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Working Paper No. QAU10-4

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Supervision, Regulation, and Credit

Federal Reserve Bank of Boston*

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Abstract

The pro-cyclical effect of bank capital requirements has attracted much attention in the post-crisis discussion of how to make the financial system more stable. This paper investigates and calibrates a dynamic provision as an instrument for addressing pro-cyclicality. The model for the dynamic provision is adopted from the Spanish banking regulatory system. We argue that, had U.S. banks set aside general provisions in positive states of the economy, they would have been in a better position to absorb their portfolios' loan losses during the recent financial turmoil. The allowances accumulated by means of the hypothetical dynamic provision during the cyclical upswing would have reduced by half the amount of TARP funds required. However, the cyclical buffer for the aggregate U.S. banking system would have been depleted by the first quarter of 2009, which suggests that the proposed provisioning model for expected losses might not entirely solve situations as severe as the one experienced in recent years.

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1 Introduction

Financial crises have wide ranging implications for an economy. Regardless of the particular transmission channel from the banking sector to the real economy (via a credit crunch, an erosion of wealth, an overall decrease in confidence, or subsequent fiscal costs,) banking crises have significant and adverse consequences. Hoggarth, Reis, and Saporta (2002) quantify that, on average, output losses accumulated during banking crises range from 15% to 20% of annual GDP.) With such costs in mind, measures directed toward the safety, soundness, and stability of the banking system are readily justified. Accordingly, policy makers are considering a wide range of regulatory reforms to address instability in the financial sector.

The pro-cyclical nature of risk-based capital requirements has been identified as a potential source of instability. Following the adoption of risk-based capital requirements under the 1988 Capital Accord (Basel I), a wide theoretical and empirical literature has analyzed the cyclical effects of bank capital regulation.¹ Less attention has been given to the role that loan loss provisions can play to mitigate the pro-cyclical features of capital regulation. The lack of attention to loan loss reserves is surprising since, from a conceptual point of view, loan loss reserves should cover expected losses, while capital is intended to provide an adequate buffer for unexpected losses.² Thus, an inaccurate level of loan loss reserves has a direct impact on bank capital. Under the US GAAP accounting rules, the purpose of the allowance for loan and lease losses (ALLL) is to cover probable credit losses that have already been incurred.³ Loan loss provisions are underestimated in the upswing of the cycle as a consequence of the current accounting standards. Incurred loan losses are lower than the long-run average. With the

¹Kashyap and Stein (2004), among others, raised the concern that risk-based capital requirements increase in a downturn when the quality of the loan portfolios deteriorates, which is exactly when capital is more scarce and expensive to raise.

²The US Basel II Final Rule states that “the IRB approach assumes that reserves should cover ECL (expected credit losses) while capital should cover credit losses exceeding ECL (that is, unexpected credit losses)”, p. 69293, Risk-based capital standards: advanced capital adequacy framework- Basel II; Final Rule. Federal Registry, December 7, 2007.

³Under ASC 450 (SFAS 5) and ASC 310-40 (SFAS 114), an incurred loss model based on historical loss rates and expert judgment adjustments is used to estimate credit impairment of a bank’s loan portfolio.

deterioration of the quality of bank loan portfolios during economic downturns, banks increase their loan loss provision, thereby magnifying the impact of the economic cycle on banks' capital.⁴ The G20 Summit in April 2009 and the subsequent U.S. Treasury proposal for regulatory reform of June 2009 call for a change to the accounting standards to induce the implementation of more forward-looking loan loss provisions and corresponding allowance accounts. Furthermore, the Treasury proposal calls for the creation of stronger buffers when the economy is growing so that these accounts can be drawn down when economic conditions deteriorate.⁵ We formalize this proposal by mimicking what the Spanish banking authorities implemented in 2000, known as dynamic provisioning.

The dynamic provisioning system attempts to create an a-cyclical loan loss provision that reduces the chances of the amplification of an economic crisis through the banking sector. We follow the same approach and calibrate the parameters of the Spanish dynamic provision for the U.S. banking system using publicly available data. We show that if U.S. banks had funded provisions in expansion periods using this provisioning model, they would have been in a better position to absorb loan portfolio losses during the financial turmoil. At the onset of the economic downturn, our calculations show that a synthetic aggregated bank would have accumulated over \$100 billion dollars in general reserves. However, due to the severity of this crisis, these reserves would not have been sufficient to cover all losses and it is likely that government assistance would still have been required to stabilize the financial system. Specifically, we estimate that the general allowance accumulated by means of a dynamic provision in the upswing would have been depleted by the first quarter of 2009. By construction, the measure does not prepare banks for catastrophe-like situations but rather to face the downturns of an average business cycle.

We begin by conducting the exercise for a synthetic bank, generated by aggregating balance sheets of individual U.S. banks and computing the resulting dynamic provisions based on the Spanish model. The purpose of this approach is to have a picture of the banking system as a

⁴Laeven and Majnoni (2003)

⁵Financial Regulatory Reform: A New Foundation. June 17, 2009 (p. 11-24).

whole and to allow us to draw conclusions about the desirability of such a provisioning system from a macro-prudential regulatory perspective. In a second exercise, we look at each individual bank that received more than \$2 billion in Troubled Asset Relief Program (TARP) funds under the Capital Purchase Program. By looking individually at these 13 financial institutions, we can observe in more detail which type of institutions would be more affected by a dynamic provisioning system.

The main limitation of our analysis is that we ignore the endogenous response of bank behavior to regulatory changes. We argue that a bank's response to such a policy shift would be to restrain credit during expansions due to the additional provisions. In our calculations, we assume that banks would not restrain credit in the presence of higher provisions requirements. Therefore, the results presented in the paper represent an upper bound in provisions accumulated by means of a dynamic provisioning system in the U.S.

Pro-cyclicality could be addressed either by requiring a general loan loss provision or by requiring countercyclical capital requirements. We acknowledge that there are substantial differences in these two approaches. The current BIS proposal, presented in Drehmann et al. (2010), addresses the pro-cyclicality problem with capital requirements. In this paper, we analyze the loan loss provision approach. Adding a dynamic component that covers loan losses arising from cyclical fluctuations of the economy would minimize the amplification mechanism induced by regulation and accounting. Whether that is accomplished through provisioning for expected losses or through capital requirements for unexpected losses is left for future research.

The remainder of the paper is structured as follows: section 2 provides a background on the pro-cyclical effects of capital requirements and accounting rules; section 3 presents the mechanism and the model of the dynamic provision; section 4 outlines the key findings of our analysis; section 5 provides a policy discussion on whether it is best to implement a dynamic provision through revised accounting rules or as part of Pillar 2 capital; section 6 concludes.

