Latin American bank capital buffers and the business cycle: Are they pro-cyclical?

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Abstract:

This paper examines capital buffer fluctuations over the business cycle and provides empirical evidence on the determinants of capital buffers for the banking sectors of 13 Latin American and Caribbean countries for the period 2001-2012. The estimation results indicate that there is a negative and significant relationship between regulatory capital buffers and the GDP growth for Argentina, Colombia, Ecuador, Peru and Uruguay, suggesting that capital buffer fluctuates counter-cyclically over the business cycle in these countries. The sign of GDP growth is significantly positive in Bolivia, Brazil, Dominican Republic, Mexico, Panama and Venezuela, indicating that capital buffers behave pro-cyclically. We do not find a significant relationship between business cycle fluctuations and capital buffers in Chile and Paraguay. Adjustment costs, size, profitability and risk are significant determinants of buffers holdings. We present evidence to the fact that the competitive environment affects optimal cyclical behavior, also interacting with the level of financial depth and the stringency of capital regulation.

Keywords: Bank capital buffers; Business cycle; Regulation; Latin American Banking
JEL Classification: G21; G28

1. Introduction

The aftermath of the recent global financial meltdown underlined the importance of macro-financial linkages and the role played by the banking sector in financial markets. When Basel Accord was first established in 1988 (Basel I), the aim was to build a safety net against business cycle fluctuations and market risks, by assuring that banks would hold adequate levels of capital. Banking sectors of countries incorporated into the Basel I Accord were required to hold at least 8% of their Risk Weighted Assets (RWA) in capital. Basel I was replaced by Basel II in 2004 to ensure that minimum capital requirements were more closely linked to banks' risk profiles and supervisory intervention were implied in case of bank failures.

Capital buffers are capital holding of banks exceeding the regulatory minimum. The incentives for banks to hold capital in excess of required minimum are many: to avoid costly intervention, to signal financial soundness to the market, to take advantage of profitable market opportunities and to create a cushion against recessions. Nevertheless, short sighted banks downplay the future benefits of today's capital holdings above the required minimum by decreasing their capital buffer holdings in economic booms. As a result, they are trapped with an insufficient level of capital during an economic downturn. Under these circumstances banks would be forced to deleverage assets and reduce their lending to the market in order to meet the regulatory minimum capital requirements in busts since it is costlier to raise capital through new equities. Hence, the cyclical behavior of capital buffers amplifies the impact of shocks on economic stability through reduced lending. Aiming to prevent the destabilizing impact of countercyclical fluctuation of capital buffers, Basel III require banks to construct capital buffers during economic booms through a "mandatory capital conservation buffer" of 2.5% and through a "discretionary counter-cyclical buffer" of up to another 2.5% in times of

credit booms. Therefore, assessing the cyclical behavior of capital buffers is important for a successful implementation of Basel III.

Regarding the cyclical behavior of capital buffers, the empirical evidence is inconclusive. Ayuso *et al*. (2004), Lindquist (2004), Stoltz and Wedow (2005), Bikker and Metzemakers (2004), Jokipii and Milne (2009) and Shim (2012) find evidence in favor of countercyclical fluctuation of capital buffers in advanced economies. On the other hand, Jakipii and Milne (2009) study commercial, savings and co-operative banks separately, as well as the small and large banks. They find evidence in favor of a counter-cyclical fluctuation of capital buffers for commercial, savings banks and large banks while capital buffers of co-operative and smaller banks fluctuate pro-cyclically. Fonseca and Gonzales (2010) find differentiated patterns in the *levels* of capital buffer holdings across and within developed and developing countries.

The aim of this paper is to assess cyclical patterns of capital buffers empirically for a panel of banks from thirteen Latin American and Caribbean countries. The progressive implementation of Basel II was expected after 2007, the agreed date for implementation by Basel Committee members. Even before that, different analysts warned about the effect of Basel II on the competitive landscape of the region. According to Majnoni and Powell (2003), the multiple options for regulatory capital determination contained in the proposals would most likely created regulatory divergence in the region. Underlying factors were the different levels of market penetration and development in credit rating institutions (standardized approach) and internal risk based approaches. By the beginning of 2000s most of the banking systems in the region had adopted Basel I standards and questions were raised regarding its cyclical effects. Barajas, Chami and Cosimato (2005) examined the economic effects of Basel I in the banking systems of the region. Although they found evidence of increased lending activity and capitalization after its implementation, they also did find an

increased sensitivity of lending growth to changes in their capital ratios. Consequently, the authors expected lending growth to become more procyclical after Basel´s II implementation as capital ratios were expected to reflect, under Basel II, risk factors that vary with the cycle.

The irruption of the global financial crisis in 2008 affected Basel´s II implementation plans in the region. According to a Financial Stability Institute questionnaire sent to the region´s supervisory authorities in 2004, eleven out of the fifteen main countries in the region had plans to implement Basel II during 2007-2009 (FSI-BIS 2004). However, according to the World Bank global Survey Banking Regulation in 2012, only Brazil, Mexico, Peru, Uruguay, Costa Rica and Cayman Islands had fully implemented Basel II in 2011. The rest of the countries declared Basel I to be the regulatory standard in place[1]. Currently, plans for the full implementation of Basel III are underway in Brazil, Mexico and Argentina, member states of the Basel Committee on Banking Supervision and the G-20. As of recent, other countries such as Uruguay and Colombia have been modifying their regulatory chapters to incorporate elements of Basel III, whereas the rest of the region shows reform delay. Thus, both because of the timing of implementation and of the drastic regulatory reformulation after the crisis, the current state of banking regulation in the region is characterized as non-convergent, caught in the middle of uncompleted implementation of both Basel II and III.

