Moving in tandem: bank provisioning in Emerging Market Economies

Andres Murcia and Emanuel Kohlscheen[1]

Abstract

We study the determinants of loan loss provisions and delinquency ratios based on balance-sheets of 554 banks from emerging market economies. Our results show that provisions in EME banks respond mostly to aggregate variables, and very little to idiosyncratic factors. In particular, the bank-specific credit growth rates – usually thought of as a measure of individual risk taking – do not explain the level of loan loss provisions. We do find some evidence that bank-specific earnings and the size of the intermediaries have an effect on provisions. Throughout, the predominant effect, however, is that the level of provisions and actual losses is clearly negatively related to past economic growth and positively related to past aggregate credit growth. We also estimate the forward and backward looking component of provisions finding that provisions respond mainly to past reported losses. These findings suggest that EME banks' provisioning decisions in emerging economies are highly correlated.

Keywords: credit growth, provisions, pro-cyclicality

JEL classification: G21; G28

[1] The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank for International Settlements. The authors are, respectively, Visiting Economist at the Representative Office for the Americas and Senior Economist at Economics for Latin America and the Caribbean at the BIS. We would like to thank Claudio Borio, Hyun Song Shin, Leonardo Gambacorta, Ramon Moreno, Patricio Jaramillo and Rodrigo Cifuentes for the comments and suggestions. We also thank the comments received at the Conference on Banking Development, Stability and Sustainability organized by the Chilean Superintendence of Banking and Financial Institutions (SBIF), at the Workshop on Financial Stability organized by the Research Institute for Development, Growth and Economics (RIDGE) and the Central Bank of Uruguay and at research seminars at the Bank for International Settlements and at the Bank of the Republic-Colombia. Research assistance from Tania Romero and Julieta Contreras is gratefully acknowledged.
Emails: Andres.MurciaPabon@bis.org ; Emanuel.Kohlscheen@bis.org

Introduction

Financial crises are frequently preceded by episodes of rapid credit growth. Several recent studies in the economic literature have pointed out that abnormal credit growth can be taken as an indication of increasing risk taking behaviour by the financial sector and can therefore be used as a leading indicator of financial crises (Borio, 2009; Jorda; Schularick and Taylor, 2011; Schularick and Taylor, 2012; Gourinchas and Obstfeld, 2012).

Nevertheless, credit expansions do not always imply future loan portfolio deterioration. If new loans are provided to solvent borrowers with profitable projects, there should be no significant impact of loan growth on financial soundness indicators. Particularly in emerging market economies (EMEs) credit growth could well be a signal of a healthy process of financial deepening. In this respect, a better understanding of the relationship between credit growth and subsequent financial soundness indicators is particularly important in this context.

The existing literature on the effects of credit growth on financial soundness indicators has developed mainly along two lines. One group of studies has examined the relationship between relevant banking variables and macroeconomic developments. As we explain in more detail below, the main questions of this first strand of the literature are usually related to the pro-cyclicality of the financial sector (see Laeven and Majnoni, 2003; Bikker and Metzemakers, 2005; Packer *et.al.,* 2014). Complementing this approach, other papers have focused on the inter-temporal relationship between bank health and individual risk-taking decisions. According to these studies, the difference between individual credit growth of a particular financial institution and the aggregate credit growth in a given economy is a good proxy for individual risk-taking. Within this second strand of the literature, one study of particular interest is the one by Foos *et al.*, 2010, that analysed the behaviour of advanced economy banks, highlighting the role of idiosyncratic abnormal credit growth as a predictor of poor financial performance.

To better understand financial deepening vs. excessive risk taking in EMEs, our study performs a systematic analysis of the dynamics of loan loss provisions and of non-performing loans. For this, we use information contained in the balance sheets of 554 EME banks from 18 countries in our exercise. We simultaneously evaluate the relative contribution of aggregate and idiosyncratic variables for explaining the differences in bank provisioning behaviour and loan losses. The identification of these determinants by means of a dynamic panel model estimation enables us to better understand some characteristics of banking in these countries and to detect some pro-cyclical patterns.

