

# Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late?

Luc Laeven and Giovanni Majnoni<sup>\*\*</sup>

**Abstract:** Only recently the debate on bank capital regulation has devoted specific attention to the role that bank loan loss provisions can play as a part of the overall minimum capital regulatory framework. Several national regulators have adopted or are planning to introduce a cyclically adjustable requirement for loan loss provisions and the Basel Committee on Banking Supervision is considering how to provide adequate treatment to provisioning practices within a broad bank capital regulatory framework. This paper contributes to the ongoing debate by exploring the available evidence about bank provisioning practices around the world. We find that in the vast majority of cases banks tend to delay provisioning for bad loans until too late, when cyclical downturns have already set in, possibly magnifying the impact of the economic cycle on banks' income and capital. Notwithstanding a considerable difference in patterns followed by banks around the world we find that size and timing of provisions tend to improve with the level of economic development.

JEL classification numbers: G21, G28.

Keywords: banks, bank regulation, loan loss provisions

---

<sup>\*\*</sup> Luc Laeven: email: [llaeven@worldbank.org](mailto:llaeven@worldbank.org). Giovanni Majnoni: email: [gmajnoni@worldbank.org](mailto:gmajnoni@worldbank.org); The World Bank, 1818 H Street, NW, Washington, DC, 20433. Tel: (202) 458 7542; Fax: (202) 522 2031. We are grateful to Franklin Allen, Jerry Caprio, Patrick Honohan, Rick Mishkin, Larry Promisel and Anthony Santomero for useful comments on earlier drafts of this paper. This paper's findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent.

## **1. Introduction.**

Risk-based bank minimum capital requirements tend to have a pro-cyclical effect on the economy (Basel Committee on Banking Supervision, 2000). The deterioration of the quality of bank loan portfolios during economic downturns inevitably increases banks' risk exposure - and therefore the level of capital requirements - exactly when capital becomes more expensive or simply unavailable to weaker institutions.

The discussion on this topic has raged ever since the 1988 Capital Accord was originally enforced in G10 economies and subsequently, following the introduction of Basle-like approaches by most developed and emerging countries around the world. On one side it has become widely perceived that risk exposures need to be explicitly mirrored in the level of bank capital if regulatory arbitrage is to be avoided and bank stability pursued. On the other side, potential negative externalities of capital regulation have been stressed, pointing to the contraction of credit supply that higher capital requirements may generate during economic downturns. In general, critics of the solvency ratios discipline warn that controlling individual risk positions may not always minimize systemic risks and strict capital standards may, for instance, have aggregate undesirable liquidity effects.

The discussion has become more animated in the last couple of years as a consequence of the ongoing revision of the old Basle Capital Accord. This paper contributes to the ongoing debate by focusing on a frequently ignored aspect of bank capital regulation: the role of bank loan loss reserves as a component of bank regulatory capital. The question addressed is twofold. First, are there good reasons – conceptual *and* empirical - for a specific regulation of loan loss reserves within the general regulation of

solvency ratios? Second, is it likely that a distinct treatment of loan loss reserves may affect the pro-cyclical features of capital regulation?

Following what appears to be the consensus view among practitioners and analysts of risk management we relate the volume of bank capital to the size of unexpected credit losses and loan loss reserves to the size of expected losses. We also argue that, consistently with this view, loan loss reserves should be left free to fluctuate over the cycle and comply with a minimum requirement to be respected on average over a predefined period and not at every single moment in time. A constant minimum requirement would therefore apply to economic capital and an average minimum requirement would instead apply to loan loss reserves. This approach would clearly strike a balance between the supporters of the opposing views of a fixed versus adjustable solvency regulation, but its relevance can hardly be defined at a theoretical level. Only an empirical verification can show whether bank managers are already pursuing a desirable pro-cyclical cyclical management of loan loss provisions and reserves, making additional regulatory incentives useless.

This paper therefore proceeds to analyze the cyclical patterns of bank loan loss provisions followed by large commercial banks in different geographical areas of the world. We anticipate some of the relevant results, noting that clearly different patterns prevail according to the location of the banks. Bankers on average create too little provisions in good times and are then forced to increase them during cyclical downturns magnifying losses and the size of negative capital shocks. These patterns are considerably diversified within the group of industrialized countries as well as within emerging

economies. Larger and more timely provisions, though, appear to be positively affected by the level of economic development.

The paper is structured as follows. Section 2 draws from the current debate on the cyclical impact of banks' capital requirements. Section 3 discuss the role of bank loan loss provision in the current debate of banks' minimum solvency ratios. Section 4 describes the empirical analysis and the data. Section 5 reports the empirical results, and Section 6 concludes.

## **2. Bank capital requirements and the economic cycle.**

The cyclical effects of bank capital regulation have been thoroughly analyzed by a wide theoretical and empirical literature that has flourished in the 1990s following the introduction of the 1988 Capital Accord. The concern raised by academic and policymakers in the wake of the new regulation was that new higher capital ratios could lead to a reduced credit supply in periods of economic slowdown.

