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# French Bank Mergers and Acquisitions and Loan Pricing

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**Abstract-** *This paper analyzes the effects of mergers and acquisitions on bank pricing behavior. Using the Monti-Klein Model and the data set of French consolidation transactions happening between 1996 and 2006, we find that, on average, loan pricing tends to increase with the default risk and have negative relationship with efficiency and GDP growth rate. Bank profitability, deposit ratio and liquid risk have no significant impact. Bank market characteristic (CR5 concentration ratio) was not been significant too. French banks decide their loan interest rates independently from market concentration level.*

**JEL classification-** *G21, G34*

**Keywords-** *French Banking Sector; Mergers-Acquisitions; Relationship Lending; Loan Pricing.*

## 1. INTRODUCTION

The importance of the banking industry in the financing of the economy doesn't make any more doubt. It is important not only for small businesses, which often lack access to public debt markets, but also for large corporations, which depend on them as a reliable source of liquidity helping to insulate them from market shocks (James and Smith 2000). Over the past decade, the banking industry has undergone a rapid consolidation process via the mergers and acquisitions transactions. This process is encouraged by improvements in information technology, financial deregulation, globalization of financial and real markets, and increased shareholder pressure for financial performance (Group of Ten report 2001).

Bank mergers and acquisitions may be geared to exploit economies of scale or scope, improve the X-efficiency of the consolidating banks, may enable the merged banks to exercise increased market power, or may simply be motivated by the management's desire for increased size (Berger et al. 1999). On the other hand, these operations also lead to increased concentration, which may entail negative consequences for bank customers.

Indeed, when two banks merge, there are potential benefits that could be derived from economies of scale and scope. Significant cost savings may be realized from closing overlapping branches, laying off redundant staff, selling redundant capital goods, and consolidating back office operations. Revenue enhancement may result from cross-selling products to the combined customer base from both banks. Management may get an excuse to implement unpleasant restructuring that is much needed for efficiency improvement but could not be carried out before due to internal obstruction. Moreover, better risk-return tradeoff may be achieved when banks diversify into new products and geographical markets. If these benefits can be realized, bank consolidation is surely value enhancing. However, when two banks merge into one bank, the consolidated bank will achieve a higher market power, which may enable it to change prices to the disadvantage of consumers. Merged banks may exploit their market power to extract higher economic rents in concentrated markets. They will offer lower deposit rates (Berger and Hannan 1989) or charge higher interest rates on loans (Hannan 1991). Then, borrowers may be harmed to the extent that consolidated banks exert their market power.

The impact of bank mergers on firm borrowers has been a topic of interest for researchers and policy makers for several years. The two main questions have been: do bank mergers harm or benefit firm borrowers? Do bank mergers result in less credit for small firms?

To date, most of the available studies on effects of bank mergers and acquisitions on bank behavior come from the US market. European bank markets have attracted less attention, perhaps caused by the methodological difficulties in studying these markets. But, empirical results are still inconclusive.

This paper contributes to the banking literature by studying the effects of banking consolidation on loan pricing in French. It is organized as follows: The first section will

analyze the impact of bank relationship on loan behavior. The second will present the main empirical studies on the effect of bank mergers and acquisitions on loan pricing behavior. The third will describe the methodology used in this study and the fourth will present the empirical results.

## 2. BANKING RELATIONSHIP AND LOAN BEHAVIOR

One characteristic which may distinguish banks from other financial institutions is the role of relationship between the bank and its borrowers. This Relationship banking can be defined as "the investment in providing financial services that will allow dealing repeatedly with the same customer in a more efficient way" (Freixas and Rochet 2008). It occurs when banks acquire proprietary information about its borrowers throughout the duration of the relationship, contrary to transactional bank lending, where the bank is simply a passive intermediary in channelling funds from savers to borrowers, without any proprietary information. Then these relationships can help resolve market failures since they can generate useful information as well as be used to constrain borrowers.

Banks may be more efficient at collecting information due to simple economies of scale. They can collect information once for hundreds of borrowers thus reducing the aggregate cost of collecting information. If this information is durable (can be used as an input to the lending decision over multiple periods) and not easily replicated by competitors, theory suggests that a firm with close ties to financial institutions should have a lower cost of capital and greater availability of funds relative to a firm without such ties (Diamond 1991).

Certain firm characteristics are associated with external banks' abilities to distinguish the riskiness of a loan applicant, and thus provide a measure of the asymmetric information for a given group of borrowers. For companies where noncurrent, tangible assets constitute a large fraction of total assets, we expect information asymmetries to be smaller. These assets may be used as collateral for bank loans, and they are arguably more difficult for management to divert for personal benefits. Although the value of collateral may be exposed to asymmetric information, this problem is likely to be smaller compared to other assets. Additionally, the liquidation value of current assets like accounts receivables and inventories is usually more uncertain, since its value is potentially more firm dependent than that of, e.g., real estate. In other words, irrespective of how the firm's operations are exposed to information asymmetries, the tangibility of its assets impacts the firm's ability to obtain financing.

