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

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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 address provisioning practices within a broad bank capital regulatory framework. This paper contributes to the ongoing debate by exploring the available evidence about bank loan loss provisioning around the world. We find that many 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. At the same time, we find a considerable difference in patterns followed by banks around the world.

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> "A sound banker, alas, is not one who foresees danger and avoids it , but one who, when he is ruined is ruined in a conventional way along with his fellows so that no one can really blame him."
>
> J.M. Keynes (1931)

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 economic 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 risk-adjusted and cyclically neutral solvency regulation, but its relevance can hardly be defined at a theoretical level. Bankers would face an additional incentive to look ahead and set provisions in the good phases of the cycle: "to foresee danger and avoid it" along with the initial quotation. Only an empirical investigation can show whether bank managers today, differently from Keynes' observation, are already pursuing forward-looking pro-cyclical management of loan loss provisions and reserves, making additional regulatory incentives redundant.

This paper analyzes 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 geographical 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. We also find an undesirable negative relation of loan loss provisions with loan growth and GDP growth. However, these patterns vary considerably within and across different countries.

The paper proceeds as follows. Section 2 draws from the current debate on the cyclical impact of banks' capital requirements. Section 3 discusses 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.[1]

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 cyclicality question should be addressed by means of different instruments. For example, national supervisors

[1] 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).

(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.

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 by 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 with this interpretation, loan loss provisions required to build up loan loss reserves should be considered and treated as a cost. A cost that will be faced with certainty over time but that is uncertain as to when it will materialize. Conversely, resources required to build up capital – a buffer against

truly unpredictable (unexpected) events – should not be dealt with as a cost but should only come from post tax earnings. 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 loss 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. Our example draws on Kim and Santomero (1993). For simplicity, consider a bank that finances each period t a one-period project of US$ 1. With probability p_H the project is a success with payoff $(1+r_H)$ at time t+1 and with probability $(1-p_H)$ the project fails with a payoff of 0 at time t+1. Under risk-neutrality, it follows that the expected return on the project at time t is 1 plus the risk-free rate r_f

$$p_H \cdot (1 + r_H) + (1 - p_L) \cdot 0 = (1 + r_f) \quad , \; r_H > r_f \tag{1}$$

It follows that the required rate in case of success is equal to

$$r_H = \frac{1 + r_f}{p_H} - 1 \tag{2}$$

and the default premium $r_H - r_f$ is equal to

$$r_H - r_f = \frac{1 - p_H}{p_H}(1 + r_f) \tag{3}$$

Under risk-neutrality, the lending rate on loans r_L would be set equal to r_H. However, given the possibility of default it is not appropriate to report earnings of r_H in case of success at t+1. To reflect the true underlying profitability of the bank at time t+1, the

bank should set aside its expected loss equal to the default premium $r_H - r_f$. This has the effect of smoothing *reported* bank earnings over time,[2] and reduces the possibility that the bank has to eat into its capital in case a future project fails (at time *t*+2, …).

More generally, banks can smooth their earnings by drawing from loan loss reserves if actual losses exceed expected losses and by contributing additional loan loss provisions to loan loss reserves if actual losses are lower than expected losses. The advantage of income smoothing is that it reduces the volatility of reported bank profits and reduces the possibility that the bank may have to eat into its capital. With perfect income smoothing, earnings are not (or are less) affected by the fluctuations of credit losses over the cycle. This is achieved when loan loss provisions compensate for the difference between realized credit losses and average credit losses by taking positive values during cyclical expansions and negative values during downturns. As a result, loan loss reserves would increase in good times and decrease in bad times.[3]

Several papers have tested the hypothesis of income-smoothing empirically and have found different results. Based on data for individual US banks, Greenwalt and Sinkey (1988), Collins et al. (1995), and Ahmed et al. (1999) have found a positive relation between loan loss provisions and bank earnings, while Beatty et al. (1995) do not find evidence of earnings smoothing. Based on aggregate data for European Union the group as a whole. Our main contribution lies in testing the hyp0thesis of income banking

[2] Volatility of reported earnings derives in our simplified model purely from accounting practices (i.e. from an omitted registration of costs that inflates earnings) and has no economic determinants.
[3] Our considerations are referred to the present institutional setting where banks' accounts are predominantly kept on historical cost basis. In a world where banking assets are valued at "market" (fair) prices – fully reflecting future expected events – future valuation changes could only be due to unexpected events and no loan loss reserves would be required in addition to capital (Borio et al. 2001).

systems, the ECB (2002) finds that differentiated patterns prevail among EU countries but that a negative relationships between income and provisions characterize smoothing for banks, to a larger group of countries – developed and emerging - around the world.

