COST EFFICIENCY OF FRENCH COMMERCIAL BANKS: DOMESTIC VERSUS FOREIGN BANKS

Raoudha Béjaoui Rouissi, LEFA – IHEC Carthage
Houssam Bouzgarrou, CREM University of Rennes 1

ABSTARCT

The present paper investigates efficiency levels of commercial domestic versus foreign banks in France between 2000 and 2007. Using Stochastic Frontier Analysis, we also shed light on the determinants of cost efficiency of 62 domestic and 40 foreign banks. Our results indicate that foreign banks exhibit higher cost efficiency than domestic banks. This finding contradicts previous empirical literature, concluding an advantage of cost efficiency for domestic banks in developed countries such as France (Berger et al. 2000). This suggests the decision to practice retail banking activities by domestic banks implies high fixed costs.

JEL: G21; C23; D24

KEYWORDS: efficiency, domestic banks, foreign banks

INTRODUCTION

The transposition of the 1988s European Directive, on the free movement of capital into national law, eliminated lending restrictions and currency controls and removed many administrative barriers that had compartmentalized the credit institution business in European countries. This had a large impact on traditional banking intermediation business. It gave rise to disintermediation in lending and an alignment of bank lending rates and terms to those of the market. Furthermore, gradual liberalization of financial markets that started in the mid-1980s in France increased competition from non-banks, such as mutual funds and insurance companies. Most notably, it stimulated competition from markets. An important resulting change in the French banking industry was a substantial decrease in the population of banks. At the same time, the number of foreign owned banks in France rose between 1984 and 2001.

Greater openness in the French banking market includes increased openness to foreign-owned banks, with the intention of improving competitiveness and efficiency of the financial system. However, Weill (2006b) notes that reduced performance of French banks allows entry of foreign banks in France, since foreign banks are able to significantly affect the performance of domestic banks. Poor results of French banks signify the possibility of easier entry of foreign banks on the French market.

This study compares the efficiency of foreign-owned banks operating in France with French domestic banks of the French banking system. The objective is to determine if foreign banks were more or less cost efficient than domestic banks during our estimation period of 2000-2007. Thus, the purpose is to investigate the efficiency levels of commercial domestic versus foreign banks in France by comparing basic accounting ratios and the stochastic cost frontier analysis (SFA). We analyze cost efficiency by using an unbalanced sample, including 62 domestic and 40 foreign banks over the period 2000-2007.

The outline of this paper is as follows. Section 2 provides an overview of previous studies that have considered; (i) the efficiency of the French banking system and (ii) the efficiency of foreign banks. Section 3 discusses the data and methodology employed, while the fourth section discusses the results. The final section provides conclusions.

LITERATURE REVIEW

There are two relevant streams of literature to this study, (i) those dealing with bank efficiency in France, and (ii) those comparing foreign bank efficiency with domestic bank efficiency. The literature on efficiency was applied to banks only during the 90s. A small number of studies focused on the efficiency of French banks. We can however distinguish two categories: studies that focus entirely on French banks; and studies consisting of international comparisons of bank efficiency.

Studies on French banking efficiency were performed by Dietsch (1996), Dietsch and Weill (1999) and Weill (2006b). Dietsch (1996) uses a parametric method, the Distribution Free Approach to estimate the cost efficiency of 375 commercial and savings banks, over the period 1988-1992. The results show the existence of an average cost efficiency of 56.1% and 70.7%, with a truncation of 1% and 5%, respectively. The analysis of the relationship between the cost efficiency and the risk-taking supports the assumption that less efficient banks take excessive risks. Dietsch and Weill (1999) use a nonparametric method, Data Envelopment Analysis, to measure the technical efficiency of 93 French deposit banks in 1994. The average scores vary between 78% and 91%, depending on the retained productive combination. Personnel and interest expenses relative to total borrowed funds and other non-financial expenses represent the inputs. Credits, demand deposits, savings and other remunerated assets represent the outputs. The results show the lack of a clear relationship between the size and the existence of a negative relationship with the risk-taking.

Weill (2006b) analyzes the evolution of cost efficiency of 93 French banks, over the period 1992-2000. The author uses two parametric approaches to calculate the cost efficiency scores: the Stochastic Frontier Approach and a system of equations composed of a Fourier-flexible cost function and its associated input cost share equations derived using the Sheppard's lemma. The results show an increase in cost efficiency between 1992 and 2000, the average scores going from 77.20% to 83.98%. According to the Rosse-Panzar competition test, the increase in efficiency is not related to an increase in competition. Weill (2006b) also tests for convergence in French banks' efficiency, finding convergence over the period 1992-2000. This finding implies a catching-up process of the least efficient banks over the last decade.