Therefore, we expect the effect of information asymmetry experienced by external banks to be higher for firms with a large fraction of current or intangible assets on the balance sheet. We denote these firms as 'opaque'. Since low transparency increases the occurrence of a high interest rate charged by the relationship lender, opaque borrowing firms will suffer the most from the information monopoly lock-in effect, in the form of either increased interest rates or reduced loan amounts.

On the other hand, if the benefits of a close relationship are substantially large, opaque firms will gain more from a relationship than transparent firms. In their access to borrowing, opaque firms are likely to depend more on soft information held by the bank and individual loan officers, while the value of transparent firms is easier to evaluate through "hard" measures like key figures from the financial accounts. According to Boot (2000), theory predicts that relationship banking should be most valuable for smaller and less transparent firms.

If a firm can pledge collateral with a common, known value, the bank may not have to rely as much on soft information about the firm's operations when evaluating a credit application. The extent to which a firm pledges collateral for borrowing is therefore likely to be negatively correlated with the firm's opaqueness.

There are several causes that make relationship valuable for banks and firms. First, it is necessary for banks to collect informations about firms. Indeed, in the loan market, the interest rate should adjust to equate the demand with the supply. If firms ever found themselves desiring more capital than lenders were willing to supply at the current price, the interest rate would rise. In this case, riskier firms would be required to pay higher rates on their capital. This simple model works if lenders know the borrower and his investment opportunities. If they do not, increases in the interest rate will may drive away safer borrowers (the adverse selection problem) or encourage firms who borrow to invest in riskier projects (the moral hazard problem).

The solution to this problem is the use of financial intermediaries to produce and use information about the borrowers and their projects. In this case, the information asymmetry between borrower and lender can be resolved and the market can once again clear. Then firms with viable investment projects will be able to raise external capital.

One of the advantages of relationships is they may allow the lender to collect information about a borrower which is not easily reproduced by other financial institutions. This can give the lender a competitive advantage as he can learn about a firm over time. History with the bank raises the banks expectation that the borrower is a good credit risk. (Diamond 1991). In addition, bank may do more than just lend money. It manages the firm’s cash account, factor its sales, and service its lock box. This can give the bank an additional perspective on the current financial strength of the borrower and potentially an early indicator if the borrower experiences financial distress.

On other hand once loan is gotten, borrower may take actions which transfer value from fixed claim holders to equity holders. If bank knows borrowers, it can avoid loans to firms which they consider more able or more willing to undertake such transfers. Bond covenants are used to reduce this problem. Actions which transfer wealth away from debt holders could be prohibited. Then, loan

contracts would have to specify not only that the risk adjusted return of investment projects must be positive, but also specify the distribution of the returns. Banks may have more control over borrowers. The threat of cutting off future funds may constrain the types of actions that firms take.

Lending relationships should be most valuable where the information about a firm and its potential investment opportunities are most uncertain. This is especially true of small firms. They tend to be young and thus have little track record. They are often in new industries or markets, and thus firms against which they can be compared are also less common. Empirical research on lending relationships has thus focused on small firms. However, even for large and publicly traded firms, for whom access to capital markets should be less costly and lending relationship potentially less valuable, lending relationship appear to have value.

Empirical researches in the subject have been focused on American large companies due to data availability. However, small and medium sized companies are usually less complex and more dependent on bank lending relationships. Empirically, relationships appear to have the greatest effect on the provision of credit.

One strand of this literature focuses on the information asymmetries between lenders and banks. These asymmetries create switching costs which limit businesses' ability to switch lenders and thus realize benefits from competition between banks. Sharpe (1990) and Rajan (1992) showed how monitoring by a bank lender can lead to an ex-post information monopoly. This bank has more information about its borrowers than its competitors. These competitors will therefore take into account adverse selection problems when being approached by a loan applicant who is borrowing or has recently borrowed from the incumbent bank. Since competing banks are unable to fully distinguish between firms of good versus bad credit quality, they must offer a single interest rate, at which high credit quality borrowers must subsidize poor credit quality borrowers. The borrowing firms face the risk of a hold-up situation since uninformed potential lenders are impeded from competing since they face a winner's curse.

Slovin, Sushka, and Polonchek (1993) examined the stock price response of firms which had publicly disclosed lending relationships with Continental Illinois Bank when the bank announced its insolvency. They show that negative (positive) news about the bank lead to negative (positive) returns for firms associated with the bank. The stock price change was larger, the larger the lending amount (relative to firm size) and was smaller if the borrower had publicly documented relationships with other banks.