We have argued that the advantage of income smoothing is that the bank achieves a sounder capital management, since expected loan losses no longer affect bank capital. While this is rather uncontroversial in our simple model, information imperfections can make our statement less obvious and more controversial than it may seem at first sight. On one side there is a widely shared view within the accounting profession that "income smoothing" has negative connotations because it introduces judgmental modifications to a firm's earnings, that also when not induced by personal managers' objectives, tend to reduce the comparability of results across firms, and may ultimately damage shareholder value.[4] An alternative view, prevailing among the economic profession and discussed to a larger extent in the previous section, is that "income smoothing" has positive connotations because it reduces the negative impact of asset volatility on bank capital for risk averse agents.[5]

The merit of the debate spurred by these different views is to have clearly spelled out the set of different incentives that may lead banks to adopt income smoothing practices. Regulatory constraints on capital would give the bank manager an incentive to smooth out earnings over time. In addition to meeting capital requirements, a bank manager may potentially have several alternative motivations for income smoothing. First, the manager may attempt to positively affect risk perceptions of the bank by

[4] See Wall and Koch (2000) for a discussion of the relationship between accounting and economic concepts of bank losses and provisions.
[5] See Borio et al. (2001) for a clear exposition of the merits of "income smoothing".

reducing earnings variability (Greenwalt and Sinkey, 1988). Second, income smoothing behavior may result from regulatory constraints or accounting practices (Wall and Koch, 2000). Third, compensation packages of bank managers may encourage income smoothing behavior (Lambert, 1984). The very fact that bank managers have substantial discretion to set loan loss provisions, has raised concerns especially from accountants and bank supervisors that banks mislead the market about their underlying earnings, providing support to the "accounting view". However, requiring more information on banks' loan loss provisioning behavior to be disclosed is not necessarily optimal if it gives the banks an extra incentive to manipulate their books in order to present a better picture (Rajan, 1994).

From the perspective of this paper, the different incentives at work in different institutional settings are not so important as the final outcome, i.e. whether banks pursue a policy of income smoothing through a pro-cyclical loan loss provisioning. Such a policy would in fact have a positive impact on bank's capital management reducing its volatility and the fall out of capital shortages on the business cycle.

The dynamic adjustment of loan loss provisions over the cycle - often called statistical provisioning (Fernandez de Liz et al., 2000) - is 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.[6]

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 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 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.

4. Data and Methodology

We hypothesize that a bank shows imprudent loan loss provisioning behavior – susceptible to have procyclical effect on banks' capital – if one of the following three conditions is met:

[6] 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 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.

1. Loan loss provisions are negatively associated with banks' earnings;

2. Loan loss provisions are negatively related to loan growth;

3. Loan loss provisions are negatively associated with GDP growth.

Condition (1) refers to the income smoothing hypothesis, while conditions (2) and (3) capture loan loss provision misalignments with bank-specific and macroeconomic cyclical indicators.

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

$$\left(\frac{LLP}{A}\right)_{it} = \alpha + \beta_1\left(\frac{EBP}{A}\right)_{it} + \beta_2 \Delta L_{it} + \beta_3 \Delta GDP_{it} + \beta_4 T_t + v_i + \varepsilon_{it} \qquad (4)$$

where loan loss provisions (*LLP*) over total bank assets for bank *i* at time *t* are a function of profits before tax and loan loss provisions (*EBP*) over total assets for bank *i* at time *t*, loan growth in real terms (ΔL) for bank *i* at time *t*, real growth in per capita GDP (ΔGDP) at time *t*, and year dummies (*T*). The dependent variable of the regression in (4) is the level of loan loss provisions scaled by the one-period lag of total assets.