Besides studies entirely orientated toward French banks, an important number of international bank efficiency tests exist. Two categories of international comparisons can be distinguished: First, those estimating a national frontier for each country (Berger et al. 2000, and Weill, 2004). Second those estimating common frontiers to several countries as a whole (Allen & Rai, 1996, Pastor, Pérez & Quesada, 1997, Chaffai & Dietsch, 1999, Dietsch & Lozano-Vivas, 2000, Altunbas et al. 2001, Chaffai, Dietsch & Lozano-Vivas, 2001, Lozano-Vivas, Pastor & Hasan, 2001 and Vander Vennet, 2002). Berger et al. (2000), from the first category noted above, use the Stochastic Frontier Approach (SFA) to estimate the cost and production frontiers for five countries (France, Germany, Spain, the United Kingdom and the United States). The results show an average cost efficiency of 70.9% in France, 79.3% in Germany, 91.5% in Spain, 79.1% in the UK and 77.4% in the US. Results of the large majority of studies consist of an average efficiency score between 70% and 80%.

Research on domestic versus foreign bank efficiency has expanded in recent years. The literature on foreign banking suggests that foreign banks may be less subject to domestic credit allocation rules than domestic banks and domestic banks may have informational advantages relative to foreign banks (Claessens & al, 2001).

Berger and Humphrey (1997) survey 130 efficiency studies of financial institutions, of which a few address the impact of foreign ownership. They suggest that a general conclusion regarding the efficiency effect of foreign ownership cannot be drawn based on the available empirical literature. The relative efficiency of foreign vs. Domestic ownership appears to depend on host and home country conditions. Berger et al. (2000), for instance, provide empirical evidence that foreign banks, in transition and developing markets,

show higher efficiency compared to their domestically owned counterparts. However, foreign banks in developed countries exhibit lower efficiency than domestic banks. The authors perform an analysis of cross-border banking efficiency in France, Germany, Spain, the UK, and the US during the 1990s. On average, they find that domestic banks in these countries have both higher cost efficiency and higher profit efficiency than foreign banks operating in the country. Thus, the relative efficiency of foreign vs. domestic ownership appears to depend on host and home country conditions.

Berger et al. (2000) differentiate between "home field advantages" and "global advantages". The "global advantages" hypothesis states that foreign banks benefit from competitive advantages relative to their domestically owned peers. Because of a stiff home market competition, foreign-owned banks use more advanced technologies. Foreign banks might also become more competitive when compared to domestic banks due to an active market for corporate control in the home country, and because they have access to an educated labor force that is able to adapt new technologies. Similarly, Havrylchyk (2006) suggests that foreign banks might profit from better risk management, and reliance on modern information technologies. The "home field advantages" hypothesis predicts foreign banks suffer from disadvantages when compared to domestic banks. Foreign-controlled banks are assumed to perform less well than domestically controlled banks due to higher costs of providing the same financial services or due to lower revenues.

Recent literature surveys confirm this conclusion. On one hand, it shows that foreign banks in transition and developing markets are more efficient than domestically owned banks. On the other hand, it shows that foreign banks in developed countries exhibit lower efficiency relative to domestic banks (Isik & Hassan, 2002, Jemric & Vujcic, 2002, Miller & Parkhe, 2002, Nikiel & Opiela, 2002, Hasan & Marton, 2003, Weill, 2003, Green et al. 2004, Sturm & Williams, 2004, Bonin et al. 2005, Fries & Taci, 2005, Havrylchyk, 2006, Zajc, 2006, Weill, 2006a, Lensink et al. 2008 and Berger et al. 2009).

METHODOLOGY

Our sample is an unbalanced panel that includes financial data of 102 French commercial banks, including 62 domestic and 40 foreign banks during the period 2000-2007. Income and Balance Sheet data was obtained from IBCA's BANKSCOPE data set. Domestic banks are defined as banks whose state and/or private domestic ownership is 100% of total ownership. Majority foreign banks are defined as banks whose foreign ownership is 100% of total ownership.

Cost efficiency measure how well a bank is predicted to perform relative to a best-practice bank producing the same outputs under the same environmental conditions. We start by assuming that underlying technologies of domestic and foreign banking service productions in France are similar. This assumption allows us to correctly define a common frontier. Pooling all banks would implicitly assume efficiency differences across banks are attributed, entirely, to managerial decisions within banks regarding the scale and mix of inputs. In other words, a common frontier is based on the belief that efficiency differences across banks are primarily attributable to managerial decisions within banks. Banking technology can be defined as the set of specific methods that banks use to combine financial and physical inputs to generate a certain amount of banking services, such as liquidity and payment services, portfolio services and loan services. These methods are diversification, risk pooling, financial information collection and evaluation, risk management, and so on. There is a presumption that the technology used by domestic and foreign banks in France should be the same. However, bank-specific variables are taken into account because we believe these variables are major factors in explaining the differences in the banking cost. Thus, we use the common frontier approach to compare domestic and foreign banks of the French banking industry. We believe that efficiency differences between banks are determined by bank specific rather than technological differences (Dietsch & Lozano-Vivas, 2000).

