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**The cross-border strategies of European banks:  
Effects on performance 2004–12**

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**Abstract**

Are the cross-border strategies of European banks effective? Over the period 2007 to 2012, banking systems experienced some important transformations in several dimensions including the international expansion, especially in OECD countries. However, European banks further continued their trend of increased foreign bank ownership between 2007 and 2012. Besides, the share of foreign banks assets in European area remains the same before and after the crisis in 2012 (about 80 % according to the report of IMF in 2013). This is mainly due to the regionalization context in which European banks operate. Therefore, this paper is motivated by an intense internationalization in the banking sector since the beginning of this century until 2012. We investigate whether the various options for expanding overseas have a positive impact on the profits of European banks. We analyse the results that 42 European banks might expect by expanding abroad through subsidiaries, conducting cross-border acquisitions, or forming cross-border partnerships, during the period 2004–12. We find that extending international operations through subsidiaries could have a negative impact on profits, whereas cross-border partnerships could improve them.

Keywords: subsidiaries, cross-border partnerships, cross-border acquisitions, profits, European banks, geographic diversification.

## **I. Introduction**

The cross-border strategy of banks is an issue that interests a large number of financial actors and economic regulators worldwide. Many questions have been raised about its real benefits since the beginning of the 1980s—and even more since the recent European debt crisis. For example, at the beginning of October 2012, in order to halt the losses it had amassed, Crédit Agricole began the sale of its shares in the Greek Emporiki Bank, which it had bought in 2006, to Greece's Alpha Bank. This sale allowed Crédit Agricole to reduce its exposure in Greece. Société Générale also announced the share handover of its Greek subsidiary Geniki Bank to Piraeus Bank at the end of 2012.

The 2007 subprime crisis in the United States continues to affect the international strategies of financial companies. Many other large financial institutions, such as AIG, Citicorp and RBS, have sold shares in their subsidiaries in order to minimize their losses. Some of them, including Bank of America and Barclays, took advantage of the fall in share value to intensify their internationalization strategies.

Parada, Alemany and Planellas (2009) argued that two main observations could be made about the wave of geographic diversification between 1990 and 2008: first, there were no clear or common strategies adopted by financial companies; second, it was obvious even before the crisis that the internationalization of banking was unprofitable. Financial companies therefore developed several market entry modes in different countries. Grant and Venzin (2009) identify the main motivation for this as opportunism and mimicry.

An international bank is not the same thing as a multinational bank. An international bank operates from its home country, while a multinational bank operates by establishing affiliates abroad (Nekhili & Karyotis, 2008). Although the literature on this subject is well developed, there is no obvious consensus about the effects of internationalization strategies on companies' profits. Nonetheless, studies on financial institutions agree that there is no clear,

positive link between performance and internationalization strategies (Grant & Venzin, 2009; Slager, 2004; Ayadi & Pujals, 2005; Elango, Ma & Pope 2008).

We therefore explore in greater depth here the reason why the internationalization strategies of financial companies seem to be inefficient. This is a question of interest at a moment where banks are beginning to think again about using international development as leverage for growth. We want to analyze the extent to which entry mode explains the success or failure of these strategies.

Several factors favor or hinder the success of an internationalization strategy. Entry mode could be either a brake or a key lever (Petrou, 2009) when financial companies expand abroad. Schmid and Walter (2009) state that there are no empirical results that clearly demonstrate economy of scale in the case of financial companies.

We think it is valid to deal with the assumed link between internationalization strategies and profit in depth. In this paper we focus on three market entry strategies—subsidiaries, partnerships, and mergers and acquisitions (M&A)—and attempt to analyze the most efficient way to establish operations in a foreign market.

We analyze this link using a panel data analysis of 42 European banks during the period 2004–12. The paper continues as follows: in section 2 we present the literature review, in section 3 our method, and in section 4 our results.

## **2. Literature review**

The main problem associated with internationalization identified in the banking and financial literature is how and why banks are set up abroad.

### **2.1 Why should a bank expand overseas?**

There are internal and external determinants for geographic diversification within international banking.

Among the internal reasons cited in financial theory are the need to achieve profits, the

desire to follow the customer base or create a new one, and access to capital and liquidity. The principal reason among these is the search for profit and efficiency. Deng and Elysiyani (2008) argue that banks expand abroad because they want to reduce costs by extending the basis of their deposits and to exploit new resources. Boot and Schmeits (2000) state that geographic diversification enables banks to limit the volatility of results. In principle, geographic expansion should reduce risk and increase banks' efficiency and value.

For example, in the case of a cross-border acquisition or merger, shareholders could consider critical size as a way to prove the bank's profitability. The wave of cross-border bank consolidation that started at the end of the 1980s showed the desire to improve efficiency. Berger *et al.* (2000), believe that international activity allows banks to realize economies of scale. Cross-border acquisitions or partnerships generate important synergies that can create value. Caves (1981) shows that geographic diversification intensifies market power but also enables financial institutions to exploit new resources.