We use lagged values of stock variables and current values of flow variables to avoid potential endogeneity problems. For example, loan loss provision at *t* correspond to provisions during the year *t*, while assets at *t*-1 correspond to the stock of bank assets at the beginning of year *t*. Hence, $\left(\frac{LLP}{A}\right)_t$ is measured as $\frac{LLP_t}{A_{t-1}}$.

Our critical explanatory variable is given by bank income before taxes and provisions. We control for bank risk through loan growth and for the economic cycle though GDP growth. The real growth rate of bank loans 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. Year control dummies are intended to catch time-specific effects such as trends in the regulatory stance. We estimate model (4) using bank-specific random effects. Our empirical specification follows closely the models used in the literature to test the income-smoothing hypothesis (see, for example, Greenawalt and Sinkey, 1988).

As an alternative model to test the income-smoothing hypothesis we specify a dynamic model of loan loss provisions by introducing lags of the dependent variable.

$$\left(\frac{LLP}{A}\right)_{it} = \alpha + \gamma_1\left(\frac{LLP}{A}\right)_{i,t-1} + \gamma_2\left(\frac{LLP}{A}\right)_{i,t-2} + \beta_1\left(\frac{EBP}{A}\right)_{it} + \beta_2\Delta L_{it}$$

$$+ \beta_3\Delta GDP_{it} + \beta_4 T_t + v_i + \varepsilon_{it} \qquad (5)$$

The dependent variable lagged values capture the speed of adjustment of loan loss provisions to an equilibrium level. The advantage of this formulation consists in a better approximation of the potential impact of stock variables on loan loss provisions at time t, captured through the lagged values. This reduces the potential problems related to omitted variable and makes it possible to focus on the effects of flow variables on loan loss provisioning. We include the first and the second lag, to take into account a change of the speed of adjustment beyond the first year.

The inclusion of lags of the dependent variable renders OLS estimation of (5) inconsistent. We resort to the GMM difference estimator in Arrelano and Bond (1991) to get consistent estimates of the above model. This procedure estimate the specific dynamic model in first-differences to solve the estimation problem raised by the potential presence of unobserved individual effects v_i and gives consistent estimates under the assumption that the error term ε_{it} is not serially correlated and the explanatory variables are (weakly) exogenous. We assume that our explanatory variables are (weakly) exogenous. Under these assumptions, $\left(\frac{LLP}{A}\right)_{i,t-3}$,$\left(\frac{LLP}{A}\right)_{i,t-4}$,…, $\left(\frac{LLP}{A}\right)_{i1}$ are valid instruments and the difference estimator is an efficient GMM estimator for the above model. To assess the validity of the assumptions on which the GMM difference estimator is based we consider the test of second-order serial correlation of the error term suggested by Arellano and Bond (1991). If the null hypothesis of no second-order serial correlation of the error term is rejected, the GMM difference estimator is not valid.

Based on the above specifications, our hypothesis of prudent loan loss provisioning behavior is rejected if one of the following three conditions is met: (1) the coefficient on earnings *EBP* is negative; (2) the coefficient on loan growth ΔL is negative; and (3) the coefficient on GDP growth ΔGDP is negative. If condition (1) holds then the hypothesis of income smoothing is rejected. If condition (2) and/or (3) holds then there is evidence that banks are not pursuing a procyclical provisioning behavior.

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. All data are reported in US dollars.

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 lagged total assets greater than 10 percent; a ratio of earnings before tax and provisions over lagged total assets larger than 10 percent in absolute value; or a growth rate of bank loans in real terms larger than 50 percent in absolute value. These outlier rules roughly correspond to the exclusion of the observations above the 99th percentile and below the 1st percentile of these variables. The resulting sample includes 45 countries,[7] with a total of 1,419 banks and 8,176 bank-year observations. We collect real growth rates in per capita GDP from the World Development Indicators of World Bank.

[7] The final sample of countries is: Argentina, Australia, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Ecuador, Egypt, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Korea, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom, United States, Uruguay and Venezuela.

Table 1 provides some descriptive statistics about the variables in our estimation sample. The ratio of loan loss provisions to lagged total assets equals 0.65 percent on average (with a standard deviation of 0.88 percent), the ratio of earnings before taxes and provisions to lagged total assets equals 1.6 percent, and the average rate of real loan growth equals to 7.8 percent. Table 2 presents the distribution of our sample across years and countries. Our sample is dominated by French, Japanese and US banks.