To measure cost efficiency of French banks we employ the stochastic frontier approach (SFA). The SFA specifies a particular form for the cost function, usually a translog form, and allows for random error. It assumes these errors consist of inefficiencies, following an asymmetric distribution, usually a truncated or half-normal distribution, and random errors following a symmetric distribution, usually the standard normal distribution. The reason for this composite error term structure is that, by definition, inefficiencies cannot be negative. Both the inefficiencies and random errors are assumed to be orthogonal, to input prices, outputs and country-level or bank-specific variables specified in the estimating equation. We estimate efficiency levels by specifying the commonly-used translog functional form for the cost function, presented as follows:

$$Ln\,TC = \alpha_0 + \sum_i \beta_i Ln\,y_i + \sum_j \beta_j Ln\,w_j + 1/2\sum_i\sum_k \lambda_{ik} Ln\,y_i Ln\,y_k + 1/2\sum_j\sum_h \xi_{jh} Ln\,w_j Ln\,w_h$$
$$+ \sum_i\sum_j \omega_{ij} Ln\,y_i Ln\,w_j + u_i + v_i$$

Where *TC* is the bank's total costs; y_i; *i=1,2* are outputs; and w_j, *j=1,2,3,* are inputs prices. The homogeneity restrictions are imposed by normalizing total costs and input prices by one of the input prices

$$\sum_j \beta_j = 1 \quad , \quad \sum_h \xi_h = 0 \quad , \quad \sum_k \omega_k = 0 \quad \text{and the symmetry restriction is} \quad \lambda_{ik} = \lambda_{ki}$$

Nevertheless, our approach estimates not only the cost efficiency scores of French banks but also identifies determinants that affect these scores. Therefore, we adopt the Battese and Coelli (1995) approach, where u_i, the technical inefficiency effect, is assumed to be a function of a set of bank specific variables that can be specified by the equation $u_i = z_i\delta + w_i$, where the random variable, w_i, is defined by the truncation of the normal distribution $N(0,\sigma^2)$, such that the point of truncation is $-z_i\delta$ i.e. $w_i \geq -z_i\delta$. These assumptions are consistent with u_i being a non-negative truncation of the $N(z_i\delta,\sigma^2)$

This paper used the intermediation approach to define outputs and inputs of a banking firm, which views the bank as employing labor, physical capital, and borrowed funds to produce earning assets, as first proposed by Sealey and Lindley (1977). This approach is commonly used in the conventional bank cost function literature. Two outputs are included in the model: Y_1 = loans and Y_2 = earning assets including negotiable certificates of deposit, all other negotiable debt instruments and equity investments. The inputs include labor, physical capital, and deposits. The first input price is the price of labor (w_1) defined as the ratio of personnel expenses scaled by total assets. Although scaling over total employees, instead of total assets, gives a better proxy of the price of labor, the latter is chosen since for many observations the former is not available. The price of capital (w_2) is constructed as depreciation and other non interest expenses to fixed assets. The third input (w_3) is the price of funds (financial factor). It is defined as the ratio of a bank's interest expenses scaled by the sum of deposits and other interest bearing funding. Total costs (TC) are the sum of staff expenses, depreciation and other non-interest expenses and interest expenses. We scale total costs, the price of labor and the price of capital by price of funds to guarantee linear homogeneity of the cost function.

To study the determinants of bank efficiency, the second analysis is to explore the characteristics of inefficient banks. Varieties of financial ratios are applied for this evaluation to provide indications for a bank's technical efficiency. First, the return on assets (ROA), measured by profits before taxes to total assets. The second ratio is equity to total assets (EQTA). The third ratio is bank's loans divided by customers and short term funding (LCSTF). The fourth ratio is bank size, measured by the logarithm of total assets. The fifth ratio is loan-loss provision to total loans (LLPCR). The sixth ratio is off-balance-sheet activities to total assets and off-balance-sheet activities (OBS). The last variable is foreign ownership, it is a

dummy variable equals to 1 for foreign banks and equals to Zero for domestic banks. The cost function model is:

$$Ln\left(\frac{TC}{w_3}\right)_{it} = \beta_0 + \beta_1 Ln\left(\frac{w_1}{w_3}\right)_{it} + \beta_2 Ln\left(\frac{w_2}{w_3}\right)_{it} + \beta_3 LnY_{1it} + \beta_4 LnY_{2it} + \frac{1}{2}\beta_5\left(Ln\left(\frac{w_1}{w_3}\right)\right)^2_{it} +$$