2 Pro-cyclical lending results from capital requirements and accounting rules

The 1988 Basel Accord (Basel I) increased the international consistency of capital requirements for depository institutions. However, a key criticism of Basel I is that capital charges levied against assets were not risk sensitive enough. Consequently, in 2004, the Basel Committee on Banking Supervision (BCBS) approved the Basel II Accord. Basel II calls for implementing risk-sensitive capital requirements—meaning that assets with different risk levels carry different capital charges. One result of this risk-sensitivity is that capital requirements are lower in the upturn of the business cycle when estimates of default risk decrease, which encourages banks to further increase lending during these “boom” times. The opposite applies during downturns and bank lending decreases. The pro-cyclical effects of Basel II on the supply of credit have been well documented and discussed in the literature.⁶ In a growing economy, an otherwise marginal borrower has a risk-rating that indicates a low probability of default. If a default does occur in this state of the economy, the incurred loss is generally not as severe as in a state of economic downturn. Thus, the bank sets aside very little capital against this loan because it is perceived as safe. Because of the small capital charges, banks are willing to issue higher numbers and volumes of new loans. As the economy deteriorates, so does the likelihood of a borrower making good on his or her obligations, and the bank assesses a higher capital charge against this loan. This positive covariance between the business cycle and the likelihood of a borrower repaying his or her loan dictates capital charges that co-vary negatively with the business cycle. When credit and economic growth are most essential, a bank is building its capital base and reducing its lending activity. Capital requirements that force banks to hold higher (lower) amounts of capital in negative (positive) states of the economy motivate the bank’s lending decisions to follow the business cycle. In this sense, risk-sensitive capital requirements have pro-cyclical effects.

⁶See Repullo and Suárez (2009) for a survey on capital buffers of Basel II compliant banks.

It is not only risk-based capital requirements that have this pro-cyclical impact. Accounting rules governing the loan loss provisions —measuring incurred credit losses in loan portfolios⁷— also create pro-cyclical lending activity. Indeed, loan loss reserves are an integral component of capital regulation given that loan loss reserves are intended to cover expected credit losses while bank capital covers for unexpected credit losses.

One key feature of the US GAAP accounting rules is that the allowance for loan and lease losses (ALLL) reflects information only up until the date of the financial statements. Consequently, the ALLL is calculated based on the *current* economic conditions. Consider a loan to a borrower that has recently lost his job. Assuming that the borrower has a modicum of savings to continue making loan payments for a few months, the bank may not observe a missed loan payment for 60 days. However, the bank may consider this borrower amongst the losses inherent in the portfolio since he was unemployed at the time that the bank’s quarterly financial statement was released. The bank incorporates these types of losses into the ALLL through estimates at the portfolio level for credit losses that have been incurred at the reporting date but not yet confirmed by specific evidence. If the bank forecasts that unemployment will increase in the next quarter, and a second borrower will lose her job in that upcoming quarter, the bank cannot include this possible future impairment amount in the ALLL as the economic conditions that would cause such a loss have not yet occurred. Because the current accounting rules prohibit forward looking measures, the ALLL reflects the state of the loan portfolio as it changes with the business cycle.

Figure 1 shows that loan loss provisions have a negative correlation with GDP growth (the correlation coefficient between the two time series is -0.58). When the economy is growing, provisions for loan losses are low. In bad states of the economy, the provisions for loan losses are high. This phenomenon is not unique to the US economy. For example, Bouvatier and Lepetit (2008) also find a negative correlation between loan loss provisions and GDP growth using a

⁷Provisions incrementally change the allowance for loan and lease losses (ALLL). The ALLL represents an estimate of credit losses inherent in a bank’s loan and lease portfolio. In layman’s terms, the ALLL is the level of the cushion to absorb loan losses. The provision is the flow of funds (either positive or negative) to that account.

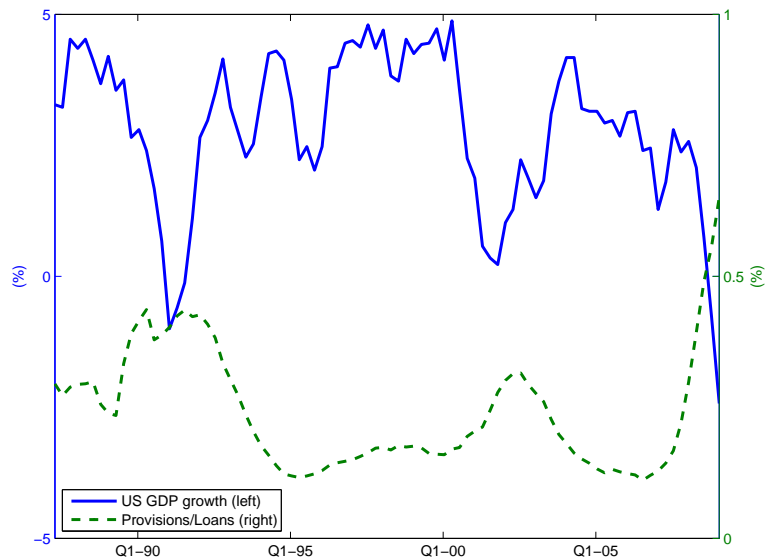


Figure 1: Provisions follow the business cycle with a lag. US Quarterly data. 4-quarter moving average. Source: Consolidated Reports of Condition and Income and National Income and Product Accounts (NIPA). Sample period Q2-1987 to Q1-2009.

sample of European banks. The cyclical behavior of loan loss provisions further exacerbates the business cycle fluctuations.

Bank capital and loan loss provisions might drive lending on this pro-cyclical schedule. Low and Morgan (2006) show that lending standards tighten during recessions and quality borrowers are denied access to credit. This credit rationing stunts growth at a time when job creation is most essential. Resources are misallocated. Well functioning, efficient markets rely on proper allocation of resources. Further, banks may raise capital as needed when the economy is growing. During this time of growth, a bank's loan portfolio is performing well and capital could be raised at reasonable prices. This is motivated by a lower risk premium during periods when the discount factor is low; however, the opposite occurs in recessions. It is only when capital is scarce that the bank is asked to raise more of it. As we witnessed in the recent financial crisis, either capital cannot be raised privately and a government injection is required or it is raised at such an expense that the institution's debt service payments further impede the flow of credit to

qualified borrowers. Either way, there is a cost imposed on the real economy. The dynamic provisioning system analyzed in this paper aims at minimizing these aggregate costs.

The adoption of a system that forces banks to increase provisions during the upturn for expected losses that will occur during the downturn bears some costs. To quantify the costs of an anti-cyclical provisioning system is out of the scope of this paper. We refer to the literature⁸ that quantifies the costs of business cycles and the impact in long term economic growth of eliminating such fluctuations.

3 Dynamic provision as an instrument to counter pro-cyclicality

In economic downturns, borrowers' credit quality tends to deteriorate. There is uncertainty about when the downturn will occur, but it is probable that credit losses will increase in a downturn. As explained above, the current accounting standards in the U.S. do not specifically address the cyclical behavior of credit losses. Consequently, loan loss allowances are usually underfunded after an expansionary period because loan loss rates are below the long-run average. One way to address the cyclical properties of credit losses is to introduce a dynamic provision system. This type of provision mechanism has been in effect in Spain since July 2000.⁹ The Spanish provisioning system has two components: a *specific provision* for impaired loans, which is determined with very detailed rules specifying the percentage of the loan amount overdue that needs to be set aside as specific provision for each type of loan, and a *general provision* for performing loans, which is computed from a statistical model of losses based on historical experience over a full credit cycle. The general (or statistical) provision serves the purpose of generating a buffer to cover for the expected losses that are inherent in the loan portfolio but have not yet been identified. We explain the dynamics of the general provision over the credit

⁸Lucas (1987), Álvarez and Jermann (2004), Reis (2009), and Santis (2007) are the main references for studies that quantify the cost of business cycle fluctuations in terms of consumption growth. These papers do not intend to dictate policy in order to eliminate fluctuations but rather to quantify the welfare costs of such fluctuations.