Table 3 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 21 percent, suggesting that banks do exercise income smoothing on average. The correlation between loan loss provisions and loan growth is around –15 percent, suggesting imprudent behavior by the average bank. The correlation between loan loss provisions and GDP growth is also negative around –18 percent, suggesting a anti-business cyclical behavior of bank's loan loss provisioning.

5. Estimation Results

Table 4 presents the basic random effects regression results for the model in (4). We find a positive and significant relationship between the ratio of loan loss provisions and bank earnings (both scaled by the beginning of period stock of bank assets). These results are consistent with previous results for the US market (Greenwald and Sinkey, 1988) and suggest that banks in our sample have followed an income-smoothing pattern on average. A one standard deviation increase in earnings is associated with an increase

in provisioning of 0.22 percent (the average ratio of loan loss provisions to assets is 0.65 percent). The real loan growth rate has, contrary to expectations, an undesirable negative coefficient. Banks appear to have increased the amount of provisions during periods of positive profits but at the same time they have been less prudent during periods of rapid credit growth. This effect of loan growth on provisioning is economically significant as well, but somewhat less strong than the effect of a change in earnings. A one standard deviation increase in loan growth is associated with a decrease in loan loss provisions of 0.13 percent. We also find an undesirable negative relationship between GDP growth and loan loss provisions, suggesting that banks provision during and not before economic recessions. Again, this effect is economically significant, and of a similar order of magnitude as the effect of a change in earnings on provisioning. A one standard deviation increase in GDP growth is associated with a decrease in loan loss provisions of 0.20 percent.

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 4). The results indicate that banks make statistically significantly higher provisions when they incur losses[8] than when they generate a positive level of income before provisions and tax. The average association between negative earnings and provisioning is 0.42 (the absolute value of the sum of the coefficient on earnings and the coefficient on the interaction term between earnings and the earnings dummy variable). This implies that during cyclical downswings banks eat into their capital to make provisions for loan

[8] Note that negative EBP times the negative regression coefficient of the interacted term (negative earnings dummy*EBP) implies a positive effect (increase) on provisions.

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 country-specific as a result of the different features of accounting, fiscal and prudential regulation. To analyze the different behavior across banks located in different parts of the world we run a series of separate regressions for banks active in different regions. For this purpose we consider five different regions: Europe, US, Japan, Latin America and Asia. "Europe" includes Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and United Kingdom; "Latin America" includes Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay and Venezuela; and "Asia" includes India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan and Thailand.[9] The results are presented in Tables 5 and 6. 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 and Japanese banks represented a very large share of the overall sample.

Table 5 reports the results for the five regions when no distinction is made between periods with positive and negative earnings. The results show that banks in all regions except Asia smooth their income over time on average. Not only do we reject the

[9] We exclude Hong Kong from the Asia group because of its significantly higher level of economic development compared to other countries in the group. Inclusion of Hong Kong banks does however not alter the results. We do not make a separate for the Oceanic countries Australia and New Zealand due to lack of bank observations for these countries.

income-smoothing hypothesis for the Asia region, we actually find a significantly negative association between earnings and provisioning for Asian banks.

We also find a negative association between credit growth and loan loss provisioning for each region, consistent with the pooled results in Table 4. The negative association is found to be strongest in Japan.[10] This effect is strongest for banks in the US and Japan. The Hausman test rejects the use of random effects against the use of fixed effects in the case of Japan, Latin America, and Asia (at a 10 percent level). In these two cases, the fixed effects results do not differ significantly from the random effects results, and therefore are not reported.

Table 6 shows the regression outcome when the negative earnings dummy is added. For all the five regions we find that banks with negative income (before tax and provisions) make more provisions than banks with positive income. For all regions this difference is statistically significant at a 10 percent level. This suggests that insufficient provisioning during good times is common practice among banks in different regions, in particular in Japan and Asia.