To be noticed, the formal adoption of Basel III does not seem to pose a disproportional challenge for Latin American and Caribbean banks. Galindo, Rojas-Suarez and Del Valle (2012) examine initial conditions for implementation of Basel III in Andean countries Bolivia, Colombia, Ecuador and Peru, finding that these countries would have little difficulty in the initial adapting their banking systems to the new standards, even reducing their current levels of regulatory capital. To a similar conclusion arrives Warman (2013)

[1] The survey´s results are found at: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTGLOBALFINREPORT/0,,contentMDK:23267421~pagePK:64168182~piPK:64168060~theSitePK:8816097,00.html

when looking at the main banking systems of the region. Although initial conditions are different, regulatory capital items different to compare, and regulatory standards overlapped, the formal transition to the regulatory standards stipulated in Basel III is reachable by most countries.

However, little attention has been paid to the *de facto* real economic initial conditions and implications of the new philosophy and measures proposed by Basel III, as related to Latin America and the Caribbean. To the extent the new proposals have been calibrated, they have been so in the context of advanced banking systems. The constitution of counter cyclical capital buffers is a central element of the new regulatory package. As capital ratios under Basel I and II were designed to reflect more closely underlying risks in bank´s portfolios, and given the cyclical nature of those risks, the perception have arisen that those frameworks might have contributed to the procyclicality of business cycles since their global implementation[2].

The contribution of this paper to the related literature is to provide new information on the behavior of capital buffers using data from emerging markets in Latin America. There is only a limited number of studies on this issue in the literature. Previous research has mostly focused on developed countries' banking sectors. A few studies use single country data to investigate the behavior of capital buffers for emerging markets[3]. To our knowledge, this is the first paper on the topic that uses cross country data from an emerging market region. Examining the cyclical behavior of capital buffers for the banking markets of developing countries contributes to the literature. Hence, this paper would allow the comparison of results for emerging economies with those of developed economies.

[2] See Borio and Zhu (2008) for an assesstment on the procyclicity of Basel I and II. For fundamental documents that shaped the new regulatory package, see: Brunnermeier M., Crochet A., Goodhart C., Persaud A. and Shin H. (2009): "The Fundamental Principles of Financial Regulation", Genève 11; Basel Committee on Banking Supervision Consultative Document Strengthening the resilience of the banking sector, Issued for comment by 16 April 2010.

[3] See for example, Garcia-Suaza, *et al*. (2012), Gursoy and Atici (2012), and Zheng, *et al*. (2012)

The remainder of the paper is organized as follows. Section 2 introduces the empirical specification and methodology. Section 3 presents data and empirical results. Section 4 concludes.

2. Methodology

We model the capital buffer with a partial adjustment framework to assess the adjustment cost of changing capital and to examine the impact of the business cycle on banks' capital buffer. Following previous literature (Ayuso *et. al.* 2004; Jokipii and Milne, 2009; Shim 2012), the partial adjustment model can be demonstrated as follows:

$$\Delta \mathrm{BUF}_{\mathrm{i,t}} = \alpha(BUF_{i,t}^{*} - BUF_{i,t-1}) + \eta_i + u_{i,t} \ . \quad (1)$$

Here, $BUF_{i,t}$ and $BUF_{i,t}^{*}$ denotes the actual and the optimum capital buffer of bank *i* at time *t*, respectively. The speed of adjustment of actual capital buffer towards its optimum level is measured by the coefficient α. Bank-specific factors that affect banks' capital structure enter the model through η_i. The disturbance term, $u_{i,t}$, is independently distributed with zero mean. By adding $BUF_{i,t-1}$ to both sides of Eq. (1), we obtain the following expression:

$$BUF_{\mathrm{i,t}} = \alpha BUF_{i,t}^{*} + (1-\alpha)BUF_{i,t-1} + \eta_i + u_{i,t} \quad (2)$$

Because the optimum level of capital buffer ($BUF_{i,t}^{*}$) is not observable, it is approximated by the business cycle and bank specific characteristics as in the related literature (Jokipii and Milne, 2009; Stolz and Medow, 2005; Shim, 2012; Garcia-Suaza *et. al*. 2012). Hence, the empirical model is specified as follows:

$$BUF_{i,t} = \alpha_0 + \alpha_1 BUF_{i,t-1} + \alpha_2 CYCLE_t + \delta' X_{i,t} + \eta_i + u_{i,t} \quad (3)$$

where *CYCLE* is a measure of the business cycle at time *t*, $X_{i,t}$ is a vector of bank-specific variables for bank *i* at time *t*, $\alpha_1 = 1 - \alpha$, reflecting costs of adjustment. A negative α_2 indicates an inverse relationship between capital buffer and the business cycle, suggesting that the capital buffer decreases in booms and increases in business cycle busts. Hence, the idea behind this specification is that the effect of business cycle fluctuations determines the build-up of capital buffers (Stolz and Wedow, 2011).

The introduction of a lagged dependent variable among the right hand side variables in Eq. (3) creates an endogeneity problem since the lagged dependent variable might be correlated with the disturbance term. To solve this problem, Arellano and Bond (1991) developed a difference GMM estimator for the coefficients in the above mentioned equation, where the lagged levels of the regressors are the instruments for the equation in first differences. However, Arellano and Bover (1995) and Blundell and Bond (1998) suggest to difference the instruments instead of the regressors in order to make them exogenous to the fixed effects. This leads from the difference GMM to the system GMM estimator, which is a joint estimation of the equation in levels and in first differences. Hence, we use the two-step system GMM estimators.

3. Data and Empirical Results

Data:

Bank level data and GDP figures for 13 Latin American and Caribbean countries were obtained from the Bankscope and World Development Indicators data bases, respectively. Data cover for the period 2001-2012 and consist of an unbalanced panel of commercial, real estate, savings and corporate banks. The countries included are Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela. After reviewing the data for reporting errors, inconsistencies, missing values and extreme values; we eliminate 61 observations with negative equity to total asset ratio and 5 observations with equity to total asset ratio greater than one. Therefore, our sample consists of an unbalanced panel of 621 banks from 13 countries over the sample period.