⁹See Fernández de Lis, Martínez Pagés, and Saurina (2000) for a comprehensive explanation of the Spanish dynamic provisioning system.

cycle in more detail below. In this paper, we adopt this model of the general provision and calibrate it for the U.S. banking system using publicly available data from the last 20 years.

3.1 Model

Under the Spanish dynamic provisioning system, general provisions are calculated using the following equation:

$$GP_t = \alpha \Delta C_t + \left(\beta - \frac{SP_t}{C_t} \right) C_t. \quad (1)$$

In this expression, GP_t is the general provision to be computed. C_t is the total of the loan portfolio. For individual banks, it is the sum of all loans on the bank's balance sheet. ΔC_t is the change in the loan portfolio over one quarter. SP_t is the specific provision as defined by accounting rules.¹⁰ The free parameters to be calibrated are α and β . As discussed in more detail below, the parameter α is the long-run average credit loan losses in the loan portfolio, and the parameter β is defined as the long-run average of the ratio of specific provision to the total amount of loans.

We calibrate the parameters α and β following the same approach as in the Spanish dynamic provision. The parameters are equal to historical averages that are computed using data from at least a credit cycle in order to proxy for the long-run expected loss rates. The parameter α in the first term of equation (1), $\alpha \Delta C_t$, implies that general provisions increase when loans are granted based on a proportion α . In order to compute α we run the following regression using the data from at least one complete business cycle:

$$NPL_t = \alpha C_t + \varepsilon_t, \quad (2)$$

¹⁰The calculation of the specific provision in Spain is based on IFRS accounting rules. The regulation can be found in annex IX of circular 4/2004 of the Bank of Spain.

where NPL_t represents non-performing loans, and as above, C_t represents total loans.

The second term of equation (1), $\left(\beta - \frac{SP_t}{C_t}\right) C_t$, constitutes the dynamic or counter-cyclical part of the provision. The ratio of specific provision with respect to total loans at a given point in time is used to approximate the position in the credit cycle at that time. The parameter β is defined as the historical long run average of that ratio. Thus, the term $\left(\beta - \frac{SP_t}{C_t}\right)$ represents the distance between the current position in the credit cycle from the “normal” level of specific provision. During expansion periods, loans appear to have a lower risk profile due to more favorable economic conditions, therefore the specific provision ratio is smaller than the long-run average and the dynamic term is positive—adding to the total provision in a period of growth. In a credit bust, specific provisions are higher than the long-run average and therefore the dynamic term is negative—reducing the total provision in a period of contraction. However, note that the general provision can only be negative as long as there are positive funds in the general allowance.¹¹ This dynamic term simply acts as a mean reverting component of the general provision.

As noted above, the total provision is the sum of the specific provision and the general provision. Specifically,

$$TP_t = SP_t + GP_t = SP_t + \alpha\Delta C_t + \left(\beta - \frac{SP_t}{C_t}\right) C_t = \alpha\Delta C_t + \beta C_t \quad (3)$$

Equation (3) shows that the total provision at a given time does not depend on the specific provision as long as $\left(\beta - \frac{SP_t}{C_t}\right) \neq 0$ and the general allowance is positive. However, if $\left(\beta - \frac{SP_t}{C_t}\right) < 0$ and the funds in the general allowance are zero, then, the total provision is equal to the specific provision:

$$TP_t = SP_t \quad \text{if general allowance} = 0 \quad \text{and} \quad \left(\beta - \frac{SP_t}{C_t}\right) < 0 \quad (4)$$

¹¹The general allowance is the accumulation of general provisions over time as defined by equation (1).

In the Spanish system, the parameters α and β are calibrated to six homogenous groups of risk and increase with the riskiness of the assets.¹² There are limits imposed on the general allowance. A maximum is imposed in order to avoid a continuous increase in loan loss reserves after several years of expansion, and a minimum amount is required in order to cover for collective losses not yet individually identified. The Spanish regulator maintains a data registry containing very detailed portfolio information for all of the banking institutions subject to regulation, which is used to calibrate the parameters of the formulas above.

In this paper, we use data for U.S. banks from the Consolidated Reports of Condition and Income (Call Report, FFIEC 031 and 041 and OMB No. 7100-0036). The variables of interest are:¹³ (1) aggregate loans, (2) non-performing loans, (3) provisions and (4) ALLL and ¹⁴. We use charge offs plus 90 days past due, plus non-accrual loans as a measure for non-performing loans.¹⁵

We do not have the ability to break down loans into homogeneous groups according to their riskiness because the ALLL and loan loss provisions are not reported by loan type but at the aggregate level. We calibrate the parameters aggregating the variables across all institutions using quarterly data from the second quarter of 1987 to the last quarter of 1999. This period is long enough to cover a wide range of economic conditions. The parameter estimates are: $\hat{\alpha} = 0.009756$ and $\hat{\beta} = 0.002189$. Note that $\hat{\alpha}$ and $\hat{\beta}$ are calculated for the aggregate banking

¹²The six groups are: zero risk (cash, public sector debt), low risk (home mortgages with LTV below 80%, corporate with rating A or above), low-medium risk (loans with real guarantees and home mortgages with LTV above 80%), medium risk (rest of loans, including corporate and SMEs), medium-high risk (consumer durable goods financing), and high risk (credit cards and overdrafts).

¹³See Appendix for variable definitions and corresponding Call Report items.

¹⁴We use ALLL to measure the specific allowance. In the context of this paper, specific provisions are “ex-post” in nature as they reflect probable credit losses that have already been incurred. That is, specific provisions refer to individual loans that are impaired (FAS 114) as well as loss contingencies in relation to individual loans or in relation to groups of similar types of loans even though particular loans that are uncollectible may not be identifiable (FAS 5). In contrast, general provisions are “ex-ante” provisions that refer to the mean value of the loan loss distribution.

¹⁵We explore five different measures for non-performing loans: charge-offs, charge-offs minus recoveries, loans 90 days past due plus non-accrual loans, loans 90 days past due, and charge-offs plus loans 90 days past due plus non-accrual loans. Results are reported for the latter: charge offs plus 90 days past due plus non-accrual loans. Results are not significantly sensitive to the variables used for non-performing loans, and are available upon request.

system and are therefore the same for all institutions.

We assume that a dynamic provision system was implemented in the U.S. in the first quarter of 2000. Given $\hat{\alpha}$ and $\hat{\beta}$, we compute the general provision for the period Q1-2000 to Q3-2009. We perform the analysis at two different levels. First, we aggregate balance sheet items for all U.S. banks to create a synthetic aggregated bank. We apply the dynamic provisioning model to this aggregate institution and compute the general provision from equation (1) above and the corresponding accumulated general allowance. This approach analyzes what would have happened to the U.S. economy from an aggregate point of view and allows us to examine the impact of such a provisioning system from a macro-prudential regulatory perspective. Second, we repeat the exercise by computing the general provisions for each one of the individual banks that received more than \$2 billion dollars in government support under the Capital Purchase Program. By looking individually at these 13 financial institutions, we can observe in more detail that the effectiveness of a dynamic provisioning system depends on the severity of the impact of the crisis on each institution.