The results that emerge from our analysis show that provisions in EME banks respond mostly to aggregate variables, and very little to idiosyncratic factors. In particular, the bank-specific credit growth rates – usually thought of as a measure of individual risk taking – do not explain the level of loan loss provisions at all. We do find some evidence that bank-specific earnings and the size of the intermediaries have an effect on provisions. Throughout, however, the predominant effect is that the level of provisions and actual losses is negatively related to past economic growth and positively related to past aggregate credit growth in a clear way. These findings suggest that EME banks' provisioning decisions in emerging economies are highly correlated. Macro-prudential tools based on aggregate variables could therefore be effective to dampen credit cycles and pro-cyclical behaviour.

The remainder of this paper is organised as follows: in Section II we provide a selective review of the related literature. In Section III we describe the empirical approach that we used and discuss the main results. Some concluding remarks follow.

Related literature

The literature on the determinants of loan loss provisions suggests that banks may respond differently to an economic upswing and rising incomes. Some banks might behave in a "myopic" manner, in the sense that they do not internalise the fact that improvement in the debtor probability of default could be only temporary. As a result, their provisioning decisions could reinforce credit cycles. According to this interpretation, we should observe a negative relationship between provisions and economic conditions. Other works have highlighted that credit risk tends to be built up gradually in boom periods, only to be materialised in downturns (Borio *et al.* 2001; Lowe, 2003). In particular, the longer duration of an economic expansion can lead to an upswing in credit as the quality of risk assessments by banks deteriorates. In contrast, for conservative and far-sighted banks, provisions and the lending cycle would be positively related.

To test the relationship between provisions and the business or credit cycles,, some studies have evaluated the relationship between loan loss provisions and GDP growth or credit growth.[2] Bank behaviour is said to be pro-cyclical if the relationship between provisions and credit growth or GDP growth is negative. In other words, during good times, when credit and incomes are increasing, provisions tend to fall. In contrast, during bad times, provisions tend to increase as losses materialise.

By and large, the literature has found a negative relation between economic activity and loan loss provisions (see Bikker and Hu, 2002; Cavallo and Majnoni, 2002; Laeven and Majnoni, 2003 among others) suggesting that provisions increase only when income falls. Findings on the relationship between the credit cycle and provisions are much more mixed. On one hand, Bikker and Metztemakers (2005) find a positive relationship between these variables. On the other hand, studies such as Laeven and Majnoni (2003) and Cavallo and Majnoni (2002) report a negative association.

Another indicator of cyclical behaviour is the relationship between earnings and loan loss provisions. Tests within this literature are generally based on the "income-smoothing" hypothesis. Banks can smooth their earnings by drawing from loan loss reserves if actual losses exceed expected losses and by increasing loan loss provisions in the opposite case. The advantage of this behaviour is that it can reduce the volatility of reported bank profits, diminishing the possibility of using capital in adverse times (see for instance Sinkey and Greenwald, 1991, Laeven and Majnoni, 2003;). Evidence of earnings smoothing has been reported by Packer *et. al.* (2014) for a group of Asian economies.

[2] Packer *et. al.* (2014) argue that there is a "leaning against the business cycle" element in the behaviour of bank provisions.

A second strand of the literature evaluates the inter-temporal effects of credit growth on banks' performance indicators. These works highlight how individual risk taking decisions of banks affect their financial performance. Foos *et al.* (2010) study a group of developed economies and find that loan growth leads, in the following three years, to an increase in loan loss provisions, to a decrease in relative interest income, and to lower capital ratios. Amador *et al.* (2013) evaluate these relationships for Colombian banks. They find that abnormal loan growth is positively and significantly associated with non-performing loans, and negatively and significantly related with bank solvency.

Finally, Bouvatier and Lepetit (2012) and Bushman and Williams (2012) have shown how backward-looking provisioning systems tend to amplify the pro-cyclicality of loan market fluctuations. Too the best of our knowledge, there are no works in the literature that evaluate simultaneously the role of aggregate and individual risk taking variables for explaining differences in health measures of banking sectors based on a representative panel of EMEs.