The dependent and bank-specific variables used in the estimation are defined as follows:

Capital buffer (BUF): Following Jokipii and Milne (2008), capital buffer is defined as the amount of actual capital ratio of banks exceeding the regulatory minimum level of capital. The minimum capital ratio for each country is obtained from the World Bank´s Banking Regulation Surveys for 2000, 2003, 2007 and 2012. Table 1 in Appendix displays the minimum capital requirement ratio for each country in the sample on yearly basis.

Business Cycle (CYCLE): The business cycle is approximated by *GDP* growth variable.

Bank Size (LTA): The natural logarithm of total assets is used to control for bank size in the regression.

Profitability (ROA): The return on assets is used to control the impact of profit on buffer and risk.

Loan loss reserve (LLR): Loan loss reserve ratio is a quality indicator of the loan portfolios of banks as it measures the amount of reserves banks hold to cover potential losses in their loan portfolios[4].

Table 2 reports summary statistics of the key and control variables[5].

(Insert Table 1)

The graphs in Figure 1 plot bank capital buffers and GDP growth rate over the sample period. It is important to mention that the bank capital buffer is defined as the difference between the observed capital ratio (i.e., equity to total assets ratio) of bank *i* in period *t* and the regulatory minimum capital level in the related country. The graphs indicate both negative and positive co-movement between capital buffers and the GDP growth rate[6]. In addition, the impact of the recent global financial crisis on the time series is clear. We can identify two critical sub-periods that can help us to identify cyclical patterns. Indeed, in the initial part of the series, countries were experiencing low growth in the aftermath of the Asian crisis at the end of the nineties. Some countries, such as Venezuela and Argentina experienced sharp recessions and economic turbulence. A period of strong recovery associated with the commodity boom then follows. Around 2009, all the economies in the region experienced a sudden deceleration of growth in connection to the global financial crisis. The quick rebound after 2010 and the remarkable resilience shown by the region has been a matter of discussion in the academic

[4] Nonperforming loans ratio is commonly used in the literature as a proxy for risk. There are many missing values for the nonperforming loans ratio in our data set. Hence, we use loan loss reserve instead due to high correlation with the nonperforming loans ratio.

[5] To avoid confusion in the interpretation of the text, when we refer to capital buffer being procyclical we mean that the coefficient on GDP in the buffer regression is positive. This of course is the optimal economic sense. This has a different meaning from procyclical in the macroeconomic effect sense (a non-optimal amplifying effect on the cycle).

[6] We also calculated the correlation between bank capital buffers and GDP growth rates for the sampled countries. About half of the coefficients are negative. They are not reported but available from the authors upon request.

literature. According to one school of thought, on average Latin American countries seem to have graduated from fiscal and monetary procyclicality, although with heterogeneity in countries´ policy responses (Corbo and Schmidt-Hebbel 2013). On the other hand, authors such as Izquierdo, Romero and Talvi (2008) find the good performance of the region as the results of positive external shocks, vulnerable to reversals. Besides the effect of either better policies, or favorable external conditions on reducing the severity and duration of crises in the region, it is clear that the banking systems showed differential patterns with regard to the cyclical behavior of capital buffers during the period. Thus, factors endogenous to the banking markets in those countries should account for these divergent results in buffer cyclicality.

(Insert Figure 1)

Empirical Results

The two step *system* GMM regression results for 13 Latin American and Caribbean countries' banking sectors are reported in Table 3. The consistency of the *GMM* estimators depends both on the assumption that the error term does not have serial correlation problem and on the validity of instrument. To verify the validity of these assumptions, we use the Arellano-Bond test for the no serial correlation in the error terms and the Hansen test for the instruments. The bottom block of the table reports the specification test results for the regressions[7]. According to these tests all *GMM* equations are properly specified.

The estimation results indicate that there is a negative and significant relationship between regulatory capital buffers and the GDP growth (*CYCLE)* for Argentina, Colombia, Ecuador, Peru and Uruguay, suggesting that capital buffer fluctuates counter-cyclically over

[7] The Arellano-Bond test results require significant *AR*(1) serial correlation and lack of *AR*(2) serial correlation. Moreover, the Hansen test is a test on whether the instruments are uncorrelated with the error term.

the business cycle in these countries. The sign of GDP growth is significantly positive in Bolivia, Brazil, Dominican Republic, Mexico, Panama and Venezuela, indicating that capital buffers behave pro-cyclically. We do not find a significant relationship between the business cycle fluctuations and the capital buffer in Chile and Paraguay.

For each country in the sample, the coefficient of lagged capital buffer is positive and significant, suggesting that adjustment costs are relevant across all countries in the sample. This coefficient is in the interval [0, 1] with higher values indicating slow speed of adjustment (or high cost of adjustment, since $\alpha_1 = 1 - \alpha$) and in turn, banks' access to the capital markets. The speed of bank capital adjustment is the highest in Panama, Mexico and Paraguay (0.746, 0.611 and 0.614) implying that these countries' banks access to capital replenishment is much easier than in other countries in the sample. On the other side, adjustment costs are highest in Argentina and Colombia.

The coefficient of bank size (*SIZE*) is negative and significant for all countries except for Colombia and Peru which implies that the amount of bank capital buffer tends to be lower as size increase[8]. That is, average capital buffers are lower for larger banks in the region. Hence, this finding is in line with the "too big to fail" hypothesis such that large banks would be recipient of government support in case of a financial difficulty and in return they tend to hold less capital buffer. This result also provides empirical support for scale economies, suggesting that large bank enjoy a higher level of monitoring compared to small ones, which cause a reduction of excess capital held. The coefficient of return on assets (*ROA*) has significantly positive sign in most regressions, indicating that when the profitability of banks gets stronger, they will tend to retain more earnings so as to increase their capital buffer. In Mexico and Uruguay, however, banks that earn higher profitability hold less capital buffers.

[8] Garcia-Suaza, Gomez-Gonzalez, Pabon and Tenjo-Galarza (2012) find that only large banks have capital buffers behaving counter cyclically.