The main empirical limitation of our analysis is that we ignore the endogenous response of bank behavior to policy actions. We do not take into account the optimal bank's response after a new regulatory paradigm has been implemented. We argue that a bank's response to such a policy shift would be to restrain credit during expansions due to the additional provisions that would result. Therefore, the results herein provide an upper bound of policy consequences, that is, our calculations reflect the maximum of the general provisions that would be accumulated by means of a dynamic provision.

3.2 A comparison of the US and Spanish banking sectors

As demonstrated in the upper-left panel of Figure 2, Spanish banks recognized a much larger loan loss provision as a percentage of non-performing loans from 2003 until the crisis hit in 2007 as compared to the US banks. In the upper-right panel of Figure 2 we can observe that

the dynamic provision smooths the impact of loan losses on profits over the business cycle. While the profitability, measured as Returns on Assets, of U.S. banks decreased dramatically at the onset of the crisis, the profitability of Spanish banks was barely impacted. This is due, in part, to the dynamic loan loss reserves that were built over the expansionary part of the business cycle to absorb the credit losses realized in the downturn.¹⁶ The lower-left panel of Figure 2 shows the evolution of the ratio of non-performing loans to total loans in both the United States and Spain. From 2003 to 2006, the ratio is stable in both countries. In 2007, the ratio of non-performing loans started to increase in the U.S. coinciding with the sharp decline in bank profitability observed in the upper-right panel. In 2008, Spain experienced a drastic increase in the ratio of non-performing loans, but, as noted above, there was no corresponding decrease in profitability. The evidence presented so far suggests that the Spanish dynamic provision may have contributed towards increasing the resilience of the Spanish banking sector. Banks were obliged to build up a buffer to counter balance the pro-cyclical effects of regulation and accounting. Lastly, the lower-right panel of Figure 2 shows a small discrepancy in capital over risk-weighted assets between the two countries during the relevant period, reflecting the similarity in terms of capital requirements in the two countries, with a sharp decline over the course of the crisis.

While the dynamic provision appears to be a promising method to reduce the effects of pro-cyclicality based on the preceding informal analysis, it is important to note some key differences between Spain and the United States in their financial markets structure and banking regulations. Spain had far less exposure to structured products. Spanish banks placed a higher emphasis on retail banking than did U.S. banks. This simpler approach to banking could also have played an important role in Spain's economic resilience in the face of this banking crisis. Further, Spain strictly regulated off-balance sheet entities. The Spanish Central Bank did not allow the creation of an off-balance sheet vehicle unless a real transfer of risk occurred. Since institutions had to keep loans on their books, they closely monitored risk exposures that were

¹⁶We discuss in section 5 the implications of dynamic provision for income smoothing over the business cycle.

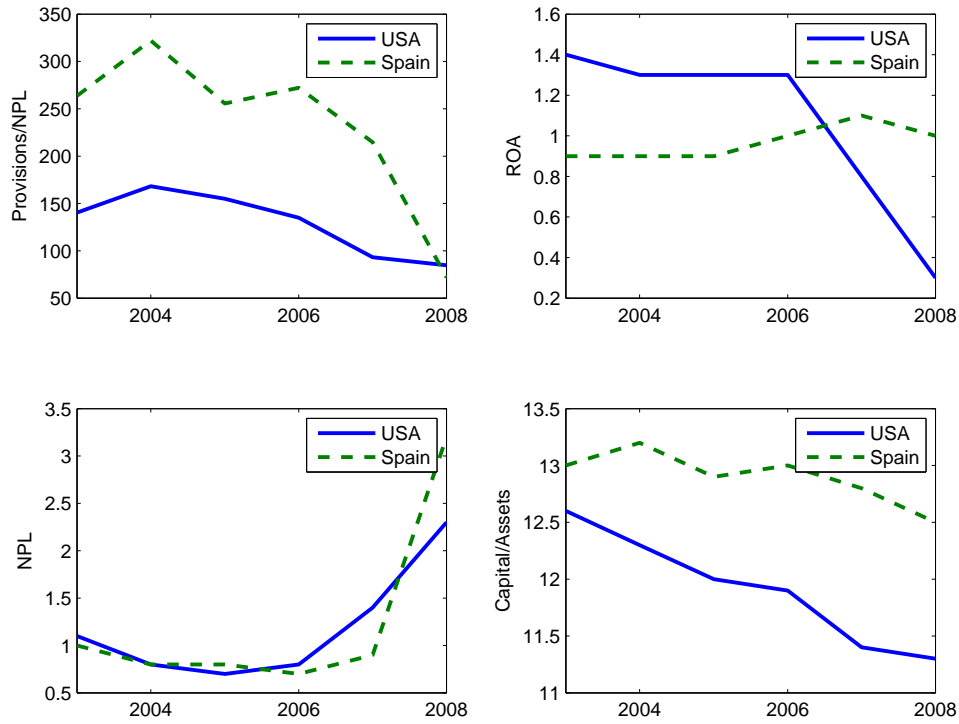


Figure 2: Upper-left panel: Provisions over non-performing loans. Upper-right panel: Return on Assets of the banking systems. Lower-left panel: Non-performing loans over total loans. Lower-right panel: Capital over Total Risk-Weighted Assets. Annual data comparison for US and Spain, 2003-2008. Source: IMF

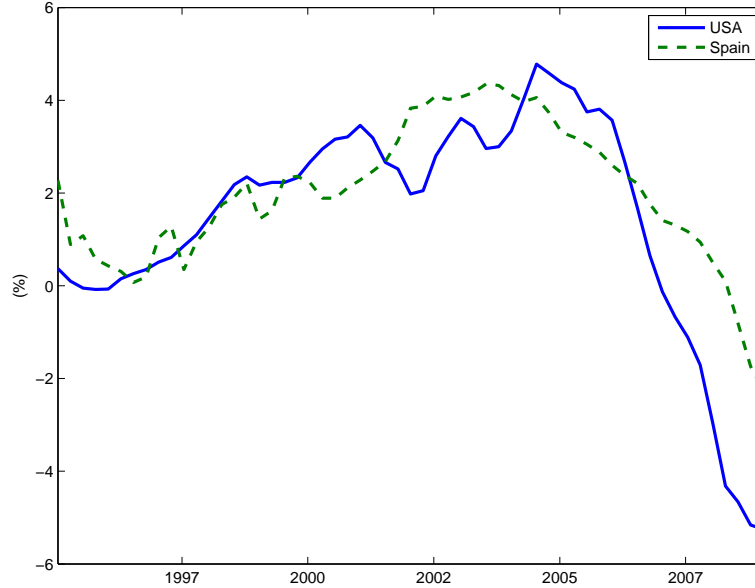


Figure 3: HPI (Household Price Index) growth rate. US and Spain. Quarterly data from Q1-1995 and Q1-2009. 4-quarter moving average. US prices from OFHEO and Spanish prices from the National Statistics Institute (INE.)

generated by new loan origination.

In some crucial aspects, though, the shocks that hit the United States banking system were the same shocks that hit the Spanish banking system—a credit boom from 2002-2006 accompanied by a credit bubble, soaring house prices, credit levels, and household indebtedness (see Figure 3 and Figure 4). These shocks resulted in increased loan losses as a proportion of total loans in 2007-2008 (see lower-left panel of Figure 2). However, as we discussed above, the loan loss provisions and profitability measures show very different patterns in the two countries (see upper-right panel Figure 2). For these reasons, the empirical exercise proposed in this paper, i.e. implementing the Spanish dynamic provisioning model in the US banking sector, may offer insight into the role of loan loss provisions in determining the health of the banking system and individual banks during a severe crisis.

