"Bank risks, provisioning and the business cycle: a panel analysis on European intermediaries"

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Bank risks, provisioning and the business cycle: a panel analysis on European intermediaries

Abstract

The accounting practices as regards provisioning of the losses on loans adopted by banks fluctuate with the business cycle and can reinforce financial instability. The objective of this study is to examine whether and to what extent provisioning policy is procyclical. We focus on the interaction between business cycle and provisioning policy (loan loss reserves and loan loss provisions) consistent with the Basel Accord of 1988 which made Loan Loss Reserves no longer part of Tier I capital in the numerator of the capital adequacy ratio. An empirical model on panel data is then adopted on the European banks of 1992 to 2004. In this model we consider two types of provisioning policy determinants: loan loss provisions and loan loss reserves. We find that large banks tend to hold less risk. They establish fewer reserves than small banks. However, our results provide that functional diversification has no impact on provisioning policy. We also find that risk weighted assets reduce the volatility of the provisioning policy during the cycle. The findings of our research are consistent with the empirical work of Bikker and Hu (2002), Laeven and Majnoni (2003), Bikker and Metzemakers (2005) who show that banks more fund the losses on loans in period of economic downturn than in period of economic upturn for a whole of the OECD countries.

Keywords: procyclicality, loan loss provisions, loan loss reserves, European banks, panel data.
JEL Classification: G21, F34.

Introduction

These twenty last years were characterized by the introduction of the solvency ratios by the Basel[1] Committee on the Banking Regulation and Supervisory Practices. The Basel Committee revised the 1988 Basel accord to Basel II. The aim of the revisions is to closely align the regulatory capital requirements with the underlying risks in the on- and off-balance sheet activities. However, capital ratios (Cooke ratio and currently McDonough) were suspected to be sources of financial instability. Indeed, capital ratios proved to be procyclical as they tend to exacerbate the economic cycle. Moreover, provisioning is closely related to the business cycle. Provisions are more sensitive to the fluctuations coming from the macroeconomic environment and from borrowers' solvency. It reduces the profits which banks can add to their capital. Provisions are related to the quality of the credit banks' portfolios. It is one of the first quantitative indicators of deterioration in loan quality and, at the same time, a key contributor to fluctuations in bank earnings and capital (Hoggarth and Pain, 2002). Consequently, provisions are a proxy of the overall riskiness of the banks' portfolios. The beginning of an expansionary phase is characterized by an increase in the firms' profits, a rise in asset prices and the optimism of customers' expectations leads to a growth in bank lending. During this phase (expansionary phase), banks underestimate their risk exposures, reduce their credit standards and provisions for future losses. However, the risk materializes in recession-ary phase because of a worsen customers' profitability and the deterioration of borrowers' creditworthiness. Borrowers can not repay their debts. The consequence of this phenomenon is the deterioration of banks' balance sheets because of the appearance of loan losses. The risk exposure of banks increases associated with the high cost of capital and the high level of provisions. Banks react by reducing lending. The reduction of lending exacerbates the effects of economic downturn (procyclicality). Borio, Furfine and Lowe (2001) show that provisions increase during the recession and that provisions reach their maximum one year after the real deceleration of the economy[2].

Provisioning policy differs across countries and institutional types (practical accountants, regulations and tax policy for example). It depends on the banks' behavior. Banks create provisions during economic upturn and they are forced to increase them in economic downturn because of a high failure rate of the borrowers and this in spite of the fall of their results. This behavior justifies the procyclical character of provisioning policy because provisioning varies according to economic fluctuations. During upward swing periods, banks feed more stock of provision than in downswings periods when the results are low and the capital is expensive[3]. The

[1] The Basel Committee includes governors of Central Banks and presidents of the authorities of supervision of the G 10 countries.

[2] It is the case, for example, in Japan where provisions increased only in the middle of the year 1990, a long time after the problems of the Japanese banking structure were recognized.
[3] We suppose that Loan loss provisions are stocks (of provisions) deducted by banks each year to cover the share of presumed existing unrecovered loan in the banks' loan portfolio. This stock could be fed by financial flows such as movements of currency entering or outgoing of the banking profits on a given date. Consequently, in upward period, this stock would be fed because of the high results of banks. However, in downswings period, this stock would not be fed any more following the fall of the results and more still this

increase of provisions (decrease) during periods of weak (strong) economic growth is synonymous with a reinforcement of the cycle. The capital ratio itself was suspected to be procyclical (Turner, 2000). Several works concerning the analysis of loan loss provisions, such as Bikker and Metzemakers (2005), Bikker and Hu (2001), Cavallo and Majnoni (2001), Fonseca and Gonzalez (2005), Bouvatier and Lepetit (2006), Perez, Fumas and Saurina (2006), Laeven and Majnoni (2003), Anandarajan (2005), Lobo and Yang (2001), Dewenter and Hess (2006) mainly approached following points: the introduction of loan loss provisions like an integral part of the capital regulation, the amplification of the fluctuations of the credit supply induced by the capital adequacy constraint and the provisioning system, the management of loan loss provisions at universal banks[1] and specialized banks, and finally, the use of provisions for managing objectives and for signaling. Another study focuses on the signaling effects of additions to bank loan reserves (Hatfield and Lancaster, 2000). Such approaches are a rich lesson. However, they do not integrate the impact of functional diversification on the procyclical character of provisioning policy and they do not consider the effect of the risk weighting asset regulations imposed by the Basel Committee.