Empirical Analysis

In order to test for the effect of abnormal loan growth on the financial health of banks (i.e., on provisions for non-performing loan losses), we used micro-level bank balance sheet data from non-public banks for eighteen EMEs[3] for the period between 2002 and 2013. This information was obtained from *Bankscope*.

Our focus on EME banks is motivated by the fact that, so far, the literature has mainly focused on evaluating the effects on credit growth on financial bank health indicators for advanced economies. In addition, financial systems in EMEs tend to be much more bank oriented (see Kohlscheen and Miyajima, 2015), so that developments within this sector typically have larger macroeconomic effects when compared to advanced economies. Also, the pro-cyclicality of the financial sector may deserve particular attention in these economies, which often exhibit larger macroeconomic volatility among others, due to less diversified economic structures and greater exposure to capital flow reversals. Moreover, in the recent past credit growth in EMEs has been much higher than in advanced economies. Between 2009 and 2014, for instance, annual credit growth in the EMEs considered in this study averaged 8.1% in real terms - compared to only 0.5% in the G7 economies. Taken together, these factors suggest that a systematic evaluation of the long-term effects of credit growth on financial health indicators of EME banks is of special interest at the current juncture.

Effects on loan loss provisions and non-performing loans

To evaluate the effects of credit growth on loan loss provisions, we estimate an equation containing the main determinants of this variable. We look at both,

[3] Our analysis includes data for Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Poland, South Africa, Thailand and Turkey.

aggregate factors as well as idiosyncratic ones as possible drivers of provisions. To be more specific, our baseline empirical model is specified as follows:

$$Llp_{i,t} = \alpha + \alpha_1 Llp_{i,t-1} + \sum_{s=1}^{n} \beta_s Medianx_{i,t-s} + \sum_{s=1}^{n} \beta_s ALG_{i,t-s} + \sum_{s=1}^{n} \beta_s \Delta GDP_{i,t-s} + \gamma\, Earnings_{i,t} + \delta Cap_{i,t} + \phi Liq_{i,t} + \upsilon Size_{it} + \theta_i + \tau_t + \varepsilon_{it} \quad (1)$$

where $Llp_{i,t}$ represents the ratio of loan loss provisions to the total volume of loans of institution *i* at time *t* (in logs) and $Medianx_{it}$ the country-specific median bank loan growth rate in year *t*. $ALG_{i,t}$ is the difference between institution *i* annual loan growth rate in period *t* and the median annual loan growth rate in the respective country at time *t*. This variable has been used as an indicator of idiosyncratic behaviour in loan concessions (eg Foos *et al*, 2010). $\Delta GDP_{i,t}$ denotes the annual growth rate of the host country of bank *i* at year *t*. $Cap_{i,t}$ represents the ratio between the capital and the total assets of the respective bank, whereas $Liq_{i,t}$ captures differences in the liquidity positions of financial institutions. This is proxied by the ratio between bank holdings of securities and total assets. To evaluate the effect of earnings on loan provisions, we also included the ratio of total earnings before taxes and total assets as an additional control variable $(Earnings_{i,t})$. Finally, we included $Size_{i,t}$ to capture eventual effects of the size of the respective financial institution. This variable is the log of the value of the loan book in USD (in millions) in any given year. Summary statistics of the variables are presented in Table A1 in the appendix.

To address the issue of endogeneity of regressors, which is a common concern in this kind of exercises, we used the system GMM estimator developed by Arellano and Bover (1995). Our dynamic model specification allows for the fact that bank variables show a tendency to persist over time and tend to be serially correlated. Lagged variables of explanatory variables were used as instruments in the GMM equation. Throughout, we included time and country effects to control for unobserved heterogeneities.