Table 7 presents the basic regression results of the dynamic model in (5). The results are similar to the results in Table 4 where the specification did not include lags of the dependent variable. Again, we find a positive association between the ratio of loan loss provisions and bank earnings, suggesting the average presence of income-smoothing, together with a negative association between loan growth and loan loss provisioning, which signals that the lack of considerations of the real business cycle effects on creadit quality.

[10] See Packer (2000) for a description of the evolution of loan loss accounting practices in Japan.

The loss of a significant number of observations due to the inclusion of lagged dependent variables has not affected the estimation result in any significant way providing a good test of robustness of our results. The coefficients on both the first lag and the second lag of the dependent variable are statistically significant, suggesting that banks are slow in adjusting to their optimal path of provisioning over a multiyear horizon.

We again add a interaction term between the earnings variable and a dummy variable that takes value of one when earnings are negative and zero elsewhere to allow for an asymmetric pattern of loan loss provisions during periods of positive and negative earnings. The results of this alternative specification are reported in Column 2 of Table 7. Again, we find that banks make statistically significantly higher provisions when they incur losses 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.

Tables 8 and 9 report the regression results of the dynamic model in (5) when allowing for regional differences. Table 8 reports the results without the negative earnings dummy interaction. We find that banks in Europe, US, and the Latin America smooth their income over time on average, but our results reject the income-smoothing hypothesis in Japan and the Asia region. These results differ from those in Table 5, where we also found evidence of income-smoothing in Japan. The results of the dynamic specification for US and Japan, though, should be interpreted with caution, due to lack of

rejection of second-order autocorrelation in the estimates for these two countries, that may bias the coefficient estimates for these two countries.

Table 9 reports the results when the negative earnings dummy is added. Consistent with the regression results of the static model in Table 6, we find that for all five regions that banks with negative income make more provisions than banks with positive income. However, only for Japan and the Asia countries this difference is found to be statistically significant, contrary to the results in Table 6 where the difference was found to be statistically significant (at a 10 percent level) for all regions. The results in 9 thus suggest that insufficient provisioning during good times is more common practice among banks in Asia, in particular in Japan than among banks elsewhere (in Europe, US and Latin America).

Overall, the regional results of both model specifications suggest that the loan loss provisioning behavior of Japanese and Asian banks is the least pro-cyclical among the five considered regions. 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. Regressions results for individual East Asian countries (not reported) confirm this hypothesis.

The negative relation found earlier for the whole sample between credit growth and loan loss provisioning is present only in Europe, Japan and Latin America. For Asia, no significant relation between credit growth and loan loss provisioning is found, and for the US we find the desirable positive relation between credit growth and loan loss

provisioning. Banks in the US, Japan, and Asia, also provision less during high GDP growth, suggesting an undesirable anti-business cyclical behavior of provisioning.

Finally, we find differentiated and significant time patterns across the five different regions (not reported). 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 with 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 countries.

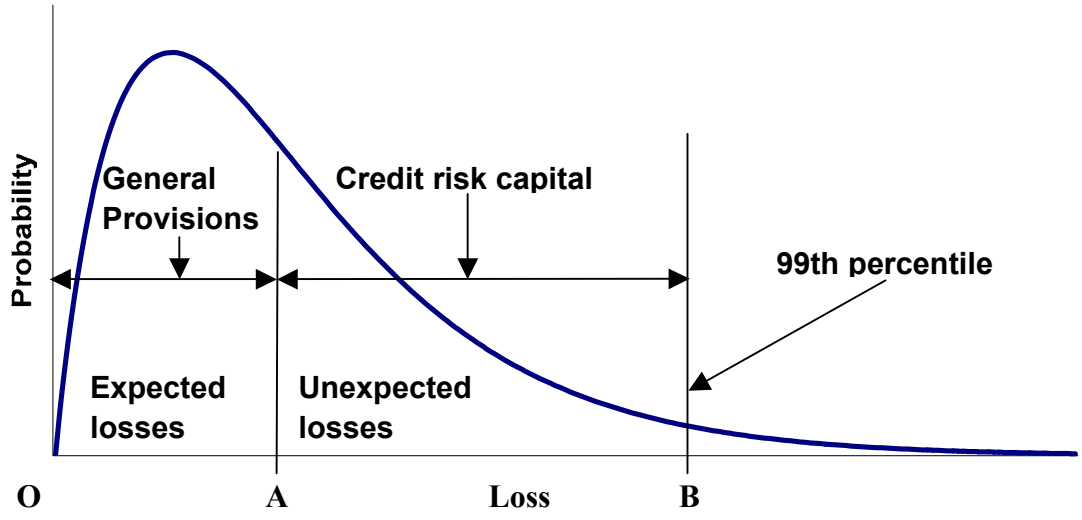
While it is becoming increasingly clear among bank regulators that more explicit recognition should be paid to the problems associated with inadequate provisioning policies, the solution is not easy to define or to envision as a result of the complicated interaction of accounting, fiscal and prudential 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. The results suggest that progress in this area may benefit all countries, inclusive of more developed ones, but that it may have a particular bearing for the stability of emerging banking systems.