Concerns were twofold. On one side there was the preoccupation that the shift to a new regulatory regime could impact negatively on the supply of credit with a once for all effect. A second and more generalized concern was that a risk-based capital regulation by increasing capital requirements might increase the likelihood of capital shortages during recessions potentially reducing the supply of credit to the economy. The expression "capital crunch" was coined in the early nineties to characterize the

simultaneous shortage of capital and the contraction in the supply of new loans that affected banks in New England during the early 1990s recession in the United States<sup>1</sup>.

A capital crunch could result in the reduction of total bank assets or alternatively in a shift toward less risky assets such as government bonds. An extensive survey of the empirical evidence available for industrialized economies, has concluded that “there is some evidence that bank capital pressures during cyclical downturns in the US and in Japan may have limited lending in those periods and contributed to economic weakness in some macroeconomic sector” (Basel Committee on Bank Supervision, 1999). Recent empirical evidence shows that the introduction of more severe capital regulation may have reduced bank credit supply also across emerging economies (Chiuri et al., 2002).

These concerns have recently been addressed by policy makers as well. The Financial Stability Forum, for instance, has raised the question whether several features of the new capital regulation currently discussed by the Basel Committee on Banking Supervision could increase the cyclical fluctuations of the economy. In response, the Basel Committee has confirmed that risk-based capital requirements are inevitably pro-cyclical (more capital is required during recessions exactly because credit risks in banks’ portfolios increase in cyclical downturns) and suggested that the cyclicity question should be addressed by means of different instruments. For example, national supervisors (under Pillar II of the new accord) could request banks to comply with higher than minimum capital requirements and leave bank capital free to fluctuate above that level.

---

<sup>1</sup> See Bernanke and Lown (1991) and Peek and Rosengren (1995) for evidence in favor of the presence of a capital crunch during the 1990-91 recession in the US. A contrary view is taken by Berger and Udell (1994).

At a theoretical level, an explicit treatment of the impact of capital requirements on the level of economic activity is provided by Holmstrom and Tirole (1997) in a model that provides a rationale for applying lower solvency ratios in recessions. They find that, in a world where agents both in the real and in the financial sector may be capital constrained, market-determined solvency ratios are pro-cyclical, i.e., they are higher during expansions and lower during recessions. More precisely, they show that a negative shock to banks' capital negatively affects the level of economic activity and that the lower level of investment generated by the capital crunch requires a reduction of market determined solvency ratios.

Tirole and Dewatripont (1994) also remark that the lack of discrimination between idiosyncratic and macroeconomic shocks may have undesirable effects negatively affecting bank managers risk taking incentives. Bank managers would in fact be punished both for idiosyncratic shocks, that are under their control, and for macroeconomic shocks, that are independent from their control. They conclude that Basle standards are “excessively tough on bank managers in recessions”.

How can concerns about the cyclical effects of a risk based capital regulation be reconciled with the Basel Committee assessment that risk based capital requirements are a necessary ingredient of financial stability? This paper suggests that a compromise between these opposing position may in fact exist. The suggested reconciliation is based on the recognition that bank capital and bank loan loss reserves perform different functions and that therefore their regulatory requirements could differ. For example, while capital may be regulated by a fixed minimum requirement, loan loss reserves may

be required to meet a minimum requirement on average over a predefined period, allowing them to fluctuate over the cycle.

### **3. Loan loss reserves and banks minimum capital requirements.**

Current minimum solvency regulations commonly refer to a particular notion of capital called “regulatory capital” which differs from “economic capital” and that results from the sum of Tier 1 and Tier 2 capital (Berger et al., 1995). The bulk of Tier 1 capital is represented by paid-in capital and retained earnings, while Tier 2 capital includes general loan loss reserves and a variety of bank liabilities characterized by a lower degree of seniority with respect to other non-capital bank liabilities. The sum of Tier 1 and Tier 2 capital represents the numerator of the solvency ratio and needs to meet minimum regulatory requirements.

We suggest that a reconciliation of the different views about banks capital requirements could be envisioned by considering a partition of regulatory capital based not only on seniority considerations - as is the case for Tier 1 and Tier 2 capital - but also and foremost on risk management considerations. Following the general consensus among risk management analysts and practitioners, economic capital should be tailored to cope with unexpected losses, and loan loss reserves should instead buffer the expected component of the loss distribution. Coherently, loan loss provisions required to build up loan loss reserves should be considered as a cost – that may be delayed in time but eventually will realize – differently from earnings which affect the stock of capital. A more detailed description of the conceptual difference between loan loss reserves and provisions and capital and earnings is provided in Appendix 1.