Results of the estimations are presented in Table 1. We present six different estimations in separate columns. In the first column, we present the results of the GMM estimation without including the median loan growth per country as a regressor. The second column includes the bank-specific deviation of credit growth. In the third column, we present the estimation results for the same equation using pooled OLS. In the fourth column, we report the results using the change in the level of loan loss provisions as the dependent variable (DLPROV) instead the ratio of provisions to total loans.[4] The fifth column presents similar estimations considering the delinquency ratio - which is defined as the ratio between Non Performing Loans (NPL) and total loans - as the dependent variable. In this estimation, we used aggregate credit and GDP growth, always controlling for individual bank

[4] We included this specification since the dynamics of the LLP ratio can be explained by changes in provisions or variation in the total loans. To isolate this effect we also present the results using the level of provisions as the dependent variable.

characteristics. Finally, in the sixth column we report the results adding the bank-specific credit deviations as an explanatory variable for NPL ratio.

The statistical tests indicate that the model specifications are valid. In particular, the the Hansen test validates the instruments used in all specifications. The *p-value* of the *J-statistic* is greater than 0.10 in all cases suggesting that we cannot reject the null hypothesis that the instruments can be considered exogenous.

The results indicate that loan loss provisions in EME banks of are driven mainly by aggregate variables. Most notably, the level of provisions responds negatively to changes in GDP growth, a finding that is in line with the conclusions of Bikker and Metzemakers (2005) for advanced economies. Provisions also respond positively to changes in the median loan growth rate in each country. More precisely, an increase in aggregate loan growth leads to a significant increase in loan loss provisions two years later. The negative sign of GDP suggests pro-cyclical behaviour of banks in loan loss-provisioning. This effect is attenuated somewhat by the positive sign of median credit growth. As the magnitude of the estimated coefficients for growth is between 4 to 6 times larger than the coefficients for median credit growth, the pro-cyclical behaviour dominates.

In addition, a question of interest is whether loan-loss provisioning depends on historical losses or future losses. If future losses are an important driver, it suggests that when credit grows fast, expected losses would increase as well, so that general provisions could have counter-cyclical effects. As a first step to addressing this question, we evaluate the effect of the same right-hand side variables on actual losses - calculated as the delinquency ratio (NPL). The results are quite similar to those obtained before (Table 1, Columns V and VI) and support the idea that provisions in EMEs mainly reflect past credit risk losses.

Looking at the bank-specific control variables, we detect a significant effect of earnings on general provisions, which is in line with the earnings smoothing hypothesis: ie when earnings are higher provisions tend to increase. This behaviour is desirable in the sense that banks in EMEs tend to reduce the negative impact of asset volatility on bank capital.

In contrast to the results for advanced economies (Foos *et al*, 2010), however, idiosyncratic credit growth does not seem to affect individual provisions and reported credit losses in EME banks. In other words, bank losses and provisions respond much more to aggregate data than to individual information[5]. This result would seem to indicate a certain extent of group behaviour in provisioning. One possible conjecture is that individual banks may not want to deviate very much from the ratios practiced by their peers in the same jurisdiction.

We did not find evidence that would be supportive of the capital management hypothesis, as the capital ratio does not explain the variation of loan loss provisions in any specification. However, we found that the size of the financial intermediaries does matter, since larger banks tend to exhibit higher loan loss provisions. This result is broadly in line with some previous works that find that larger banks tend to exhibit riskier behaviour and more pro-cyclical patterns than smaller banks (see Jopikii and Milne, 2008; García-Suaza et al., 2012; Carvallo et al., 2015).

[5] We also calculate the long run coefficients of this variable. The effects of idiosyncratic loan growth on provisions are not statistically significant.

