Banks' procyclicality behaviour: Does provisioning matter?*

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Abstract

The purpose of this research is to determine if banking behaviour leads to amplification of the credit cycle and then amplification of the business cycle. A panel of 41 European banks (balanced information) is used for the period 1995-2001 to investigate the effect of the capital adequacy constraint and loan loss provisions (LLP) on fluctuations in bank lending. The non discretionary and discretionary components of LLP are estimated to differentiate their impact on banks lending. Our finding is consistent with the capital crunch hypothesis, which means that during a cyclical downturn capital requirement increases and poorly capitalized banks reduce their lending to respect solvency ratios. We find that the non discretionary component of LLP amplifies the credit cycle. Non discretionary LLP increases in periods of downturn and thus reduce bank lending, whereas it decreases in periods of expansion when credit risks are undervalued by banks and this increases credit supply. By contrast, the discretionary component of LLP does not affect credit fluctuations. The findings of our research are consistent with the call for the implementation of dynamic provisioning in the European Union.

JEL classification: C23, G21, M41, E51

Keywords: Credit cycle, procyclicality behaviour, loan loss provisions, discretionary accruals, capital requirement

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1. Introduction

The linkage between financial system and business cycle has been the subject of much investigation. There are numbers of conflicting views on banking operations regarding the economic role of financial intermediaries and the most important characteristic of their activities. Much concern has been recently expressed about the perceived excessive cyclicality of banks lending which may exacerbate the cyclical behaviour of the economic activity. This pattern is recognized to be more important for banks than for most of the other sectors of the economy because they provide demand deposits (the largest part of the money supply) and they are also a major provider of lending to the economy. Furthermore, banks are used by the Central Bank as its primary channel for transmitting monetary policy (Bernanke & Gertler, 1995). The procyclicality of bank lending behaviour may create a number of potential problems, including exacerbating the business cycle, increasing systemic risks and misallocating lending resources. Consequently, all factors which amplify the cyclicality of lending may represent risks to both the macroeconomy and the financial stability. This paper focuses on some of these factors, and more precisely on the effect of banking regulation and provisioning rules.

The literature on the cyclicality of bank lending is based on the work of Bernanke & Blinder (1988) who introduce the credit market equilibrium in a textbook IS-LM model and analyze interactions between monetary policy and credits. Much empirical work (Bernanke & Blinder, 1992; Kashyap & Stein, 1995; Peek & Rosengren, 1995a; Ehrmann et al., 2001) uses this framework to estimate credit market equilibriums and to test the credit channel hypothesis or the relevance of a credit crunch. Evidence from the credit crunch literature suggests that factors such as changes in bank capital (Bernanke & Lown, 1991; Hancock & Wilcox, 1994; Peek & Rosengren, 1995b; Brinkman & Horvitz, 1995; Furfine, 2001), increase in supervisory toughness (Peek & Rosengren, 1995c; Wagster, 1999) or reduction in loan demand (Bernanke & Lown, 1991; Berger & Udell, 1994; Furfine, 2001), had an effect on the real economy.

However, the research mentioned above provides only a partial explanation of the stylised facts about cyclicality because it neglects bank behaviour during the expansion and downturn of the business cycle, which may be driven by risks. This implies that banks (and their supervisors) are excessively optimistic during the expansionary phase of the cycle and excessively pessimistic during the contraction phase (Guttentag & Herring, 1993). We analyse two banks’ behaviour which may be procyclical. Firstly, the capital adequacy constraint may
lead banks behaviour to amplify the credit cycle. Indeed, Capital requirements are said to be procyclical because they might intensify the fluctuations of the credit cycle and thus amplify the business cycle. During a downturn capital becomes more expensive and banks often respond by cutting bank lending or shifting towards lower-risk customers. By contrast, in the boom phase, banks can obtain additional capital under more favourable terms, which may give further impetus to their lending. The variability over time of the Basel II risk weight may amplify this cyclicality effect. An increasing number of studies deal with the analysis of the procyclical effect of capital regulation (BCBS, 2001; Borio et al., 2001; Bikker, 2004) but these papers often disregard banks’ provisioning practices and their links with the cyclicality of banks lending.

Secondly, the provisioning system also influences bank lending behaviour. LLP are made up of two components. Typically, loan loss provisions (LLP) are made in order to cover identified credit losses in a bank’ loan portfolio (Cavallo & Majnoni, 2001). Thus, the component of the LLP links with the non performing loans, called the non discretionary component, is procyclical. Indeed, during periods of slow growth or recession, loan defaults are higher, leading to increasing LLP. This increase in LLP during economic downturns, cumulated with a decrease in the interest income due to the reduction in outstanding loans, may increase the negative impact on banks profits. Banks will grant fewer loans and will increase credit rationing, possibly leading to a credit crunch. On the contrary, economic upswings and booms should lead to reduce provisioning. Thus, the non discretionary component of LLP may amplify the cyclicality of banks lending.

The second component of LLP, called the discretionary component, results from the utilization of LLP for management objectives. At least three different discretionary behaviours over provisions can be distinguished (Beaver & Engel, 1996; Liu et al., 1997 and Ahmed et al., 1999, Lobo & Yang, 2001). The first one, called the income smoothing, may be countercyclical. Banks may have incentives to smooth earnings when their current performance, relatively to the previous years, is very high or very low. When earnings are expected to be low, LLP are deliberately understated to mitigate adverse effects of other factors on earnings. On the contrary, when earnings would be unusually high, banks will choose discretionary income-reducing accruals. In this case, income smoothing has been hypothesized to lower the present value of tax obligations\(^1\). Thus, under the income-

\(^1\) Taxation arrangements can have a major influence on banks’ incentive to create provisions. In almost all countries, bad loans are ultimately tax-deductible, either at the point when provision is made, or at the point when the loan write-off actually occurs. Arguably, allowing tax deductibility of provisions encourages earlier
smoothing behaviour, banks choose accruals to minimise the variance of reported earnings. This smooth of provisions implies that LLP increase during an expansionary phase and decrease during a recession phase. Consequently, the income smoothing behaviour has a positive impact on banks lending. The two other discretionary behaviours, the capital management and the signalling, may have no clear impact on the cyclicality of banks behaviour. Capital-constrained banks may improve their regulatory capital ratio by reducing either lending or dividends and their ability to absorb expected losses. Alternatively, banks may use discretionary accruals to achieve regulatory-capital targets. Under Basel II, general and specific provisions reduce Tier1 capital via their impact on earnings. But since general provisions are also included as a component of Tier2 capital and deducted from risk-weighted assets, an increase in general provisions may actually increase the regulatory capital especially if the increase in Tier2 is larger than the decrease in Tier1 capital. To the extent that such discretionary behaviour increases regulatory capital without a corresponding reduction in risk of insolvency, it constitutes regulatory capital arbitrage. The last discretionary behaviour occurs when banks may use provisions to signal financial strength. The opportunity for signalling through discretionary LLP arises when managers have information indicating that bank values are higher than those assessed by the market. Such banks may be willing to see their market values revised upwards. One approach to doing so is to signal that the bank is strong enough to absorb future potential losses by increasing current LLP.

The objective of this paper is to consider the potential for banking behaviour to lead to amplification of the credit cycle and thus of the business cycle. As this macroeconomic concern is investigated with panel data, we use a top down approach. A panel of 41 European banks (balanced information) is therefore used for the period 1995-2001 to analyze the effect of the capital requirement and LLP on the fluctuation of bank lending. The non discretionary and discretionary components of LLP are estimated to differentiate their impact on banks lending. We want to determine if provisions amplify the credit cycle. This issue is particularly relevant for the debate between financial supervisors and accounting authorities about bank’s recognition of potential problems, and thus more forward-looking provisioning. Taxation arrangements differ greatly around the world, although most countries permit specific provisions expense as a tax deduction. The situation with respect to general provisions is more varied. For example, in the United Kingdom, general provisions are not allowed as a tax deduction whereas in Switzerland they are tax-deductible (see Fernandez de Lis et al. (2001) and Borio et al., (2001) for more details).  

2 Note that in the current discussion for Basle II, banks and regulators disagree on the inclusion of provisions in the definition of capital.