The aim of this article is to determine the procyclical behavior of provisioning policy of European banks within the period of 1992-2004 by distinguishing banks according to their degree of diversification and by respecting risk weighting assets as required by the Basel Committee. This choice is mainly explained by the fact that, on the one hand, universal bank principle is very common throughout Europe, and, on the other hand, we suppose that the procyclicality of provisioning policy could be re-

duced if banks respect the regulatory constraint. For this purpose, we adopt a panel data approach inspired by Laeven and Majnoni (2003), Bikker and Metzemakers (2005) on a basis of European banks' data containing the individual information extracted from the Bankscope database. According to the empirical literature, we use two possible measures depending on whether information on provision has been extracted from banks' balance sheets or from the income statement. So we propose two models with two different ratios (loan loss reserves/total assets, and loan loss provisions/total assets) to represent provisioning policy. Our results confirm banks' procyclical provisioning policy. In particular, these results show that the taking into account the risk weighted assets as defined by the Basel Committee reduces the volatility of provisioning policy during the business cycle.

This article is organized in the following way. Section 1 examines the credit risk along the business cycle. Model specifications and variables used in this study along with a description of our data are provided in section 2. Section 3 analyzes and discusses principal results obtained, and the last section concludes the article.

1. Credit risk along the business cycle

Credit risk is related to the business cycle because of the cyclicality of bank lending. Several explanations of the cyclicality of bank lending can be given, such as disaster myopia, over-optimism, asymmetric effects and insufficient market discipline. However, for a better understanding of the study, it is necessary to discuss bank lending behavior to businesses over the business cycle (1.1) and to examine the link between provisions for loan losses and procyclicality (1.2).

1.1. Bank lending and the business cycle. Bikker and Hu (2002) argue that lending depends on either demand or supply variables. Indeed, the demand for credit depends on the business cycle and the interest of loans. However, credit supply depends on the interest rate on loans, banking-specific factors and expected profits. Capital and reserves are the most important banking-specific factors. Bikker and Hu find that lending is shown to be strongly dependent on demand.

Bank lending to businesses tends to be procyclical (Gorton and He, 2007). Bank lending is contracted during economic downturn and increased during economic upturn. According to bank lending theory, the central point in the issue of procyclical behavior of banks is to examine lending into the macroeconomic sphere. The procyclical feature of bank lending to business is driven by the supply of credit.

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stock would strongly decrease because banks will have to fund more (because of the very high failure rate of the borrowers).

[1] Universal banks are banks which carry on several activities. They offer an exhaustive range of banking services to all customers. The cover of the whole of the financial services would lead to savings of range and scale. At the present time in European countries where banking consolidation is most advanced, the banking environment is structured in oligopoly of universal banks. Engaged in processes of externalization and delocalization, these banks get some their products, either near specialized subsidiary companies, or near external suppliers. It is the case of the insurance but also for trades closer to the traditional bank and the consumer credit. In addition, Germany, Switzerland and Austria never derogated from the concept of the universal bank since nineteenth century. Each bank being entitled to cover the entirety of the banks' operations. What does not exclude the existence from banks specialized in certain types of operations. Spain, France, United Kingdom and Italy performed the choice much more tardily. In France, the universal bank principle was introduced by the banking law of 1984 which removed the traditional distinction between investment banks and deposit banks. The second banking directive of 1989 made it possible to combine deposit banks, investment banks, credit management, financial advisory activities and operations related to the insurance. The law of July 2, 1996 of "modernization of the financial activities" founded a single statute of financial intermediaries authorized to exert activity related to stock exchange.

Borrowers have private information about their ability to repay their loans. At the beginning of the loan agreement, this private information may not be known by banks. The moral hazard problem creates risks that banks can address both through terms and conditions of lending in their contracts and through the selection of their asset portfolios. Moreover, the quality of bank loans may deteriorate during expansions because banks may expand their business loan portfolios beyond the standard level. This excess lending creates an adverse selection, and afterwards leads to an excessive contraction of bank lending. The adverse selection is mostly due to the institutional memory of the bank (Berger and Udell, 2003), which means that during economic downturn, loan officers acquire the skills to recognize risky borrowers, and they lose these skills as the economic downturn recedes into the past. This implies that some experienced officers may forget the lessons of the past, due to short memory. We can add that the availability of bank credit has a significant effect on the aggregate economy. It helps firms to obtain alternative sources of funding. Direct access to credit markets is not an option for many firms. This availability of bank loans to fund the economic activities of business may exacerbate the magnitude of economic business cycles (Berger and Udell, 1992). However, Gorton and He (2007) show that the relative bank performance of commercial and industrial loans is an autonomous source of macroeconomic fluctuations.

The procyclical feature of bank lending to businesses is also involving the demand of credit. During economic downturns characterized by a decline in business investment, the demand decreases. This weaker demand affects the quantity of bank loans.

However, bank lending is exposed to changes in the overall economic conditions. These changes can lead to several risks, including credit risk. Credit risk is influenced by the business cycle conditions. Vennet et al. (2004) give three explanations of the link between banks' risk and the business cycle. The first explanation is the association between business cycle, the degree of asymmetric information and bank default risk. They argue that the banking sector is vulnerable to adverse selection and moral hazard, both caused by asymmetric information. It is difficult for banks to assess the creditworthiness of borrowers. During economic downturn, the value of collateral attached to loans decreases and the degree of asymmetric information increases. This leads to a risky bank intermediation. The second explanation is a shift in the risk profile of banks over the business cycle. During economic downturn, banks are tempted to lower their lending standards. Loans

granted during boom periods have a higher probability of default than those granted during slow credit growth periods (Jimenez and Saurina, 2005). However, during economic upturns, banks increase loan growth. There are three reasons that can explain the increase of growth loans. These include principal-agent problems, herd behaviors and short-term objectives. The principal-agent problem between bank shareholders and managers can lead to excessive volatility of loan growth (Perez, Jimenez and Saurina, 2006). In order to obtain a reasonable return on equity for their shareholders, managers may engage in riskier activities, and focus more on their own rewards. The reward of the managers can be more in terms of growth objectives instead of profitability targets. In this case, managers have incentives to increase loan growth. They also may increase loan growth if their profitability decreases. The second cause of increased loan growth volatility is herd behavior. During boom periods, many banks are encouraged to increase their volume of loans in order to preserve their market share. The third reason for the increased volatility is banks' preference for short-term objectives. Banks finance more projects during economic upturns because they have short-term objectives.