Determinants of Loan loss provisions and Non performing loans[1]

Table 1

Dependent variable: $Llp_{i,t}$ (columns I to III) and NPL (columns V and VI),

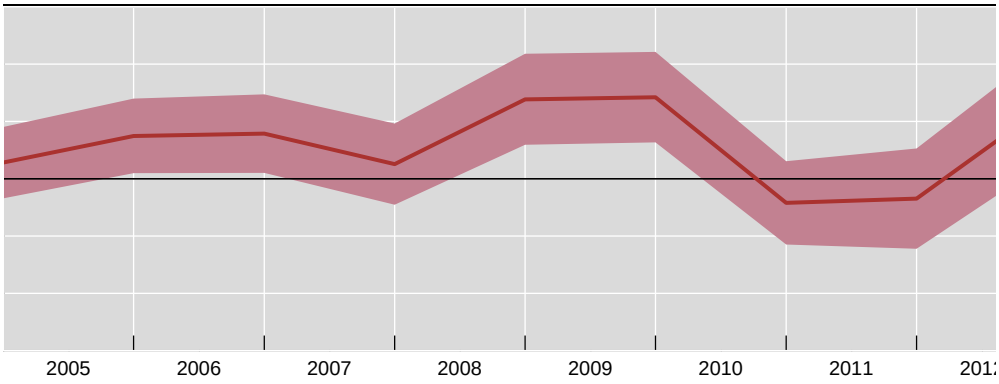
	I	II	III (OLS)	IV (DLPROV)	V (NPL)	VI (NPL)
Lagged dependent variable	0.8102***	0.7706***	0.8786***		0.5841***	0.5582***
	(0.0349)	(0.0386)	(0.00909)		(0.0524)	(0.0586)
$Size_{i,t}$	**0.0766****	**0.0511***	-0.0039	0.0311	**-0.00674***	**-0.01100***
	(0.0332)	**(0.0359)**	(0.0065)	(0.2709)	**(0.00365)**	**(0.00609)**
$Earnings_{i,t}$	**1.7141****	0.0789	**0.5162***	**1.9837****	0.06864	0.05861
	(0.7461))	(0.7979)	**(0.3069)**	**(0.6970)**	(0.06514)	(0.075091)
$Cap_{i,t}$	0.3566	0.7717	-0.1331	0.39055	-0.03463	-0.070399
	(0.6080)	(0.6860)	(0.1700)	(0.6257)	(0.05481)	(0.06820)
$Liq_{i,t}$	0.0520	0.3976	-0.03781	-0.3412	-0.02455	-0.022283
	(0.3215)	(0.2889)	(.0738)	(0.3392)	(0.02723)	(0.029524)
$ALG_{i,t-1}$		0.0000	0.00003			-0.000073
		(0.0004)	(0.0003)			(0.000104)
$ALG_{i,t-2}$		0.0000	-0.0001			0.000044
		(0.0006)	(0.0003)			(0.000101)
$ALG_{i,t-3}$		0.0002	0.0001			-0.000025
		(0.0003)	(0.0003)			(0.000059)
$Medianx_{i,t-1}$	-0.1295	-0.0297	0.0467	0.28628	**0.04340***	**0.045552***
	(0.2938)	(0.2955)	(0.1244)	(0.3276)	**(0.02451)**	**(0.026410)**
$Medianx_{i,t-2}$	**0.8264*****	**1.0927*****	**0.4668*****	**0.9381*****	**0.04079****	**0.032397***
	(0.2397)	**(0.2226)**	**(0.1230)**	**(0.2672)**	**(0.01913)**	**(0.018984)**
$Medianx_{i,t-3}$	-0.1434	-0.0082	0.0783	-0.19061	-0.00358	-0.008559
	(0.2264)	(0.2005)	(0.1124)	(0.24941)	(0.01792)	(0.019261)
$GDP_{i,t-1}$	-0.0423	-0.9580	-1.5771	0.8012	-0.10367	**-0.141597***
	(1.1024)	(1.0308)	(0.4898)	(1.1627)	(0.08363)	**(0.082528)**
$GDP_{i,t-2}$	**-4.6525*****	**-4.4581*****	**-2.2798*****	**-4.0246*****	**-0.25825*****	**-0.222081*****
	(1.1274)	**(0.9535)**	**(0.4842)**	**(1.2533)**	**(0.81019)**	**(0.080790)**
$GDP_{i,t-3}$	1.0092	0.7329	0.0447	1.3763	-0.084184	-0.081296
	(1.0044)	(1.1532)	(0.4782)	(1.0747)	(0.06688)	(0.07600)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of banks	553	471	471	553	554	472
Number of observations	3013	2528	2528	3013	3029	2541
Wald chi-squared	6249.0	5967.2	541.76	314.60	1986.8	1271.9
AB test for AR(2)	0.566	0.766	NA	0.339	0.437	0.499
Hansen test Prob>chi-squared	0.169	0.105	NA	0.198	0.145	0.131