Petersen and Rajan (1995) show that a hold-up situation could have beneficial consequences if it allows the financing of risky, but socially desirable, projects which would otherwise not have been funded. The relationship bank's commercial rationale is to offer low initial interest rates to capture new borrowers, in order to reap future rents as these customers become locked-in. This possibility exists as long as the borrower will not be able to tap new (typically uninformed) sources of credit in the future. In a separate paper, Petersen and Rajan (1994) showed that relationships increased the availability of financing for small and medium sized US firms.

Boot (2000) argues that channels through which relationship lending can provide value include increased eligibility and discretion in contracts, enhanced abilities of the contracting parties to include covenants to reduce conflicts of interest, facilitated monitoring of collateral, and transfers in loan pricing.

Boot and Thakor (2000) presented a theory where economic value is created through the lending relationship, implying that the relationship is potentially beneficial for both bank lenders and firm borrowers.

Ongena and Smith (2001) explain the duration of bank lending relationships by a firm's trade-off between the benefits of relationships synergies and the disadvantage of information monopolies. A trade-off between funding costs and information was found by Dell'Ariccia and Marquez (2004) studying banks with different information about the quality of borrowers and different funding costs.

## 3. BANK MERGERS AND ACQUISITIONS AND LOAN PRICING BEHAVIOR: THE EMPIRICAL EVIDENCE

Bank mergers and acquisitions lead to organizational changes at the merged banks which cannot be without effect on the amount of soft information encompassed in the firm-bank relationship. Bank internal reorganizations such changes in the management, organization, and strategy may lead to deterioration in the abilities to produce necessary relationship-related services (monitoring).

The organizational changes will probably be largest at the target bank of the merger. The largest bank may dominate the merging process, leading to less interference in its daily operations, while the target bank may be expected to introduce the larger bank's internal systems, structures, and routines. The target bank will probably also be more affected by employee redundancies following the merger. Thus, the effects on opaque borrowers will be largest for firms borrowing from target banks. (Degryse et al. 2010). Branches of the acquiring bank were more likely to be kept, and that the new branch head after the merger was more likely to come from the acquiring bank. The bank may respond by increasing its interest rates or reducing its credit volumes to relationship-dependent customers.

Then, the consequences of bank M&As on consumer welfare have been examined from two standpoints: the availability of loans for specific groups of consumers (SME) and bank pricing behaviors. With regard to the price effect, mergers may either increase concentration and thereby create more unfavorable prices for customers, or alternatively create efficiency savings which are passed on

to individual customers through more favorable loan terms. Thus it is an empirical issue.

Very few papers have provided sufficient evidence on the effects on pricing, due to a lack of data on the quantities of specific consumer loans made by banks. Most of the studies rely on American banks. Literature analyzing European markets is small.

Considering American market, Prager and Hannan (1998) concluded that loan interest rates tend to increase as local concentration increases as a result of bank mergers and acquisitions. This result is consistent with the results suggested by Berger and Hannan (1989), Hannan (1991), Kahn, Pennacchi and Sopranzetti (2001) and Corvoisier and Gropp (2001), who provided statistically significant evidence that the loan market is affected by concentration such that the more concentrated the market, the less competitive the pricing for loans. In other words, commercial banks operating in more concentrated markets tend to charge higher loan rates and pay lower deposit rates than those in less concentrated markets. Moreover, Kahn, Pennacchi and Sopranzetti (2001), who examined the effects of bank mergers on personal loan rates and on automobile loan rates, suggested that consolidation transactions appear to increase the price of the personal loans charged by all banks in the market. However, automobile loan rates and bank mergers have a negative relationship. Banks are quicker to adjust automobile loan rates than to change the price of their personal loans and this rigidity in the price of personal loans is higher in more concentrated markets.

Berger et al. (2005) analyzed the impact of bank mergers on the prices of loans for small businesses and find that consolidated banks tend to increase lending rates to these businesses which generally have a weak relationship with their banks as these merged.

Scott (2006) provides empirical evidence that loan officer turnover reduces firms' access to credit. In the same year, and using data from the Survey of Terms of Business Lending (STBL), Erel (2005) find evidence that banks reduce loan spreads after a merger, especially when the acquiring banks are non-mega banks. In 2009, this author analyzes the effects of banking mergers and acquisitions on American commercial loans and the interest spreads paid by borrowers. The main finding is that most mergers lead to reduced spreads subject to actual efficiency gains obtained in the merger.

In contrast, examining interest rates for personal and automobile loans at the bank-market level, Kahn et al. (2005) find that bank mergers lead to lower personal loan rates but leave auto loan rates unchanged. Small and mixed effects on prices have been found by Akhavein at al. (1997).

Berger et al. (1998) found that the static effect of such transactions is reduced lending to small businesses, but that competitors to a large degree offset this by increased lending.

Results of Focarelli and Panetta (2003) depend on time. In the short run, bank mergers and acquisitions lead to unfavorable prices to consumers, but in the long run, if banks succeed in reducing costs, efficiency gains from M&As prevail over the market power effects, so that consumers benefit.