The third explanation concerns the evidence of the bank lending channel in most developed economies, such as European countries where the lending channel is particularly relevant. Monetary shocks, for example, may trigger a tightening of lending standards. Credit rationing is one of the responses of banks during an economic downturn. Credit rationing is the restriction of the quantity of credit available to potential borrowers. Banks choose to ration credit in order to avoid adverse selection and negative incentive effects (Bernauer and Koubi, 2002). Another response of banks during economic downturn is to reorganize their loan portfolios. They can redirect their portfolios toward less risky assets at that moment. The refusal of banks to make loans even though borrowers are willing to pay more, reduces the financial resources of these borrowers, or makes the cost of external financing higher. This fact can prolong the economic downturn.

To summarize, the bank lending channel is explained by the supply and demand for credit. The bank lending cycle is procyclical, which means that it moves in the same way as the business cycle. However, during economic downturns, banks reduce their lending standards. Credit contraction exacerbates the business cycle (procyclicality).

1.2. Provisions for loan losses and procyclicality. Provisions are used to anticipate a probable loss. Provisions are deducted from the banks' profits to

face loan losses. Provisions for loan losses are considered as a charge because their calculations also involve a reduction in the value of the credit net, generally by a reduction of the measured value of the loans. Dewenter and Hess (2003) add that provisions for loan loss reduces the net profits which banks can add to their capital. This fact reduces banks' capacity to increase the amount of their credits or their risk and to satisfy capital requirements. Provisioning gives a more faithful image of banks' profits (Borio and Lowe, 2001). Banks fund loan losses for two main reasons. The first reason relates to the obligation of the balance sheet to be transparent. The second one emphasizes the impact of provisioning policy on the volatility and the cyclical evolution of earnings.

We distinguish two types of provision: general provisions and specific provisions (Cortavarria et al., 2000). General provisions are used to protect the bank from loan losses on banks' loan portfolios while specific provisions are made up for individually evaluated loan losses. General provisions may be subject to a bank's discretion. That is why regulatory authorities have set up rules for this class of provisions. Specific provisions are only given when losses are probable (Cavallo and Majnoni, 2001). Specific provisions have a retrospective nature that means they reduce risks of accounts manipulation but they can amplify business cycles (Borio and Lowe, 2001; Bouvatier and Lepetit, 2006). Indeed, this retrospective nature contributes to the increase of provisions during downswing periods because of the deterioration of the credit quality. The result of this fact is the increase in the variability of the accounting incomes.

Provisions for loan losses have procyclical behavior. The level of provision depends on the phase of the economic cycle. There is interdependence between loan loss provisions and business cycles. Granger causality tests (Table 1) show that there is a feedback between loan loss provisions and GDP growth rate. Thus, loans loss provisions may have significant effects on the macroeconomic activity and may amplify swings in the economy. Banks generate high profits during the upswing periods. They increase loan growth rates. The excessive abundance of funding in these periods involves a little assessment of risks by banks in approving all projects (risky and non-risky).

Favorable economic conditions lead to a positive borrower's payment capacity and to any specific provisioning for loans granted in these periods. During these boom periods banks' behavior is characterized by low provisioning and high reported profits. However, during downswing periods banks generate low profits. Thus, provision for loan losses is one of the most important factors affecting bank profitability (Walter, 1991). The deterioration of the economy leads to a decrease of borrowers' repayment capacity and to the materialization of the loan risks that banks acquired during the upswing period. Provision levels increase, which will negatively affect profits and capital adequacy ratios of these banks. Thus, we remark that the determination of the actual level of provision will continue to depend on the phase of the economic cycle. The current practice used to evaluate risks related to the bank's portfolio is to determine provisions according to the deterioration of the portfolio instead of taking into account the future potential risks on assets. The new proposals on provisions made in the Basel agreement focus on measuring credit risk by using models that are internal or external to banks, taking as a reference the probability of default within a horizon of one year. Thus, banks make low provisions during periods of economic boom, when probability of default is less, and then banks make excessive provisions during times of recession. That is why, to resolve this problem, it is proposed that statistical provisions be set up[1] (dynamic provisioning) to lower profit volatility throughout the economic cycle. Statistical provisions offset the cyclical effect of specific provisions on profit and loss account. Statistical provisions are implemented in Spain in July 2000 to correct the trend of making little provisions during boom periods and excessive provisions during period of recession.

If capital ratio is suspected to have procyclical behavior, for example, according to the rating system "through the cycle", then we can suppose that provisions will also have procyclical behavior. We can use the link between loan loss provisions and equities to explain this point of view. The relation between loan loss provisions and equities is explained by the covering of credit risk: the conceptual framework of the credit risk management supposes that expected losses must be covered by provisions on losses on credit while unexpected losses must be covered by capital. If banks' profits are not sufficient to cover provisions, there is an erosion of the banking capital. Cavallo and Majnoni (2001) argue that in the presence of shock, loan losses provisions make it possible to cover expected losses while capital makes it possible to cover unexpected losses.

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[1] Statistical provisions are the difference between latent losses and specific provisioning. For latent losses to determine them, we may use internal models on the basis of an institution's history, specific provisions-gross portfolio average ratio throughout the previous cycle, according to homogeneous risk category, to be multiplied by the current amount subject to exposure. Banks which can not use internal models have to take the exposure coefficients by risk types, which are imposed by the regulator, to calculate the latent losses.

They notice that capital requirements only concern unexpected losses and that the loan loss provisions are not subject of the capital regulation. General provisions are built-in in the owners' equity of category 2 (within the limit of 1.25% of the credits balanced according to the risk) under Basel I[1].