We can show that a loan provision management coherent with an increase of loan loss reserves in good time and a decrease in bad times reduces bank profit volatility and the probability of a negative shock to economic capital. For simplicity, consider a bank with only loans as assets. Let  $L$  be the amount of bank loans,  $r_L$  the lending rate and  $r$  the average cost of funding. In this case, net interest income equals  $L \cdot (r_L - r)$ . Let bank profits ( $p$ ) be expressed by the difference between net interest income, operating costs ( $OC$ ) and the amount of asset depreciation ( $AD$ )

$$p = L \cdot (r_L - r) - OC - AD \quad (1)$$

Let the lending rate ( $r_L$ ) be defined as the sum of the risk-free interest rate ( $r_f$ ), the pro-rated (unconditional) expected loss ratio  $E(d)$ , the level of unit operating costs ( $c$ ), and the level of risk premium ( $k$ ):

$$r_L = r_f + E(d) + k + c \quad (2)$$

By substituting equation (2) in (1) and abstracting from operating costs (we assume that  $c \cdot L = OC$ ), we have that profits may be represented by the following equation:

$$p = L \cdot [(r_f + k) - r] + (L \cdot E(d) - AD) \quad (3)$$

It is clear that, if asset depreciation is kept equal to the value of unconditional expected losses ( $AD = L \cdot E(d)$ ), the volatility of bank profits is not affected by the fluctuations of credit losses over the cycle. To keep asset depreciation ( $AD$ ) constant is sufficient for loan loss provisions ( $LLP$ ) to compensate the difference between realized credit losses and average credit losses by taking positive values ( $LLP > 0$ ) during cyclical expansions



and negative values ( $LLP < 0$ ) during downturns. As a result, loan loss reserves will increase in good times and decrease in recessions.

Let us now consider, as an example, the extreme case where provisions are null and credit losses have a bimodal distribution over the cycle. In this case during cyclical downturns  $AD$  would reach high values ( $AD^H = L * d^H$ ) while low values ( $AD^L = L * d^L$ ) would prevail during booms. Expansions would boost profits ( $p^H > p$ ) and downturns would possibly generate losses ( $p^L < 0 < p$ ) and negative shocks to capital.

The technique of dynamically adjusting  $LLP$  over the cycle - often called statistical provisioning (Fernandez de Liz et al., 2000) - is therefore coherent with the cyclical oscillations of reserves proposed by Holmstrom and Tirole (2000), giving flexibility to regulatory capital (Tier 1 and Tier 2) and also avoiding (or reducing) negative shocks to economic capital (the core component of Tier 1). From a regulatory viewpoint the flexibility of loan loss reserves requires only that regulatory requirements be met on average over a predefined time interval and not continuously over the same time period<sup>2</sup>.

The application of this approach to the current Basel regulatory setting (where general loan loss reserves are allowed to reach up to 1.25 per cent of risk weighted assets) would translate in a minimum capital requirement of 6.75 per cent of risk-weighted assets and an average requirement for loan loss reserves of 1.25 per cent of risk-weighted assets, to be met over a pre-defined number of years (defined according to the average length of an economic cycle). The level of regulatory capital would therefore vary over the cycle

---

<sup>2</sup> It is interesting to observe the similarity with the regulation of compulsory reserves on bank deposit, where several countries have moved from a fixed ratio to be met at each point in time to an average

between a maximum of 9.25 per cent and a minimum of 6.75 per cent of risk-weighted assets.

From a practical perspective this additional complication of bank solvency regulation could be avoided should bank managers already face a proper set of incentives and follow “virtuous” pro-cyclical provisioning practices. We therefore turn to the empirical analysis of prevailing loan loss provisioning practices around the world where different fiscal, accounting, and regulatory regimes may prevail and affect provisioning patterns.

We could face two general situations. In the first, provisions would follow a pro-cyclical (and desirable) pattern by which loan loss reserves are built up in good times and depleted in bad times signaling a prudent pattern that does not require any additional set of incentives. In the second case, where loan loss reserves follow an anti-cyclical pattern by remaining low in good times and increasing in bad times, bank regulation may be revised to provide a new set of incentives.

#### **4. The estimation procedure and the data.**

To verify the nature of the relationship between banks’ earnings and to test our hypotheses about the determinants of banks’ provisioning decisions, we estimate the following econometric relationship:

$$LLP_{i,t} = \mathbf{a} + \mathbf{b} \cdot EBP_{i,t} + \mathbf{g} \cdot L_{i,t} + \mathbf{d} \cdot LG_i + \mathbf{h} \cdot A_i + \mathbf{J} \cdot T_t + \mathbf{e}_{i,t} \quad (4)$$

---

requirement to be met over the reserve holding period. The purpose, as in this case, was that of avoiding undesired negative externalities of prudential regulation on market liquidity.

where loan loss provisions over total assets ( $LLP$ ) for bank  $i$  at time  $t$  are a function of profits before tax and loan loss provisions over total assets ( $EBP$ ) for bank  $i$  at time  $t$ , total loans over total assets ( $L$ ) for bank  $i$  at time  $t$ , loan growth in real terms ( $LG$ ) for bank  $i$  at time  $t$ , the natural logarithm of total assets ( $A$ ) for bank  $i$  at time  $t$ , and year dummies ( $T$ ). The dependent variable of the regression in (5) is the level of loan loss provisions scaled by total assets. Our critical explanatory variable is given by bank income before taxes and provisions. We also control for bank asset portfolio composition, its risk profile and its size. We use the ratio of loan to total assets as a proxy of portfolio composition and we expect provisions to be positively related to the loans' share. As proxy of credit risk exposures we use the real growth rate of bank loans. This indicator is thought to be positively associated with bank risk, given that rapid growth of bank lending is generally associated with lower monitoring efforts and a deterioration of the quality of loan portfolios. A prudent bank should therefore show a positive association between the amount of loan loss provisions and the growth rate of its loan portfolio. We add the logarithm of total assets to control for a potential size effect: larger banks are expected to be better equipped to manage their risk exposure or simply may benefit from larger portfolio diversification opportunities. Year control dummies are intended to catch time-specific effects such as trends in the regulatory stance.