Erel (2005) finds also mixed evidence: bigger acquirers tend to impose more favorable credit terms on small customers. That is, banks which have grown through mergers tend to reduce their loan spreads, in particular, in the case of non-mega consolidation. No significant effect on availability of credit or loan contract terms to small firms was found by Scott and Dunkelberg (2003).

The effects of European bank mergers and acquisitions on loan interest rate are also controversial. The empirical evidence implies that there are often significant efficiency gains which result in better conditions for consumers (Ayadi and Pujals 2005). It is the case of Italian domestic bank mergers and acquisitions where both merged banks and non-merged participant banks have a tendency to reduce their loan interest rates as mergers occurred. However, when the target bank is large enough to give consolidated banks significant market power in the industry, merged banks tend to increase loan prices to their continuing borrowers. This suggests that, when M&As produce significant increases in concentration, banks exercise market power and set more unfavorable prices to their customers (Sapienza 2002). It is also the case of Spanish bank mergers and acquisitions where positive effects on average loan rates for borrowers who continue the lending relationship with consolidated <<banks have been found by Montoriol-Garriga (2008). This decline in loan rates is small when there is a significant increase in local banking market concentration.

However, studying Italian data, Bonaccorsi di Patti and Gobbi (2007) find a persistent negative effect of bank M&As on firm credit, the termination of banking relationships, and on borrowing firms' investments. Negative effects from bank mergers on performance of the target bank borrower which lose the relationship without being able to replace it performance have been found by Degryse et al. (2010) in a study of Belgian data. The focus was on small and medium sized firms and their subsequent performance explained by whether they continue the relationship, are dropped, or switch bank post-merger.

The lack of evidence above mentioned makes it interesting to examine the effects of bank mergers and acquisitions on bank pricing behavior, in particular, decision-making on bank loan interest rates. Our contribution to banking literature consists on studying the impact of French bank mergers and acquisitions on loan pricing, using the Monti-Klein model.

## 4. METHODOLOGY

### 4.1. Data

This study considers all French mergers and acquisitions deals implying one of the 14 greatest banking groups that occurred between 1996 and 2006. To be included in the sample, banks (bidders and targets) must be two

independent entities in the time of consolidation operation and not to make part in any other operation for three years before and after the operation being part of the sample. These conditions are able to permit us to precisely examine the effects of every operation in an isolate manner (Ramaswamy 1997), avoiding thus any external influences.

Thus, these deals are: the merger in 1996 between Paribas and BNP, the acquisition in 1996 of Sovac by the American GE Capital, the acquisition in 1997 of Crédit du Nord by Société Générale, the acquisition in 1998 of the Group CIC by Crédit Mutuel, the acquisition in 1999 of Natexis by Banques Populaires, the acquisition in 1999 by Caisses d'Épargne of Crédit Foncier de France, the acquisition in 2000 of the Bank Worms by the Deutshe Bank AG, the acquisition in 2002 of Crédit Coopératif by the Banques Populaires, the acquisition in 2003 by Crédit Agricole of Crédit Lyonnais, the acquisition in 2006 by BNP Paribas (born as a result from the merger between BNP et Paribas) of the italien la Banca Nazionale Del lavoro.

The acquisition in 2000 by the British HSBC of Crédit Commercial de France (CCF) and the acquisition by CCF of Bank Hervet in 2001 have been excluded from the sample given that these two deals were been near in the time not allowing us to study the impact of every deal in an isolated way. We have then 10 mergers and acquisitions (7 domestic and 3 transfrontier) implying 20 banks (17 national and 3 foreign).

Most of the data relative on the sample have been collected from the "Bankscope" and "Thomson Financial" databases and the rest from the bank individual annual reports published on bank official sites. All the model variables have been calculated for three years before and after the consolidation operation. This choice was not decided arbitrarily but followed evidence found by several empirical studies in the subject mentioning three years as the gestation period needed to restructure the merged bank (Berger et al. 1998; Calomiris and Karceski 2000 and Focarelli and Panetta 2003). This three year period is assumed because it is more likely that gains will only appear at least one year after the merger but that all gains should be realized within 3 years (Ayadi and Pujals 2005 and Panetta, Schivardi and Shum 2004).

### 4.2. The Monti-Klein model of the banking firm

The model used to estimate the impacts of bank M&As on loan interest rate is based on the Monti-Klein model. In this model, a bank is assumed to be a financial intermediary which collects savings from households and finances investment needs to firms. The bank holds two types of asset, securities and loans, and one liability, deposits. Banks are assumed to be price takers in the security market and price setters in the loan and deposit markets. Then, they determine whatever interest rate for deposits and loans would maximize its profit.

One of the weaknesses of the Monti-Klein model is that it ignores default risk and liquidity risk. The model assumes that these two risks are exogenous because both deposit and loan repayments are random without notice. Moreover, the bank is assumed to be able to ignore the liquidity risk which arises from a cash deficiency.