$$\frac{1}{2}\beta_6\left(Ln\left(\frac{w_2}{w_3}\right)\right)^2_{it} + \beta_7\left(Ln\left(\frac{w_1}{w_3}\right)Ln\left(\frac{w_2}{w_3}\right)\right)_{it} + \frac{1}{2}\beta_8\left(LnY_1\right)^2_{it} + \frac{1}{2}\beta_9\left(LnY_2\right)^2_{it} + \beta_{10}\left(LnY_1 LnY_2\right)_{it} +$$

$$\beta_{11}\left(Ln\left(\frac{w_1}{w_3}\right)LnY_1\right)_{it} + \beta_{12}\left(Ln\left(\frac{w_1}{w_3}\right)LnY_2\right)_{it} + \beta_{13}\left(Ln\left(\frac{w_2}{w_3}\right)LnY_1\right)_{it} + \beta_{14}\left(Ln\left(\frac{w_2}{w_3}\right)LnY_2\right)_{it} +$$

$$v_{it} + u_{it} \tag{1}$$

Where i, t index the bank and year, respectively, and cost efficiency determinants are defined as:

$$u_{it} = \delta_1 ROA_{it} + \delta_2 EQTA_{it} + \delta_3 LCSTF_{it} + \delta_4 LnTA_{it} + \delta_5 LLPCR_{it} + \delta_6 OBS_{it} + \delta_7 foreign_{it} + w_{it} \tag{2}$$

Models (1) and (2) are simultaneously estimated using the maximum likelihood parameter estimation. The computer program, FRONTIER Version 4.1 developed by (Battese & Coelli, 1995) was used to obtain the maximum likelihood estimates of parameters in estimating the technical efficiency. The program can accommodate cross sectional and panel data; cost and production function; half-normal and truncated normal distributions; time-varying and invariant efficiency; and functional forms which have a dependent variable in logged or original units.

EMPIRICAL RESULTS

Descriptive Statistics

Table 1 presents bank characteristics and financial performance measures. The average values of total loans and earning assets varies greatly between the two groups, from 2,484 and 2,739 million € for domestic banks to 797 and 1,008 million € for foreign banks. We show similar findings with the average values of total assets, total costs and operating profit. Regarding equity, domestic banks have a lower equity-to-asset ratio (9.24%) than foreign banks (10.65%). Interestingly, the provision-to-loan ratio of foreign banks is relatively higher than the domestic banks ratio, 0.9% and 0.5%, respectively. This result suggests that foreign banks operate with high non-performing loan level on the one hand, and prudence and ability to set aside such reserves on the other hand. This is consolidated by the average value of off balance sheet activities ratio, where foreign banks have a high ratio (27%) than domestic banks (24%).

Bank Efficiency by Ownership Type

To compare the two samples of domestic and foreign banks, we use the separate frontier approach. Table 2 presents the results of separate frontiers of cost efficiency for domestic and foreign banks. Note that a negative sign indicates a negative impact of the variable on the bank inefficiency and therefore a positive effect on cost efficiency.

Table 1: Descriptive Statistics of Variables Used in the Cost Efficiency Estimation

	Domestic Banks				Foreign Banks			
	Mean	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**
Output quantities (in million €)								
Total loans (Y_1)	2,484.4	4,045.3	3.900	30,789	796.83	1,305.6	7.500	11,497
Earning assets (Y_2)	2,739.1	5,744.8	1.700	52,335	1,008	1,724.8	5.300	11,644
Input prices								
Price of labor (w_1)	0.017	0.019	0.000	0.164	0.022	0.022	0.000	0.143
Price of capital (w_2)	0.274	0.283	0.006	3.000	0.252	0.222	0.015	1.000
Price of funds (w_3)	0.177	1.026	0.004	17.925	0.051	0.095	0.001	1.121
Cost (in million €)								
Total costs (TC)	311.98	506.85	1.800	3,460.3	91.411	138.53	2.900	1,136.6
Bank efficiency determinants								
ROA	0.016	0.032	-0.157	0.343	0.013	0.027	-0.155	0.384
EQTA	0.092	0.121	0.002	0.883	0.106	0.085	0.002	0.556
LCSTF	1.288	2.815	0.001	37.777	1.108	4.274	0.023	50.382
TA (in million €)	5,566.2	8,224.2	105.10	60,789	2,015.5	2,778.5	48.70	16,325
LLPCR	0.005	0.028	-0.235	0.353	0.009	0.043	-0.133	0.470
OBS	0.240	0.180	0.000	0.856	0.271	0.181	0.000	0.869
Observations			485				320	