In order to capture both economic upswings and downturns we need to use bank data for a sufficiently long period. We collect bank balance sheet information from Bankscope for the period 1988-99. This period captures both the economic slowdown in the US of the early 1990s (Peek and Rosengren, 1995) and the following upswing in the mid and late 1990s. For other countries this period captures at least one business cycle,

and for certain countries, notably the East Asian countries, an economic crisis (during 1997-98). Bankscope data refer to the set of large commercial banks in each country, for which accounting data are believed to be of better quality. Where possible we also use consolidated balance sheets data. We include in our sample the countries that had over the sample period at least three commercial banks recorded in the Bankscope database. We have then eliminated the banks that over the sample period had less than three consecutive years of balance sheet observations, in order to control for the consistency and quality of bank reporting. Finally, in order to minimize the effects of measurement errors and outliers we have filtered out the bank/year observations that exhibited one of the following features:

- a ratio of loan loss provisions over total assets greater than 10%;
- a ratio of earnings before tax and provisions over total assets larger than 10%;
- a ratio of total loans over total assets smaller than 10 % or larger than 90%;
- a growth rate of bank loans in real terms larger than 50% in absolute value.

The resulting sample includes 37 countries<sup>3</sup>, with a total of 1,205 banks.

Table 1 provides some descriptive statistics about the variables in our estimation sample. The ratio of loan loss provisions to total assets equals 0.56 per cent on average (with a standard deviation of 0.84 per cent) and the ratio of earnings before taxes and provisions to total assets equals 1.6 per cent (with a standard deviation of 1.2 per cent). Loans represent 57.8 per cent of banks' asset portfolios on average and the average real rate of loan growth is equal to 4.2 per cent. The average real per capita GDP of the

---

<sup>3</sup> The final sample of countries is: Australia, Belgium, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Greece, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Korea, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States, and Uruguay.

countries in our sample equals 2,200 US dollars, and ranges from 500 to 45,000 US dollars. A detailed description of the source and of the construction of each individual variable is provided in Appendix 2.

Table 2 presents the correlation matrix of the regression variables. The correlations indicate a statistically significant correlation between loan loss provisions and each of the explanatory variables. The correlation between loan loss provisions and earnings before tax and loan loss provisions is around 17 per cent.

We use both fixed effects and random effects regressions to allow for bank-specific effects. The Hausman test indicates that we should rely on the random effects estimates rather than the fixed effects estimates in most specifications. We therefore only report the random effects regression results with their respective Hausman test statistics.

## **5. Estimation Results.**

Table 3 presents the regression results for the whole sample. We find a positive relationship between the ratio of loan loss provisions over total assets and bank earnings, consistently with previous results for the US market (Greenwald and Sinkey, 1988). At first sight, therefore, banks in our sample seems to have followed on average an income smoothing pattern. The ratio of loans over total assets has the desirable positive sign, while the loan growth rate, contrary to expectations, has a negative coefficient. Banks appear to have increased the amount of provisions together with the share of loans in their portfolio but at the same time they have been less prudent during periods of rapid credit and asset growth. We do not find a significant size effect: total bank assets are not

related to the level of loan loss provisions once individual bank features have already been captured by the random effects. The time dummies, not reported in the table, indicate a decreasing trend over the sample period.

To allow for an asymmetric pattern of loan loss provisions during periods of positive and negative earnings, we interact the earnings variable with a dummy variable that takes value of one when earnings are negative and zero elsewhere (Column 2 in Table 3). The results indicate that banks make higher provisions when they incur losses<sup>4</sup> than when they generate a positive level of income before provisions and tax. This implies that during cyclical downswings banks eat into their capital to make provisions for loan losses, and that therefore on average banks do not provision enough during good times to cover losses during bad times.

The relation between bank earnings and loan loss provisioning is expected to be highly country-specific. In particular, it is expected that banks in developing countries experience more difficulty in smoothing their income than banks active in more developed economies due to the lack of adequate incentives and a poorer level of information. To allow for a country-specific relation between bank earnings and loan loss provisioning we interact the earnings variable with the level of GDP per capita (Column 3 in Table 4). We find that the positive link between bank earnings and provisions is stronger for countries with a higher income level, suggesting that pro-cyclical behavior of loan loss provisioning is higher in developed countries than in developing countries.

Column 4 in Table 3 presents the regression results with both the negative earnings dummy and the level of income. We still find that banks provision more when

---

<sup>4</sup> Note that negative EBP times the negative regression coefficient of the interacted term (negative earnings dummy\*EBP) implies a positive effect (increase) on provisions.

they generate negative earnings but the level of per capita GDP is no longer significant. The possibility of a non-linear relation between our proxy of development and the quality of bank provisioning and risk management has suggested to run additional separate regressions for different subsets of countries.