This is inconsistent with the characteristics of the banking market and may make the results of the traditional Monti-Klein model inappropriate for explaining bank lending behaviors. Therefore, to make the model more rational, these two risks should be considered (Prisman, Slovin and Sushka 1986; Fuentes and Sastre 1998 and Corvoisier and Gropp 2001). We included also bank size measured by capitalization (Cap) and bank profitability measured by the ratio of return on (ROE). Finally, the five-bank concentration ratio (CR5) is included in the regression as a measure of banking market concentration in the French bank market and the GDP growth rate to consider the bank loan demand elasticity.

Then according to the above assumptions, the estimated equation can be expressed as the following equation:

$$r_{it} = \beta_0 + \beta_1 prof_{it} + \beta_2 dep_{it} + \beta_3 cost_{it} + \beta_4 defrisk_{it} + \beta_5 lidrisk_{it} + \beta_6 gdp_t + \beta_7 cr5_t + +e_{it}$$

Where:

$r_{it}$ is the loan interest rate of bank *i* at time *t*. following Kahn, Pennacchi and Sopranzetti (2001), and Valverde and Fernandez (2007), we use the average loan rate. This interest rate is an average loan interest rate calculated from dividing a bank's interest revenue by the total amount of its issued loans plus the total amount of other earning assets.

$ROE_{it}$ is the bank return on equity measuring its profitability.

$dep_{it}$ is the ratio of deposits to total assets of bank *i* at time *t.* This variable captures bank deposit characteristics and indicates changes in bank financing, as in the study of Ayadi and Pujals (2005). The impact of deposits on loan pricing is included in the required reserve variable. That is, as the level of deposit increases, the level of bank reserve also increases. As deposits increase, the bank liquidity risk decreases. The bank may then decrease its loan interest rates as the cost of liquidity risk decreases. Then the sign of the ratio of deposits to total assets is expected to be negative.

$cos_{it}$ is the cost-to-income ratio of bank *i* at time *t*. This ratio is used as a proxy of the marginal cost of issuing loans. In addition, this variable also controls for the difference in bank efficiency and productivity. This is because, the lower the efficiency and productivity, the higher the operating cost. Therefore, to offset the increase in this cost, banks tend to increase their revenue by raising their loan interest rates. Thus, the cost-to-income ratio is expected to have a positive relationship with the price of bank loans.

This cot ratio has been used in the studies of Corvoisier and Gropp (2001), Focarelli and Panetta (2003), Altunbas and Ibanez (2008), Gambacorta (2004) and Ayadi and Pujals (2005).

$defrisk_{it}$ is the ratio of the loan loss provision to the net interest revenue of bank *i* at time *t*. This variable is used as a measurement of the bank default risk. Loan loss

provision is an expense set aside for loans which will probably not be repaid. Using this historical loss rate to justify significant defaults becomes more difficult, thus we used this ratio which is the widely identified in several banking studies as a suitable proxy for credit risk (Rose 1996; Fisher, Gueyie and Ortiz 2000; Demirgue-Kunt and Huizinga 1998; Nys 2003). In the context of bank M&As, Altunbas and Ibanez (2008) and Ayadi and Pujals (2005) use the relation of loan loss provision to net interest revenue as a default risk indicator in their studies of bank M&As in the EU banking market.

The loan loss provision ratio is expected to have a positive relationship with loan interest rates. This is because an increase in credit risk will raise the marginal cost of debt and equity, which in turn increases the cost of funds for the banks. In order to retain a reserve to cover credit losses, the banks tend to offer higher loan prices for higher-default risk borrowers. That is, the higher ratio refers to the larger amount of expected bad loans on the books and the higher are the risks (Ayadi and Pujals 2005). Thus, banks tend to issue loans with higher interest rates for these riskier borrowers.

$liqrisk_{it}$ is the ratio of the net loan to the total deposit and short-term borrowing of bank *i* at time *t*. Following Mercieca, Schaeck and Wolfe (2009), we use this ratio to indicate a bank's liquidity risk. In addition, as suggested by Matz (2007), the higher the lending of a bank, the greater the possibility that the bank cannot survive unexpected deposits withdrawals. That is, the greater the ratio, the higher liquidity risk the bank suffers; thus banks tend to increase their loan price to offset this risk.