The output variables considered are: total loans and earning assets. The input prices variables are: price of labor, defined as the ratio of personnel expenses scaled by total assets, price of capital, measured as depreciation and other non-interest expenses to fixed assets, and price of funds, defined as the ratio of a bank's interest expenses scaled by the sum of deposits and other interest bearing funding. Total costs include both financial and operating costs and are defined as the sum of staff expenses, interest expenses and depreciation and other non interest expenses. Bank-specific factors are : (1) return on assets (ROA) measured by profits before taxes to total assets ; (2) the ratio of equity to assets (EQTA); (3) the ratio of bank's loans divided by customers and short term funding (LCSTF) ; (4) bank size measured by the log of total assets ; (5) ratio of loan-loss provision to total loans (LLPCR); (6) ratio of off-balance-sheet activities to total assets and off-balance-sheet activities (OBS); and (7) a foreign ownership variable is a dummy variable equals to 1 for foreign banks and equals to 0 for domestic banks.

The variance parameter ($\gamma = \dfrac{\sigma^2}{\sigma^2 + \sigma_v^2}$) estimates equal 81.4% and 79.4% respectively for domestic and foreign banks and are significant at the 1% level. The value of the likelihood-ratio test of the null hypotheses LR, that the inefficiency effects are absent or that they have simpler distributions equals 145.81 (281.14) for domestic (foreign) banks efficiency and are accepted at the 1% level of significance. This indicates that the joint effect of these explanatory variables on the inefficiencies is significant.

The *ROA* coefficient is positive and significant at the 1% level for domestic banks, indicating it has a negative effect on the cost efficiency. This variable measures the quality of management, shows that domestic banks operate with higher costs, so they are less cost efficient. Nevertheless, the *ROA* coefficient is negative and significant at the 10% level for foreign banks, which indicates that it has a positive effect on the cost efficiency. The possible outcome is that foreign banks are able to overcome any cross-border disadvantages and operate more efficiently than domestic banks. The higher efficiency occurs as a result of spreading superior managerial skills or best-practice policies and procedures, of obtaining diversification of risks that allows for higher-risk, higher expected-return investments, or of providing services of superior quality or variety that raises revenues (Berger et al. 2000).

Equity to assets (*EQTA*) is negative and significant at the 1% level related to cost efficiency for domestic banks (i.e. positive effect on inefficiency). This finding provides the argument that domestic banks invest more in risky assets. This result is confirmed by the coefficient sign's of the *OBS* variable, which has a positive and significant effect on the cost efficiency.

Table 2: Determinants of Bank Inefficiency by Ownership Type

	Domestic banks	Foreign banks
ROA	0.233	-1.183
	(2.58)***	(1.82)*
EQTA	0.109	-0.107
	(2.86)***	(-0.75)
LCSTF	0.104	-0.637
	(-5.53)***	(-2.20)**
LnTA	0.064	0.189
	(-1.51)	(1.15)
LLPCR	-0.183	-0.534
	(-2.15)**	(1.98)**
OBS	-1.654	-1.718
	(-3.46)***	(-1.15)
$\sigma^2 + \sigma_v^2$ (a)	0.739	0.678
	(4.76)***	(2.42)**
$\gamma = \dfrac{\sigma^2}{\sigma^2 + \sigma_v^2}$	0.814	0.794
	(19.54)***	(4.15)***
Maximum Likelihood	26.471	24.389
LR Test	145.81	281.14
Observations	485	320

Bank-specific factors are : (1) return on assets (ROA) measured by profits before taxes to total assets ; (2) the ratio of equity to assets (EQTA); (3) the ratio of bank's loans divided by customers and short term funding (LCSTF) ; (4) bank size measured by the log of total assets (LnTA) ; (5) ratio of loan-loss provision to total loans (LLPCR); and (6) ratio of off-balance sheet activities to total assets and off-balance sheet activities (OBS). ***, **, * are significant at 1%, 5%, and 10% significance levels, respectively. a: $\sigma^2 = \sigma_u^2 = \sigma_w^2$

The ratio of loans to customer and short term funding (*LCSTF*) is statistically significant at the 1% level and negatively related to efficiency for domestic banks (significant at 5% and positively related to efficiency for foreign banks). This ratio shows the relationship between comparatively illiquid assets (i.e. loans) and comparatively stable funding sources (i.e. deposits and other short term funding). Therefore, domestic banks have more liquid assets than foreign banks and, high liquidity means improper management of resources and loss of investment opportunities.

The provision for loan loss ratio (*LLPCR*) is positive and significant at the 5% level for both domestic and foreign banks. This variable, used to account for credit risk, suggests that banks which provide more loans are expected to incur higher credit risk correlated with cost efficiency. This shows that both banks seem to have adopted a risk-averse strategy, mainly through policies that improve screening and credit risk monitoring.