Loan loss reserve (*LLR*) has a significantly positive sign in most of the regressions. Hence, in Bolivia, Brazil, Dominican Republic, Ecuador, Mexico, Panama, Uruguay and Venezuela, banks which have a higher expected loss in their loan portfolios tend to increase their capital reserves for meeting the minimum regulatory requirements.

(Insert Table 3)

What factors account for the observed differences in bank buffers cyclical behavior in the region[9]? In other words, what determines that banks in some countries exhibit procyclicality with respect to GDP growth, and do not in others? Table 3 shows different structural country measures of financial depth, regulation, and performance for both groups of countries. As adjustment costs are relevant for all countries in the sample, we present two indicators of financial depth: the ratio of credit to the private sector to GDP, and the stock market capitalization plus outstanding private debt in securities to GDP. Also, as shown by Fonseca and Gonzalez (2010) for a large sample of countries, market power and regulations that affect it through market discipline and scope of activities allowed, are relevant explanatory variables of bank´s observed levels of capital buffers. Market power is relevant because it related to the preservation of the bank´s charter value (Keeley 1990). Banks with large market power have incentives to reduce risk in order to preserve charter value, building capital buffers as a mean to achieve so. Also, Kasman and Carvallo (2013, 2014) find that in the absence of developed capital markets in the region, banks facing increased risk and

[9] In this paper, we have aimed to detect cyclical patterns in the region´s capital buffers. The diversity in cyclical behavior in economic variables across countries is a more general issue. Reinhart, Rogoff and Qiang (2010) study the issue of countries "graduation" from episodes of default, inflation and banking crises. Also, Frankel, Vegh and Vuletin (2013) study graduation from fiscal procyclicality, and Shin and Shin (2011) analyze the cyclical patterns of monetary aggregates and non-core deposits. Graduation from procyclicality can be understood as the acquisition of the ability by countries, to diminish the risk of recidivism in the occurrence of crises in economic activity, cyclically synchronized with monetary, fiscal, external or financial variables.

lowered capital improve cost and revenue efficiency, which is related to market power. Latin American banking´s main capital replenishment channel is internal. Thus, in Table 3 we present different indicators of market competition: Lerner indices and Boone indicators; performance: the Z-scores; and stringency of capital and activity regulations in the region[10].

(Insert Table 4)

As shown in Table 4, when comparing the two groups of countries, several structural differences surface[11]. The average coefficient for the group of countries with statistically significant countercyclical coefficient ("short-sighted banks") equal -0.22, almost the double of those countries with countercyclical pattern (0.12). This could be a sign of asymmetrical intensity of cyclicality in both groups. As noted, costs of adjustment are relevant for all countries. They are also higher for the group of countries with countercyclical coefficient; with average cost of adjustment is 0.84, as compared to 0.54 for the group of countries with procyclical coefficient (forward-looking behavior). There are differences in financial depth could help to explain these higher adjustment costs. Regarding Stock Market Capitalization, the averages reported in both groups would be in different quartiles (2dn. and 3th.). However, we presume that regulation is an important part of the story. Figure 3 shows the relationship

[10] Kasman and Carvallo (2014) estimate common stochastic cost and revenue frontiers for thirteen Latin American and Caribbean countries. From those, they calculate efficiency, Lerner and Boone indicators. Boone (2001, 2008) develops theoretical models that prove that banks with lower marginal costs gain larger market shares. The indicator measures the derivative of banks market shares with respect to marginal costs. The larger this negative effect the more competitive the market is. Positive values are possible and consistent with either extreme collusion or competition on quality. The Z-score is an indicator of financial stability which measures the distance from insolvency. Overall capital stringency measures the extent of regulatory requirements regarding the amount of capital banks must hold. The Overall Bank Activity and Ownership Index measure the range of activities banks are allowed to exercise, and the extent of restrictions on bank´s ownership. The higher the indexes the more stringency (Barth, Caprio and Levine 2001, 2004, 2012).

[11] The differences are descriptive and we do not present here the statistical basis, but nevertheless can help us visualize potential patterns. The statisticals for the variables from Kasman and Carvallo (2014) can be provided upon request. The distributions for the financial development and bank regulation indicators are tabulated in Cihák, Demirgüc-Kunt, Feyen and Levine (2012), and Barth, Caprio and Levine (2001, 2004 and 2012).

between the index of Overall Capital Stringency and both the cyclicality, and the adjustment cost coefficients. There is a clear difference in the average value of this index in both groups. The value of the index for the group of negative cyclicity would be at 0.61 S.D. above the mean value of the year 2000 distribution, whereas the value of the other group would be at 0.35 S.D. bellow the mean value. As argued by Fonseca y Gonzalez (2010), separation of markets is fruitful to market power, which again creates incentives and resources to form capital buffers. However, the values of the index for Overall Bank Activity and Owners is practically the same for both groups. Also, differences in systemic financial stability, as measured by the Z-scores do not seem to be relevant for most of the period, although instability differences widen in the latest period.

There are differences in market power in both groups of countries as measured by Lerner indices and the Boone indicators. A competitive environment could be detrimental to optimal cyclical behavior but this effect could be more strongly felt in the absence of financial depth and stringent capital regulation. Overall, one or a combination of factors seems to be relevant in each of the detected cases of non-optimal dynamic response. To illustrate these points, the case with the strongest countercyclical coefficient in the sample, Argentina, has had the most contested competitive market in the region, stringent capital regulation, low financial stability scores which reflects volatility of earnings, and very low financial intermediation to the private sector. All these factors, in combination, constitute a "deadly embrace" on banks capacity to create capital buffers. On the other side of the spectrum, Brazilian banks operate with high earning capacity, a regulation more amicable to market share and capital formation, and relatively deep financial markets and institutions. Intermediate situations are also present. For example, the cost of adjustment is quite high for Colombian banks, despite the fact that financial depth indicators are normal according to the region's standards. Banks in Ecuador have high financial stability scores, but the country´s

index of capital stringency is the highest in the sample. Stock market capitalization to GDP in Uruguay is the lowest in the sample. Can these factors by themselves create the cyclical patterns we detect in data? It seems instead that is a particular interaction of factors what shapes the underlying conditions for cyclicality of capital buffers in each country.