[1] System GMM estimation using the Arellano-Bover dynamic panel estimator, except for the third column – which is based on a simple pooled OLS estimation. Robust standard errors are reported in parenthesis. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Finally, looking at the coefficients of time effects we can identify some aggregate patterns of loan loss provisions over time which can be related to global factors. In particular, since 2002, the highest level of provisions in EMEs was seen in 2009, when the global financial crisis was affecting international markets. (Graph 1).

Time effects of the Determinants of Loan loss Provisions[1]

Graph 1



[1] Robust standard errors used when constructing 95% confidence interval.

Source: Authors calculations.

Backward and forward component of Loan loss provisions

It wasshown in the previous subsection that loan loss provisions and effective delinquency ratios respond strongly to the same determinants, namely, GDP growth and aggregate credit growth. These results indicate that loan loss provisions in EMEs mainly reflect past losses and collective responses. To scrutinize this finding further, we estimated the equation proposed by Bushman and Williams (2012) for our set of EMEs in order to identify the forward and backward looking components of provisions.[6] To be more specific, we estimate the following equation:

$$Llp_{i,t} = \alpha + \alpha_1 Llp_{i,t-1} + \beta_1 \Delta NPL_{i,t-1} + \beta_2 \Delta NPL_{i,t} + \beta_3 \Delta NPL_{i,t+1} + \sum_{s=1}^{n} \beta_s Medianx_{i,t-s} + \sum_{s=1}^{n} \beta_s \Delta GDP_{i,t-s} + \gamma\, Earnings_{i,t} + \delta Cap_{i,t} + \phi Liq_{i,t} + \upsilon Size_{it} + \theta_i + \tau_t + \varepsilon_{it} \qquad (2)$$

The main coefficients of interest are β_1, β_2 and β_3, which evaluate the relationship of loan loss provisions with respect to past, current and future changes in reported credit losses, respectively. The remaining variables in this exercise are equivalent to the ones already presented in Equation 1. Since the objective of provisions consists in covering expected losses (and assuming that the trend of loan

[6] Earlier, Bouvatier and Lepetit (2008) used a comparable specification for a sample of European banks.

losses is predictable to some extent), we should ideally observe a significant positive relationship between provisions and future losses.

The results of the exercise are presented in Table 2. In line with our previous findings, loan loss provisions are clearly related to macro variables as the change of credit and the economic activity. In addition, we find that provisions mainly respond to current and past changes in reported credit losses - since the backward and contemporaneous effects are positive and significant. In contrast, the forward looking component of provisions with respect to future losses is not positive, which suggests that provisions do not anticipate increases in credit losses.

Backward and forward component of provisions[1]

Dependent variable: $Llp_{i,t}$ Table 2

$Llp_{i,t-1}$	0.8371***
	(0.0428)
$dNPL_{i,t-1}$	**0.0410****
	(0.0182)
$dNPL_{i,t}$	**0.2704*****
	(0.0429)
$dNPL_{i,t+1}$	-0.0776*
	(0.0462)
$Size_{i,t}$	0.0360
	(0.0298)
$Earnings_{i,t}$	0.2976
	(0.6485)
$Cap_{i,t}$	-0.5593
	(0.6381)
$Liq_{i,t}$	0.0908
	(0.3291)
$Medianx_{i,t-1}$	-0.0560
	(0.2049)
$Medianx_{i,t-2}$	0.7780***
	(0.2215)
$Medianx_{i,t-3}$	-0.0537
	(0.1939)
$GDP_{i,t-1}$	1.7922*
	(1.0444)
$GDP_{i,t-2}$	-3.6531***
	(0.9766)
$GDP_{i,t-3}$	0.2661
	(0.9315)
Constant	-0.7755**
	(0.3820)
Time effects	yes
Country effects	yes
Number of banks	445
Number of observations	2173
Wald chi-squared	12576.14
AB test for AR(2)	0.190
Hansen test Prob>chi-squared	0.269