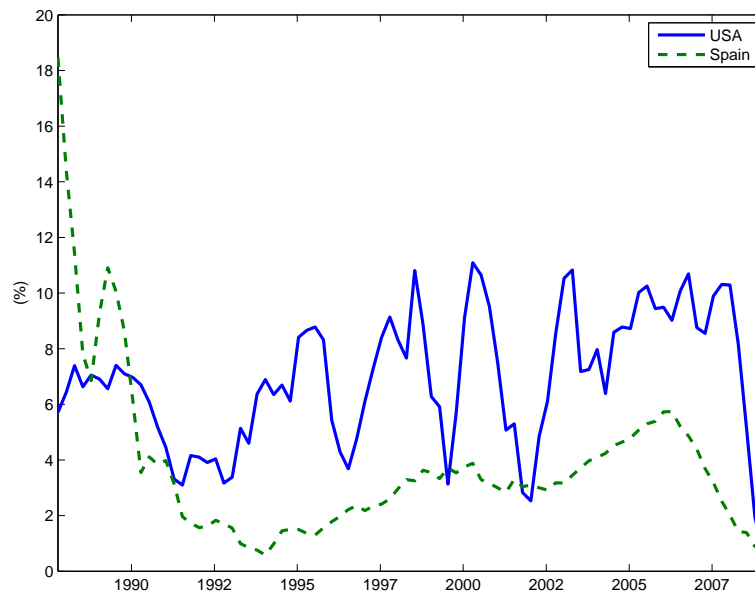


Figure 4: Aggregate credit growth rate. Credit defined as total aggregate loans, commercial and industrial, and consumer loans aggregated in a comparable way across US and Spain. Quarterly data, 4-quarter moving average.

4 Results

In this section we present the results of implementing a dynamic provision system in the U.S. in the first quarter of 2000. The main results for the aggregate US banking system are summarized by Figure 5. The results for the individual banks are discussed in the next subsection. The dash-dotted line shows the actual provision expense computed by aggregating all quarterly provisions of the banking institutions in the U.S. during the period Q1-2000 to Q3-2009, as reported in the bank level Call Reports. Note that our sample period covers two recessions: 2001 and 2007-2009. The dashed line shows the amount of general provisions that the banks would have been required to set aside if the dynamic provisioning system detailed above were in place. The solid line represents the sum of the two types of provisions.

The pattern observed from 2000 to 2008 is that the general provision seems to mirror the specific provision, with the result of smoothing the aggregate total provision, as described in equation (3). On the one hand, in positive states of the economy when the specific provision is below the long-run average ($\beta > \frac{SP_t}{C_t}$), the general provision is positive, and therefore a buffer is created. This is how the dynamic provision is intended to work under “normal” business cycle fluctuations. We can observe a positive general provision in the following quarters: 2000 Q1 to 2001 Q2 and from 2003 Q1 to 2007 Q3. On the other hand, the specific provision is large in negative states of the economy ($\beta < \frac{SP_t}{C_t}$), the general provisions are negative, and the buffer is drawn down. We can observe a negative general provision in Q3-2001 to Q1-2002 and from Q4-2007 to Q1-2009.

The general provision is zero from Q2-2002 to Q4-2002 and in 2009, second and third quarter. In these quarters we have ($\beta < \frac{SP_t}{C_t}$). However, the general allowance has already been depleted and, following (4), the total provision is equal to the specific provision.

Figure 6 shows the specific, general and total allowances. The dash-dotted line represents the specific aggregate allowance for loans and leases losses under the current system, i.e. the actual

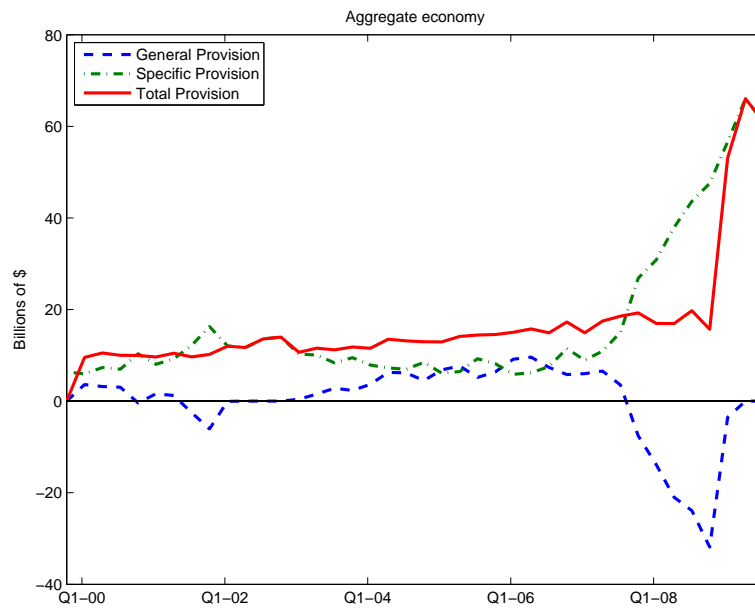


Figure 5: Time series of the Specific Provision, General Provision, and Total Provision. Parameters calibrated with US data on aggregate provisions from 1987 to 2000 and applied to provisions from Q1-2000 to Q3-2009

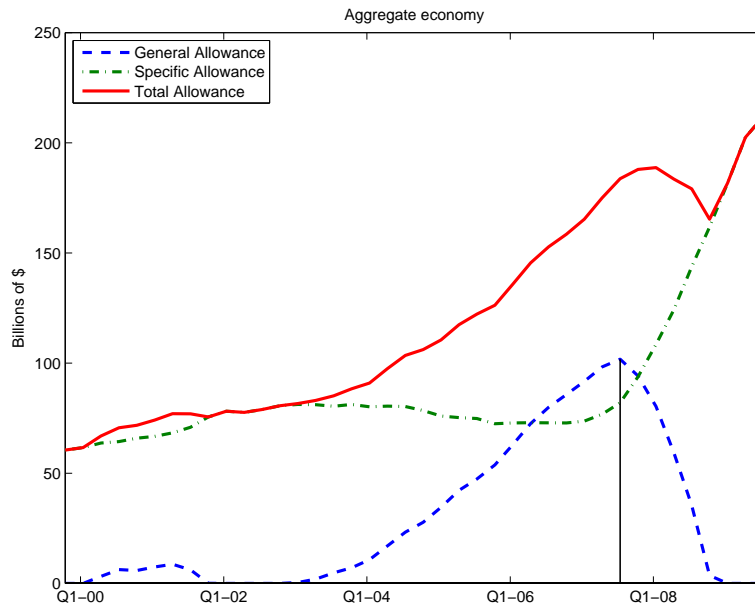


Figure 6: Allowance for Loan and Lease Losses (ALLL), General Allowance net of charge-offs, and Total Reserve. Parameters calibrated with US data on aggregate provisions from 1987 to 2000 and applied to provisions from Q1-2000 to Q3-2009

allowance reported in bank Call Reports (ALLL). It is noteworthy that ALLL decreases from 2003 to 2006. The dashed line depicts the general allowance under the hypothetical dynamic provisioning system. Since there was a recession in 2001, the general allowance starts from zero in the first quarter 2003. In the subsequent quarters, the general allowance increases. The total allowance (solid line) with the dynamic provision would have been much higher than the actual ALLL. The highest level of the general allowance, depicted by the vertical solid line, is \$101.75 billion, attained in the third quarter of 2007. However, the allowance would have been depleted by the first quarter of 2009. After this quarter, the situation is akin to not having dynamic provisioning. Equation (1) would result in negative general provisions when the stock of general reserves is already zero. Therefore, after the first quarter of 2009, the total allowance is equal to ALLL.