3 General provisions can increase loan loss reserves of up to 1.25% of risk weighted assets, the excess will be deducted from Tier1.
provisioning system. The current system in Europe is backward-looking (excluding Spain and Portugal) and this may amplify the cyclicality of bank lending. In recent years, there have been calls (Trichet, 2000; Poveda 2000; Crockett, 2000 and Borio et al., 2001) for more forward-looking provisioning decisions to mitigate the potential problem that may arise from the cyclicality of lending and bank profitability. But there is no consensus about the way in which this should be achieved: dynamic provisioning\(^4\) promotes banking stability whereas Full Fair Value Accounting\(^5\) promotes market discipline. To our knowledge, this is the first study which examines the impact of discretionary and non discretionary provisions on banks lending behaviour. This paper aims to fill this shortage.

The remainder of the paper is organized as follows. Section 2 reviews the literature on bank cyclicality. Section 3 describes the model specification of credit supply, credit demand and credit market equilibrium. Section 4 presents the regression models for discretionary and non discretionary LLP as well as the credit market equilibrium. Section 5 reports empirical results. Section 6 discusses the credit cycle and dynamic provisioning. Concluding remarks are presented in the final section.

2. Related literature on bank cyclicality

As figure 1 shows, the growth of bank lending is characterised by significant short term fluctuations for the four European countries considered: Germany, France, Italy and United Kingdom\(^6\). These fluctuations are stronger than the ones of the business cycles; means on absolute values (Table 1) sum up this difference of size exhibited in Figure 1. The standard error, which is also a proxy for the average size of a gap (the gap mean is close to zero),

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\(^4\) With a statistical or dynamic provisioning, general and specific provisions are created continuously in the traditional manner. General provisions are established as usual to cover expected losses as a given proportion of the total loan portfolio, which are, however, not connected with direct assets and are for unspecified losses. Specific provisions are created to cover the expected impairment of assets based on problem loans. In addition to these provisions, the statistical provision is formed with purpose of anticipating risks arising from changes in business cycles for each risk category. The statistical provision records the expected losses connected with the initial portfolio in a way that total provisions (specific, general and statistical) created over the years are smoothed. The statistical provision increases in periods of economic growth, complementing net specific provisions, which are rather low in these periods compared to total loans. Such a system was established in Spain, Portugal and Australia. For a more detailed discussion on this issue, see Fernandez de Lis et al. (2001), Borio et al. (2001) and Mann & Michael (2002).

\(^5\) Fair value accounting tries to approximate as closely as possible the value that the asset would have if it were traded on the market. This implies that the value of a bank’s problem assets will fall immediately, in contrast with historical accounting where banks have to make reserves for the difference between the book value and the actual value. One of the benefits of fair value accounting is that it offers better information to investors and supervisors. However, the frequent changes in the value of assets exposed to market price fluctuations tend to amplify capital volatility and thus lending cycles. See Jackson and Lodge (2000) and the Joint Working Group Standard Setters (2000) for an overview of the debate on fair value accounting.

\(^6\) The figures for all the European country are not reported to economize on space. We find that the growth of bank lending is cyclical for all them.
confirms the higher amplitude of the credit cycle. However, the credit and business cycles have a similar persistence as their first order autocorrelations are around 0.90 (Table 1).

Figure 1. Business and credit cycles from 1993 to 2003 (computed with the Baxter King filter\(^7\))

\(^7\) Gaps are computed using the SAS macro of Dominique Ladiray: www.unige.ch/ses/sococ/mirage/.

The lag length K=12, the shortest cycle length p=1.5 and the longest cycle length p=8 are retained.

Output gap is defined by: \(\frac{GDP_t - GDP^*_t}{GDP^*_t} \times 100\), with \(GDP^*_t\) the output trend computed with a Baxter King filter. The credit gaps are computed in the same way.
The duration of these short term fluctuations are therefore important. Moreover, there is a significant interdependence between credit cycles and business cycles. Granger causality tests (Table 1) show, except for Germany, that we have a feedback effect between credit and GDP. But the latter show a strong contemporaneous correlation (as measured by the Pearson correlation coefficient, Table 1). Fluctuations in bank credit thus may have significant, indeed critical, effects on the macroeconomic activity and may amplify swings in the economy.


Table 1. Statistics on the business and credit cycles from 1993 to 2003

<table>
<thead>
<tr>
<th></th>
<th>Germany</th>
<th>France</th>
<th>Italy</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean on absolute values</td>
<td>0.4619</td>
<td>0.5187</td>
<td>0.5596</td>
<td>0.5222</td>
</tr>
<tr>
<td>Standard error</td>
<td>0.5955</td>
<td>0.6733</td>
<td>0.7125</td>
<td>0.6438</td>
</tr>
<tr>
<td>First order autocorrelation</td>
<td>0.8840</td>
<td>0.8917</td>
<td>0.8894</td>
<td>0.8652</td>
</tr>
<tr>
<td>Pearson Correlation Coefficients</td>
<td>0.5272</td>
<td>0.3441</td>
<td>-0.0433</td>
<td>0.3108</td>
</tr>
<tr>
<td>GDP does not Granger cause Credit (p-value)</td>
<td>0.2642</td>
<td>0.0154</td>
<td>0.0721</td>
<td>0.0004</td>
</tr>
<tr>
<td>Credit does not Granger cause GDP (p-value)</td>
<td>0.4672</td>
<td>0.0013</td>
<td>0.0004</td>
<td>0.0014</td>
</tr>
</tbody>
</table>

Own calculations made with International Financial Statistics (IFS).

8 The bracket number is the p-value associated with the null hypothesis.
This procyclicality of bank lending is traditionally explained by demand and/or supply factors (Bernanke & Gertler, 1995). The balance sheet channel theory supports the hypothesis that changes in net capital positions of businesses and household caused by the business cycle may be responsible for a decline in credit demand\textsuperscript{9}. The bank lending channel theory, by contrast, focuses on the monetary policy influences expenditures via the supply of bank credit. A monetary policy tightening reduces the liquidity and then banks cannot turn freely to the bond market, due to the external finance premium\textsuperscript{10}. Then, they must reduce the amount of loans they supply and/or increase the interest rate charged for loans. It implies an amplification of the monetary policy.

Bikker (2004), for a panel of 26 OECD countries over the period 1979-1999, finds that lending at a macroeconomic level is strongly dependent on demand, measured by cyclical variables such as real GDP growth, inflation, unemployment and real money supply. This result is consistent with those reported by Bernanke & Blinder (1992) and Kliesen & Tatom (1992) on US bank loans. However, such macroeconomic models underrate the transmission channel and the role played by bank capital. Indeed, using macroeconomic data, it is difficult to separate the role of loan demand from the one of loan supply. This difficulty has prompted researchers to focus on microeconomic panel data to explore some of the cross-sectional implications of the lending view, namely that the responses of banks to changes in monetary policy may differ, depending on their characteristics. The idea behind this is that some types of banks are more capable than others to offset a monetary policy induced by an increase in the cost of funding because they can find non-deposit funding easily or draw on their buffer of liquid assets. Kashyap and Stein (1995) proposed for the first time a reduced form dynamic equation for bank loans using a panel of American banks over the period 1976 - 1992. Their findings are consistent with the bank lending channel view and show that bank loan growth in the smallest asset category is most responsible for monetary policy. These small banks have a very simple capital structure and are financed almost exclusively with deposits and common equity. Other studies, who follow the approach of Kashyap and Stein, find that the impact of bank lending channel is greater for banks with less capital and less liquid assets\textsuperscript{11}. Poorly capitalised banks are more dependent on monetary policy shocks because they have less access to markets for uninsured funding (Peek & Rosengren, 1995a; Stein, 1998 and Kishan

\textsuperscript{9} A monetary squeeze increases debt service which can prompt sales of real assets, reducing their value and causing a loss of creditworthiness and a reduction of lending.

\textsuperscript{10} It may only work when deposits and bonds are imperfect substitutes in the balance sheet of banks.

\textsuperscript{11} A summary of additional evidence from various loan markets and various countries can be found in Kashyap & Stein (1997).
& Opiela, 2000 on US banks; Gambacorta, 2001 and De Haan, 2001 on European banks); the less able to shield its loan portfolio from a restrictive monetary policy measure a bank is, the less liquid asset it can draw on (Kashyap and Stein, 2000 on US banks; De Haan, 2001; Ehrmann et al., 2001; Gambacorta, 2001; Hernando & Nez-Pages, 2001; Kaufman, 2001; Loupias et al. 2001 and Worms, 2001 on European banks). Unlike in the US, the size of European banks does not generally explain its lending reaction.