Borio and Lowe (2001) analyze the need for clarifying the relation between provisions and capital. They theoretically suggest the exclusion of general provisions of capital equities[2] and the determination of provisions so as to cover the estimated amount of net losses in the banks' portfolio. Thus, provisions should cover identified credit losses and capital unidentified credit losses. The solution suggested by the Basel Committee is to anticipate provisions for the expected and not yet identified losses (Bank of France, 2003).

Laeven and Majnoni (2001), Bikker and Metzemakers (2005), Cavallo and Majnoni (2001), Ahmed et al. (1999), Perez et al. (2005) confirm that loan loss provisions must be taken into account in the capital regulation. They empirically find a reverse relation between capital ratio and loan loss provisions. Indeed, by holding risky credits, banks fund more (in the loss event) and they have troubles with respect to the capital requirements. This is coherent with the capital management hypothesis which postulates that banks fund more when their ratio of capital is weak or low. Anandarajan, Hasan and McCarthy (2005) do not share this idea. They confirm the relation between loan loss provisions and capital management on a group of Australian banks.

Ahmed et al. (1999), Moyer (1990), Beatty et al. (1995), Collins et al. (1995), and Perez et al. (2006) show that banks use loan loss provisions for managing their capital, with the aim of satisfying capital requirements specified by regulators. Lobo and Yang (2001) show that banks which have a small capital ratio can increase their loan loss provisions with the intention to reduce the regulatory costs imposed by capital requirements. However, in period of recession, capital becomes expensive and loan loss provisions are high. Banks often respond by reducing their loans. Consequently, it is difficult for banks to manage their capital by the way of loan loss provisions in period of recession. Martins and

Pinho (2003) argue that unlike the capital adequacy rules set forth by the Bank of International Settlements proposals and according to principles advanced by the Basel Committee on Banking Supervision, there is no underlying proposal for full harmonization of the provision requirements. Generally, all countries and bank supervision authorities agree on the necessity of creating buffers against loan losses on future defaults and past-due loans. However, the way this is implemented in practice differs amongst countries. Some countries specifically define provisions for expected futures losses and provisions for past due loans. This is the case of Portugal, Italy, France, Denmark, Spain or the Netherlands. Other countries, such as the USA, Germany and the UK rely on firms to actually determine the adequate amount of provisions. This implies that capital management and loan loss provisions may differ from country to country.

In the analysis of the impact of the provisions on capital, we must consider taxes. Cortavarria et al. (2000) show that the deductible tax can increase the capital ratio. By supposing, for example, an identical rate of tax and a detention of general provisions to the level common for banks in emerging countries, the deductible tax (of general provisions) can contribute to increasing the ratio of capital and to cause a strong incentive of banks to be subjected to capital requirements. Conversely, a very restrictive tax policy discourages banks to adequately fund their loans (Cavallo and Majnoni, 2001).

To summarize, banks need to make provisions in order to anticipate unexpected losses. Provisions for loan losses reduce banks profits. Loan loss provision rises to cover the potential losses on non-performing loans (specific provisions). Banks used loan loss provisions as a tool to adjust the historical value of loans to reflect their true value. Banks make little provision during expansion periods, and excessive provision followed by the ensuing possibilities of bankruptcy during periods of recession. This leads to procyclical behavior of provisions. This behavior can also be explained by the relationship between capital and loan loss provisions. Indeed, if capital adequacy ratios are suspected to be procyclical then we can deduce that provisions for loan losses will also be procyclical. Thus, it is necessary to set up an anticyclical provisioning scheme to offset the cyclical effect of specific provisions on profit and loss account, and to reduce profit volatility of banks throughout the economic cycle.

2. Empirical estimation of the loan loss provisions and loan loss reserves sensibility along the business cycle

The aim of this paper is to determine the procyclical behavior of provisioning policy depending on whether information on reserve has been extracted

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[1] The Basel Committee proceeded to a revision of the treatment of provisions for Basel II. It proposes to adjust the criteria to taking into account provisions beyond the amount which can be included in capital equities of category 2. Provisions higher than the ceiling can compensate for capital requirements but only insofar as the share of loss anticipated in capital requirement NI also exceeds the maximum amount of the provisions being able to be included in equities of category 2.
[2] Opinions are divided between banks authorities and banks supervisors. Researchers (in the banking field) consider that equities are intended to protect it from unidentified losses rather than losses envisaged resulting from the solvency of the borrower. Banks supervisors disagree with his opinion.

from banks' balance sheets or from the income statements. We use the information on reserve because the loan quality information should be most trustworthy immediately after regulators examine a bank, and they provide additional information about the riskiness of the loan portfolio (Walter, 1991). We propose two models with two different ratios (loan loss reserves/total assets and loan loss provisions/total assets) to represent provisioning policy. We adopt an empiric approach different from those generally adopted in the existing literature. We add two proxy variables describing diversification of the banks activities and the risk weighted assets.

2.1. Methodology and data. *2.1.1. Data.* The bank accounting data are retrieved from annual accounts available in the Bankscope database maintained by rating agency IBCA (International Credit Analysis Limited). These data relate to the details of the asset and the liability harmonized, and on the income statement. We use a sample consisting of an unbalanced panel of annual report data from 1992 to 2004 for a set of European banks in 17 European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Switzerland, Sweden and the United Kingdom. These banks are listed and are commercial ones. The choice of only commercial banks is explained by the fact that commercial banks concentrate more of their activity on loans and deposits. The sample initially contained 2,512 banks and 32,669 observations (Table 2 in the appendix). A majority of banks do not give information on some variables needed for this study (loan loss provisions and total capital ratio). Some outliers have been eliminated in order to avoid the possibility that a small number of observations, with a very low relative weight over the total sample, could bias the results. To minimize negative effects of missing observations in our estimates, we exclude banks whose information is not indicated over three consecutive years. Thus, the final sample consists of 105 banks with 627 observations.

