (2002) suggest that composite indicators of banking crisis can be useful for assessing future financial distress with a reasonable degree of confidence. These member economies could, therefore, consider tracking these composite indicators (e.g., financial stress indicator, business confidence indicator) to signal the build-up of systemic risk.
- In analysing the credit-to-GDP gap as an indicative key variable, the observation is that the variable has exhibited considerable volatility over the last decade, making its application as a rule difficult. To meet this challenge, future research might utilise, when data permits, a longer time series as well as analyse performance of a seasonally adjusted or smoothed credit-to-GDP gap with appropriate moving averages, as well as incorporate end-point estimation techniques. These may also address some of the problems with data revision and end-point biases associated with filters.
- Future empirical work should also look at the relationship between macro-indicators and sources of financial vulnerability. One extension could be the introduction of the credit-to-GDP gap in the modified Taylor Rule to evaluate the impact of the gap variable on central bank's policy rate. Others could include the suitability of the 0% - 2.5% RWA range of additional capital and the suitability of different buffer accumulation types (e.g. linear, in-step).
- Finally, raising awareness of the CCCB among bank supervisors, inspectors and auditors is crucial going forward. The main objective of the CCCB as a countercyclical tool is still not very clear among banking professionals, as their main reference is still the overall banking capital, which is (for some economies) currently higher than the combined capital requirement after including the conservation buffer and countercyclical buffer. The crucial function of the CCCB, which is to impose restrictions on banks during credit booms to minimise loss or maintaining credit during a downturn, seems to be an unfamiliar concept. This problem can be addressed by increasing

awareness among banking professionals on the CCCB through various platforms such as discussions, workshops, conferences and training programmes.

12. Conclusion

The CCCB has been incorporated in Basel III as one of the crucial policy measures that would address pro-cyclicality and inadequacy of capital in the banking system. The distinct feature of the CCCB is that it combines rule with appropriate judgment in its implementation. The latter would crucially depend on the underlying economic situation, stages of economic development and institutional framework. In view of the emerging character of most SEACEN economies, this project sets out to empirically assess and arrive at some implications for policy issues relating to the CCCB.

Although there are significant differences among the participating members, with some in the advanced stages of the Basel III implementation and others only currently at the Basel II requirements, we endeavour, nonetheless, to assess the viability of key macroprudential variable(s) as advocated by the Basel Guidelines. The objectives are to classify variables that can be used as a basic input for identifying good and bad times, act as an early warning indicator for systemic risk and indicate thresholds, accompanied by appropriate judgements, for triggering the accumulating and releasing buffers. While it is a challenging task to come to a consensus on the above, this research has derived some significant output using robust quantitative analysis.

Our research indicates that the credit-to-GDP gap can be considered as a viable variable for CCCB in the SEACEN economies but with the caveat that other macroprudential variables such as the credit growth gap, output gap, etc., may also be important. Empirical findings generally indicate that the early warning properties of the gap variable will enable relevant authorities to pronounce decisions on CCCB build-up three to four quarters ahead. The thresholds (L and H), on an average, are found to be higher than those indicated in the Basel recommendation. However, given the features of financial inclusion, financial deepening and emerging nature of the participating members, higher threshold values may augur well for these economies. Notwithstanding problems with the availability of high frequency data, empirical findings indicate that stock prices, housing index and non-performing asset growth can be useful supplementary indicators during the accumulation and release phases.

In the process of this research, the scarcity of lengthy macro-time series data (free from structural break or definitional changes) or high frequency financial market data posed major challenges. For some members, the estimated gaps are found to be too volatile to be a rule for policy implementation. It is, therefore, felt that improvements in the quality and availability of macroprudential variables and high frequency financial time series could significantly help in CCCB policy implementations. Members may also consider publishing composite indicators that may represent cyclical changes and systemic risk build-up in their economies. Increasing awareness among bankers, supervisors and regulators about the critical role of the CCCB as a countercyclical tool would also enhance the effectiveness of policy implementation.

This research provides suggestions and recommendations which set the stage for further work on the implementation of the CCCB. While many questions remain for future research to answer, this study clearly indicates that the success of a countercyclical capital buffer for the SEACEN members would crucially depend on a balance between a simple, robust transparent rule and an element of judgement in all phases of implementation.