Appendix 1: Loan loss provisions, reserves, and expected losses

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.

Figure 1: PDF of loan losses, provisions and economic capital



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.

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Table 1 Summary Statistics

Provisioning/Assets equals loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. Loan growth equals loan growth in real terms. GDP growth is real growth in per capita GDP. The total number of bank-year observations is 8,176 for all variables.

Variable	*Mean*	*Standard deviation*
Provisioning/Assets	0.652	0.880
EBP/Assets	1.755	1.391
Loan growth	7.771	16.541
GDP growth	3.083	2.656

Table 2, Panel A Distribution of bank-year observations by year

Year	*Number of bank-year observations*	*Percentage of total*	*Cumulative percentage*
1989	416	5.09	5.09
1990	494	6.04	11.13
1991	546	6.68	17.81
1992	608	7.44	25.24
1993	628	7.68	32.93
1994	1,119	13.69	46.61
1995	984	12.04	58.65
1996	993	12.15	70.79
1997	987	12.07	82.86
1998	920	11.25	94.12
1999	481	5.88	100.00
Total	8,176	100.00	100.00

Table 2, Panel B Distribution of bank-year observations by country

Country Name	*Number of bank-year observations*	*Percentage of total*	*Cumulative percentage*
Argentina	127	1.55	1.55
Australia	206	2.52	4.07
Belgium	112	1.37	5.44
Brazil	163	1.99	7.44
Canada	128	1.57	9.00
Chile	81	0.99	9.99
Colombia	51	0.62	10.62
Denmark	96	1.17	11.79
Ecuador	17	0.21	12.00
Egypt	62	0.76	12.76
Finland	49	0.60	13.36
France	599	7.33	20.68
Germany	121	1.48	22.16
Greece	53	0.65	22.81
Hong Kong	130	1.59	24.40
India	194	2.37	26.77
Indonesia	92	1.13	27.90
Ireland	33	0.40	28.30
Israel	48	0.59	28.89
Italy	310	3.79	32.68
Japan	1,016	12.43	45.11
Jordan	19	0.23	45.34
Korea	77	0.94	46.28
Malaysia	165	2.02	48.30
Mexico	73	0.89	49.19
Netherlands	144	1.76	50.95
New Zealand	57	0.70	51.65
Nigeria	19	0.23	51.88
Norway	68	0.83	52.72
Pakistan	16	0.20	52.91
Peru	26	0.32	53.23
Philippines	87	1.06	54.29
Portugal	108	1.32	55.61
Singapore	29	0.35	55.97
South Africa	47	0.57	56.54
Spain	350	4.28	60.82
Sweden	50	0.61	61.44
Switzerland	89	1.09	62.52
Taiwan	201	2.46	64.98
Thailand	119	1.46	66.44
Turkey	112	1.37	67.81
USA	2,288	27.98	95.79
United Kingdom	295	3.61	99.40
Uruguay	6	0.07	99.47
Venezuela	43	0.53	100.00
Total	8,176	100.00	100.00

Table 3 Correlation matrix

Provisioning/Assets equals loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. Loan growth equals loan growth in real terms. GDP growth is real growth in per capita GDP. ** indicates significance at a 5% level.