2.1.1.1. The dependent variables. We have chosen two main dependent variables which correspond to two different ratios: loan loss reserves/total assets and loan loss provisions/total assets. These two ratios represent the provisioning policy. The empiric literature proposed two measures of provisioning depending on whether information on reserves has been extracted from banks' balance sheets or from the income statements. The first possibility consists in using the available information in the bank's balance sheets[1]. Indeed, we calculated, for every bank

of our sample, an annual ratio of loan loss reserves/total asset. This variable indicates the global amount of provision for loan losses build by the *i* bank to a *t* date. This measure coming from the banks balance sheet has been used in numerous empiric studies in particular those of Grammatikos and Saunderses (1990).

The second possible measure proposes to extract data on reserves from the income statements, since some authors such as Wahlen et al. (1994) and Ahmed et al. (1999) preferred to measure the impact of reserves on the value of banks in terms of flow. Loan loss provision reflects the observation of a reserve grant or allocation during the exercise. This measure with the provision write-off corrects the amount of reserves of every exercise. It can be considered as the stock of provision (in terms of flow). We have used the ratio of loan loss provisions/total asset as the second dependent variable.

We add two other dependent variables which represent the volatility of LLR (Loan Loss Reserves) and LLP (Loan Loss Provisions).

2.1.1.2. The explanatory variables. Valckx (2003) models loan loss provision as a function of GDP growth, interest rate and some bank-specific indicators both at sector level and for individual banks.

♦ *Microvariables*

The earning before tax (EBT_A). We expect a negative sign between this variable and LLR or LLP. Banks increase their loan loss provisions or add additional reserves when their profits are weak.

Loans growth rate (GL). It is a proxy variable of the risk (Bikker and Metzemakers, 2005; Jimenez and Saurina, 2006; Laeven and Majnoni, 2003) because the increase of the loans in economic upswings leads to an increase of the risk. Banks pursuing higher lending growth rates are more likely to accept riskier borrowers (Quagliariello, 2004). Loans growth is associated with a fall of the efforts of banks' monitoring and a deterioration of the quality of the portfolio. We expect a negative sign of this parameter.

The ratio of total loans on total assets (TL/TA). This variable reflects the importance of loans in the bank's portfolio. This variable represents the size of lending and serves to characterize a bank's balance

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[1] The reserve for loan loss account appears on the asset side of a bank's balance sheet as a deduction from total loans. It is called by the ac-

countants a *contra asset account*. The total book value of a bank's loans less the reserve for loan losses should be, if the bank is accurate in its assessment of future loan losses, the best estimate of the net realizable value of the loan portfolio as of the financial statement date. Total loans less reserves are called *net loans*. Nevertheless, the reserve for loan account is established and maintained by periodic charges against earnings. Charges show up on the income statement as an expense category named *provision for loan losses* or *loan loss provisions*. For more details see Walter (1991).

sheet (Bikker and Hu, 2002). We supposed that if the proportion of loans in the total assets is high then banks may reduce their LLP or they no add additional reserves during economic upswings. However, during economic downswings, credit risk materializes with a high borrower's probability of default. The expected sign is positive.

Size equals log of total assets. It is introduced as a control variable. It controls the too-big-to-fail phenomenon and the possibility that loan loss provisions or loan loss reserves variables differ for large and small banks. We suppose that universal banks are large banks and they tend to hold less risk (Dewenter and Hess, 2003). If universal banks have closer ties to their clients, they should have an informational advantage over specialized banks. They have longer lasting relationships with their borrowers than specialized banks do, they are more likely to renegotiate. Then we can suppose that the larger the size of the bank is, the more the loan loss provisions (or loan loss reserves) decrease.

The return on asset per unit of risk (SHP_ROA). We expected a negative sign between LLP and LLR. The more the return on asset per unit of risk is high, the lower is LLP.

The ratio of Equity on total assets (EQTA). It makes it possible for banks to absorb their unexpected losses. Thus a more important cover of the credit by the capital makes it possible to absorb not anticipated losses. The expected sign is positive.

Her is the Herfindahl index. It is also used here as a proxy of functional diversification. Revenue diversification is measured using a Herfindahl index (Stiroh, 2003). It also measures the concentration of the banks activities.

Risk-weighted assets ratio (RWAA). It is a measure of banks' profiles. It is also a measure of portfolio composition ("regulatory risk"). The impact of RWAA on loan loss provisions or loan loss reserves depends on the extent to which a bank's portfolio is risky. The risk weights are determined by the Basel Capital Accord of 1988 and independent of cyclical influences. The sign expected is negative.

We include two variables for diversification strategies: Herfindahl indexes *(HER)* and the share of non interest income over total revenue *(DIV2)*. DIV2 measures the degree of revenue diversification and a larger value indicates a more diversified mix. The greater the diversification of banks' activities is, the lower the increase of loan loss provisions or loan loss reserves appears to be. The expected sign is negative.

♦ *Macrovariable*

The real rate of growth of the domestic product (GDPG). It is the most general and most direct measure of macroeconomic developments. It is the single most useful indicator of the business cycle (Bikker and Hu, 2002). Even if provisions go down in economic upswings, banks tend to create more reserves in good years. In this case, we will expect a positive sign because banks are less procyclical concerning loan loss provisions. On the other hand, we may expect a negative sign as well. This would be the case, if banks create more provisions in economic downswings than in economic upswings.