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Annex Table 1
Data Matrix

	Macro-indicators			Banking Data				Financial Indicators*			Data	Breaks Crisis	Major Reforms
	GDP	Credit	Deposit	Profit	GNPA	Restructured Assets	CRAR	Asset Prices	Commodity Housing Prices	Business / Credit Surveys	Availability & Frequency	Year	Year
Column	1	2	3	4	5	6	7	8	9	10	11	12	13
Cambodia	Annual	Monthly	Monthly	Monthly	Monthly	Quarterly	Monthly	Shallow And Newly Established	-	-	Limited	-	1999
Chinese Taipei	Quarterly	Quarterly	-	Quarterly	Quarterly	-	-	Monthly	Monthly	Available	Good	1998, 2001, 2005, 2008	-
Indonesia	Quarterly	Quarterly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	-	Good	1997, 2005, 2008	2000 - 2003
Malaysia	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Good	1997	since 2010
P.N. Guinea	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	-	-	Quarterly	-	-	Limited	no crisis	No major reform
Philippines	Quarterly*	Quarterly	Quarterly	Quarterly	Quarterly	-	-	Quarterly	-	-	-	-	2000**
Thailand	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Monthly	Quarterly	Quarterly	Quarterly	Good	1997-98	1990, 2004-08, 2010-14
Vietnam	Quarterly	Quarterly	-	-	Quarterly	-	Available	-	-	-	Limited	1997-98; 2008	2011-15

*Annual series converted to a quarterly series in EViews; ** Central Banking Act was passed by Parliament.

Annex Table 2
Summary of Research Findings for Member Economies

- **Cambodia**

The paper seeks to provide the baseline information for the design of Basel III capital requirement, in particular the CCCB in Cambodia. Following the BCBS' Guidelines, the calibration of the CCCB is guided by calculating the deviations of credit-to-GDP ratio from its long-term trend. Unlike in many past studies, the credit-to-GDP gap as the main candidate variable is estimated based on both one-sided and two-sided HP filters with three different smoothing parameters λ (1600, 25K, and 400K). Results show that the credit-to-GDP gap using one-sided HP filter (λ=1600) is a leading indicator which can signal the build-up of financial imbalances, approximately 6 quarters ahead of the actual crisis. The lower and upper thresholds of 5% and 11% of the gap value are found to be the most appropriate range in which the capital buffer should be accumulated. In addition to the credit-to-GDP gap, credit and GDP growths are also helpful in the release phase of the buffer. It is suggested that the indicators and thresholds should be subject to continuous research and empirical tests and as new indicators become available; they should be explored for their usefulness in the CCCB decisions. Above all, national authorities are expected to apply judgment by flexibly calibrating the buffer by measuring the build-up of system-wide risk rather than relying mechanically on the credit-to-GDP guide.

- **Chinese Taipei**

The authors seek to provide a rational interpretation to the seeming ambiguity about identifying the best predictor variables and the thresholds which can be viewed as a basis for the calculation of the countercyclical buffer add-on. Different from previous papers, the candidate variable (i.e., credit-to-GDP gap) is calculated by using both one-sided and two-sided Hodrick-Prescott filters with three different smoothing parameters λ (i.e. 1,600, 144,000 and 400,000). The empirical result shows that the setting of the lower threshold of 2 and the upper threshold of 13 are appropriate for Chinese Taipei. It is noted that high fluctuation in the credit-to-GDP gap can reflect the excess credit condition in Chinese Taipei. Nevertheless, given that the gap is extremely volatile, it's impossible to implement countercyclical capital buffer measure solely using the indicator. As a result, according to this analysis, it seems too conservative for a newly industrialised economy like Chinese Taipei to impose the maximum buffer of 2.5% when the credit-to-GDP gap is just above 10%.

- **Indonesia**

The CCCB is a macroprudential policy introduced by the BCBS. The main objectives of CCCB are for preventing the build-up of systemic risk from the excess credit growth and maintaining credit supply in the downturn. As the member of G-20, Indonesia will implement CCCB since its credit growth is proven to have pro-cyclicality behaviour on the economy. Based on the empirical result, the standard CCCB setting of the BCBS Guidelines is found to be inappropriate for Indonesia. The appropriate main indicator is the bank credit-to-GDP gap and thresholds range between 3 and 6 (L=3, H=6). In addition, some supplementary indicators useful for activating and releasing CCCB are the NPL, CPI and ROA. The Basel III framework in Indonesia came about as a result of the 2008/2009 Global Financial Crisis (GFC). It is BCBS' continuous effort to enhance the banking regulatory The Basel III framework in Indonesia came about as a result of the 2008/2009 Global Financial Crisis (GFC). It is BCBS' continuous effort to enhance the regulatory framework. The proposed implementation of Basel III is expected to complement Basel I and II during periods of stress.

The CCCB would ensure that banks hold sufficient capital that will enable them to absorb unexpected losses when faced with a negative systemic shock and therefore not compromise lending to the real economy.