(Insert Figure 2)

4. Conclusions:

This paper examines the capital buffer fluctuations over the business cycle and provides some empirical evidence on the determinants of capital buffers for the banking sectors of 13 Latin American and Caribbean countries for the period 2001-2012.

The estimation results indicate that there is a negative and significant relationship between regulatory capital buffers and the GDP growth for Argentina, Colombia, Ecuador, Peru and Uruguay, suggesting that capital buffer fluctuates counter-cyclically over the business cycle in these countries. The sign of GDP growth is significantly positive in Bolivia, Brazil, Dominican Republic, Mexico, Panama and Venezuela, indicating that capital buffers behave pro-cyclically. We do not find a significant relationship between business cycle fluctuations and capital buffers in Chile and Paraguay. Adjustment costs, size, profitability and risk are significant determinants of buffers holdings. The results suggest different cyclical patterns of capital buffers held by Latin and Caribbean banks.

These differences in cyclical behavior of capital buffer across countries call for regulatory approaches that would ideally pay closer attention to idiosyncratic elements in the macro-financial setting of each country in the region: regulatory regimes, the general institutional setting, the macroeconomic and policy outlook, the degree of financial development and integration, the particular competitive landscape. These differentiated

patterns should inform the important regional efforts to revamp the regulatory landscape in a harmonized and coordinated way. Basel III contains fundamentally sound guidelines for this revamping. As a number of countries in the region prepare for full implementation of Basel III, the institution of cycle-dependent capital buffers is a central proposal of these efforts. However, initial conditions in different groups of countries are clearly divergent. The optimal timing and mix of instruments and priorities should therefore differ. A comprehensive regulatory approach that simultaneously took into account regulatory competitive and prudential aspects involved is required, at the risk of adopting "short-sighted" solutions to "forward-looking" problems.

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Appendix

Table 1. Minimum Capital Requirements in Latin America, risk-weighted (%)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Argentina	11.5	11.5	11.5	8	8	8	8	8	8	8	8	8
Bolivia	10	10	10	10	10	10	10	10	10	10	10	10
Brazil	11	11	11	11	11	11	11	11	11	11	11	11
Chile	8	8	8	8	8	8	8	8	8	8	10	10
Colombia	9	9	9	9	9	9	9	9	9	9	9	9
D. Rep.	8	8	10	10	10	10	10	10	10	10	10	10
Ecuador	9	9	9	9	9	9	9	9	9	9	9	9
Mexico	8	8	8	8	8	8	8	8	8	8	10	10
Panama	8	8	8	8	8	8	8	8	8	8	8	8
Paraguay	10	10	10	10	10	10	10	10	10	10	10	10
Peru	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.5	9.8	10	10
Uruguay	10	10	10	10	10	10	10	8	8	8	8	8
Venezuela	12	12	12	12	12	12	12	12	12	12	12	12

Source: World Bank´s Banking Regulation Surveys for 2000, 2003, 2007 and 2012 and National Authorities for not contestants.

Table 2. 2001-2008 averages for bank and country variables

	BUF			*CYCLE*			*SIZE*			*ROA*			*LLR*		
	Mean	Stdev	CV	Mean	Stdev	CV	Mean	Stdev	CV	Mean	Stdev	CV	Mean	Stdev	CV
Argentina	0.139	0.220	1.583	0.053	0.063	1.189	12.761	2.017	0.158	-0.001	0.102	-10.200	0.087	0.129	1.483
Bolivia	0.073	0.189	2.589	4.199	1.075	0.256	12.702	1.408	0.111	0.656	2.567	3.913	11.598	15.719	1.355
Brazil	0.097	0.180	1.856	3.422	2.322	0.679	13.771	2.065	0.150	2.241	3.702	1.652	6.426	13.001	2.023
Chile	0.069	0.145	2.101	3.837	2.345	0.611	14.743	1.800	0.122	1.107	1.630	1.472	3.093	2.298	0.743
Colombia	0.046	0.093	2.022	4.265	1.781	0.418	14.638	1.452	0.099	1.959	2.336	1.192	6.270	10.431	1.664
Dominican Republic	0.095	0.161	1.695	5.499	3.666	0.667	11.129	2.098	0.189	2.185	5.264	2.409	5.752	6.387	1.110
Ecuador	0.054	0.139	2.574	4.510	2.168	0.481	12.439	1.713	0.138	1.444	1.650	1.143	6.172	4.866	0.788
Mexico	0.092	0.176	1.913	2.183	3.140	1.438	14.270	1.958	0.137	0.205	6.813	33.234	6.079	7.862	1.293
Panama	0.040	0.110	2.750	6.968	3.275	0.470	13.041	1.403	0.108	1.303	1.642	1.260	2.198	3.016	1.372
Paraguay	0.024	0.069	2.875	3.452	4.356	1.262	12.380	1.153	0.093	1.899	3.284	1.729	5.153	5.260	1.021
Peru	0.033	0.080	2.424	6.167	2.699	0.438	13.979	1.793	0.128	1.782	2.452	1.376	5.701	3.843	0.674
Uruguay	0.129	0.253	1.961	2.499	5.148	2.060	12.124	2.007	0.166	-1.135	8.408	-7.408	10.364	17.545	1.693
Venezuela	0.095	0.260	2.737	4.040	8.288	2.051	13.357	2.039	0.153	3.830	6.898	1.801	6.623	9.390	1.418

Note: *BUF*, *CYCLE*, *SIZE*, *ROA* and *LLR* represent capital buffers, business cycle proxied by *GDP* growth rate, natural logarithm of total assets, return on asset, and loan loss reserves, respectively. Stdev and CV denote standard deviation and coefficient of variation, respectively.