The studies mentioned above use banks characteristics to classify them in order to analyse if the monetary policy has a different impact according to the type of the bank. Some other microeconomic models focus directly on the impact of capital requirement on bank lending. Most of these studies concern US banks12 and try to assess whether there was a “capital crunch”13 caused by increased capital requirements or more stringent regulatory practices occurred at the beginning of the 90's14. Bernanke & Lown (1991) find a positive correlation between loan growth and changes in bank capital during 1990-1991 while Hancock & Wilcox (1994) and Peek & Rosengren (1995b) detect a positive effect of bank capital requirement on credit growth during the same period. Brinkmann & Horwitz (1995) find also a positive effect on loan growth, but only for large banks. Wagster (1999) shows that stricter supervision which occurred during 1990-92 in Canada, UK and the USA implies that less credit was extended towards lower-risk investment such as government bonds.

However, these studies on credit crunch do not take into account banks’ behaviour during the expansion and downturn of the business cycle and thus provides only a partial explanation of the procyclicality of banks lending. Indeed, another important reason which may explain the fluctuation of bank lending is the realisation of risks. In phases of economic boom, banks are inclined to take on greater risks, owing to their basically positive anticipations as regard of the course of the economy and future trends. By contrast, banks are excessively pessimistic during the cyclical downturns. This cyclical behaviour of banks is supported greatly by the fact that during economic upturns the value of collaterals accepted by banks increases significantly, while during economic recessions the value of such collaterals may decline considerably.

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12 For a survey on the studies that attempt to determine the degree to which tighter capital regulation could account for the backward shift in the supply of bank loans, see Sharpe (1995).
13 Peek & Rosengren (1995) define the term “capital crunch” to include only the bank shrinkage resulting from binding capital requirements, whereas “credit crunch” refers to the situation where loan supply has fallen faster than loan demand, a possible but not necessary outcome of a capital crunch.
14 The BIS risk-based capital standards began to phase in at the end of 1990 and were fully implemented in 1992.
The academic literature (BCBS, 2001; Borio et al., 2001; Bikker, 2004) considers that the link between capital requirements and risks is a decisive factor to explain the procyclicality of banks’ behaviour. In a downturn, when risks are more likely to materialise, capital requirements might increase. Thus, capital requirements and output growth will move in opposite directions. But this reduction in capital requirements may lead banks to cut their loans. This credit squeeze would add to the downturn and capital requirements are therefore said to be procyclical. Bikker (2004), using aggregate data from 1979-1999 for a panel of 26 OECD countries, fails to support the thesis that capital requirements are procyclical: he finds that capital and reserves are not a significant determinant of lending.

Another decisive factor which should affect the procyclicality of bank lending is the provisioning system. In Europe, provisions tend to be more backward-looking than in the United States. These rules, based on fairly well identified losses, imply that LLP typically increase in an economic downturn and only after a significant deterioration in credit quality has occurred. This pattern is a major factor in driving the strongly cyclical nature of recorded bank profits and bank lending. It can be seen as contributing to the overall cyclical nature of the financial system and the macroeconomy more generally. Although the recent debate about whether current practices of provisioning are biased to produce procyclical bank behaviour, there is no study to our knowledge that examines the impact of provisions on bank lending. Shriever & Dahl (2002), who do not test this hypothesis but analyse the utilisation of the discretionary accounting practice of the Japanese banks during 1989-1996, find a negative and significant relationship between LLP and year-on-year change in total loans. This result is consistent with the hypothesis that LLP influence credit cycles.

By contrast, the non discretionary component, through the income smoothing behaviour, may reduce the procyclicality of bank lending.

3. Empirical model specification

3.1. Credit supply fluctuations: a top down approach

A model on bank lending fluctuations is developed to investigate macroeconomic implications of bank’s procyclicality behaviour. Most models on this topic are drawn on

\[\text{For a more detailed discussion of this issue, see Borio et al. (2001) and Clerc et al (2001).}\]
Bernanke and Blinder (1988) which originally introduce the credit market equilibrium in a textbook IS-LM model. However, empirical investigation with panel data calls several digressions. The empirical model has to fit to microeconomic data and explain credit fluctuations at the bank level.

The model specification is exposed in three steps. In the first step, variables which influence credit supply fluctuations are defined. In the second step, the problem of endogenous variables is resolved. Finally, in the last step, credit fluctuation at the bank level is identified.

3.1.1. First step: variables of interest

Credit supply fluctuations are assumed to depend on three different kinds of variables.

First, variations in banks liability are probably the main factor explaining credit supply fluctuations. We consider deposits ($D$), market funding ($MF$) and equity ($E$). Consequently, most banks resources are taken into account especially market funding which represents an increasing part of banks liability. A positive relationships between these variables and credit supply fluctuations are expected.

Second, credit supply fluctuations depend on macroeconomic variables which affect banks’ incentives. Therefore, we have retained as explanatory variables the money market rate ($i$), the lending rate ($l$) and the inflation rate ($\pi$)\textsuperscript{16}. The money market rate represents the opportunity cost whereas the lending rate is the gain associated with credit supply and we should therefore have respectively a negative and a positive relationship with credit supply fluctuations. Moreover, the inflation rate is a control variable used to capture cyclical movements as well as uncertainty in the economy and should negatively affect credit supply fluctuations (Ehrmann et al., 2001; Gambacorta, 2001; Loupias et al, 2001).

Finally, two institutional constraints are considered: one linked to banking regulation ($TCR$) and another linked to the accounting system ($NDISC$ and $DISC$). The former constraint results from the solvency ratio; banks have to respect a minimum capital adequacy ratio according to their total risk weighted exposures. The capital ratio is expected to affect negatively the ability of poorly capitalized banks to supply new credits. Indeed, during a cyclical downturn, capital requirements increase and banks may reduce lending to respect the capital ratio. The latter constraint focuses on the provisioning system and its effects on credit

\textsuperscript{16} Credit supply fluctuations depend more on the level of the money market rate, the lending rate and the inflation rate than their variations. We then consider these variables in level and not in variation as banks liability variables.
supply. The definition of non performing loans and loan loss provisioning rules varies across countries. This contrasts with the harmonization of capital requirements at an international level. Nevertheless, in each country, banks have to make some specific provisions according to their amount of non performing loans. Provisions are also made of general provisions which have to cope with “expected losses” but banks do not implement rigorous and statistical methods to compute them. These general provisions depend on expansion of total loans and discretionary behaviours of bank managers. This ex-post provisioning system, based on backward-looking rules, is an unsatisfactory institutional arrangement because it inadequately takes into account credit risks. LLP are more important in the trough of the business cycle and could reduce the banks ability to supply credits. The opposite effect could happen during an economic expansion: problem loans decrease, optimism is widespread and then credit risks are undervalued by banks which ease credit supply. Ex-post provisioning systems are therefore expected to amplify the credit cycle.\(^\text{17}\)

The relationship between provisions and credit supply fluctuations has to be cautiously analyzed because provisions merge different information and behaviours. We have to distinguish the non discretionary component (NDISC) and the discretionary component (DISC) of the LLP. The former is linked to non performing loans - i.e. specific provisions - and its amount directly depends on accounting rules. This part of provisions is specially expected to reduce banks’ ability to expand their credit supply. Indeed, non discretionary provisions materialize reserves that banks have to charge to offset non performing loans and therefore reduce banks’ resources available for lending. On the other hand, discretionary provisions - included in general provisions - are linked to different banks’ behaviours like income smoothing, capital management or signalling. The income smoothing behaviour may be countercyclical and then offsets the evolution of non discretionary provisions, increasing reserves in good times and therefore positively affects banks’ ability to supply credits, whereas the capital management and signalling behaviours may have no clear impact on the cyclicity of bank lending.