2.1.2. Methodology. We consider in our estimates two categories of explanatory variables. The first relates to the LLP_A and LLR_A; the second is the volatility of LLP_A (RISK_LLP) and LLR_A (RISK_LLR). Principal equations of estimates are as follows:

From the balance sheet model
Equation (1.1) and equation (1.2)

$$
\begin{aligned}
LLP\_A = &\ \alpha_0 + \alpha_1 Gdpg + \alpha_2 Ebt\_a + \\
&+ \alpha_3 GL + \alpha_4 TLTA + \alpha_5 Size + \\
&+ \alpha_6 Shp\_roa + \alpha_7 EQTA + +\alpha_8 Her + \\
&+ \alpha_9 RWAA + \alpha_{10} Div2 + \varepsilon_{it}.
\end{aligned} \tag{1.1}
$$

$$
\begin{aligned}
LLR\_A = &\ \alpha_0 + \alpha_1 Gdpg + \alpha_2 Ebt\_a + \\
&+ \alpha_3 GL + \alpha_4 TLTA + \alpha_5 Size + \\
&+ \alpha_6 Shp\_roa + \alpha_7 EQTA + +\alpha_8 Her + \\
&+ \alpha_9 RWAA + \alpha_{10} Div2 + \varepsilon_{it}.
\end{aligned} \tag{1.2}
$$

From the flux model

Equation (1.3) and equation (1.4)

$$
\begin{aligned}
RISK\_LLP = &\ \alpha_0 + \alpha_1 Gdpg + \alpha_2 Ebt\_a + \\
&+ \alpha_3 GL + \alpha_4 TLTA + \alpha_5 Size + \\
&+ \alpha_6 Shp\_roa + \alpha_7 EQTA + +\alpha_8 Her + \\
&+ \alpha_9 RWAA + \alpha_{10} Div2 + \varepsilon_{it}.
\end{aligned} \tag{1.3}
$$

$$
\begin{aligned}
RISK\_LLR = &\ \alpha_0 + \alpha_1 Gdpg + \alpha_2 Ebt\_a + \\
&+ \alpha_3 GL + \alpha_4 TLTA + \alpha_5 Size + \\
&+ \alpha_6 Shp\_roa + \alpha_7 EQTA + +\alpha_8 Her + \\
&+ \alpha_9 RWAA + \alpha_{10} Div2 + \varepsilon_{it}.
\end{aligned} \tag{1.4}
$$

To have robust and valid results, we carried out several preliminary tests. First of all, a Fisher test was carried out to check if we are in the presence of a homogeneity or heterogeneity of behaviors. In other words, we want to know if European banks (resulting from our sample) have or do not have individual specificities which can induce different behaviors with regard to loan loss provisions or loan loss reserves. For that, we confront the null assump-

tion H0 (complete homogeneity of the behaviors) with alternative assumption HA (complete heterogeneity of the behaviors) on the basis of Fisher test statistics.

We reject the null assumption with a threshold of risk too strongly be mistaken in 1%. We can thus affirm that there is heterogeneity of the behaviors. Then, we tested the individual effect to see if it is fixed or variable by the Haussman test. This test consists in checking the exogeneity of the explanatory variables compared to the specific error of the model. The null hypothesis of this test is the absence of correlation between the specific error and the specific variables. Results of this test reveal the need for taking into account specific effects on banks. These specific effects can be related, for example, to the accounting of the non-performing loans and to tax policy. Then, we evaluated homoscedasticity of the residuals by application of White test. We point out that the White test is based on a significant relation between the square of the residue and one or more explanatory variables in level, and with the square within the same regression equation. Taking into consideration the White test, we conclude that heteroscedasticity is present. We corrected this heteroscedasticity by the matrix developed by White. Lastly, we check if the errors are correlated by the Durbin Watson (DW) test. The autocorrelation is present and we correct it by the Newey-West method.

In addition, a unit root test was worked out for the whole of the banking series of our sample. For that, we carried out three tests: Im-Pesaran-Shin (IPS)[1], the test of Levin-Flax-Chu (LLC) and tests of Fisher relating to the data of each bank (Maddala and Wu, 1999; and Choi, 2001), Fisher-type tests using ADF and PP tests (Maddala and Wu; 1999, Choi; 2001, and Hadri, 1999). Thanks to results of these tests, we may reject the null hypothesis of non-stationarity at 1% significance level. All the data used are stationary. The results of the tests for PIB are provided in Table 3 in appendix.

3. Discussion of findings

3.1. Descriptive statistics. Table 4 contains descriptive statistics for selected variables. Most of the variables are deflated by total assets, except for DIV2, HER, SHP_ROA. References to the average of loan to total assets indicate that most of the banks in European countries focus their activities on loans. The share of

loans to total assets is between 55% and 97%. This result proves that these banks are commercial banks. Loans growth rate is on average 13.32%.

A brief inspection of the main variables of interest, loan loss provision and loan loss reserves shows that banks do not make enough provisions for loans losses. Loan loss provision are on average 0.38% with a maximum of 5.60% and loan loss reserves are 1.48% with a maximum of 17.48%. Thus, on average, banks fund fewer provisions for loans losses according to their loans. The share of non interest revenue over total revenue is on average 36.17%, the Herfindhal index is on average 59% and the return on asset per unit of risk is on average 6.65%.

Table 5 reports correlation matrix coefficients among the variables.

3.2. Simultaneous equation results. Table 6 reports the results of the estimate equation of LLP by the GLS method (model 1) or the first column of Table 6. All the coefficients associated with the selected variables are significant except for EQTA, HER and RWAA. As expected GDPg, which is the useful business indicator, is relevant in loan loss provisions and loan loss reserves equations. The coefficient of growth rate (α_1) is significant and negative. It means that business cycle fluctuations negatively affect the creation of loan loss provisions. Banks fund more loan loss provisions during economic downswings compared to economic upswings. Bouvatier and Lepetit (2006), Cavallo and Majnoni (2001), Fonseca and Gonzalez (2005), Asokan and Ananadarajan (2005) found the same results.

We also find that banks use their earnings before taxes to increase or to decrease loan loss provisions, as the coefficient α_2 is negative and significant. This result also conforms to the conclusions found by Laeven and Majnoni (2003), Anandarajan (2005). This result can be interpreted as follows. Banks minimize (maximize) loan loss provisions when their income reaches lows (highs). We can note that banks adopt imprudent behavior with regard to their provisioning policy. Furthermore, banks decrease loan loss provisions when they give more loans during economic upswings, as the coefficient α_3 is negative and significant. However, if the proportion of loans in the total assets is high then banks may increase their LLP or they add additional reserves during economic upswings.