$gdp_t$ is the French GDP growth rate at time *t*. This variable is calculated by dividing the GDP in this year minus the GDP in year t-1 by the value in year t-1. As in Gambacorta (2004) and Matthews, Murinde and Zhao (2007), the GDP growth rate is considered a proxy of bank loan demand elasticity. This is because the GDP growth rate reflects the change in macroeconomic factors, which determines the price elasticity of consumer demand. The GDP growth rate is expected to have either positive or negative signs: In boom periods, when higher average income and high GDP growth rate are expected, the average elasticity of consumer demand will tend to be lower. The bank will then tend to increase its mark-up price by increasing its loan interest rate (Fuentes and Sastre 1998). That is, in this case, the coefficient of GDP growth is expected to have a positive sign. In contrast, GDP growth rate can be negatively correlated with the loan interest rate. According to the theory of the business cycle, the bank can compensate for a riskier environment, presented by a decrease in the country's GDP by raising its loan interest rate. In addition, the reason for the negative relationship could be that the better macroeconomic conditions reflect the overall level of development of the banking sector. This development includes better technology, which can affect the increase in the bank's efficiency gains which can be passed to customers by a reduction in the lending price, as suggested by Demirguc-Kunt and Huizinga (1998). Thus, in this case, the better the macroeconomic situation, the lower the loan interest rate.

$CR5_t$ is the French five-bank concentration ratio at time *t*. This ratio is used in order to feature the bank's market structure, or, in other words, the competitive environment in each country's banking market. This concentration ratio shows the degree to which a banking industry is dominated by a small number of large banks or made up of many small banks. A higher ratio represents an intense concentration, while a lower
ratio indicates a more competitive situation in the banking market.

Competition can be measured in various ways. According to Biker, Shaffer and Spierdijk (2009), the techniques to assess the competitive climate in the banking sector can be divided into two main approaches: structural and non-structural. The structural approach to competition includes the Structural-Conduct-Performance (SCP) paradigm, which predicts that a highly concentrated market causes collusive behaviour among larger banks, resulting in superior market performance, and the Efficiency-Structure-Performance (ESP) hypothesis, which investigates whether it is the efficiency of larger banks that makes for enhanced performance.

The relationship between the CR5 ratio and loan interest rates can be either positive or negative. If the concentration leads to a bank gaining higher market power, the bank tends to increase its loan interest rate. In contrast, if market concentration occurs as the result of bank efficiency, the bank will reduce its loan interest rate with an increase in market concentration.

$e_{it}$ is the error term.

The descriptions of the variables used in the model are provided in Table 1

**Insert table 1**

Table 1. Definition of main variables

| Variables | Symbols | Description |
|---|---|---|
| Dependent variable | $r_{it}$ | The average loan interest rate, calculated by dividing a bank's interest revenue by the total amount of loans plus the total amount of other earning assets. |
| Explicative variables | ROE<br>$Dep_{it}$<br>$Cost_{it}$<br>Def $risk_{it}$<br>Liq $risk_{it}$<br>$GDP_t$<br>CR5t | Return on equity ratio<br>Total deposit to total asset ratio<br>Cost-to-income ratio<br>Loan loss provision to net interest revenue<br>Net loan to total deposit and short term borrowing ratio<br>GDP growth rate<br>Five-bank concentration ratio |

## 5. RESULTS

### 5.1. Descriptive statistics

The following table presents descriptive statistics of the model variables data. All of the values of each of these variables are values of the variable across all banks over the entire time period.

**Table 2. Summary statistics of data**

| Variable | Mean | Minimum | Maximum | Standard Deviation |
|---|---|---|---|---|
| Average loan interest rate (%) | 0.0363416 | 0.0096718 | 0.2123866 | 0.0271501 |
| ROE ratio | 0.0692938 | -0.460400 | 0.5900000 | 0.1164669 |
| Total deposits to total asset ratio | 0.3087109 | 0.0012386 | 0.7801586 | 0.1926806 |
| Cost-to-income ratio | 0.8034083 | 0.5701000 | 4.5873000 | 0.4245715 |
| Loan loss provision to net Interest revenue | 0.2217492 | -1.715900 | 2.7463000 | 0.3845807 |
| Net loan to total deposit and Short-term borrowing ratio | 0.5680608 | 0.1005400 | 1.2208000 | 0.2143305 |
| GDP growth rate (%) | 0.1790833 | -0.540000 | 3.1670000 | 0.8242939 |
| CR5 | 0.4438802 | 0.4000000 | 0.5450000 | 0.0412325 |

### 5.2. Data multicollinearity

Before even estimating our model, we must look for any potential multicollinearity. This problem occurs when variables are greatly correlated between them, what makes difficult to obtain good values following the coefficient regression. Then, a high degree of multicollinearity will lead to high standard errors of the coefficients and low t-statistics.

One of methods of detection of the multicollinearity between variables is the data correlation matrix. As showed in table 3, the multicollinearity matrix presents a weak degree of interrelationship between the explanatory variables. Therefore, there is not multicollinearity problem in our analysis.