Credit supply fluctuations are therefore specified as in equation (1):

\[
\Delta L_s^t = \beta_1 \Delta D_{it} + \beta_2 \Delta MF_{it} + \beta_3 \Delta E_{it} + \beta_4 l_t + \beta_5 TCR_{it} + \beta_6 TCR_{it} + \beta_7 \text{NDISCO}_{it} + \beta_8 \text{DISCO}_{it} \\
(+) \quad (+) \quad (+) \quad (+) \quad (-) \quad (-) \quad (+) \quad (-) \quad (+)
\]

\(^{17}\) Australia, Spain and Portugal search to reduce the cyclical behaviour of LLP by implementing a statistical provisions computed from latent risk of loan portfolio (Fernandez de Lis et al., 2001). The French supervisor also advocates in favour of dynamic provisioning (Clerc et al., 2001).
\[ \Delta = \text{Change between the year } t-1 \text{ and } t \] ; \[ i_t = \text{lending rate} \]

\[ L^*_t = \text{bank’s } i \text{ loans} \] ; \[ m_t = \text{money market rate} \]

\[ D_t = \text{bank’s } i \text{ deposits} \] ; \[ \pi_t = \text{inflation rate} \]

\[ MF_t = \text{bank’s } i \text{ market funding} \] ; \[ K_t = \text{bank’s } i \text{ regulatory capital} \]

\[ E_t = \text{bank’s } i \text{ equity} \]

\[ TCR_t = \left[ K_t \left/ \begin{bmatrix} L_{a1} & \ldots & L_{aN} \end{bmatrix} \right. \right] -8\% \] where \[ \begin{bmatrix} \delta_{a1} \\ \vdots \\ \delta_{aN} \end{bmatrix} \] is the risk-weighted assets portfolio and

\[ II = \begin{cases} 1 & \text{if the bank is poorly capitalized} \\ 0 & \text{otherwise} \end{cases} \]

\[ NDISC_t = \begin{bmatrix} NPL_{a1} & \ldots & NPL_{aN} \end{bmatrix} \] = non discretionary component of LLP where \[ \begin{bmatrix} e_{a1} \\ \vdots \\ e_{aN} \end{bmatrix} \] is the non performing loans portfolio and \[ \begin{bmatrix} e_1 \\ \vdots \\ e_N \end{bmatrix} \] are the risk-coefficients used to compute specific provisions

\[ DISC_t = \text{discretionary component of LLP} \]

The money market equilibrium is not introduced in the model because deposits are supposed to be exogenous at the bank level in equation (1). According to the money multiplier theory, there is a difference in deposit creation for a single bank versus the banking system as a whole. As a result, credits are done by deposits at the bank level whereas deposits are done by credits at the banking system level. Our credit supply fluctuation model does not therefore need to consider deposits as endogenous\(^{18}\).

Besides, the lending rate is considered as an endogenous variable in equation (1). Indeed, the credit market is competitive and therefore the lending rate is determined at the aggregate level and not at the bank level.

3.1.2. Second step: Lending rate determination

We use credit demand fluctuations to determine the lending rate. Credit demand fluctuations are assumed to depend only on macroeconomic variables. First, the real GDP growth rate, denoted \( (\dot{y}) \), captures the evolution of the transaction demand and should

\(^{18}\) We will use a Granger causality tests to confirm the validity of this hypothesis.
therefore positively affect credit demand fluctuations. Second, the money market rate \((i)\) and the lending rate \((l)\) are also expected to affect the credit demand fluctuations because they designate the different financing costs. The private sector may obtain market funding which are not perfect substitutes of bank loans. Their cost is represented by the money market rate and should positively affect credit demand fluctuations. On the other hand, the lending rate – the loan price – should affect negatively credit demand fluctuations. Finally, we also take into account the inflation rate to capture the uncertainty in the economy and it should affect negatively credit demand fluctuations. Then, credit demand fluctuations, at the bank level, are modelled as:

\[
\Delta L^D_{it} = \alpha_1 \hat{y}_{it} + \alpha_2 l_{it} + \alpha_3 i_{it} + \alpha_4 \pi_{it}, \\
(+) \quad (-) \quad (+) \quad (-)
\]  

where

\[\Delta L^D_{it} = \text{Change of demand for loans for the bank } i \text{ between the year } (t-1) \text{ and } t\]

\[l_{it} = \text{lending rate on the credit market}\]

\[i_{it} = \text{money market rate}\]

\[\hat{y}_{it} = \text{GDP growth rate between the year } (t-1) \text{ and } t\]

\[\pi_{it} = \text{inflation rate}\]

At the aggregate level, credit demand fluctuations are given by the following equation:

\[
\sum_{i=1}^{n} \Delta L^D_{it} = n \alpha_1 \hat{y}_t + n \alpha_2 l_t + n \alpha_3 i_t + n \alpha_4 \pi_t, \\
(+) \quad (-) \quad (+) \quad (-)
\]  

With \(n\), the number of banks in the credit market.

Then, we can deduce the lending rate:

\[
l_t = \lambda_1 \sum_{i=1}^{n} \Delta L^D_{it} + \lambda_2 \hat{y}_t + \lambda_3 i_t + \lambda_4 \pi_t, \\
(-) \quad (+) \quad (+) \quad (-)
\]  

The lending rate is determined at the credit market equilibrium, when: \[\sum_{i=1}^{n} \Delta L^D_{it} = \sum_{i=1}^{n} \Delta L^S_{it}.\]

3.1.3. Third step: Credit fluctuations at the bank level

At the credit market equilibrium, the single lending rate obtained with equation (4) is applied by each bank. We introduce therefore equation (4) in equation (1) to solve the endogenity of the lending rate. We then obtain, at the aggregate level:
We disaggregate equation (5) to obtain credit fluctuations at the bank level:

\[
\sum_{i=1}^{n} \Delta L_{iu}^s = \beta_1 \sum_{i=1}^{n} \Delta D_{iu} + \beta_2 \sum_{i=1}^{n} \Delta MF_{iu} + \beta_3 \sum_{i=1}^{n} \Delta E_{iu} + \beta_4 \left( \lambda_1 \sum_{i=1}^{n} \Delta L_{iu} + \lambda_2 \dot{y}_i + \lambda_3 i_i + \lambda_4 \pi_i \right) + n \beta_5 i_i + n \beta_6 \pi_i + 11 \beta_7 \sum_{i=1}^{n} TCR_{iu} + \beta_8 \sum_{i=1}^{n} NDISC_{iu} + \beta_9 \sum_{i=1}^{n} DISC_{iu}
\]

(5)

where \( \Delta L_{iu}^s \) is the loans’ variation of bank \( i \) between years \((t-1)\) and \( t \) in percentage of total assets of year \( t \).

Equation (6), which is a structural form of the credit fluctuations at the bank level, is an alternative to a reduced form equation of the credit market equilibrium. The advantage of our approach is that deposits are exogenous (according to the credit multiplier theory) and we do not need to put restrictions on parameters. This structural form of the supply schedule only needs to consider the lending rate as endogenous.

We should find a positive sign for the GDP growth rate \( \dot{y} \ (\delta_4>0) \) and a negative sign for the annual inflation rate \( \pi \ (\delta_6<0) \). The sign of the coefficient associated to the money market rate \( i \), \( \delta_5 \), is unknown because it acts contrariwise in equation (1) and (4). A negative sign means that the supply effect from equation (1) dominates. We expect a positive relationship between bank loans fluctuations and the variations between year \((t-1)\) and \( t \) of deposits \( \Delta D_{iu} \), market funding \( \Delta MF_{iu} \) and equity \( \Delta E_{iu} \ (\delta_1>0, \delta_2>0 \text{ and } \delta_3>0) \). The variations of these three liabilities variables are in percentage of total assets for the year \( t \). Three variables are also introduced to take into account the institutional constraints which can lead to a procyclical behaviour. The first constraint is the regulatory capital requirement which is expected to affect negatively the ability of poorly capitalized banks to supply new credits. We should then find a positive sign for the total capital ratio \( TCR \_ L_{iu} \ (\delta_7>0) \). The second constraint comes from the provisioning system. As we explained previously, we need to distinguish the non discretionary component (NDISC) and the discretionary component (DISC) of the LLP. We then use the methodology developed by Beaver & Engel (1996) and Ahmed et al., (1999) to estimate these two components.
3.2. Modelling bank provisions

Empirical evidence and economic theory (Beaver & Engel, 1996; Liu et al., 1997 and Ahmed et al., 1999, Lobo & Yang, 2001) suggest a number of factors which may explain the choice of LLP. These may be grouped into three classes.

3.2.1. Non discretionary behaviours

LLP are composed of specific provisions and general provisions. The former depends on non performing loans and are used to cover occurred losses. The correlation between LLP and non performing loans (NPL) is used to estimate the non discretionary provisions. We expect a positive relationship between NPL and LLP. Besides, general provisions should be used to cover “expected losses” but their amount cannot be explained by loan specific documentation. Consequently, managers can manipulate and exploit this discretionary accounting practice (Cavallo & Majnoni, 2001).