Bank Efficiency of All French Banks

To determine whether the two samples could be pooled in estimating the cost function, we assume that efficiency differences between banks are determined by bank specific rather than technological differences. This assumption allows us to define a common frontier. Pooling all banks would implicitly assume that efficiency differences across banks are attributed, entirely, to managerial decisions within banks. Thus, we use the common frontier approach and we add a dummy variable (*Foreign*) to compare the domestic and foreign banks of the French banking industry.

Utilizing the normalized version of the translog cost function and the inefficiency estimation procedure in Equation 2, inefficiency scores for the sample banks were calculated. Table 3 presents the results of (weighted) average efficiency in cost of domestic and foreign banks, as well as the total for each of the years of the period analyzed 2000-2007.

Table 3: Cost Efficiency Scores by Ownership Type and Year

	Cost Efficiency Scores (%)	
Years	**Domestic Banks**	**Foreign Banks**
2007	68.50	84.25
2006	65.81	87.29
2005	66.88	83.94
2004	66.63	88.33
2003	63.66	88.33
2002	63.16	87.09
2001	61.27	84.56
2000	62.85	84.13
Average scores	64.76	85.95

This table shows cost efficiency scores by ownership type and year for banks that operate in France.

The comparison of domestic banks and foreign banks shows higher efficiency levels in the foreign banks for all sample years. The average cost efficiency score of the 62 examined domestic banks is 64.76 percent. This suggests that, on average, about 34.24 percent of bank resources are wasted. Whereas, the average cost efficiency level for 40 foreign banks is 85.95 percent. This implies that on average 14.05 percent of the resources are wasted. We find that cost efficiency level has increased over the period for domestic banks, except for 2006, and the highest average efficiency level was reached in 2007 (68.50 percent). Foreign banks have improved their cost efficiency since 2000, with decreases of 4% and 3.5% in 2005 and 2007, respectively. This finding contradicts previous empirical literature results that conclude, on advantage, cost efficiency advantages for domestic banks in developed countries such as France (Berger et al. 2000). However, during the last decade, the number of foreign banks in France had increased until 2000, while the number of domestic commercial banks significantly decreased. In part, the number of foreign banks has increased because of the deterioration of the cost efficiency of domestic banks, which allowed foreign banks to increase their market share. Weill (2006b) indicates that reduced performance of French banks allow foreign banks to settle easily in France. The maximum likelihood parameter estimates of model 2 for the cost efficiency are presented in table 4.

The estimate for the variance parameter $\gamma = \dfrac{\sigma^2}{\sigma^2 + \sigma_v^2}$ ($\gamma = 0.914$) is close to one, which indicates the inefficiency determinants are likely to be highly significant in the analysis of the cost function value. The value of likelihood-ratio test of null hypotheses LR, that the inefficiency effects are absent or that they have simpler distributions is equal to 124.41 for cost efficiency and accepted at the 1% level of significance. This indicates that the joint effect of these explanatory variables on the inefficiencies is significant.

Foreign ownership, measured by the dummy variable *Foreign*, has a negative and significant coefficient at the 1% level, which indicates that it has a positive effect on the cost efficiency. This result shows that foreign banks are on average more cost efficient than domestic banks in France. This finding goes against previous empirical literature, concluding on advantage of cost efficiency for domestic banks in developed countries such as France (Berger et al. 2000). Therefore, the deterioration of the cost efficiency of domestic banks, allows foreign banks to increase their market share and to settle easily in France.

The *ROA* coefficient is positive and significant at the level of 5% in the cost inefficiency model, which indicates that it has a negative effect on the cost efficiency. We find a poor quality of management of domestic banks that affects the cost efficiency of French banks. This is consistent with the notion that bad managers are poor at both operations and risk management.

Table 4: The Effect of Bank-Specific Variables on Bank Inefficiency

Variables	Coefficient
Foreign	-2.712
	(-6.42)***
ROA	2.189
	(2.08)**
EQTA	1.177
	(2.46)**
LCSTF	-0.041
	(-9.53)***
LnTA	0.064
	(-1.51)
LLPCR	-2.238
	(-2.15)**
OBS	-3.726
	(-5.46)***
$\sigma^2 + \sigma_v^2$	0.678
	(4.76)***
$\gamma = \dfrac{\sigma^2}{\sigma^2 + \sigma_v^2}$	0.914
	(39.54)***
Maximum Likelihood	-261.71
LR Test	124.41
Observations	805

Bank-specific factors are: (1) a foreign ownership variable is a dummy variable equals 1 for foreign banks and equals 0 for domestic banks (Foreign); (2) return on assets measured by profits before taxes to total assets (ROA); (3) the ratio of equity to assets (EQTA); (4) the ratio of bank's loans divided by customers and short term funding (LCSTF) ; (5) bank size measured by the log of total assets (LnTA); (6) ratio of loan-loss provision to total loans (LLPCR) and (7) ratio of off-balance sheet activities to total assets and off-balance sheet activities (OBS)
***, **, * are significant at 1%, 5%, and 10% significance levels, respectively.