**Table 3- Data correlation matrix**

| | Average loan interest rate | ROE | Total deposits to total asset ratio | Cost-to-income ratio | Loan loss provision to net Interest revenue | Net loan to total deposit and Short-term borrowing ratio | GDP growth rate | CR5 |
|---|---|---|---|---|---|---|---|---|
| Average loan interest rate | 1.00000 | 0.0970 | -0.3541 | -0.0969 | 0.4043 | 0.2388 | -0.0257 | 0.0323 |
| ROE | 0.0970 | 1.00000 | -0.0181 | -0.49509 | 0.0135 | -0.0254 | -0.0189 | -0.0812 |
| Total deposits to total asset ratio | -0.3541 | -0.0181 | 1.00000 | -0.0915 | -0.1588 | -0.1009 | -0.1772 | 0.0011 |
| Cost-to-income ratio | -0.0969 | -0.4509 | -0.0915 | 1.00000 | -0.0619 | 0.3333 | 0.3050 | -0.0047 |
| Loan loss provision to net Interest revenue | 0.4043 | 0.0135 | -0.1588 | -0.0619 | 1.00000 | -0.2004 | 0.0033 | 0.0114 |
| Net loan to total deposit and Short-term borrowing ratio | 0.2388 | -0.0254 | -0.1009 | 0.3333 | -0.2004 | 1.00000 | 0.2352 | -0.0487 |
| GDP growth rate | -0.0257 | -0.0189 | -0.1772 | 0.3050 | 0.0033 | 0.2352 | 1.00000 | 0.2161 |
| CR5 | 0.0323 | -0.0812 | 0.0011 | -0.0047 | 0.0114 | -0.0487 | 0.2161 | 1.00000 |

### 5.3. The Hausman specification test (1978)

In order to decide whether the fixed effect or random effect estimations should be adopted, we have to applicate the Hausman specification test. It is a general test that involves taking both the fixed effect and random effect approaches to the model and comparing the resulting coefficient vectors. The null hypothesis is that the unobserved effects are distributed independently of the regressors. Under the null hypothesis, the test statistic has a chi-square distribution with the degree of freedom equal to the number of slope coefficients being compared.

If the null hypothesis is correct, the coefficient estimates of both models will not differ significantly. Both random effect and fixed effect are consistent, but the fixed effect will be inefficient because it involves estimating an unnecessary set of dummy variable coefficients; thus the random effect model is preferred. In contrast, if the null hypothesis is rejected, the random effect estimates will be subject to an unobserved heterogeneity bias and will therefore differ systematically from the fixed effect estimates.

The result of the Hausman specification test is presented in Table 4. This table demonstrates a P-value equalling 0.1259 which indicates that the Hausman test's null hypothesis (the random effect estimator is consistent) cannot be rejected. Then, the estimation of the equation with the random effect model can yield consistent results and can be used to examine the effects of bank mergers on bank loan interest rates.

**Table 4- The Hausman specification test**

| | Coefficients (b) Fixed | (B) Random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| ROE | -0.0001068 | -0.000321 | 0.0002141 | 0.0014847 |
| Total deposits to total asset ratio | -0.0111728 | -0.025704 | 0.0145312 | 0.0100728 |
| Cost-to-income ratio | -0.0050498 | -0.0072045 | 0.0021547 | 0.0004915 |
| Loan loss provision to net Interest revenue | 0.0336161 | 0.0333693 | 0.0002468 | . |
| Net loan to total deposit and Short-term borrowing ratio | 0.0094764 | 0.0210906 | -0.0116142 | 0.0038126 |
| GDP growth rate | -0.0026615 | -0.0030611 | 0.0003995 | . |
| CR5 | 0.0292941 | 0.0338279 | -0.0045338 | . |

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 11.30
Prob>chi2 = 0.1259
(V_b-V_B is not positive definite)

### 5.4. Regression results

Once random effect model estimators adopted, next step will seek for potential heteroscedasticity to correct it. It is a frequently met situation that qualifies data that don't have a constant variance. The most common test to detect the presence of random effects is the Breusch-Pagan Lagrange multiplier test which regresses the squares of the fitted residuals on a set of regresses.

**Table 5- The Breusch and Pagan Lagrangian multiplier test**

Breusch and Pagan Lagrangian multiplier test for random effects
Average loan interest rate [bank,t] = Xb + u[bank] + e[bank,t]
Estimated results:

| | Var | sd = sqrt(Var) |
|---|---|---|
| Average interest rate | 0.0007371 | 0.0271501 |
| e | 0.0002286 | 0.0151199 |
| u | 0.0002253 | 0.015009 |

Test: Var(u) = 0
chi2(1) = 43.36
Prob > chi2 = 0.0000

The test statistic has chi-square distribution with one degree of freedom under the null hypothesis of no random effects. The large chi-square value rejects the null hypothesis of the absence of random effects within. This confirms the existence of unobserved individual heterogeneity and thus the random effect is preferred to the pooled OLS estimators (table 5).

Once the heteroscedasticity detected, we have to use the Eicker-White test. Following table presents the random effect model estimators after standard errors heteroscedastic adjustment.