Table 3. GMM Estimation results

	Argentina	Bolivia	Brazil	Chile	Colombia	Dominican	Ecuador	Mexico	Panama	Paraguay	Peru	Uruguay	Venezuela
CYCLE	-0.388*	0.357*	0.119*	-0.002	-0.168*	0.024**	-0.0349*	0.089*	0.014*	-0.015	-0.348*	-0.162*	0.143*
	(0.007)	(0.138)	(0.053)	(0.024)	(0.051)	(0.012)	(0.014)	(0.002)	(0.002)	(0.011)	(0.064)	(0.014)	(0.004)
BUF_{t-1}	0.951*	0.656*	0.563*	0.909*	0.945*	0.696*	0.831*	0.389*	0.254*	0.386*	0.586*	0.895*	0.680*
	(0.003)	(0.028)	(0.058)	(0.041)	(0.059)	(0.004)	(0.005)	(0.001)	(0.003)	(0.058)	(0.026)	(0.003)	(0.001)
SIZE	-0.478*	-4.581*	-1.168*	-0.630*	0.290***	-0.523*	-0.215*	-1.885*	-0.729*	-0.764*	-0.346	-1.650*	-0.333*
	(0.032)	(0.647)	(0.267)	(0.184)	(0.176)	(0.054)	(0.073)	(0.025)	(0.019)	(0.123)	(0.336)	(0.035)	(0.01)
ROA	0.041*	0.418*	0.399*	0.520*	0.098***	0.734*	0.039*	-0.087*	0.923*	-0.152	0.503*	-0.070*	0.330*
	(0.005)	(0.062)	(0.064)	(0.107)	(0.052)	(0.004)	(0.011)	(0.004)	(0.008)	(0.204)	(0.060)	(0.009)	(0.003)
LLR	0.009	0.191*	0.318*	-0.042	0.069	0.387*	0.438*	0.378*	1.408*	0.031	0.119***	0.073*	0.582*
	(0.006)	(0.012)	(0.056)	(0.071)	(0.047)	(0.004)	(0.015)	(0.003)	(0.011)	(0.036)	(0.065)	(0.007)	(0.003)
Constant	9.069*	57.86*	15.87*	9.565*	-3.871	3.775*	0.854	28.770*	7.997*	10.580*	6.484	22.36*	-0.627*
	(0.471)	(7.378)	(4.208)	(3.109)	(2.802)	(0.721)	(0.939)	(0.329)	(0.253)	(1.852)	(5.346)	(0.521)	(0.142)
N	504	80	860	86	133	249	162	325	274	118	121	186	265
Hansen(*p*-value)	0.55	0.77	0.76	0.63	0.99	0.99	0.93	0.94	0.79	0.35	0.99	0.89	0.93
M1*p*-value	0.02	0.17	0.00	0.15	0.02	0.06	0.25	0.06	0.31	0.16	0.06	0.05	0.01
M2*p*-value	0.40	0.11	0.71	0.41	0.22	0.07	0.94	0.96	0.73	0.37	0.35	0.81	0.69

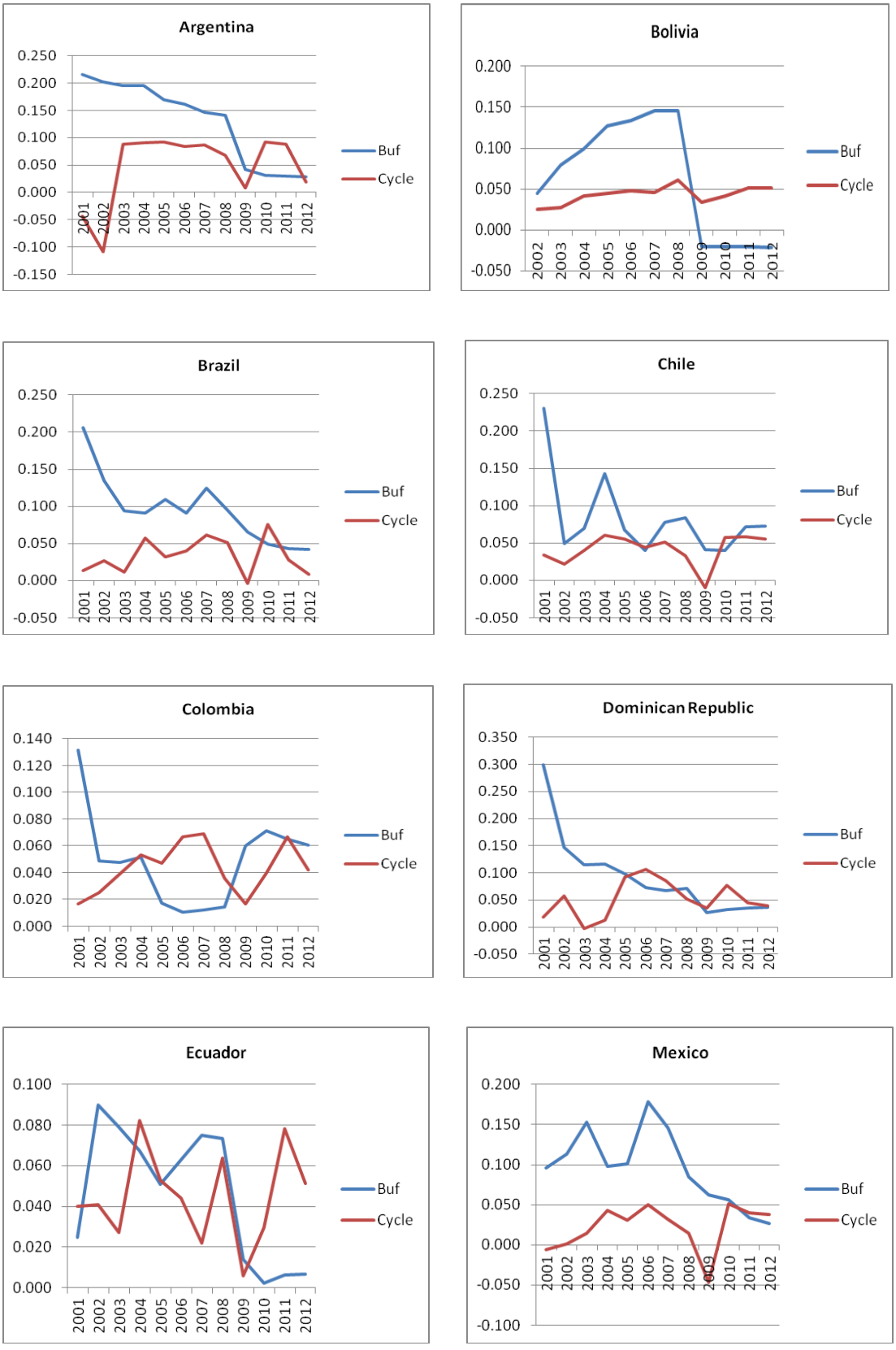
Notes: *CYCLE, BUF, SIZE, ROA* and *LLR* stand for *GDP* growth rate, capital buffer, natural logarithm of total assets, return on assets, and loan loss reserves, respectively. The sample consists of banks from commercial, savings, cooperative and real estate sectors. *, **, and *** denote significance level at 1% , 5% and 10%, respectively. The Sargan/Hansen is a test of the over-identifying restrictions for the *GMM* estimators. *M1* and *M2* are tests for the first-order and second-order serial correlation. *N* denotes number of observations.