To further analyze the different behavior across banks located in countries at different level of development we therefore ran a series of separate regressions for banks active in different regions. For this purpose we consider four different regions: Europe, US, Latin America and Asia. “Europe” includes Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and United Kingdom; “US” refers to the United States of America. “Latin America” includes Chile, Colombia, Mexico, Peru, and Uruguay; and “Asia” includes India, Indonesia, Korea, Malaysia, Pakistan, Philippines, and Thailand. The results are presented in Tables 4 and 5. The regional regressions have two advantages over the whole sample regressions. First, they allow for cross-regional differences in each of the regression coefficients. Second, the regional regressions do not suffer from an overrepresentation of banks from one region, unlike the whole sample regressions, where US banks represented a very large share of the overall sample.

Table 4 reports the results for the four regions when no distinction is made between periods with positive and negative earnings. Table 5 shows the regression outcome when the dummy for period of losses is added. For all the four regions we find that banks with negative income (before tax and provisions) make more provisions than banks with positive income. This effect, however, is stronger for the Asian and Latin America countries, or in other words for developing countries. This suggests that

insufficient provisioning during good times is more common practice among banks in Latin America and Asia than among banks in Europe and the US. Among banks with positive income we find that the positive link with bank earnings is confirmed for banks located in Europe, US and Latin America, but not for Asian banks. The average positive link between earnings and loan loss provisions is, however, stronger for US and European banks than for Latin American banks. This finding is consistent with the fact that Latin American financial systems suffer to a larger extent from poor corporate governance than their US and European counterparts.

Overall, the regional results suggest that the loan loss provisioning behavior of Asian banks is the least pro-cyclical among the four considered regions. First, there is no significant positive link between earnings and loan loss provisions for Asian banks with positive income. Second, Asian banks with negative income provision much more than their US, European and Latin American counterparts. This finding may be consistent with the recent financial turmoil during 1997-98 in the East Asian countries, when it was revealed that many East Asian banks did not set aside adequate provisions in the 1990s, when credit growth was still strong, generating a level of loan loss reserves vastly inadequate when compared with the available level of capital and the amount of loan losses.

The negative relationship found earlier for the whole sample between credit growth and loan loss provisioning is consistent across each of the four regions. Assuming that credit growth is a good proxy for bank risk, this suggest that banks across the globe tend to underprovision in situations of exuberant markets.



The amount of loans over total assets is positively related to the level of loan loss provisioning only for European and US banks, showing a prudent behavior that is not shared by banks located in emerging countries. Banks located in Latin America and in Asia also show a larger negative relation with loan growth than European and US banks confirming a more questionable approach to loan loss provisioning.

The absence of a size effect that we found for the whole sample is consistently confirmed for each of the four regions indicating that there does not seem to be any systematic difference in the degree of loan loss provisioning between large and small banks.

Finally, although not reported in the tables we find differentiated and significant time patterns across the four different regions. For example, in the US case we find that the level of loan loss provisioning has been decreasing consistently over time during the 1990s. This finding is consistent with changes in the US regulation on bank minimum capital that have diminished banks' incentive to build up loan loss reserves. From 1992 onwards in fact, with the introduction of the Capital Accord in the US, loan loss reserves were no longer counted as a component of Tier 1 capital, but were counted towards Tier 2 capital (up to 1.25% of the bank's risk-weighted assets). Hence, from the perspective of compliance with regulatory capital requirements, it became much more effective for US banks to allocate income to retained earnings (entirely included in Tier 1 capital) than to loan loss reserves (only partially included in Tier 2 capital).

## **6. Conclusions**

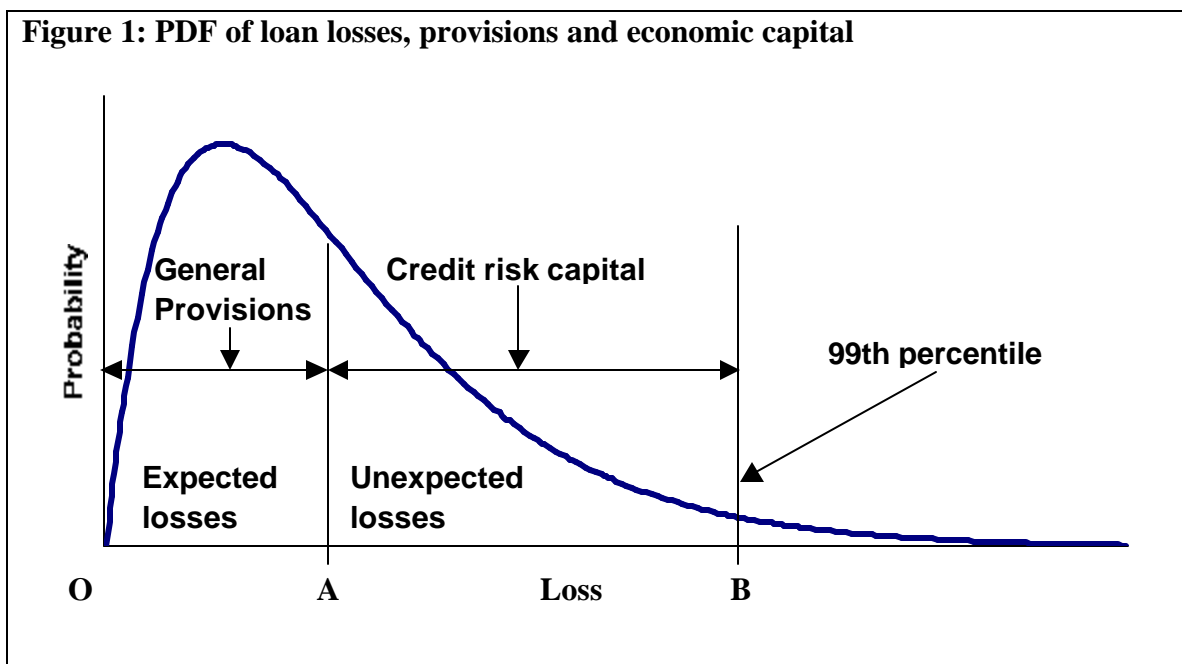
This paper has suggested that among potential benefits deriving from a risk-based regulation of loan loss provisions and reserves we should include a beneficial dampening of the pro-cyclical effects of capital regulation. The econometric evidence shows that banks on average postpone provisioning when faced by favorable cyclical and income conditions until negative conditions set in. As a result of very different regulatory and institutional frameworks, rather differentiated provisioning behaviors prevail among banks located in different geographical areas. Not only differentiated patterns prevail among countries at different levels of development, but also within industrialized economies and within emerging countries. Better level of development tends to be conducive to more prudent patterns.