- **Malaysia**

The aim of this paper is to examine the reliability of the credit-to-GDP gap in signalling financial imbalances for Malaysia. Correlations between each of the macro indicators and the seasonally adjusted GDP growth show a positive relationship, with the exception of the credit-to-GDP gap. The negative correlation for credit-to-GDP implies that this indicator signals a reduction in capital requirements when the GDP growth is strong and therefore demonstrates pro-cyclicality. The paper uses the two approaches (Sarel, 1996 and Kaminsky and Reinhart, 1999) to identify thresholds for the macro-indicators. Based on the empirical evidence, indicators such as the credit growth and asset prices tend to perform better in terms of giving "correct" signals prior to an economic distress. Nonetheless, the analysis suggests that the practical application of the model-based results still needs to be balanced with elements of judgement and discretion.

- **Papua New Guinea**

Authorities in Papua New Guinea (PNG) are yet to commit to the implementation of Basel III and therefore this study is an early research initiative in this direction. With the partial implementation of Basel II, it would require a great deal of progress before the authorities can commit to implementing Basel III. In this research, the credit-to-GDP gap can be used to indicate a possible banking crisis. However, during the period 2002 – 2014, the banking sector in PNG did not experience any banking crisis and therefore using the gap variable as the key indicator may have its limitations. An interesting finding from the analysis is that during the GFC, there was a significant growth in NPLs which was reflected in the decline in the Kina Shares Index (KSI). The gap variable did not quite capture the GFC due to the fact that financial institutions' (mainly banks) lending and deposits do not have significant international exposure. In PNG's case, the maximum credit-to-GDP gap is found to be around 3.6%, hence BCBS' lower thresholds can be accepted. However, based on PNG's credit-to-GDP gap values for the period 2002Q1 to 2014Q2, an upper threshold can be lower than 10. Based on Sarel's estimation method and judgment, a lower threshold of 2 can be set and a more conservative H can be set at 7.

- **Philippines**

The author provides an analysis of appropriate indicators to be used in designing a CCCB in the Philippines. 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. Findings suggest the use of alternative filter iteration, threshold levels and supplementary indicators in implementing the buffer measure. In particular, high frequency financial indicators perform well in the release phase of the buffer. Further, the paper identifies issues on the conduct of the CCCB measure specifically on the optimal buffer add-on to be applied and on the need to design a communication plan that allows for an efficient announcement of the entry and exit decision by regulators.

- **Thailand**

This paper provides an empirical study of the CCCB estimation from Thailand data. Both the credit-to-GDP ratio and credit growth variables are found to have power to capture

the “imbalance” condition in the economy for some time before the actual financial crisis occurred in 1997 to 1998. However, from empirical findings, the results support only the credit-to-GDP variable to be used as a key reference indicator in the CCCB framework to determine the add-on CCCB, along with the NPL variable as a supplementary indicator. The policy preannouncement period is recommended with a lead-time at least 4 quarters, consistent with the BCBS guidance.

- **Vietnam**

In this research, the authors investigate the anchor for setting the level of the CCCB for the State bank of Vietnam. Unlike the other developing economies, early warning indicators for a credit crunch and an economic crisis are not available in Vietnam. However, the non-performing loan ratio, credit-to-GDP gap and VNINDEX (stock index) are chosen as the early signals. The empirical study points out that with HP one-side filter and lamda value equals to 1600, the lower threshold of 3% gap and higher threshold of 13% cap fit in the case of Vietnam’s economy. The lagged value of VNINDEX is found to be correlated with the change in NPL.

Annex Table 3
Summary of Basel III Progress

RCAP: assessment of implementation of Basel III capital regulations (2012–2016)* Table 3

Basel Committee member jurisdiction	Assessment status	(Tentative) publication date of assessment report
European Union	Preliminary assessment	Published October 2012
United States	Preliminary assessment	Published October 2012
Japan	Completed	Published October 2012
Singapore	Completed	Published March 2013
Switzerland	Completed	Published June 2013
China	Completed	Published September 2013
Brazil	Completed	Published December 2013
Australia	Completed	Published March 2014
Canada	Completed	Published June 2014
European Union	Technical work completed	December 2014
United States	Technical work completed	December 2014
Hong Kong SAR	Under way	March 2015
Mexico	Under way	March 2015
India	Under way	June 2015
South Africa	Under way	June 2015
Saudi Arabia**	Planned	September 2015
Russia**	Planned	December 2015
Argentina**	Planned	March 2016
Turkey**	Planned	March 2016
Korea**	Planned	June 2016
Indonesia**	Planned	September 2016

* Assessments of implementation of Basel III standards relating to liquidity, leverage and G-SIBs, and follow-up assessments on capital regulations, will start from 2015.

** The assessment work will be initiated or undertaken during 2015. Ahead of that, these BCBS members will undertake self-reviews based on the RCAP assessment questionnaire.

Source: Implementation of Basel standards; A report to G20 Leaders on implementation of the Basel III regulatory reforms; November 2014 (http://www.bis.org/bcbs/publ/d299.pdf)