3.2.2. Discretionary behaviours

i) Income-smoothing behaviour

Under the income smoothing hypothesis, banks understate (overstate) LLP when earnings are expected to be low (high) relative to that of other years (inter-temporal smoothing). Two variables are computed to take into account this behaviour: \(\text{ER}_H (\text{ER}_L)\) which takes the value of the earnings before provisions and taxes over total assets (ER) when observations for bank \(i\) are greater (less) that the mean plus (minus) the half of the standard deviation of ER and 0 otherwise. If banks have an income-smoothing behaviour, we should find a positive (negative) relationship between LLP and \(\text{ER}_H (\text{ER}_B)\).

ii) Capital management behaviour

Banks can use LLP to manage regulatory capital. A positive correlation between LLP and regulatory capital could be expected if poorly capitalized banks are less willing to constitute LLP (Shrives & Dahl, 2002). However, accounting relations could also shape capital management. Regulatory capital is composed by Tier 1 - which includes equity and retained earnings - and Tier 2 - which includes subordinated debt and loan loss allowances (depending on general provisions). LLP are therefore positively correlated to Tier 2 and negatively to Tier 1. If regulatory capital variations are more related to retained earnings than loan loss allowances, correlation should be negative. A distinction between poorly capitalized banks and well capitalized banks can be made to take into account non linearity in behaviours.
Two variables are therefore computed to take into account this non-linearity: TCR\_H (TCR\_L) takes the value of the total capital ratio (TCR) minus 8 and divided by 8 when observations for bank \( i \) are in the last (first) quartile of TCR and 0 otherwise.

\[ \text{TCR}\_H = \begin{cases} \text{TCR} - 8 & \text{if observations for bank } i \text{ are in the last (first) quartile of TCR} \\ 0 & \text{otherwise} \end{cases} \]

\[ \text{TCR}\_L = \frac{\text{TCR} - 8}{8} \]

\( iii) \ Signalling \ behaviour \)

Banks can use LLP to signal financial strength. The variable SIGN, defined as the one-year-ahead changes of ER, is computed to test the signalling hypothesis and a positive correlation with LLP is expected (Beaver et al. (1989), Whalen (1994), Ahmed et al. (1999)).

\( iii) \ Signalling \ behaviour \)

Banks can use LLP to signal financial strength. The variable SIGN, defined as the one-year-ahead changes of ER, is computed to test the signalling hypothesis and a positive correlation with LLP is expected (Beaver et al. (1989), Whalen (1994), Ahmed et al. (1999)).

\[ \text{SIGN} = \frac{\text{ER}_{t+1} - \text{ER}_t}{\text{ER}_t} \]

\[ \text{SIGN} = \frac{\text{ER}_{t+1} - \text{ER}_t}{\text{ER}_t} \]

\( 3.2.3. \ Macroeconomic \ influences \ on \ asset \ quality \)

The macroeconomic environment should affect the ability of borrowers to repay banks’ assets. The private sector wealth will vary with the economic cycle, so we introduce the annual growth rate of GDP, \( \dot{y} \). Some studies have empirically studied the economic cycle as a determinant of loan loss provisions (see Pain, 2003 for UK banks, Fernandez de Lis et al., 2001 for the Spanish case, Cavallo & Majnoni, 2001 and Laeven & Majnoni, 2003), and they find a pro-cyclical behavior for provisions: loan losses increase (and hence LLP) when \( \dot{y} \) decreases, diminishing earnings and amplifying the credit cycle. Thus, the expected sign of the variable \( \dot{y} \) is negative if there is a role for provisioning practices (backward-looking) in amplifying financial distress.

As asset price changes may also affect banks’ loan portfolios via collateral, we introduce the annual rate of change in real estate prices, RESTATE\(^19\). Real assets are often taken as collateral on loans. If real estate prices fall, the value of collateral on loans will fall too and this could lead to a greater level of default. We should then expect a negative relationship between RESTATE and LLP.

Equation (7) models the relationship between loan loss provisions and the explanatory variables defined above:

\[ LLP_{it} = a_0 + a_1 NPL_{it} + a_2 ER\_H_{it} + a_3 ER\_L_{it} + a_4 SIGN_{it} + a_5 TCR\_H_{it} + a_6 TCR\_L_{it} + a_7 \dot{y}_{it} + a_8 \text{RESTATE}_{it} \]

\[ (7) \]

where LLP\(_{it}\) is the ratio of loan loss provisions (specific provisions plus general provisions) to total assets at the end of the year \( t \) for bank \( i \). The model accounts for the possibility that the

\( \text{RESTATE} = (\text{RESTATE}_{t-1} - \text{RESTATE}_{t})/\text{RESTATE}_{t} \)

where \( \text{RESTATE}_t \) is an average over year \( t \) and \( \text{RESTATE}_{t-1} \) is an average over year \( (t-1) \).
use of discretionary LLP for one purpose is conditional on the effects of the other two motivations by jointly estimating the relationships between loan loss provisions and income smoothing, capital management and signaling behaviors. Moreover, the model controls for macroeconomic influences and for the non discretionary component of LLP.

We use the estimation of equation (7) to compute the non discretionary component (NDISC) and the discretionary component (DISC) of the LLP. We assume that these two components are linear functions of the variables included in equation (7). Thus, the non discretionary component of LLP is estimated as the sum of the products of its explanatory variable times the corresponding estimated coefficient from equation (7). The same method is used to estimate the discretionary components:

$$NDISC_{it} = a_1 NPL_{it}$$

$$DISC_{it} = a_2 ER - H_{it} + a_3 ER - L_{it}$$

Provisions resulting from capital management and signalling behaviours are not introduced in the discretionary component of LLP which affects the credit market equilibrium. Actually, only the income smoothing behaviour has a counterbalancing effect on the cyclical evolution of non discretionary provisions and could therefore be considered as a kind of unregulated dynamic provisioning (Bikker & Metzemakers, 2002). This discretionary behaviour reduces the volatility of bank profits, increasing provisions during the expansionary phase and decreasing provisions during the recession phase. As a result, profits as well as provisions are smoothed, which should positively affect banks ability to supply credits. Then we expect a positive relationship between the discretionary variable and credit fluctuations in equation (6) ($\delta_6>0$). By contrast, we should find a negative relationship between the non discretionary component of LLP and bank loan fluctuations ($\delta_8<0$).

4. Data and descriptive statistics

Our source for all bank-level variables is Bankscope Fitch IBCA which provides annual financial statement. Our sample period extends from 1995 to 2001 and our database contains balanced information about 41 European commercial banks from eight different countries: Denmark, Finland, France, Ireland, Italy, Portugal, Sweden and United Kingdom (see Table 20).

---

20 All the banks in our sample publish their annual financial statements at the end of the year.
21 The European banking system can be considered as unified since the Second European Banking Directive of 1989. Thus, we consider a sample of European banks without taking into account countries of origination.
22 Banks from Germany and Spain do not give any information about non performing loans.
A1 in the appendix for details). Only these banks rigorously reported all the information we need (especially non performing loans and total capital ratio) during the sample period. We need to use balanced panel data to test the influence of the evolutions of LLP on bank credit fluctuations. Results have therefore to be based on a constant bank population facing slow growth phases and upswing phases in order to capture behaviour modifications through the credit and the business cycles. Unbalanced panel data could distort the relation between non discretionary provisions and credit fluctuations because unreported data cannot simply be analysed as missing values but can also result from a choice of banks to hide their level of NPL.

Our balanced sample represents a significant part of total loans supply by all banks available in Bankscope Fitch IBCA. The average cover rates of total assets and total loans are around 35% and appear stable during the sample period (see Table A1 in the appendix). Cover rates differ between countries; the balanced sample covers less than 10% of total loans and total asset available for Finland whereas these ratios are more than 85% for Sweden, France and the United Kingdom are in the average while figures for Italy are around 15-20%.