[1] System GMM estimation using the Arellano-Bover dynamic panel estimator. Robust standard errors are reported in parenthesis. ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Conclusions

Episodes of excessive credit growth appear to be particularly prevalent in emerging economies. To assess possible risks to financial stability, this paper evaluated the effects of credit growth (and other relevant variables) on loan loss provisions and on delinquency ratios of 554 banks for a representative group of EMEs.

Our results show that provisions in EME banks respond mostly to aggregate variables, and very little to idiosyncratic factors. In particular, the bank-specific credit growth rates – usually thought of as a measure of individual risk taking – does not seem to explain the level of loan loss provisions. We do find some evidence that bank-specific earnings and the size of the intermediaries have an effect on provisions. First and foremost, however, we find that the level of provisions and actual losses are negatively related to lagged economic growth and positively related to lagged aggregate credit growth. At least at the country level, EME banks seem to move in tandem.

Importantly, the strong negative relationship between GDP growth and provisioning suggests pro-cyclical behaviour of EME banks. When the economy is booming, provisions are reduced. They increase only when the cycle turns. This might in part be a reflection of the difficulty of assessing whether improvements in income are permanent or purely transitory. Typically, there is greater uncertainty about business cycle patterns in EMEs, as well as larger exposure to terms of trade shocks which are often hard to anticipate. In other words, banks in EMEs may face a more challenging signal extraction problem than their advanced economy counterparts, which is then reflected in their provisioning behaviour.

Since the basic objective of provisions is that they act as buffers for expected losses - which might be the result of sudden turns in the business cycle - there appears to be space for EMEs to improve their respective systems of bank loan provisioning. In particular, the results of this paper suggest that the design of macro prudential policies based on aggregate indicators could be instrumental for smoothing credit cycles.

References

Amador, J.S, J.E. Gómez-Gonzalez, and A. Murcia (2013): "Loan growth and bank risk: new evidence". Financial Markets and Portfolio Management. 27, 365-79.

Arellano, M., O. Bover (1995). Another look at the instrumental variables estimation of error-component models. Journal of Econometrics 68, 29–51.

Berger, A. N. and G. F. Udell (2004): "The institutional memory hypothesis and the procyclicality of bank lending behavior," Journal of Financial Intermediation 13, 458-495.

Bikker, J. and P. Metzemakers (2005): "Bank provisioning behaviour and prociclicality", Journal of International Financial Markets, Institutions and Money" 15, 141 – 157.

Bikker, J and H. Hu (2002): "Cyclical patterns in profits, provisioning and lending of banks and procyclicality of the new Basel capital requirements" Banca Nazionale del Lavoro Quarterly Review, pp. 143-175

Borio, C., C. Furfine and P. Lowe (2001): "Procyclicality of the financial system and financial stability: Issues and policy options", Bank for International Settlements Working Paper No. 1.

Borio, C. and P. Lowe (2002): "Asset prices, financial and monetary stability: exploring the nexus", Bank for International Settlements Working Paper No. 114.

Borio, C. (2009): "Ten propositions about liquidity crises", Bank for International Settlements Working Paper No. 293.

Bouvatier, V and L. Lepetit (2012): "Provisioning rules and bank lending: A theoretical model", Journal of Financial Stability, Volume 8, Issue 1, Pages 25-31

Bouvatier, V and L. Lepetit (2008): "Banks' procyclical behavior: Does provisioning matter?", Journal of International Financial Markets, Institutions and Money, Volume 18, Pages 513-526

Bushman, R., C.D. Williams (2012) "Accounting discretion, loan loss provisioning, and discipline of Banks'risk-taking", Journal of Accounting and Economics, Volumne 55 pages 1-18