	Provisioning/ Assets	EBP/Assets	Loan growth	GDP growth
Provisioning/Assets	1.000			
EBP/Assets	**0.205	1.000		
Loan growth	**-0.146	**0.223	1.000	
GDP growth	**-0.181	**0.125	**0.264	1.000

Table 4 Test of income-smoothing: basic GLS regressions with random effects

The regressions are estimated using generalized least squares with random bank-specific effects for the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. Loan growth equals loan growth in US dollars. GDP growth is real growth in per capita GDP. 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. A constant and year dummies are included but are not reported. Standard errors are between brackets. *** indicates significance at a 1% level; ** indicates significance at a 5% level; and * indicates significance at a 10% level.

	Whole sample	*Negative earnings dummy*
EBP/Assets	***.158	***.225
	(.008)	(.009)
Negative earnings dummy *(EBP/Assets)	-	***-.640
		(.034)
Loan growth	***-.008	***-.008
	(.001)	(.001)
GDP growth	***-.075	***-.072
	(.004)	(.004)
Hausman test (p-value)	***.000	***.000
R-squared	.114	.161
No of bank-year observations	8,179	8,179
No of banks	1,419	1,419

Table 5 Test of income-smoothing: regional GLS regressions with random effects

The regressions are estimated using generalized least squares with random ban-specific effects for the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. Loan growth equals loan growth in US dollars. GDP growth is real growth in per capita GDP. "Europe" includes Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and United Kingdom. "Latin America" includes Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay, and Venezuela. "Asia" includes India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, 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. A constant and year dummies are included but are not reported. Standard errors are between brackets. *** indicates significance at a 1% level; ** indicates significance at a 5% level; and * indicates significance at a 10% level.

	Europe	*US*	*Japan*	*Latin America*	*Asia*
EBP/Assets	***.168	***.174	***.153	***.221	***-.085
	(.017)	(.013)	(.047)	(.026)	(.027)
Loan growth	***-.008	***-.006	***-.017	***-.010	***-.008
	(.001)	(.001)	(.003)	(.003)	(.002)
GDP growth	***-.070	***-.157	***-.163	-.003	***-.105
	(.013)	(.012)	(.010)	(.017)	(.010)
Hausman test (p-value)	***.000	***.000	.129	.168	*.080
R-squared	.133	.306	.416	.213	.257
No of bank-year observations	2,477	2,288	1,016	570	951
No of banks	438	388	145	126	166

Table 6 Test of income-smoothing: regional GLS regressions with random effects and negative earnings dummy

The regressions are estimated using generalized least squares with random bank-specific effects for the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. Loan growth equals loan growth in US dollars. GDP growth is real growth in per capita GDP. "Europe" includes Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and United Kingdom. "Latin America" includes Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay, and Venezuela. "Asia" includes India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, 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. A constant and year dummies are included but are not reported. Standard errors are between brackets. *** indicates significance at a 1% level; ** indicates significance at a 5% level; and * indicates significance at a 10% level.

	Europe	*US*	*Japan*	*Latin America*	*Asia*
EBP/Assets	***.209	***.207	***.545	***.280	*.053
	(.019)	(.014)	(.059)	(.029)	(.032)
Negative earnings dummy *(EBP/Assets)	***-.373	***-.541	***-1.329	***-.444	***-.590
	(.074)	(.069)	(.131)	(.100)	(.079)
Loan growth	***-.008	***-.006	***-.016	***-.009	***-.010
	(.001)	(.001)	(.002)	(.003)	(.002)
GDP growth	***-.070	***-.160	***-.148	.000	***-.091
	(.013)	(.012)	(.009)	(.016)	(.010)
Hausman test (p-value)	***.000	***.000	***.000	.203	*.000
R-squared	.149	.323	.481	.242	.300
No of bank-year observations	2,477	2,288	1,016	570	951
No of banks	438	388	145	126	166

Table 7 Test of income-smoothing: basic GMM regressions with lags of the dependent variable

The regressions are estimated using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variables. We include two lags of the dependent variable, bank-specific fixed effects and year dummies. The regressions are estimated on the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. Loan growth equals loan growth in real terms. GDP growth is real growth in per capita GDP. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. The autocorrelation test is a test for auto-covariance in the residuals. We report the p-value of the autocorrelation tests. Year dummies are included but are not reported. Standard errors are between brackets. *** indicates significance at a 1% level; ** indicates significance at a 5% level; * indicates significance at a 10% level.