Table 2. Descriptive statistics, on average over the period 1995-2001 (%)

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>D</th>
<th>MF</th>
<th>E</th>
<th>NPL</th>
<th>LLP</th>
<th>TCR</th>
<th>ROA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>51.69</td>
<td>67.47</td>
<td>17.31</td>
<td>5.98</td>
<td>2.61</td>
<td>0.36</td>
<td>12.71</td>
<td>0.68</td>
</tr>
<tr>
<td>Std</td>
<td>14.98</td>
<td>13.06</td>
<td>12.18</td>
<td>2.88</td>
<td>2.85</td>
<td>0.29</td>
<td>5.33</td>
<td>0.46</td>
</tr>
<tr>
<td>Min</td>
<td>2.25</td>
<td>32.38</td>
<td>0.00</td>
<td>1.50</td>
<td>0.00</td>
<td>-0.14</td>
<td>3.05</td>
<td>-1.58</td>
</tr>
<tr>
<td>Max</td>
<td>82.70</td>
<td>91.56</td>
<td>59.46</td>
<td>21.37</td>
<td>24.78</td>
<td>1.83</td>
<td>42.00</td>
<td>3.01</td>
</tr>
</tbody>
</table>

Variable definitions:

L: loans/total assets
D: deposits/total assets
MF: market funding/ total assets
E: equity/total assets
NPL: non-performing loans/total assets
LLP: loan loss provisions/total assets
TCR: total capital ratio
ROA: return on asset
ER: earning before provisions and taxes/total assets
ER_H takes the value of EBPT when observations for bank i are greater than the mean plus the standard deviation of EBPT (worked out over the period 1995-2001) and 0 otherwise

ER_L takes the value of EBPT when observations for bank i are less than the mean plus the standard deviation of EBPT (worked out over the period 1995-2001) and 0 otherwise

SIGN takes the value of Δt/t+1 EBPT when observations are positive, 0 otherwise

TCR_H takes the value of (TCR-8)/8 when observations for bank i are in the last quartile of TCR (worked out over the period 1995-2001) and 0 otherwise

TCR_L takes the value of (TCR-8)/8 when observations for bank i are in the first quartile of TCR (worked out over the period 1995-2001) and 0 otherwise

Descriptive statistics of our sample are presented in Table 2\textsuperscript{23}. Deposits are the main resource of our commercial banks (67.47\%) but market funding also represents an important resource (17.31\%). Loans are the main banks’ assets (51.69\%); these assets seem carefully managed as mean ratios of LLP to total assets and nonperforming loans to total assets are respectively 0.36\% and 2.61\%. The total capital ratio is 12.71\%, thus on average banks are well capitalised and build up capital buffers.

5. Empirical results

5.1 Banks’ LLP behaviours

The Fisher test shows that data required panel estimation and not pooled estimation. The Hausman test (see Hausman, 1978) shows that random effect estimation procedure is relevant for our study compared to the fixed effects one. The estimation of equation (7) is then performed with the generalised least squares (GLS) method. The results are reported in Table 3. This estimation is robust to heteroskedasticity and autocorrelation. We also ensure that correlations between exogenous variables are weak\textsuperscript{24}.

The coefficient associated with non performing loans (a1) is significantly positive as expected. This result implies that the cyclical evolution of NPL influences provisioning via the backward-looking rules. Consequently, profits are directly affected by the accumulation of non performing loans during downturns. The impact on credit fluctuations will be tested with

\textsuperscript{23} We compared the statistics of our balanced sample of 41 banks with an unbalanced sample of 179 banks (banks which have at least three years of time series observations) in order to see if we have a selection bias. Mean tests do not show significant difference for all the variables presented in Table 2.

\textsuperscript{24} In order to take country-specific factors (such as difference in tax treatment), we also introduced a dummy variable for each country to take into account a country-specific effect.
the estimation of equation (6). Dynamic provisioning practices should enable the smoothing
of provisioning and thus decrease the cyclical effect of specific provisions.

Table 3. Random effects regression (GLS) of loan loss provisions on variables that determine
non discretionary and discretionary motivations (equation 7)

\[ LLP_{it} = \alpha_0 + \alpha_1 NPL_{it} + \alpha_2 ER_{it} - H_{at} + \alpha_3 ER_{it} - L_{it} + \alpha_4 \text{SIGN} + \alpha_5 TCR_{it} + L_{it} + \alpha_7 \hat{y}_{it} + \alpha_8 \text{RESTATE}_{it} + \mu_i + \epsilon_{it} \]

with \( \mu_i \), a specific random element and \( \epsilon_{it} \), a disturbance term.

<table>
<thead>
<tr>
<th>Coeff.</th>
<th>a0</th>
<th>a1</th>
<th>a2</th>
<th>a3</th>
<th>a4</th>
<th>a5</th>
<th>a6</th>
<th>a7</th>
<th>a8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted sign</td>
<td>(?)</td>
<td>(+)</td>
<td>(+)</td>
<td>(-)</td>
<td>(+)</td>
<td>(?)</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>Estimate</td>
<td>0.1034***</td>
<td>0.0399**</td>
<td>0.0706***</td>
<td>-0.0016</td>
<td>-0.0002</td>
<td>-0.0489*</td>
<td>-0.2518**</td>
<td>-0.0110**</td>
<td>-0.0022</td>
</tr>
<tr>
<td>t-Value</td>
<td>5.0246</td>
<td>2.3102</td>
<td>3.6862</td>
<td>0.0819</td>
<td>0.9897</td>
<td>1.7914</td>
<td>1.9925</td>
<td>1.9713</td>
<td>0.8210</td>
</tr>
<tr>
<td>p-Value</td>
<td>0.0000</td>
<td>0.0208</td>
<td>0.0002</td>
<td>0.9347</td>
<td>0.3222</td>
<td>0.0732</td>
<td>0.0463</td>
<td>0.0486</td>
<td>0.4116</td>
</tr>
<tr>
<td>Adj.R²</td>
<td>0.2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Banks specific variables are defined in Table 2. \( \hat{y} \) = the real GDP growth rate; \( \text{RESTATE} \) = the annual
rate of change in the real estate price. ***, ** and * indicate significance respectively at the 1%, 5% and 10%
levels.

The earning management behaviour does not appear symmetric. The estimated
coefficient of high earnings (a2) is significant and positive whereas it is not significant for low
earnings (a3). Therefore, banks increase provisions when earnings (before tax and provisions)
are relatively high compared to the other years but they do not practice the symmetric
smoothing behaviour when earnings are relatively low. As a result, banks accumulate LLP
during upswing phases but they do not succeed in reducing significantly LLP during
downturns. Indeed, income smoothing performs like statistical provisions only during
expansions and does not enable to properly offset the increase of non discretionary provisions
during contraction phase. So, a new regulation on provisions, implementing dynamic
provisioning practices, cannot be avoided if we want to deal with the cyclical evolution of
LLP.

The signalling behaviour (a4) does not appear significant. The sample contains listed
and non listed banks but this behaviour could only be relevant for listed banks which have
more interest signalling their financial strength to the market in order to show their ability to
borrow (Lepetit & Morin, 2004).
The coefficients associated with the total capital ratios \((a_5\) and \(a_6\)) are both significant and negative but the coefficient related to poorly capitalized banks is higher. Accounting relation is therefore more relevant than capital management. Moreover, poorly capitalized banks resort more to Tier 1 to increase capital ratio than well capitalized banks which are more able to diversify regulatory capital composition.

The significant and negative coefficient for GDP growth \((a_7\)\) indicates that macroeconomic situation is relevant and that LLP behave pro-cyclically. This result is consistent with those reported in prior studies by Cavallo & Majnoni (2001), Fernandes de Lis et al. (2001), Laeven & Majnoni (2003) and Pain (2003). Business cycle influences financial strength of firms and households and then has a close relationship with problem loans. This implies an increase of specific provisions but also an increase of the general provisions as the GDP growth modifies the credit exposure of banks. As a result, the relation between \(y\) and LLP is not included in the non discretionary component of LLP used in equation (7) but only considered as a control variable.

Similar to the study conducted by Pain (2003), we find that the second macroeconomic variable introduced to control for asset price ‘shocks’ (the annual rate of change in the real estate price, \textsc{Restate}) is not statistically significant.

Equation (7) is re-estimated without the non significant variables - \textsc{er\_l}, \textsc{sign} and \textsc{restate} - to compute the accounting constraint used in equation (6). The following variables are obtained:

\[
\text{NDisc}_t = 0.0407\text{Npl}_t \\
\text{Disc}_t = 0.0683\text{ER\_H}_t
\]

We do not include the variable \textsc{er\_l} in the discretionary component of LLP because it is not significant and it means that banks have no discretion regarding LLP when earnings are relatively low.