To better quantify the overall effect of dynamic provisioning, we also report net income and

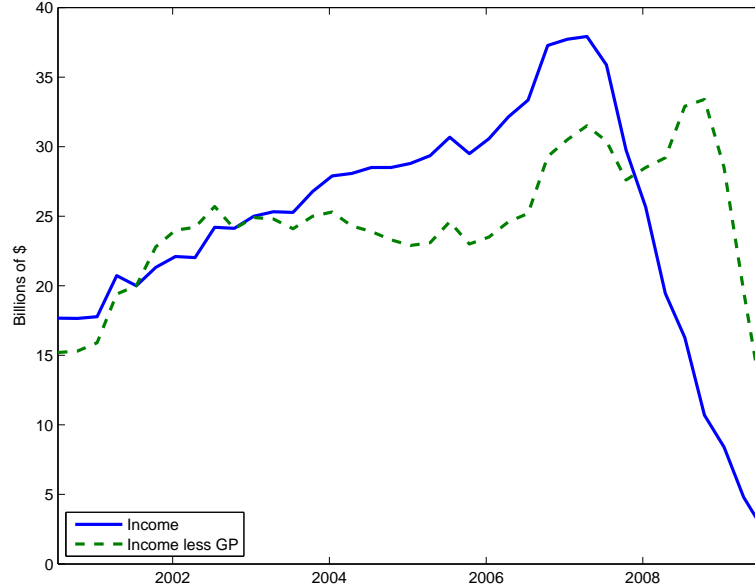


Figure 7: Actual aggregate income (\$Billion) of all banking institutions (solid line) and hypothetical income evolution within a dynamic provisioning framework (dashed line). Four quarters moving average. Sample period Q3-2000 to Q3-2009.

returns on equity with and without the dynamic provisioning system in place. Figure 7 shows the evolution of aggregate income earned by the U.S. banks during recent years. Aggregate income started to decline dramatically in mid 2007. Alternatively, with the dynamic provisioning system in place, net income would have maintained an average of \$25 billion until the first quarter of 2009. This result highlights a fundamental problem of dynamic provisioning. Even though the quality of assets would have clearly deteriorated, earnings would not reflect any of this deterioration. Accounting rules seek to accurately portray the actual performance of the bank for the period being reported, which seem at odds with the proposed dynamic provisioning system.

Under current accounting rules, banks are able to pay higher dividends during economic expansions than they would be able to under the proposed dynamic provisioning model. Dividends are a direct reduction to capital so if the ability to pay dividends is reduced during economic

upturns, there may be more capital available to cushion the effect of a downturn.

As discussed above, dynamic provisioning has the impact of reducing the variability of earnings through the business cycle. Therein lies the trade-off that policy-makers face when considering the implementation of a provisioning system that intends to reduce the pro-cyclical effects of the current capital requirements. Under dynamic provisioning, banks would less often need to raise expensive capital during crisis periods and may even be able to continue distributing dividends. One might argue that this system misleads investors regarding banks' financial health. A solution for this potentially harmful situation would be to require banks to disclose total provisions and earnings with *and* without the new dynamic provision accounts. Alternatively, banks could be asked to exclude the dynamic provisioning results from reported income and capital, and report it in a *restricted* capital account.

The finding that general allowance would have been depleted by the first quarter of 2009 highlights the limitations of the dynamic provision. Dynamic provisioning is essentially a rule for setting aside reserves based on average incurred losses over an average credit cycle. The parameters of the rule are calibrated based on historical losses. The buffer created in good times will only suffice to withstand downturns to the extent that the severity of the cycle is not above the average historical cycle

Under the generally accepted credit risk management framework, capital requirements are meant to cover for unexpected credit losses while provisions are meant to cover for expected credit losses. The dynamic provisioning system is intended to cover expected losses and is, by definition, not intended to prepare banks for events that go far beyond the normal business cycle. It cannot be assured that a situation like the one we have experienced in recent years would have been avoided through a dynamic provisioning system. Several complementary tools are being considered in policy discussions regarding banks' safety during extreme events. Among others, the use of hybrid debt instruments that convert into equity using a predetermined trigger, the curtailing of dividend payments or simply higher capital requirements for systemically important

institutions.¹⁷

4.1 Individual Institutions

We analyze separately some of the major U.S. banking institutions. In particular, we focus on the banks that received more than \$2 billion dollars in TARP funds during the financial crisis in the second half of 2008. We study the lead banks belonging to the following bank holding companies: Citigroup Inc., J.P. Morgan Chase & Co., Wells Fargo & Co., Bank of America Corporation, The PNC Financial Services Group Inc., U.S. Bancorp, SunTrust Banks Inc., Regions Financial Corporation, Fifth Third Bancorp, The Bank of New York Mellon Corporation, KeyCorp, Comerica Inc., and State Street Corporation.¹⁸

We compute the general allowance for each one of the 13 individual banks using equation (1) and using the parameters calibrated to the aggregate U.S. bank (i.e. $\hat{\alpha} = 0.009756$ and $\hat{\beta} = 0.0021899$). The results can be found in Table 1. In what follows, we analyze in more detail the situation of the three largest US bank holding companies: Citibank, JP Morgan Chase, and Bank of America.¹⁹

Figure 8, shows that Citibank would have depleted the newly created general allowance in the fourth quarter of 2007—much earlier than the rest of the institutions and earlier than the aggregate of the U.S. financial system. From that date on, Citibank would have been in the same situation as without the dynamic provision. That is, total provisions for loan losses would be equal to the specific allowance (ALLL) during the last 2 years, as observed. The results are driven by a relatively poor performance of the Citibank loan portfolio during the 2000 to 2005

¹⁷The use of convertible debt has been discussed, among others, in Flannery (2005). The question of systemically important institutions has been largely discussed recently. A survey of methodologies and a particular regulatory instrument is developed in Brunnermeier and Adrian (2009).

¹⁸There are 7 additional financial institutions that received more than \$2 billion in TARP funds; however, there is not enough historical data for those companies because they converted into Bank Holding Companies during the Great Recession. They are: American Express Company, BB&T Corp., Capital One Financial Corporation, CIT Group Inc., Hartford Financial Services Group, Inc., Morgan Stanley and The Goldman Sachs Group, Inc.

¹⁹The time series of provisions and allowances for the individual institutions, analogous to the series presented for the aggregate economy in the previous section, is available upon request to the authors.

Table 1: TARP Capital Purchase Program (CPP). *Max GA* is the maximum general allowance that results from the dynamic provisioning for the individual 13 institutions.