While it is becoming increasingly clear among bank regulators that more explicit recognition should be paid to the problems associated with inadequate provisioning policies, the solution is not easy to define or to envision as a result of the complicated interaction of accounting, fiscal and prudential requirements and responsibilities that are particularly hard to extricate.

This paper provides some new empirical evidence that stresses the importance of new developments in this area of bank regulation. It also shows that while progress may benefit all countries, inclusive of more developed ones, it has a particular bearing for the stability of emerging banking systems.

## Appendix 1: Loan loss provisions, reserves, and expected losses.<sup>5</sup>

Although regulatory capital is intended to provide an adequate buffer against adverse occurrences to banks' balance sheets it is not the only relevant buffer bankers can resort to. The prevailing conceptual framework, summarized in Figure 1, recognizes the existence of two categories of shock absorbers: loan loss reserves and capital. Regulatory capital should cope with the occurrence of “unexpected losses”, that is losses that are large but infrequent and that therefore can be located far in the tail of the frequency distribution of loan losses. Loan loss reserves should, instead, cope with “expected losses”, that is losses which occur on average and can be measured by the mean value of the frequency distribution of loan losses. According to this distinction, the occurrence of losses equal to  $OB$  in Figure 1 should be buffered for the amount  $OA$  by loan loss reserves and for the amount  $AB$  by depleting regulatory capital. What Figure 1 makes clear is that the very effectiveness of regulatory capital as a buffer of unexpected shocks rests on the existence of the subsidiary buffer represented by the reserves created through loan loss provisions.



<sup>5</sup> This section draws on Cavallo and Majnoni (2001).

A final clarification concerns the nature of “specific” and “general” loan loss provisions and their role in the definition of bank capital regulation. According to widespread accounting practices “general” provisions refer to “ex-ante” provisions and are related to future *uncertain* events. “Specific” provisions are instead “ex-post” in nature, in that they refer to *certain* events (such as past due payments, or other default-like events) for which a specific documentation can be produced.

As such, “specific” provisions are somewhat similar to write-offs, can be easily documented and are not subject to significant restrictions. “General” provisions, on the contrary, refer to probabilistic losses that cannot be supported by loan specific documentation and being highly judgmental have been often the subject of regulatory restrictions. Not always bank regulations refer explicitly to general or specific provisions but most of the times regulatory requirements can be partitioned among “ex-ante” and “ex-post” provisioning. For instance, provisions triggered by past due payments (one of the default events considered by the Basel Committee on Banking Supervision) could be considered as “specific” provisions. Provisions which are, instead, required for all loans, independently from the presence of a default event, can be considered of a “general” nature.

Since bank solvency regulation is intended to address the consequences of future credit losses, whether of expected or unexpected nature, only “general” provisions matter in the discussion of minimum bank capital requirements. “Specific” provisions and reserves, similarly to write-offs, should not be considered as a buffer against future losses.

## **Appendix 2: Data Definition and Sources**

### **I. Definition**

**Provisions/Assets** = Loan Loss Provisions / Total Assets

**Earnings before Provisions / Assets** = (Profit before Tax + Loan Loss Provisions) / Total Assets

**Loans / Assets** = Total Loans / Total Assets

**Loans in Real Terms** = Total Loans / Consumer Price Index

**Loans Growth Rate** = [Loans in Real Terms (t-1) - Loans in Real Terms(t)] / Loans in Real Terms (t-1)

**GDP per Capita (in 1995 US Dollars)** = GDP at constant 1995 US dollar market prices / Total population

### **II. Sources**

#### **Income Statement and Balance Sheet Items taken from Bank Scope**

Loan Loss Provisions: – Bank Scope, summary code No: 2095

Profit before Tax – Bank Scope, summary code No: 2105

Total Loans – Bank Scope, summary code No: 2000

Total Assets – Bank Scope, summary code No: 2050

#### **Series from the IMF and the World Bank**

CPI (1995) = 100 – IFS line 64, IMF

GDP at market prices (constant 1995 US Dollars) – World Development Indicators, World Bank