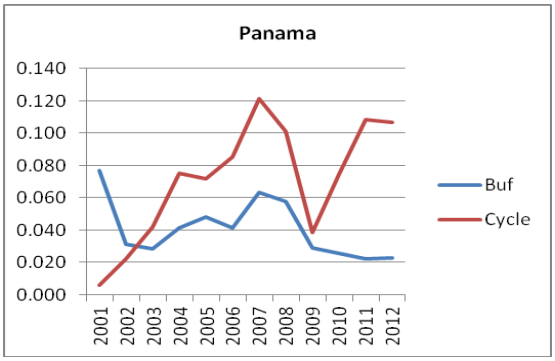
Table 4. Latin American and Caribbean banking: Competition, stability, regulation and financial depth (countries with significant cyclical effect)

	Cyclicality Coefficient	Cost of Adjustment	Lerner	Boone	Z-score	Z-score Weigthed Aver. Commercial Banks	Private Credit to GDP (%)	Stock Market Capitalization + Outs. Private Debt Sec-s (%GDP)	Overall Bank Activity and Owners. Index	Overall Capital Stringency Index
	2000-2012	**2000-2013**	**(2002-2008)**	**(2002-2008)**	**(2002-2008)**	**(2008-2010)**	**(2008-2010)**	**(2008-2010)**	**(2000-2012)**	**(2000-2007)**
Argentina	-0.388	0.95	-0.113	-0.634	7.495	5.3	12.5	20.5	2.44	4.33
Peru	-0.348	0.59	0.208	0.000	17.982	14.6	23	61.4	2.25	4.00
Colombia	-0.168	0.95	0.120	0.049	14.810	15.2	31.1	49.9	3.17	3.00
Uruguay	-0.162	0.90	-	-	-	4.7	22.9	0.4	2.67	4.50
Ecuador	-0.0349	0.83	0.093	-0.001	29.468	22.8	25.7	8.3	3	6.00
Averages	**-0.22**	**0.84**	**0.08**	**-0.15**	**17.44**	**12.52**	**23.04**	**28.10**	**2.70**	**4.37**
Panama	0.014	0.25	0.182	0.374	33.426	22.6	78.7	31.4	2.56	2.67
Dominican Republic	0.024	0.70	0.030	-0.075	13.670	23.6	19.9	-	3.13	3.00
Mexico	0.089	0.39	-	-	-	9.9	17.5	48	2.38	3.67
Brazil	0.119	0.56	0.156	-0.232	16.429	15	45.6	82.5	2.06	4.00
Venezuela	0.143	0.68	0.230	-0.289	9.351	8.4	18.2	1.7	2.85	1.67
Bolivia	0.357	0.66	0.105	-0.218	13.231	24	32	15.7	3.17	2.67
Averages	**0.12**	**0.54**	**0.14**	**-0.09**	**17.22**	**17.25**	**35.32**	**35.86**	**2.69**	**2.94**

Notes: Lerner, Boone and Z-score are three-year averages for 2002, 2005 and 2208 from Kasman and Carvallo (2014). Z-score Weighted Aver. Commercial Bank, Private Credit to GDP (%) and Stock Market Capitalization + Outs. Private Debt Sec-s (%GDP) are financial development indicators from Global Financial Development Database of the World Bank. Overall Bank Activity and Owners. Index., Overall Capital Stringency Index are calculated form WB database "The Regulation of Banks around the World", surveys I, II and III. Sources: Kasman and Carvallo (2014); Global Financial Development Indicators / WB; Levine: The Regulation of Banks Around The World, surveys I, II and III.