Institution	CPP Date	CPP Amount	Max GA	Depletion
Citigroup Inc.	10/28/2008	25,000,000,000	3,904,273,000	2007-Q4
Bank of America	10/28/2008 1/9/2009	25,000,000,000	26,797,980,000	still positive
JPMorgan	10/28/2008	25,000,000,000	11,575,570,000	2009-Q1
Wells Fargo	10/28/2008	25,000,000,000	11,815,340,000	2009-Q3
PNC	12/31/2008	7,579,200,000	2,087,532,000	still positive
SunTrust	11/14/2008 12/31/2008	4,850,000,000	5,614,091,000	still positive
Fifth Third	12/31/2008	3,408,000,000	1,260,530,000	2009-Q1
KeyCorp	11/14/2008	2,500,000,000	2,194,111,000	2009-Q2
State Street	10/28/2008	2,000,000,000	776,832,000	still positive
BoNY - Mellon	10/28/2008	3,000,000,000	1,837,191,000	still positive
Comerica	11/14/2008	2,250,000,000	1,885,250,000	still positive
Regions	11/14/2008	3,500,000,000	2,921,991,000	still positive
U.S. Bancorp	11/14/2008	6,599,000,000	3,146,228,000	2009-Q3
U.S. Aggregate		204,901,756,320	101,758,400,000	2009-Q1

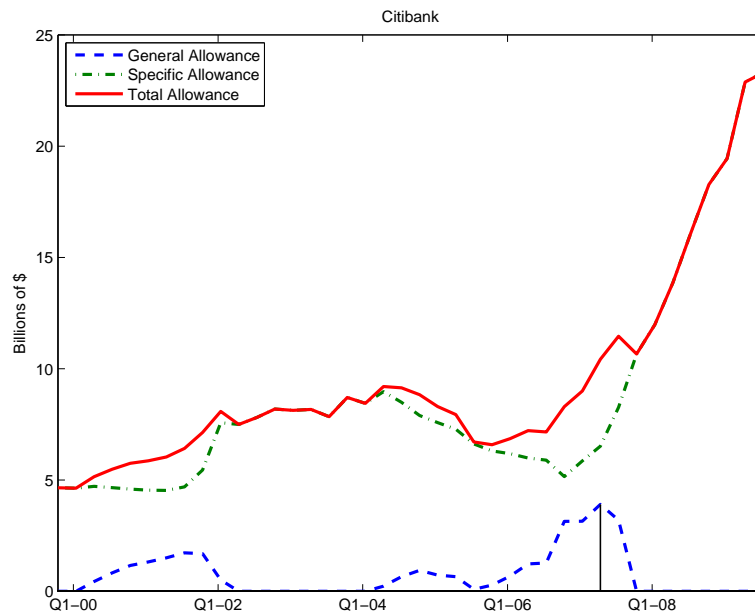


Figure 8: Citibank ALLL, General Allowance, and Total Allowance. Parameters calibrated with US data on aggregate provisions from 1987 to 2000 and applied to provisions from Q1-2000 to Q3-2009

period. During this period, the ratio of specific provisions to loans is above the banking system long-run average ($\beta < \frac{SP_t}{C_t}$). Citibank would have started to build up the stock of reserves in 2006, too late to serve the purpose of attenuating the problems caused by increased loan losses in Citibank's books with the recession.

In Figure 9 we present the results for Bank of America. We observe that the general provisions build up during the period 2001-2007 would have prevented the spike in specific provisions observed during the crisis. The general allowance accumulated by the end of the fourth quarter of 2007 (\$26,797 million) would have been used to cover the severe increase in loan losses in 2008 and 2009. In the last quarter of our data, 2009 Q3, the general allowance still had positive balance remaining. It is worth mentioning that the computations use bank level data; therefore there is no first order impact of the acquisitions that happened during the later years.

Finally, JP Morgan Chase displays a closer pattern to the aggregate of U.S. banks. Figure

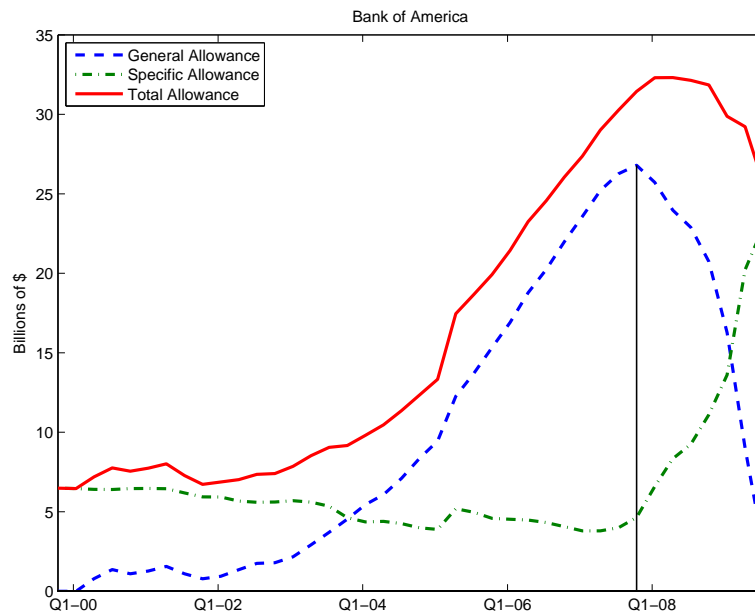


Figure 9: Bank of America ALLL, General Allowance, and Total Allowance. Parameters calibrated with US data on aggregate provisions from 1987 to 2000 and applied to provisions from Q1-2000 to Q3-2009

10 shows that the maximum general allowance is achieved in the third quarter of 2007 (\$11,575 million). The general allowance is used until it's depleted in the third quarter of 2008.

5 Policy Implementation: Accounting Reform or Pillar 2

This paper advocates addressing pro-cyclical effects of capital requirements with a dynamic component for total loan loss provisions. It does not take a normative position on whether pro-cyclical effects of capital requirements should be addressed via an additional provision in the accounting framework or whether it should be addressed via an additional capital requirement, potentially part of the Capital Adequacy requirements in Pillar 2. There are stark differences in these two approaches, and both would require a different set of regulatory reforms.

The focus of the accounting framework is to provide to investors and shareholders information

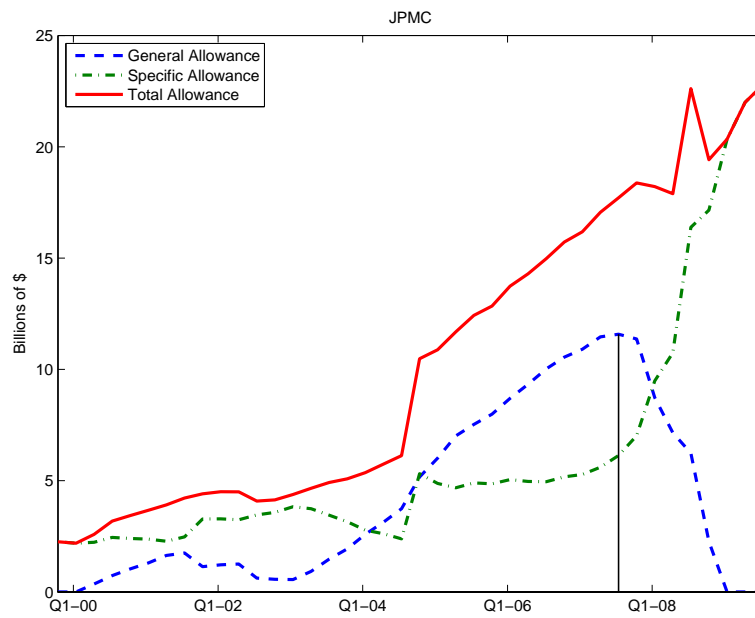


Figure 10: JP Morgan Chase ALLL, General Allowance, and Total Allowance. Parameters calibrated with US data on aggregate provisions from 1987 to 2000 and applied to provisions from Q1-2000 to Q3-2009.