Population, Total – World Development Indicators, World Bank

Gross Domestic Product – IFS line 99b, IMF

## References

- Basel Committee on Banking Supervision (1999), "Sound Practices for Loan Accounting and Disclosure", July, mimeo.
- \_\_\_\_\_ (2000), "Financial Stability and the Basel Capital Accord", March, mimeo.
- \_\_\_\_\_ (2001), "The New Basel Capital Accord Consultative Document", January, mimeo.
- Berger, Allen N. and Gregory Udell (1994), "Did Risk-Based Capital Allocate Bank Credit and Cause a 'Credit Crunch' in the U.S.?", *Journal of Money, Credit and Banking* 26(3-2), pp. 585-628 August.
- Berger, Allen N., Richard J. Herring, and Giorgio P. Szego (1995), "The Role of Capital in Financial Institutions", *Journal of Banking and Finance* 19, 393-430.
- Bernanke, Ben S., and Cara S. Lown (1991), "Credit Crunch", *Brookings Papers On Economic Activity* 2: 205-47.
- Borio, Claudio, C. Furfine and Ph. Lowe (2001) "Procyclicality of the Financial System and Financial Stability: Issues and Policy Options", BIS, mimeo.
- Cavallo M. and G. Majnoni (2001) "Do Bank Provision for Bad Loans in Good Times? Empirical Evidence and Policy Implications", Policy Research Working Paper n. 2619, The World Bank.
- Chiuri, Maria Concetta, G. Ferri and G. Majnoni (2002), "The Macroeconomic Impact of Capital Requirements in Emerging Economies: Past Evidence to Assess the Future", forthcoming in *Journal of Banking and Finance*.
- Dewatripont, Mathias and Jean Tirole (1994), *The Prudential Regulation of Banks*, Cambridge, Mass.: MIT Press.
- Fernandez de Lis, Santiago, J. Martinez Pages and J. Saurina (2000), "Credit Growth, Problem Loans and Credit Risk Provisioning in Spain", Banco de Espana Working Paper 18.

- Greenwald, Mary Brady and J. F. Sinkey Jr. (1988), “Bank Loan-Loss Provisions and the Income-Smoothing Hypothesis: An Empirical Analysis, 1976-1984”, *Journal of Financial Services Research* 1, pp. 301-318.
- Holmstrom, Bengt and Jean Tirole (1997), “Financial Intermediation, Loanable Funds, and the Real Sector”, *Quarterly Journal Of Economics* 112: 665-91, August.
- Holmstrom, Bengt and J. Tirole (2000), “Liquidity and Risk Management”, *Journal of Money, Credit and Banking* 32(3), pp.295-319, August.
- Kim, Daesik and A. Santomero (1993), “Forecasting Required Loan Loss Reserves”, *Journal of Economics and Business* 45, pp.315-329.
- Peek, Joe and Eric Rosengren (1995), “Capital Crunch: Neither a Borrower Nor a Lender Be”, *Journal of Money, Credit And Banking* 27: 625-38, August.

Table 1            Summary Statistics

Provisioning/Assets equals loan loss provisions over total assets. EBP/Assets equals profits before tax and loan loss provisions over total assets. Loans/assets equals total loans over total assets. Loan growth equals loan growth in real terms.  $\ln(\text{real GDP per capita})$  is the logarithm of GDP per capita in constant 1995 US dollars).  $\ln(\text{Assets})$  is the logarithm of assets in thousands of US dollar.

<i>Variable</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Obs</i>
Provisioning/Assets	.5639	.8390	6,152
EBP/Assets	1.6128	1.2039	6,152
Loans/Assets	57.8008	15.9696	6,152
Loan growth	4.2152	16.5022	6,152
$\ln(\text{Real GDP per capita})$	5.0481	1.0854	6,152
$\ln(\text{Assets})$	15.5803	1.4251	6,152



Table 2            Correlation matrix

Provisioning/Assets equals loan loss provisions over total assets. EBP/Assets equals profits before tax and loan loss provisions over total assets. Loans/assets equals total loans over total assets. Loan growth equals loan growth in real terms. ln(real GDP per capita) is the logarithm of GDP per capita in constant 1995 US dollars). ln(Assets) is the logarithm of assets in thousands of US dollar. \* indicates significance at a 5% level.