### 5.2. Credit fluctuations and accounting practices

The estimation of equation (6) is performed with the generalized method of moments (GMM). This method is relevant because the accounting constraints (variables \textsc{ndisc} and \textsc{disc}) are built using the coefficients from the regression of equation (7) and then contain a
measurement error. Table 4 presents the results of the estimation of equation (6)\textsuperscript{25}. The variables \textit{NDISC}\textsubscript{c} and \textit{DISC} are taken as instruments with two lags to perform the generalised method of moments.

\textbf{Table 4.} Generalized Method of Moments estimation (GMM) of credit fluctuations\textsuperscript{26} (equation 6)

$$
\Delta L_t = \delta_1 \Delta D_t + \delta_2 \Delta MF_t + \delta_3 \Delta E_t + \delta_4 \gamma_t + \delta_5 \pi_t + \delta_6 TCR - L_t + \delta_7 NDISC_t + \delta_8 DISC_t + \varepsilon_t
$$

<table>
<thead>
<tr>
<th>Coeff.</th>
<th>(\delta_1)</th>
<th>(\delta_2)</th>
<th>(\delta_3)</th>
<th>(\delta_4)</th>
<th>(\delta_5)</th>
<th>(\delta_6)</th>
<th>(\delta_7)</th>
<th>(\delta_8)</th>
<th>(\delta_9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted sign</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(?)</td>
<td>(-)</td>
<td>(+)</td>
<td>(-)</td>
<td>(+)</td>
</tr>
<tr>
<td>Estimate</td>
<td>0.1045*</td>
<td>0.4464***</td>
<td>0.5606*</td>
<td>0.6470*</td>
<td>-1.9058***</td>
<td>-0.0825</td>
<td>9.0233*</td>
<td>-11.0552***</td>
<td>-3.1673</td>
</tr>
<tr>
<td>t-Value</td>
<td>1.9163</td>
<td>3.8804</td>
<td>1.9207</td>
<td>1.8267</td>
<td>3.3374</td>
<td>0.1600</td>
<td>1.8847</td>
<td>3.0081</td>
<td>0.4604</td>
</tr>
<tr>
<td>p-Value</td>
<td>0.0553</td>
<td>0.0001</td>
<td>0.0548</td>
<td>0.0678</td>
<td>0.0008</td>
<td>0.8729</td>
<td>0.0595</td>
<td>0.0026</td>
<td>0.6453</td>
</tr>
<tr>
<td>Sargan Statistic=16.6210</td>
<td>(p)-Value=0.7338</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Banks specific variables are defined in Table 2. \(\hat{y}\) = the real GDP growth rate. ***, ** and * indicate significance respectively at the 1%, 5% and 10% levels.

Three banks resources are distinguished: deposits (\(\delta_1\)), market funding (\(\delta_2\)) and equity (\(\delta_3\)). Variations in these three variables affect significantly and positively credit fluctuations as expected. Consequently, banks do not only use deposits to create credit but also use market funding, while equity (included in Tier 1) is needed to expand credit according to the Basel agreements.

Macroeconomic variables are also relevant in credit fluctuations. As expected, the coefficient of GDP growth (\(\delta_4\)) is significant and positive. The coefficient of money market interest rate (\(\delta_5\)) is significant and negative which means that supply effect dominates demand effect. An interest rate raise mainly causes a reallocations in banks’ portfolio in favour of financial assets even if demand for intermediate financing increase. Besides, inflation rate does not affect significantly credit fluctuations. The stabilization of the inflation rate in the European countries may explain this result.

\textsuperscript{25} We realize Granger causality tests between the dependant variable \(\Delta L\) and the righten variables NDISC (links with the non performing loans), D (Deposits), MF (Market funding) and E (Equity,) and we do not find significant causality relationships.

\textsuperscript{26} We use the SAS macro of Emmanuel Duguet: http://eurequa.univ-paris1.fr/membres/duguet/macro-co.htm.
With regard to the institutional constraints, we find that the coefficient associated with the regulatory capital requirement (δ7) is significant and positive at the 10% level. Poorly capitalised banks are therefore constrained to expand credit. On the other hand, during a cyclical downturn, capital requirement increase and poorly capitalised banks shrink their risk weighted assets to respect solvency ratios. This result supports the capital crunch hypothesis whereas Shrieves & Dahl (2002) found this variable “not quite statistically significant”.

The accounting constraints also appear relevant. Non discretionary provisions (δ8) affect significantly and negatively credit fluctuations. Ex-post accounting rules therefore amplify credit cycle: weak specific provisions during upswing phases allow banks to expand credit whereas accumulation of non performing loans during downturns constrains banks to expand provisions, which reduces their ability to supply credits. By contrast, discretionary provisions (δ9), associated with the income smoothing behaviour and acting like dynamic provisions, do not affect credit fluctuations. We may explain this result by the fact that income smoothing behaviour was not found symmetric. Thus, discretionary accounting practices seem not to perform as dynamic provisions which efficiently counterbalance cyclical behaviour of nondiscretionary provisions. The findings of our research are then consistent with the actual call for the implementation of a dynamic provisioning in Europe to eliminate the role of accounting practices in credit cycle.

6. Credit cycle and dynamic provisioning

The model developed in this paper concerns credit fluctuations which include long term and short term variations in credit market. However, the accounting constraint - linked to the evolution of non performing loans - is only relevant for short term fluctuations and then is considered as an explanatory factor of the credit cycle. Banks’ behaviours – for example, bias toward optimism, herding behaviour or disaster myopia – are also frequently highlighted to explain the credit cycle. However structural developments strengthen the concurrence and banking regulators promote internal risk management approaches which do not support the implementation of incentives to control such behaviours. Dynamic provisioning could therefore lead to significant reduction in the credit cycle and could be more easily implemented insofar as bank regulators could adopt it unilaterally.

Dynamic provisioning could break or more precisely offset the correlation between non discretionary provisions and credit fluctuations. The main principle of this system is to

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27 With a p-value of 11.25%.
implement statistical provisions which link LLP with long term expected losses and no more
with actual losses. Statistical provisions are computed as the difference between expected
losses and specific provisions, i.e. they can be either positive or negative. Banks have
therefore to estimate precisely their expected losses with their own internal models or using a
standard approach developed by the regulator. As a result, banks should build up statistical
provisions during upswing phases - when actual losses and consequently specific provisions
are weak – and drawn down these “reserves” during downturns.

Previous researches (Fernandez de Lis et al., 2001 ; Borio et al., 2001 and Mann &
Michael, 2002) emphasize the effect of dynamic provisioning to smooth bank income and to
stabilize bank capital since measurements of credit risks and bank profits have been
improved. However, our findings show that provisioning also influences the credit cycle. We
can use the results of the estimation of equation (6) to illustrate the relevance of actual
accounting practices to amplify credit fluctuations. Figure 2 illustrates the contribution of
liabilities variables (variations of deposits, market funding and equity), non discretionary
provisions and variations in the GDP growth rate to the growth of credit fluctuations. The
situation of every 41 banks cannot be individually represented; we therefore illustrate the
average situation which means that this graph has to be cautiously analysed.

Credit fluctuations ($\Delta L$) are positive on average but Figure 2 shows that the growth
rate of credit fluctuations records numerous swings, which is consistent with the occurrence
of a credit cycle. Liabilities variables are the main factor explaining variations in credit
fluctuations. In particular, they have a strongly and positive contribution in 1999 and a
negative one in 1996 and 2001. Nevertheless, non discretionary provisions contribute also
significantly to amplify variations in credit fluctuations\(^{28}\) and even appear as important as the
effect of variations in the GDP growth rate in 1999 and 2000. Indeed, even if this non
discretionary LLP are not the main source of fluctuation, they contribute to amplify the credit
cycle because there is an unsatisfactory provisioning system.

As the main factors explaining swings in credit fluctuations are balance sheet variables
and non discretionary LLP, the supply side effect is more important than the demand side.
This result is not consistent with that reported by Bikker (2004) who finds that lending is
dominated by demand. This opposite result may be explained by the data used which are
different: Bikker uses country level data whereas we use bank level data. Bikker’s approach is

\(^{28}\) Except in 1996 and 2001 but we have the same “problematic” result for balance sheet variables in 1997 and
GDP growth rate in 1998. Figure 2 is based on average and then cannot represent very precisely results of our
estimations.
therefore more relevant to represent the demand side of lending whereas our approach is more relevant to represent the supply side.