Table 6 shows that profitability measured by the ROE ratio was not significant. Then, bank profitability does not matter in the interest rate decision. The same table shows also that total deposits to total asset ratio was not significant. This result does not confirm hypothesis stipulating that if the depot level increase, reserve level increase too and the liquidity risk decrease. Bank will then tend to diminish its loan interest rate. In the same order of ideas, results concerning the relation between loan interest rate and liquidity risk has not been waited since bank is supposed to increase loan price every time that its liquidity position is mediocre. In our study, these two variables supposed to be in strong relationship were not significant.

**Table 6- Regression results**

Random-effects GLS regression — Number of obs = 96
Group variable: bank — Number of groups = 16
R-sq: within = 0.4576 — Obs per group: min = 6
between = 0.2368 — avg = 6.0
overall = 0.3307 — max = 6
Random effects u_i ~ Gaussian — Wald chi2(7) = 130.81
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

| Average interest rate | Robust Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| ROE | -0.00032 | 0.025374 | -0.01 | 0.990 | -0.05005 | 0.04941 |
| Total deposits to total asset ratio | -0.02570 | 0.02090 | -1.23 | 0.219 | -0.06666 | 0.01525 |
| Cost-to-income ratio | -0.00720 | 0.00295 | -2.44 | 0.015 (*) | -0.01299 | -0.00142 |
| Loan loss provision to net Interest revenue | 0.03337 | 0.01677 | 1.99 | 0.047 (*) | 0.00050 | 0.06623 |
| Net loan to total deposit and Short-term borrowing ratio | 0.02109 | 0.01461 | 1.44 | 0.149 | -0.00754 | 0.04972 |
| GDP growth rate | -0.00306 | 0.00168 | -1.82 | 0.069 (**) | -0.00636 | 0.00024 |
| CR5 | 0.03383 | 0.03189 | 1.06 | 0.289 | -0.02867 | 0.09633 |
| Constante | 0.01624 | 0.02209 | 0.74 | 0.462 | -0.02705 | 0.05954 |

sigma_u | 0.01500895
sigma_e | 0.01511992
rho | 0.4963168 (fraction of variance due to u_i)

Note : The standard errors are robust to heteroscedasticity and autocorrelation.

*, ** Variable significant at 5% and 10% levels, respectively.

Table 6 demonstres that efficiency (cost to income ratio) has a negative sign. So, an increase of French bank efficiency generates a decrease in loan interest rate. This is logical since if the merger or acquisition is traduced by an efficiency improvement and this improvement will be traduced by reduced loan interest rates. This improvement in bank efficiency can especially result from risk diversification. This result didn't confirm those of Hannan (1991), Berger et al (2000) and Gambacorta (2004).

Default risk was significant and positive at 5% level. This result confirms theory stipulating that this variable influence bank loan interest rate positively. This is due to fact that an increase in credit risk will increase the marginal cost of equity and debt, the found cost will be

raised for the bank. To keep a reserve necessary to cover itself against losses of credit, banks tend to offer raised loan interest rates to riskier borrowers.

The sign of the GDP growth rate was negative at 10% level. This result contradicts the theoretical hypothesis stipulating that the growth in the GDP influences positively the loan demand. This hypothesis has been verified by Kashyap, Stein and Wilcox (1993): loan interest rates are positively influenced by the GDP growth rate because the good economic conditions increase the number of projects becoming profitable and increase consequently the demand for loans.

Table 6 shows also that concentration ratio of the banking market (CR5) was not significant. These results were so surprising in the sense where this ratio would have a positive or a negative sign. The first occurs if the banking market concentration is the result of efficient bank mergers that tend to offer to customers more favorable interest rates. This result has been found by Hannan (1991) and by Kahn, Pennacchi Sapranzetti (2001): consolidation improves the banking efficiency that will be traduced by less elevated interest rates. The second sign occurs if the concentration of the banking market is resulting of a domination of a small number of big banks in the market that will exploit their monopolistic power and applicate higher interest rates.

## 6. CONCLUSION

Our first ambition in this paper was to study the impact of mergers and acquisitions on French bank loan interest rates. It was about knowing if the merged banks charge higher interest rates on the granted credits, following their enjoyment of a monopolistic power of a more concentrated banking market.

This paper investigated the determinants of bank loan interest rates by employing the Monti-Klein model of the banking firm. Based on this model, the optimal loan price depends on macroeconomic factors (GDP growth rate), bank market characteristics (CR5 concentration ratio) and bank characteristics (profitability, deposit ratio, efficiency, default risk, liquidity risk).

Our empirical results showed that loan pricing tends to increase with the default risk and have negative relationship with efficiency and GDP growth rate.

Bank profitability, deposit ratio and liquid risk have no significant impact. Bank market characteristic (CR5 concentration ratio) was not been significant too. French banks decide their loan interest rates independently from market concentration level.

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