The equity position of a bank has a negative and significant effect at the 5% level on cost efficiency (i.e. positive effect on inefficiency). Indeed, financial capital affects costs through its use as a source of financing loans (Berger & Mester, 1997), and raising capital through issuing shares involves higher costs than taking deposits, so a negative relationship between *EQTA* and efficiency is expected. As a result, French banks invest more in risky assets. This result is confirmed by the coefficient sign of the *OBS* variable, which has a positive and significant effect on cost efficiency. Diversification risk does appear to be consistently related to bank efficiency, when a bank is heavily using derivative contracts, such as swaps, forwards, and futures.

The ratio loan-to-deposits (LCSTF), considered as a proxy for liquidity risk, has a positive effect on efficiency and is significant at the 1% level for all banks. This might reflect that bank's loan product is more highly valued than securities, or it could reflect higher market power that exists in loan markets compared to the other product markets in which banks operate.

The provision for loan loss ratio (*LLPCR*) is positively and significantly correlated with cost efficiency. This variable, used to account for credit risk, suggests that banks that provide more loans are expected to incur higher credit risk. This may be because banks that spent less resources on credit underwriting and loan monitoring appeared to be more cost efficient.

CONCLUSION

The French banking sector provides an interesting context for studying bank efficiency, as it underwent significant changes during the last two decades. Ownership structures have changed radically, as many foreign banks arrived on the French market and new institutions were created to specialize in specific business lines and types of financing. A subsequent change in the French banking industry was a substantial decrease in the population of banks. At the same time, the number of foreign owned banks in France rose between 1984 and 2001, where foreign institutions have a strong presence.

In the present paper, we investigate the efficiency of French banks during the period 2000–2007 and analyzed the determinants of banking efficiency in France. We show that foreign banks exhibit higher cost efficiency than their domestic peers. This suggests that foreign banks are better managed in terms of cost efficiency. On the other side, analysis of the determinants of banking efficiency in France suggests a poor quality of management which affects the cost efficiency of French banks that invest more in risky assets.

This study could be extended in several ways. One might use Data Envelopment Analysis (DEA) to compare the two methodologies. It is also interesting to investigate the profit efficiency of the French banking sector.

REFERENCES

Allen, L,. & Rai, A. (1996). Optimal Efficiency in Banking: An International Comparison. *Journal of Banking and Finance*, 20, 655-672.

Altunbas, Y., Gardener, E.P.M., Molyneux, P., & Moore, B. (2001). Efficiency in European banking. *European Economic Review*, 45, 1931-1955.

Battese, G.E., & Coelli, T.J. (1995). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. *Empirical Economics*, 20, 325-332.

Berger, A.N., De Young, R., Genay, H. & Udell, H. (2000). Globalization of Financial Institutions: Evidence from Cross-Border Banking Performance. *Brookings-Wharton Papers on Financial Services*, 1, 23-125.

Berger,A.N., & Humphrey, D.B. (1997). Efficiency of financial institutions: international survey and directions for future research. *European Journal of Operational Research*, 98 (2), 175-212.

Berger,A.N., Hasan, I., & Zhou, M. (2009). Bank ownership and efficiency in China: What will happen in the world's largest nation?. *Journal of Banking and Finance*, 33, 113-130.

Berger, A.N., & Mester, L.J. (1997). Inside the black box: What explains differences in the efficiencies of financial institutions?. *Journal of Banking and Finance*, 21, 895-947.

Bonin, J.P., Hasan, I., & Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries. *Journal of Banking and Finance*, 9, 31-53.

Chaffai, M.E., & Dietsch, M. (1999). Mesures de l'efficience technique et de l'efficience allocative par les fonctions de distance et application aux banques européennes. *Revue Economique*, 50 (3), 633-644.

Chaffai, M.E., Dietsch, M., & Lozano-Vivas, A. (2001). Technological and Environmental differences in the European Banking Industries. *Journal of Financial Services Research*, 19, 147-162.

Claessens, S., Demirguc-Kunt, A., & Huizinga, H. (2001). How does foreign entry affect domestic banking markets?. *Journal of Banking and Finance*, 25, 891-911.