that is useful in making investment and credit decisions —a faithful representation of what existed or happened at a firm as of a reporting date. From this point of view, published accounts should not anticipate possible future losses. Financial reports are meant to reflect a snapshot of the financial condition of an institution at a point in time and to provide a measure of past performance over the reporting period. Accounting rules do not seek to quantify or recognize latent risk in a credit portfolio. On the other hand, incorporating management’s expectations of how the economy would impact its loan portfolio seems more aligned with the capital regulation framework, provided that capital regulations consider a loan loss distribution of losses over a specified time horizon. Regulatory capital should cope with the occurrence of unexpected losses, that is, large and infrequent losses that are located far in the tail of the distribution. Loan loss reserves should cope with expected losses as measured by the mean value of the distribution. In that sense, loan loss reserves should be a measure of “ex-ante” expected losses. However, accounting rules focus on determining the allowance needed for probable credit losses that have already been incurred (“ex-post”). Therefore, there is a conceptual gap between the accounting rules and the regulatory capital framework in that neither capital requirements nor accounting guidelines address the expected losses as a product of the cyclical behavior of the economy. Generic provisions refer to “ex-ante” provisions and are therefore a helpful tool to align the capital requirements with the accounting rules for ALLL. See discussion in footnote 14.

With respect to the argument favoring Pillar 2, bank regulators have access to private information and have the ability to ask for higher capital levels without publicly communicating anticipated account levels. The flexibility provided by the Basel II Accord, under supervisory discretion, favors the adoption of an “economic cycle buffer” through capital requirements under the framework of Pillar 2. This countercyclical capital buffer would achieve the same goal described in this paper using an additional loan loss provision. As Jiménez and Saurina (2006) argue, if the accounting framework does not provide enough flexibility to banking supervisors, they should find it through the allowed supervisory discretion of Pillar 2. One argument against inclusion in Pillar 2 is that the dynamic provision may not be enforced uniformly across dif-

ferent regulatory authorities. This could manufacture competitive disadvantages (advantages) for firms. To prevent the variation allowed by discretion in Pillar 2, one could advocate to include a counter-cyclical component in Pillar 1. Even if the probabilities of default, recovery rates, and exposures are computed perfectly through the cycle, rating migrations have an impact on the capital requirements under Pillar 1 during downturns. A counter cyclical capital buffer that accounts for natural migrations would be consistent with Pillar 1 and would avoid the discretionary choices of economic capital under Pillar 2.

Because of the supervisory discretion embedded in the rules currently in place, it seems that the implementation of the dynamic provision as a component of Pillar 2 capital faces fewer immediate obstacles; however, further discussion about the nature of this provision and its most effective method of implementation needs to occur. At present, we do not advocate for one approach over the other.

One question that remains unanswered, both in the actual implementation of dynamic provisioning in Spain and in a potential implementation elsewhere is: would banks use the accumulated fund in a severe downturn? (See García-Herrero and Fernández de Lis (2008)). Given a rapid increase in bad loans, such as we have observed since 2007, banks may prefer to increase provisioning further rather than deplete the fund. It may be optimal for each bank to be individually cautious; however, these separate acts of caution may have second order systemic consequences that would delay recovery. In order to avoid these pernicious consequences, the dynamic provisioning system needs to be rule based and needs not to leave much discretion to banks regarding when to replenish or use the funds.

6 Conclusion

We have examined a hypothetical situation in which U.S. banking institutions are required to create a loan loss allowance buffer in order to counteract the pro-cyclicality of risk-based capital

requirements. We recognize that endogeneity problems limit the scope of the study: such a policy would alter bank incentives to extend credit during benevolent economic times due to a higher marginal cost of credit caused by the dynamic provision. We show that the buffer generated by these new allowances in the upswing of the cycle would not have been enough to prevent banks from having to ramp up the loan loss provisions at the end of 2009. The analysis is repeated for the commercial banks which received government support in the form of TARP funds. We conclude that about half of these banks would not have needed the TARP funds had the dynamic provisioning system been in place. The reason is that these banks would have raised those funds in a period of good macroeconomic conditions, when prices of risk are lower. We also discussed how a counter-cyclical policy could be implemented either through the accounting requirement (like the one developed in this paper based on the Spanish provisioning system) or through Pillar 2. However, further research is required to shed light on the conditions under which one approach would be more desirable than the other. Finally, it is worth noting that the original formulation of the dynamic provisioning system is calibrated to cover an average downturn period. Hence, the effectiveness of the dynamic provision depends on the severity of the crisis occurring. There is little disagreement that the 2008-09 economic crisis represents a fluctuation that goes beyond the intensity of a typical business cycle fluctuation. Under the uncertainty of the severity of a crisis, extra reserves in the form of allowances or capital would only mitigate the effects of a potential large negative shock to the banking system.

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Appendix: Definition of variables

All of the *riad* variables that are year-to-date have been adjusted to be quarterly data.

- Non-performing loans: we use five alternative measures
 - Charge offs = *riad4635*
 - Charge offs-recoveries = *riad4635-riad4605*
 - Loans 90 days past due + non-accrual = *totpast90d+totnonaccrual*
 - Loans 90 days past due = *totpast90d*
 - Charge offs + 90 days past due + non accrual (used in the paper)
- Total Loans = *rcfd2122*
- Loan loss provision (specific provision) = *riad4230*
- Allowances for Loans and Leases Losses (specific allowance)= *rcfd3123*
- Aggregate Income = *riad4340*
- *totpast90d* is the sum of the following items:

<i>rconf174</i>	<i>rconf175</i>	<i>rcon3494</i>	<i>rcon5399</i>	<i>rconc237</i>	<i>rcfd170</i>
<i>rconc239</i>	<i>rcon3500</i>	<i>rconf180</i>	<i>rconf181</i>	<i>rcfnb573</i>	<i>rcfd3506</i>
<i>rcfd5378</i>	<i>rcfd5381</i>	<i>rcfd1597</i>	<i>rcfd1252</i>	<i>rcfd1255</i>	<i>rcfd5613</i>
<i>rcfdb576</i>	<i>rcfdb579</i>	<i>rcfd5390</i>	<i>rcfd5460</i>	<i>rcfdf167</i>	
- *totnonaccrual* is the sum of the following items:

rconf176	rconf177	rcon3495	rcon5400	rconc229	rcfdf171
rconc230	rcon3501	rconf182	rconf183	rcfnb574	rcfd3507
rcfd5379	rcfd5382	rcfd1583	rcfd1253	rcfd1256	rcfd5614
rcfdb577	rcfdb580	rcfd5391	rcfd5461	rcfdf168	