Figure 1. Bank capital buffers and GDP growth




Panama
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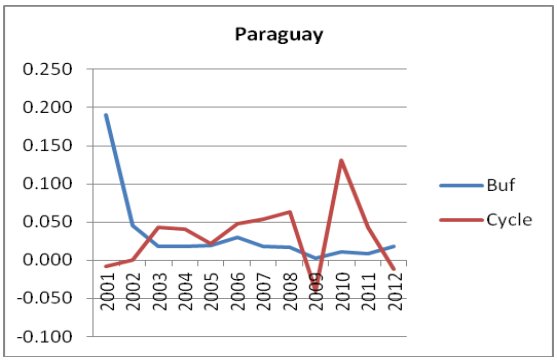
Paraguay
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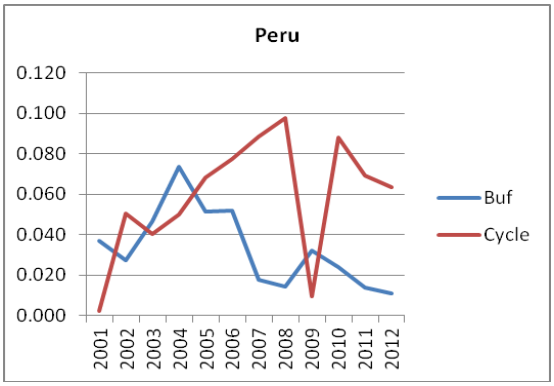
Peru
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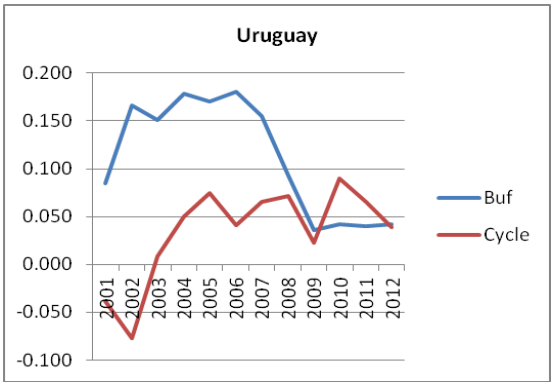
Uruguay
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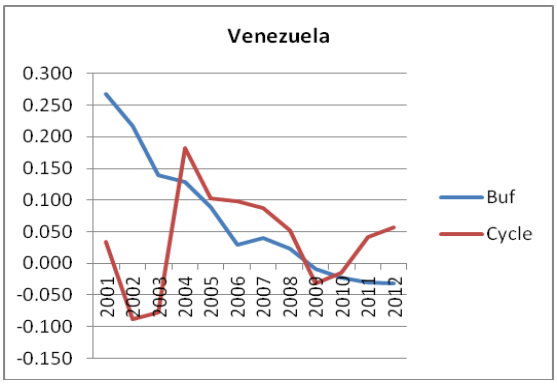
Venezuela
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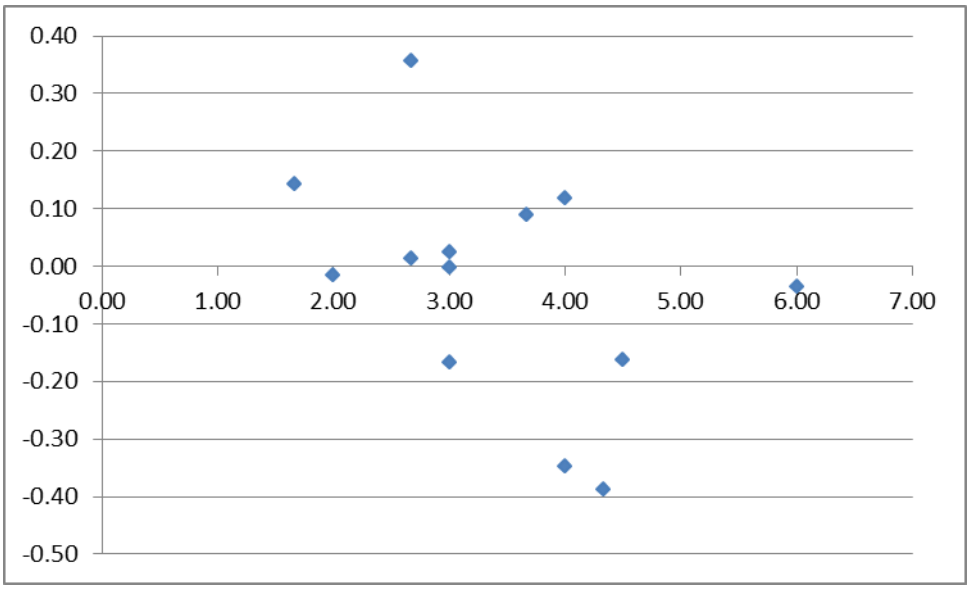
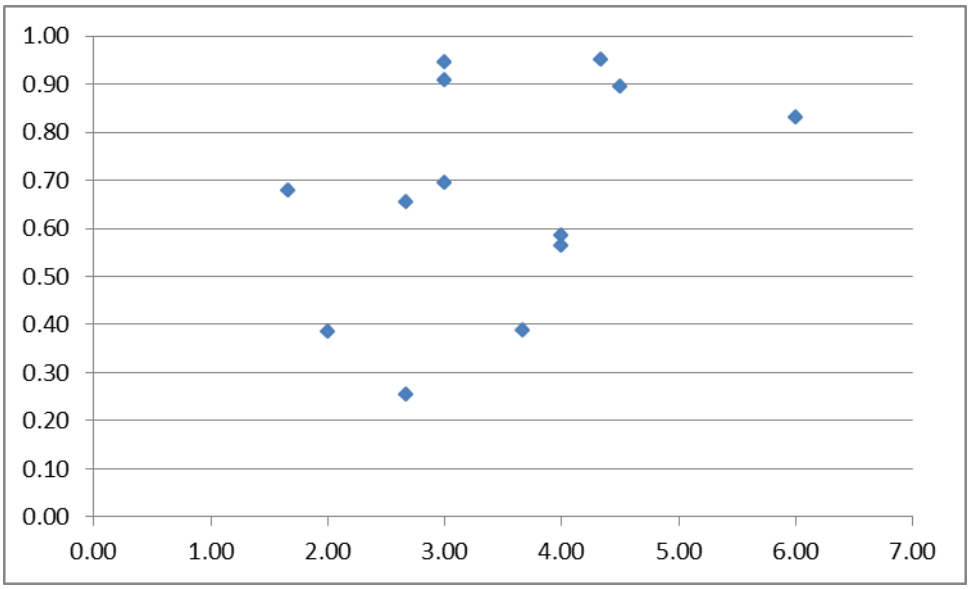
Figure 2. Cyclicality of capital buffers, costs od adjustment and Overall Capital Stringency Index

Capital stringency and cyclical coefficient



Capital stringency and cost of adjustment coefficient



Capital Stringency is meaured in the horizontal axis.