	<i>Provisioning/ Assets</i>	<i>EBP/ Assets</i>	<i>Loan/ Assets</i>	<i>Loan growth</i>	<i>ln(Real GDP per capita)</i>	<i>ln(Assets)</i>
Provisioning/ Assets	1.0000					
EBP/ Assets	*0.1677	1.0000				
Loans/ Assets	*0.1213	*0.1916	1.0000			
Loan growth	*-0.2435	0.0181	*0.1845	1.0000		
ln(Real GDP per capita)	*-0.1589	*-0.1047	*0.0705	*0.0840	1.0000	
ln(Assets)	*-0.0395	*-0.1674	-0.0221	0.0080	*0.2024	1.0000

Table 3 Random effects regression – Whole sample

The regressions are estimated using generalized least squares with random effects for the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over total EBP/Assets equals profits before tax and loan loss provisions over total assets. Loans/assets equals total loans over total assets. Loan growth equals loan growth in real terms.  $\ln(\text{real GDP per capita})$  is the logarithm of GDP per capita in constant 1995 US dollars).  $\ln(\text{Assets})$  is the logarithm of assets in thousands of US dollar. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. The Hausman test is a test of systematic difference between coefficients of the fixed effects and the random effects regression. We report the p-value of the Hausman test statistic. Year dummies are included but are not reported. Standard errors are between brackets. \* indicates significance at a 5% level.

	<i>Whole sample</i>	<i>With negative earnings dummy interaction</i>	<i>With income level interaction</i>	<i>With income level and negative earnings dummy interactions</i>
EBP/Assets	*.0840 (.0107)	*.1762 (.0115)	.0186 (.0330)	*.1348 (.0321)
Negative earnings dummy *(EBP/Assets)	-	*-.7822 (.0434)	-	*-.7799 (.0434)
$\ln(\text{GDP per capita})$ * (EBP/Assets)	-	-	*.0140 (.0067)	.0088 (.0064)
Loans/Assets	*.0092 (.0009)	*.0080 (.0009)	*.0091 (.0009)	*.0079 (.0009)
Loan growth	*-.0123 (.0006)	*-.0116 (.0006)	*-.0123 (.0006)	*-.0116 (.0006)
$\ln(\text{Assets})$	-.0110 (.0116)	.0068 (.0110)	-.0127 (.0117)	.0057 (.0111)
Hausman test (p-value)	*.000	*.000	*.000	*.000
R-squared	.1023	.1807	.1288	.1797
No obs	6152	6152	6152	6152

Table 4 Regional regressions with random effects

The regressions are estimated using generalized least squares with random effects for the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over total EBP/Assets equals profits before tax and loan loss provisions over total assets. Loans/assets equals total loans over total assets. Loan growth equals loan growth in real terms. Ln(Assets) is the logarithm of assets in thousands of US dollar. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. "Europe" includes Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and United Kingdom. Latin America ("LAC") includes Chile, Colombia, Mexico, Peru, and Uruguay. "Asia" includes India, Indonesia, Korea, Malaysia, Pakistan, Philippines, and Thailand. "USA" indicates United States of America. The Hausman test is a test of systematic difference between coefficients of the fixed effects and the random effects regression. We report the p-value of the Hausman test statistic. Year dummies are included but are not reported. Standard errors are between brackets. \* indicates significance at a 5% level.

	<i>Europe</i>	<i>US</i>	<i>LAC</i>	<i>Asia</i>
EBP/Assets	*.1387 (.0203)	*.1548 (.0160)	*.2080 (.0330)	*-.1586 (.0351)
Loans/Assets	*.0122 (.0014)	*.0116 (.0015)	.0074 (.0047)	.0049 (.0028)
Loan growth	*-.0120 (.0011)	*-.0072 (.0009)	*-.0138 (.0025)	*-.0177 (.0023)
ln(Assets)	-.0079 (.0183)	.0429 (.0178)	-.0355 (.0654)	-.0494 (.0416)
Hausman test (p-value)	*.002	*.000	.460	.083
R-squared	.2063	.3303	.3594	.2590
No obs	2239	2069	214	725

Table 5 Regional regressions with random effects and negative earning dummies

The regressions are estimated using generalized least squares with random effects for the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over total EBP/Assets equals profits before tax and loan loss provisions over total assets. Loans/assets equals total loans over total assets. Loan growth equals loan growth in real terms. Ln(Assets) is the logarithm of assets in thousands of US dollar. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. "Europe" includes Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and United Kingdom. Latin America ("LAC") includes Chile, Colombia, Mexico, Peru, and Uruguay. "Asia" includes India, Indonesia, Korea, Malaysia, Pakistan, Philippines, and Thailand. "USA" indicates United States of America. The Hausman test is a test of systematic difference between coefficients of the fixed effects and the random effects regression. We report the p-value of the Hausman test statistic. Year dummies are included but are not reported. Standard errors are between brackets. \* indicates significance at a 5% level.

	<i>Europe</i>	<i>US</i>	<i>LAC</i>	<i>Asia</i>
EBP/Assets	*.2006 (.0228)	*.2039 (.0168)	*.2605 (.0339)	.0718 (.0446)
Negative earnings dummy * (EBP/Assets)	*-.4150 (.0742)	*-.6074 (.0743)	*-.8236 (.1894)	*-.9283 (.1106)
Loans/Assets	*.0117 (.0014)	*.0100 (.0015)	.0056 (.0045)	.0021 (.0028)
Loan growth	*-.0115 (.0011)	*-.0067 (.0009)	*-.0158 (.0024)	*-.0180 (.0022)
ln(Assets)	-.0002 (.0172)	*.0454 (.0175)	-.0214 (.0633)	-.0135 (.0423)
Hausman test (p-value)	*.000	*.000	*.000	.188
R-squared	.2232	.3568	.4041	.3238
No obs	2239	2069	214	725