**Figure 2:** Contributions of the balance sheet variables, GDP growth rate and non discretionary component of LLP to the growth of credit fluctuations

![Graph showing contributions of balance sheet variables, GDP growth rate, and non discretionary component of LLP to the growth of credit fluctuations.](image)

Note: This Figure uses average on the balanced sample and estimated coefficients of equation (6). Data for 2002 are based on a subsample of 36 banks. **NDISC**, **Liabilities** and **GDP growth rate** respectively represent the contribution of non discretionary provisions, balance sheet variables and variation in the GDP growth rate to the growth of credit fluctuations, computed as follow:

\[
\frac{\Delta L_{it} - \Delta L_{it-1}}{\Delta L_{it-1}} = \frac{\Delta \text{Liabilities}_{it} - \Delta \text{Liabilities}_{it-1}}{\Delta \text{Liabilities}_{it-1}} \times \Delta \text{Liabilities}_{it-1} + \frac{b_1 \hat{\gamma}_{it} - b_2 \hat{\gamma}_{it-1}}{b_1 \hat{\gamma}_{it-1} \times \Delta \text{Loans}_{it-1} + \Delta \text{Loans}_{it-1}} \times \Delta \text{Loans}_{it-1} + \frac{b_3 \hat{\gamma}_{it} - b_4 \hat{\gamma}_{it-1}}{b_3 \hat{\gamma}_{it-1} \times \Delta \text{NDISC}_{it} - \Delta \text{NDISC}_{it-1}} \times \Delta \text{NDISC}_{it-1} + \Delta \text{NDISC}_{it-1} + \Delta \text{NDISC}_{it-1}
\]

with \(\Delta \text{Liabilities}_{it} = b_1 \Delta \text{Deposits}_{it} + b_2 \Delta \text{MarketFunding}_{it} + b_3 \Delta \text{Equity}_{it}\) and \(u_{it}\) is the growth of \(\Delta L_{it}\) unexplained by variables took into account.

Our research gets to the heart of potential conflict between financial supervisors and accounting authorities. Over recent years, different approaches have been proposed to change both national and international accounting\(^{29}\): (i) the current International Accounting Standard 39 (IAS 39) under which loans would normally be carried at their outstanding value (book value) unless there is evidence of impairment (backward-looking approach) whereas trading books are measured with market value; (ii) the Full Fair Value Accounting (FFVA) according

\(^{29}\) For a more detailed discussion of this issue, see Borio & Lowe (2001).
to which all financial instruments – including loans – should be measured at market value and expected gains and losses should be recognized immediately in the profit and loss account (forward-looking approach); (iii) the statistically dynamic provisioning\textsuperscript{30} (forward-looking approach).

Given the cyclicality of lending, a move to forward-looking principle is preferable, but through dynamic provisioning is preferable. Indeed, FFVA is not suitable because it can enhance the pro-cyclical character of bank lending because immediate recognition of unrealized value might reinforce the effects of shocks (Enria, 2004). It also increases banks’ earnings and regulatory capital volatilities (Barth, Landsman & Wahlen, 1995) and then the volatility of banks’ balance sheets. Moreover, FFVA could affect the liquidity transformation role of banks and then should reduce their contribution to intertemporal smoothing (Freixas & Tsomocos, 2004). Furthermore, FFVA does not adequately recognize the specific nature of bank lending. It views banks as portfolio managers rather than as resolvers of information problems\textsuperscript{31}. As a result, the banking industry and banking supervisor are opposed to FFVA (Chisnall, 2000).

Therefore, dynamic provisioning is preferable to fair value accounting as a means of coping with expected losses. The statistical provision records the expected losses connected with the initial portfolio in a way that total provisions (specific, general and statistical) created over the years are smoothed. The statistical provision increases in periods of economic growth, complementing net specific provisions, which are rather low in these periods compared to total loans. Therefore, implemented a dynamic provisioning could allow to compensate the contribution of the non discretionary LLP to the variation of credit fluctuations.

7. Concluding remarks

The purpose of this research was to determine if banking behaviour leads to the amplification of the credit cycle and thus of the business cycle. Using a panel of 41 European banks for the period 1995-2001, we empirically investigated the effect of the capital requirement and LLP on the fluctuation of bank lending. For that, in a first step, we analyzed whether the choice of LLP reflects expected credit losses, macroeconomic conditions or bank managers’ income smoothing, capital management and signaling behavior in order to

\textsuperscript{30} See the footnote 4 for more details.
\textsuperscript{31} This is because the market value of banks' loan is difficult to define due to the underlying special information which is only available for banks (Berger et al, 1991).
compute the non discretionary and discretionary components of the LLP. Then, in a second step, we examined the variables which have an impact on bank credit fluctuations.

Our results show that bank resources (deposits, market funding and equity) as well as GDP growth rate, affect significantly and positively credit fluctuations as expected. The capital requirement is also, for the poorly capitalized banks, relevant to explain credit fluctuations. Our finding is consistent with the capital crunch hypothesis, which means that during a cyclical downturn capital requirement increases and poorly capitalized banks reduce their lending to satisfy solvency ratios. We also find that the non discretionary component of LLP amplifies the credit cycle. Non discretionary LLP increase in periods of downturn and then reduce bank lending whereas they decrease in periods of expansion when credit risks are undervalued by banks which rise credit supply. By contrast, the discretionary component of LLP does not affect credit fluctuations.

Our findings are consistent with the actual call for the implementation of a forward-looking principle in the European Union through a dynamic provisioning system as Spain and Portugal already successfully did it. Such dynamic provisioning system will require to recalibrate the Basel Accord in order to implement a forward-looking provisioning system. A fourth pillar – called the accounting pillar – could therefore be included in the Basel Accord especially to cope with expected losses32. Moreover, the bank regulatory capital which incorporate general provisions up to a ceiling (see footnote 3), should also need to be changed in order to cover just unexpected losses.

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32 We consider that Pillar 2 – discretionary decisions of the regulator – and Pillar 3 – market discipline – could be an inadequate arrangement to cope with expected losses.
## APPENDIX

Table A1. Coverage of total assets and total loans

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of commercial banks available under Bankscope Fitch IBCA</th>
<th>Number of commercial banks retained in our balanced sample</th>
<th>Total assets of commercial banks retained in our balanced sample / Total assets of commercial banks available under Bankscope Fitch IBCA</th>
<th>Total loans of commercial banks retained in our balanced sample / Total loans of commercial banks available under Bankscope Fitch IBCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>54 55</td>
<td>6 6</td>
<td>0.6677 0.6682</td>
<td>0.4454 0.8222</td>
</tr>
<tr>
<td>Finland</td>
<td>6 7</td>
<td>1 1</td>
<td>0.1055 0.0428</td>
<td>0.0732 0.0325</td>
</tr>
<tr>
<td>France</td>
<td>244 194</td>
<td>8 8</td>
<td>0.3682 0.4046</td>
<td>0.4067 0.3855</td>
</tr>
<tr>
<td>Ireland</td>
<td>22 32</td>
<td>2 2</td>
<td>0.5638 0.4592</td>
<td>0.5742 0.5835</td>
</tr>
<tr>
<td>Italy</td>
<td>96 123</td>
<td>12 12</td>
<td>0.1654 0.1779</td>
<td>0.1727 0.1811</td>
</tr>
<tr>
<td>Portugal</td>
<td>28 17</td>
<td>3 3</td>
<td>0.2478 0.3710</td>
<td>0.2638 0.3644</td>
</tr>
<tr>
<td>Sweden</td>
<td>9 20</td>
<td>3 3</td>
<td>0.8749 0.9352</td>
<td>0.8637 0.9468</td>
</tr>
<tr>
<td>UK</td>
<td>141 132</td>
<td>6 6</td>
<td>0.3498 0.3665</td>
<td>0.3606 0.3799</td>
</tr>
<tr>
<td>Average (weighted according to GDP 2001)</td>
<td>0.3444 0.3659</td>
<td>0.3522 0.3728</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## REFERENCES


Peek, J., Rosengren, E., 1995b. The capital crunch: neither a borrower nor a lender be. Journal of Money, Credit and Banking. 27, pp 625--638.