The size coefficient in the LLP equation is significantly negative and significant at the .01 level, suggesting that large banks make relatively small provisions. Larger banks tend to hold less risk. Universal

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[1] The H0 assumption of the IPS test is: all the series are non-stationary against the alternative assumption: only a fraction of the individual series is stationary. A probability of the test lower than 10% leads to the reject of H0. The null assumption of the LLC test is: all the series are non-stationary against the alternative assumption: all the series are stationary. A probability of the test lower than 10% leads to the reject of H0.

banks are considered large banks. This result is consistent with the hypothesis that if universal banks have closer ties to their clients, they should have an informational advantage over specialized banks. We also find that if the return per unit of risk is high, default risk is reduced and then banks make fewer loan loss provisions. The coefficient of RWAA is significant. This result suggests that if banks weight their assets according to their risk then they will have a lower default rate. Thus, they will fund fewer loan loss provisions.

The insignificant coefficient on HER and DIV2 suggests that diversification did not impact the provisioning strategy of banks, after controlling for the other determinants. The coefficient on E is insignificant.

The standard deviation is often used to measure the risk. It is a better measure of volatility. The results for the risk of loan loss provision equation show that if banks' cash flows are weak then loan loss provisions are more volatile. In the same way, if banks weight their assets according to their risk then the volatility of loan loss provisions is reduced. Banks have less risk. However, we find a positive correlation between E and risk_llp. This result is surprising. The other coefficients are not significant.

To summarize, we have shown that if the information about reserves has been extracted from the income statement the provisioning policy behavior is procyclical. We find that functional diversification has no impact on loan loss provisions. However, if banks weight their assets according to their risk then they will have less risk and less loan loss provisions to constitute.

Concerning LLR equation, only SHP_ROA and EQTA are insignificant. The coefficients of five variables (GDPG, EBT_A, GL, TLTA, and SIZE) are significant with the expected signs. A significant negative coefficient on earnings (EBT_A) indicates that banks with lower earnings increase their LLR. We find that banks increase their loan loss allowance when the share of loans to total assets is high. Larger banks decrease their loan loss allowance (or reserve) as they negotiate their loans before charging them off. In the same way, we find that universal banks establish fewer loan loss reserves. DIV2 are negatively significant. HER and RWAA coeffi-

cients are significant. In terms of risk, GDPG, GL, SHP_ROA, HER, DIV2 have no impact on the LLR volatility. A high level of banks' earning reduces the volatility of loan loss reserves for expected future losses. Banks establish more reserves when their equity levels are high. The risk weight asset reduces the volatility (risk) of banks.

Conclusion

In this paper, we investigate the procyclical behavior of provisioning policy whether information on reserve has been extracted from banks' balance sheets (loan loss reserves) or from the income statements (loan loss provisions). We develop a panel data approach to test this hypothesis.

First, we find that loan loss provisions and loan loss reserves have procyclical behavior. Positive (negative) GDP growth rate has significantly negative (positive) effect on loan loss reserves or loan loss provisions. This suggests that provisioning policy reacts to predicted changes in the business cycle and it can reinforce economic phases.

Second, our results provide strong evidence that the risk weight assets reduce the volatility of both loan loss provisions and loan loss reserves. If banks weighted their assets according to the counterparty's risk weighting then they would have less risky portfolios. Furthermore, the results also indicate that large banks tend to hold less risk as they make relatively small provisions. In the same way, these banks decrease their loan loss allowance as they renegotiate their loans before charging them.

Third, we find that whether information on reserves has been extracted from banks' balance sheets or from the income statement, provisioning policy is procyclical. These results imply that provisioning policy varies over the business cycle.

This finding offers support to the claim for implementation of a dynamic provisioning system in Europe. Such dynamic provisioning systems will reduce the procyclicality of provisioning policy. However, our main results clearly suggest that future research on the implications of IFRS (International Financial Reporting Standards) norms and capital requirements for the provisioning policy is warranted.

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Appendix A

Table 1. Granger causality for GDP growth (lag 2). Sample 1993-2004

PIB does not Granger cause LLP_ASSET (p-value)	0.60158
LLP_ASSET does not Granger cause PIB (p-value)	0.00163

Table 2. Distribution of the observations by country

Countries	Number of banks * available on Bankscope Fitch IBCA	Number of observations retained in our sample
Austria	145	21
Belgium	81	-
Denmark	93	12
Finland	13	-
France	461	41
Germany	456	37
Greece	29	-
Ireland	48	21
Italy	272	69
Luxembourg	147	-
The Netherlands	73	9
Norway	21	90
Portugal	40	33
Spain	137	169
Sweden	30	27
Switzerland	270	10
United Kingdom	197	21
Total	2513	627

Note: * – commercial and cooperative banks are considered.

Table 3. Unit root test for GDPg. Sample 1993-2004

Panel unit root test: Summary				
Exogenous variables: Individual effects				
User specified lags at: 1				
Newey-West bandwidth selection using Bartlett kernel				
Method	Statistic	Prob.**	Crosssections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-36.4027	0.0000	46	306
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.94732	0.0000	46	306
ADF - Fisher Chi-square	163.001	0.0000	46	306
PP - Fisher Chi-square	177.971	0.0000	46	352
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	11.8772	0.0000	105	627

Note: ** – probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 4. Descriptive statistics for European commercial and cooperative banks over the period of 1993-2004

	DIV2	EBT_A	EQTA	GL	HER	LLP	LLR	TLTA	SHP_ROA	SIZE	GDPG	RWAA
Mean	36.17	0.91	6.14	13.32	0.59	0.38	1.48	0.55	6.65	16.76	2.68	2.27
Max	178.12	8.65	24.80	516.97	3.78	5.60	17.49	0.97	302.09	20.63	8.80	0.61
Min	-23.47	-3.97	1.37	-99.90	0.50	-2.15	0.00	0.01	-0.81	12.14	-1.03	292.01
Std. dev.	16.63	0.89	3.15	33.33	0.17	0.48	1.38	0.19	23.02	1.912	1.66	0.00