Carvallo, O, A. Kasman, and S. Kontbay-Busun (2015), "The Latin American bank capital buffers and business cycle: Are they pro-cyclical?", Journal of International Financial Markets, Institutions and Money, Volume 36

Cavallo, M., Majnoni, G. (2002) Do banks provision for bad loans in good times? Empirical evidence and policy implications, in R. Levich, G. Majnoni and C. Reinhart (eds), Ratings, rating agencies and the global financial system, Kluwer Academic Publishers, Boston, Dordrecht and London

Cortavarria,L., C. Dziobek, C. Kananaya, A.Song (2000) "Loan Review, Provisioning, and Macoreconomic Linkages" IMF Working Paper no. 00/195.

Dell'Ariccia, G., D. Igan and L. Laeven (2008): "Credit booms and lending standards: Evidence from the subprime mortgage market", IMF Working Paper 08/206.

Demyanyk, Y. and O. Van Hemert (2011): "Understanding the subprime mortgage crisis", Review of Financial Studies 24, 1848 – 1880.

Foos, D., L. Norden and M. Weber (2010): "Loan growth and riskiness of banks", Journal of Banking and Finance 34, 2929 – 2940.

García-Suaza, A., J. E. Gómez-González, A. Murcia and F. Tenjo-Galarza (2012): "The cyclical behavior of bank capital buffers in an emerging economy: Size does matter" Economic Modelling 29, 1612 – 1618.

Gourinchas, P.O, M. Obstfeld (2012) "Stories of the twentieth century for the twenty-first" American Economic Journal: Macroeconomics" 4(1), 226-265

Jorda, O.; M. Schularick, and A. Taylor (2011): "Financial crises, credit booms, and external imbalances: 140 years of lessons," IMF Economic Review 59, 340-378.

Jopikii, T and A. Milne (2008): "The cyclical behavior of European bank capital buffers", Journal of Banking and Finance, 32 (2008), pp. 1440–1451

Kick, T.;T. Pausch, and B. Ruprecht (2013) "The Winner's Curse: Evidence on the Danger of Aggressive Credit Growth in Banking" Mimeo. Deutsche Bundesbank

Kohlscheen, E., K. Miyajima "The Transmission of Monetary Policy in EMEs in a Changing Financial Environment: a Longitudinal Analysis" BIS Working Paper 495.

Leaven, L. and G. Majnoni (2003): "Loan loss provisioning and economic slowdowns: Too much, too late", Journal of Financial Intermediation 12, 178 – 197.

Lowe, P (2003): "Credit Risk Measurement and Procyclicality" In: Kuppers, J.G. , Prast, H.N., Wesseling, A.A.T. (eds), Supervision on a Cress-road, 136-163

Ogura,Y. (2006): "Learning from a rival bank ad lending boom" Journal of Financial Intermediation 15, 535-555

Packer, F., J. Shek and H. Zhu (2014): "Countercyclical Loan loss provisions in Asia" SEACEN Financial Stability Journal 3, 25-58

Sinkey, J. and M. Greenwald (1991): "Loan loss experience and risk-taking behavior at large comercial banks", Journal of Financial Services Research 5, 43 – 59.

Schularick, M. and A. Taylor (2012): "Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870-2008", American Economic Review 102, 1029-1061.

Stiglitz, J. and A. Weiss (1981): "Credit Rationing in Markets with Imperfect Information" American Economic Review Vol. 71, No. 3 , pp. 393-410

Appendix 1

Descriptive statistics

(3,232 observations) Table A1

Variable	Mean	Std Dev	Min	Max
LLP	–3.5330	1.1398	–9.2103	–0.5433
Cap	0.0921	0.0525	0.0016	0.7362
NPL	0.05065	0.0582	0	0.5808
Size	8.7314	1.3005	6.8055	14.1574
Liq	0.2199	0.1189	0	0.5970
ALG	0.0170	0.1624	–0.8471	0.9786
Medianx	0.1610	0.0902	–0.1015	0.5138
Earnings	0.0429	0.0352	–0.3278	0.6266
GDP	0.0529	0.0333	–0.0647	0.1415