	Whole sample	*Negative earnings dummy*
First lag of Prov/Assets	***.346	***.334
	(.028)	(.028)
Second lag of Prov/Assets	***.095	***.109
	(.022)	(.021)
EBP/Assets	***.154	***.252
	(.021)	(.025)
Negative earnings dummy *(EBP/Assets)	-	***-.390
		(.059)
Loan growth	***-.003	***-.004
	(.001)	(.001)
GDP growth	***-.077	***-.076
	(.006)	(.006)
Test for autocorrelation of order 2 (p-value)	.112	.152
No of bank-year observations	3,553	3,553
No of banks	1,419	1,419

Table 8 Test of income smoothing: regional GMM regressions with lags of the dependent variable

The regressions are estimated using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variables. We include two lags of the dependent variable, bank-specific fixed effects and year dummies. The regressions are estimated on the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. Loan growth equals loan growth in real terms. GDP growth is real growth in per capita GDP. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. The autocorrelation test is a test for auto-covariance in the residuals. We report the p-value of the autocorrelation tests. Year dummies are included but are not reported. Standard errors are between brackets. *** indicates significance at a 1% level; ** indicates significance at a 5% level; * indicates significance at a 10% level.

	Europe	*US*	*Japan*	*Latin America*	*Asia*
First lag of Prov/Assets	***.330	***.274	-.205	-.157	.047
	(.053)	(.032)	(.116)	(.111)	(.095)
Second lag of Prov/Assets	***.114	.029	-.040	.114	***-.430
	(.041)	(.024)	(.103)	(.111)	(.076)
EBP/Assets	***.274	***.047	.028	***.164	-.006
	(.042)	(.024)	(.064)	(.064)	(.077)
Loan growth	**-.004	***.003	***-.011	***-.018	-.004
	(.002)	(.001)	(.004)	(.006)	(.004)
GDP growth	-.039	***-.299	***-.120	-.044	**-.124
	(.029)	(.029)	(.018)	(.036)	(.020)
Test for autocorrelation of order 2 (p-value)	.433	*.080	*.090	.970	.188
No of bank-year observations	1,130	983	574	166	345
No of banks	305	308	142	66	124

Table 9 Test of income smoothing: regional GMM regressions with lags of the dependent variable and negative earnings dummy

The regressions are estimated using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variables. We include two lags of the dependent variable, bank-specific fixed effects and year dummies. The regressions are estimated on the whole sample of countries and for the period 1988-1999. Dependent variable is the ratio of loan loss provisions over lagged total assets. EBP/Assets equals profits before tax and loan loss provisions over lagged total assets. The negative earnings dummy takes value one if profits before tax and loan loss provisions are negative, and zero otherwise. Loan growth equals loan growth in real terms. GDP growth is real growth in per capita GDP. The autocorrelation test is a test for auto-covariance in the residuals. We report the p-value of the autocorrelation tests. Year dummies are included but are not reported. Standard errors are between brackets. *** indicates significance at a 1% level; ** indicates significance at a 5% level; * indicates significance at a 10% level.

	Europe	*US*	*Japan*	*Latin America*	*Asia*
First lag of Prov/Assets	***.328	***.276	-.136	-.142	.056
	(.052)	(.032)	(.117)	(.112)	(.095)
Second lag of Prov/Assets	***.124	.034	-.009	.160	***-.382
	(.041)	(.024)	(.102)	(.114)	(.078)
EBP/Assets	***.381	***.081	***.307	***.260	*.196
	(.051)	(.029)	(.087)	(.084)	(.105)
Negative earnings dummy *(EBP/Assets)	***-.512	***-.131	***-.885	*-.304	***-.517
	(.143)	(.066)	(.177)	(.174)	(.184)
Loan growth	***-.005	***.003	***-.112	***-.017	-.006
	(.002)	(.001)	(.004)	(.007)	(.004)
GDP growth	-.038	***-.301	***-.114	-.038	**-.117
	(.029)	(.029)	(.018)	(.037)	(.020)
Test for autocorrelation of order 2 (p-value)	.339	**.049	**.044	.828	.232
No of bank-year observations	1,130	983	574	166	345
No of banks	305	308	142	66	124