Variable definitions: all variables are in percentage. Except SIZE and SHP_ROA. DIV2: (non interest income/total revenue); EBT_A: earnings before tax/total assets; EQTA: equity/total assets; GL: loans' variation of bank i between years (t-1) and t; HER: ((non interest income/total revenue)^2 + (net interest income/total revenue)^2); LLP: loans loss provision/total assets; LLR: loan loss reserves/total assets; TLTA: total loans/total assets; SHP_ROA: roa/risk_roa with risk_roa: @sqrt((roa –@mean roa)^2); SIZE: log of total assets; GDPG: the real rate of growth of the domestic product; RWAA: rwa/total assets with rwa: (tot_capratio).

Table 5. Correlation matrix

	DIV2	EBT_A	E	GL	HER	LLP	LLR_A	TLTA	RWAA	SHP_ROA	SIZE	GDPG
DIV2	1.000	-0.055	-0.265	-0.146	0.070	-0.181	-0.091	-0.423	-0.049	0.063	0.352	-0.128
EBT_A	-0.055	1.000	0.586	-0.008	-0.101	-0.389	0.154	0.174	-0.045	0.032	-0.129	0.275
E	-0.265	0.586	1.000	-0.015	0.031	-0.034	0.117	0.296	-0.002	-0.019	-0.421	0.170
GL	-0.146	-0.008	-0.015	1.000	0.079	-0.118	-0.120	0.047	0.145	0.005	-0.027	0.162
HER	0.070	-0.101	0.031	0.079	1.000	0.057	-0.026	-0.029	0.009	-0.045	-0.228	-0.041
LLP	-0.181	-0.389	-0.034	-0.118	0.057	1.000	0.226	0.191	-0.029	-0.049	-0.013	-0.221
LLR_A	-0.091	0.154	0.117	-0.120	-0.026	0.226	1.000	0.158	-0.039	-0.050	-0.133	0.019
TLTA	-0.423	0.174	0.296	0.047	-0.029	0.191	0.158	1.000	-0.169	-0.043	-0.183	0.160
RWAA	-0.049	-0.045	-0.002	0.145	0.009	-0.029	-0.039	-0.169	1.000	-0.021	-0.108	0.016
SHP_ROA	0.063	0.032	-0.019	0.005	-0.045	-0.049	-0.050	-0.043	-0.021	1.000	-0.007	-0.008
SIZE	0.352	-0.129	-0.421	-0.027	-0.228	-0.013	-0.133	-0.183	-0.108	-0.007	1.000	-0.139
GDPG	-0.128	0.275	0.170	0.162	-0.041	-0.221	0.019	0.160	0.016	-0.008	-0.139	1.000

Variable definitions: all variables are in percentage. Except SIZE and SHP_ROA. DIV2: (non interest income/total revenue); EBT_A: earnings before tax/total assets; EQTA: equity/total assets; GL: loans' variation of bank i between years (t-1) and t; HER: ((non interest income/total revenue)^2 + (net interest income/total revenue)^2); LLP: loans loss provision/total assets; LLR: loan loss reserves/total assets; TLTA: total loans/total assets; SHP_ROA: roa/risk_roa with risk_roa: @sqrt((roa –@mean roa)^2); SIZE: log of total assets; GDPG: the real rate of growth of the domestic product; RWAA: rwa/total assets with rwa: (tot_capratio).

Table 6. Results

	LLP_A (1.1)	LLR_A (1.2)	RISK_LLP (1.3)	RISK_LLR (1.4)
Intercept	0.050* (3.51)	0.000* (8.56)	0.65* (2.73)	0.65* (2.73)
GDPg	0.000 (-4.65)	0.000* (-3.78)	12.29 (-1.54)	12.29 (-1.54)
EBT_a	0.000* (-8.55)	0.000* (-6.65)	0.000* (-7.12)	0.000* (-7.12)
GL	0.000* (-6.36)	0.000* (-4.98)	58.49 (0.54)	58.49 (0.54)
TLTA	0.000* (7.99)	0.000* (19.41)	52.60 (-0.63)	52.60 (-0.63)
Size	0.000* (-3.57)	0.000* (-8.41)	1.90* (-2.53)	1.90* (-2.35)
Shp_roa	0.34* (-2.94)	77.27 (-0.28)	20.33 (-1.27)	20.33 (-1.27)
EQTA	13.89 (1.48)	10.66 (-1.61)	0.58* (2.76)	0.58* (2.76)
HER	76.09 (0.30)	0.570* (2.77)	73.25 (-0.34)	73.25 (-0.34)
RWAA	0.05* (-3.50)	4.73** (1.98)	0.31* (-2.97)	0.31* (-2.97)
DIV2	76.92 (0.29)	1.96 (-2.34)	33.12 (0.97)	33.12 (097)
Ajusted R² (%)	0.87	0.93	0.65	0.65
Observations	627	627	627	627

Note: *, ** and *** indicate significance at the 1%, 5% and 10% levels respectively. T-statistics are corrected for heteroskedasticity following White's methodology.

Variable definitions: DIV2: (non interest income/total revenue); EBT_A: earnings before tax/total assets; EQTA: equity/total assets; GL: loans' variation of bank i between years (t-1) and t; HER: ((non interest income/total revenue)² + (net interest income/total revenue)²); LLP: loans loss provision/total assets; LLR: loan loss reserves/total assets; TLTA: total loans/total assets; SHP_ROA: roa/risk_roa with risk_roa: @sqrt((roa -@mean roa)²); SIZE: log of total assets; GDPG: the real rate of growth of the domestic product; RWAA: rwa/total assets with rwa: (tot_cap*100)/(tot_capratio).