Dietsch, M. (1996). Efficience et prise de risque dans les banques françaises. , *Revue Economique*, 47 (3), 745-754.

Dietsch, M., & Lozano-Vivas, A. (2000). How the environment determines the efficiency of banks: A comparison between French and Spanish banking industry. *Journal of Banking and Finance*, 24 (6), 985-1004.

Dietsch, M., & Weill L. (1999). Les performances des banques de dépôts françaises : une évaluation par la méthode DEA. *Méthode DEA (Eds: P. Badillo & J. Paradi)*, Editions Hermés.

Fries, S. & Taci, A. (2005). Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries. *Journal of Banking and Finance*, 29, 55-81.

Green, J.C., Murinde, V., & Nikolov, I. (2004). Are foreign banks in central and eastern European countries more efficient than domestic banks?. *Journal of Emerging Market Finance*, 3, 175-205.

Hasan, I., & Marton, K. (2003). Development and efficiency of the banking sector in a transitional economy: Hungarian experience. *Journal of Banking and Finance*, 27, 2249-2271.

Havrylchyk, O. (2006). Efficiency of the Polish banking industry: Foreign versus domestic banks. *Journal of Banking and Finance*, 30, 1975-1996.

Isik, I., & Hassan, M.K. (2002). Technical, scale and allocative efficiencies of Turkish banking industry. *Journal of Banking and Finance*, 26, 719-766.

Jemric, I., & Vujcic, B. (2002). Efficiency of banks in Croatia: A DEA approach. *Comparative Economic Studies*, 44, 69-193.

Lensink, R., Meesters, A. & Naaborg, I. (2008). Bank efficiency and foreign ownership: Do good institutions matter?. *Journal of Banking and Finance*, 32, 834-844.

Lozano-Vivas, A., Pastor J.T. & Hasan I. (2001). European Bank Performance beyond Country Borders: What really matters?. *European Finance Review*, 5 (1-2), 141-165.

Miller, S.R., & Parkhe, A. (2002). Is there a liability of foreignness in global banking? An empirical test of banks X-efficiency. *Strategic Management Journal*, 23, 55-75.

Nikiel, E.M., & Opiela, T.P. (2002). Customer type and bank efficiency in Poland: Implications for emerging market banking. *Contemporary Economic Policy*, 20, 255-271.

Pastor, J.M., Pérez, F., & Quesada, J. (1997). Efficiency analysis in banking firms : An international comparison. *European Journal of Operational Research*, 98, 395-407.

Sealey, C.W., & Lindley, J.T. (1977). Inputs, outputs and a theory of production and cost at depository financial institutions. *Journal of Finance*, 32, 1251-66.

Sturm, J.E., & Williams, B. (2004). Foreign bank entry, deregulation and bank efficiency: Lessons from the Australian experience. *Journal of Banking and Finance*, 28, 1775-1799.

Sturm, J.E., & Williams, B. (2008). Characteristics determining the efficiency of foreign banks in Australia. *Journal of Banking and Finance*, 32, 2346-2360.

Vander Vennet, R. (2002). Cost and profit efficiency of financial conglomerates and universal banks in Europe. *Journal of Money, Credit and Banking*, 34 (1), 254-282.

Weill, L. (2003). Banking efficiency in transition economies: The role of foreign ownership. *Economics of Transition*, 11, 569-592.

Weill, L. (2004). Measuring cost efficiency in European banking: A comparison of frontier techniques. *Journal of Productivity Analysis*, 21, 133-152.

Weill, L. (2006a). Propriété étrangère et efficience technique des banques dans les pays en transition. Une analyse par la méthode DEA. *Revue Economique*, 57, 1093-1108.

Weill L. (2006b). L'efficience de coût des banques françaises au cours des années quatre-vingt-dix. *Revue Banque & Marchés*, 85, 6-16.

Zajc, P. (2006). A comparative study of bank efficiency in central and eastern Europe: The role of foreign ownership. *International Finance Review*, 6, 117-156.

BIOGRAPHY

Raoudha Béjaoui Rouissi is an Associate Professor of Finance at High Institute of Accounting and Business, University of Manouba, Tunisia. Her research interests are banking, market efficiency and risk management. Institutional affiliation: Institut Supérieur de Comptabilité et d'Administration des Entreprises (ISCAE), Université de la Manouba E-mail address: raoudhaiscaet@yahoo.fr.   Postal address: ISCAE, Campus Universitaire de Manouba, 2010, Tunisia

Houssam Bouzgarrou is currently an Assistant Professor of Finance at Rennes 1 University. He is a researcher at CREM Rennes (UMR 6211 CNRS). His research interests are Mergers and Acquisitions, Corporate governance and Investment Banking. E-mail address: houssam.bouzgarrou@univ-rennes1.fr.