The second internal determinant most quoted in the literature is the desire to follow their customer base. The earliest theories on this subject state that the first wave of banking internationalization was linked to the foreign direct investment (FDI) behavior of multinational firms (Goldberg & Saunders, 1981; Casson, 1990). This strategy is closely linked to the desire to increase market power because it allows banks to test a new market. They can follow multinational firms by supporting them financially when they trade with foreign countries. In this way, banks try to build portfolios with new foreign customers. This strategy will be followed by the establishment of subsidiaries because of the costs involved if the bank continues to operate from its home country.

The third main internal determinant for internationalization is access to capital and liquidity. Banks' capital costs differ from those of industrial firms because their equity cost is a major item in the bank balance sheet. Acharya *et al.* (2006) assert that banks practice in a

regulatory environment that sets a basic level in terms of capital, loans, and asset risk. The ability to spread interest rates between countries can be an attraction factor for banks (if rates are higher) or a rejection factor (if they are lower).

External determinants include financial innovations, regulatory environment, country risk, or economic and cultural similarity. Financial innovations are a guarantee for banks to realize profits. Technical progress and financial innovation cause a wave of internationalization. According to Miller and Parkhe (2002) American banks are interested in countries where banking market practices are well developed. Regulatory environment can also have an impact on the internationalization of banks [see Acharya (2003) and Houston et al. (2012)]. According to Mishkin et al. (2013) the Gramm-Leach Act in the United States (1999) led banks to diversify their activities and then intensify M&A between retail and investment banks. In Europe, the Basel III reforms (2010–11) should have a real impact on the international strategies of banks not only because of the amount of equity expected to cover traditional financial risks but also because of the operational risks related to the control of foreign structure [see Karolyi et al (2015)]. Niepmann (2012, 2015) worked on the determinants of the cross border banking activity of German banks regarding the situation of the host country. He focused on the differences in relative factor endowments and on differences in relative banking sector efficiencies across countries.

Niepman (2012) found that that home countries with lower overhead costs hold larger assets abroad. His results also suggest that German Banks invest more in countries whose banking sectors are less efficient.

## 2.2 How banks are set up abroad

In our introduction, we highlighted the difference between an international bank and a multinational bank. A multinational bank is distinguished from an international bank by its activities and its strategic behavior. The international bank will mainly act on the basis of its

export policies and from its country of origin whereas the multinational bank will set up directly abroad by the abovementioned modes of establishment.

We consider it important to distinguish between these three modes of entry because the organizational form of the establishment implies different competitive aspects and a distinct profitability, as indicated by Heinkel and Levi (1992). The differences between these input modes are multiple. Besides, several authors have been interested in the choice between these forms of commercial presence. There are two types of studies: works that focus on the determinants of the choice of the various "physical" implantation methods and analyses that compare the effects of an entry through cross-border mergers and acquisitions vs those of an entry through alliances. Harr and Ronde (2005) develop a theoretical model to explain the choice between a subsidiary and a branch. They stipulate that, due to the subsidiary's mere structure, risk aversion is higher for the parent company. Fiechter et al. (2011) provide an in-depth study on the choices of implementation methods. They demonstrate that the branch facility provides a broad range of basic customer services, better liquidity and risk management, and better cost efficiency. However, the branch location is more likely to contain losses and is a more appropriate organizational form for retail banking. Concerning studies on cross-border partnerships and acquisitions, one of the first analyses is the one from Kogut and Singh (1988). Indeed, Kogut and Singh (1988) focused on the effects of national culture on the choice of mode of entry abroad by conducting a study on a sample of 228 multinational banks. They concluded that acquisitions lead to a higher cost risk than joint ventures and the creation of subsidiaries, insofar as they involve the integration of different managerial and organizational practices.

A multinational banking establishment has three major means of spreading abroad. It can:

- proceed to cross-border acquisitions or mergers

- carry out installation of subsidiaries or branches
- conclude partnerships and alliances with foreign countries.

**Cross-border acquisitions:** These represent *external growth*. This type of development allows the bank to control assets that are already productive on the market and are initially held by other banks. It gives the purchaser the opportunity for a rapid increase in its production capacity. External growth is a strategic option that generally allows value creation. However, it can also be destructive, for example, if the establishment is developed thanks to the resources of another bank.

External growth takes usually the form of a merger,<sup>1</sup> share acquisition,<sup>2</sup> acquisition by share purchase,<sup>3</sup> or acquisition by share exchange.<sup>4</sup> We have to distinguish international M&A, which involve credit institutions located in different countries, from international conglomerates, which involve credit institutions, insurance companies, or other financial establishments set up in a different country.

These are the main operations used in the banking sector (see Table 1 and Figure 1), as external growth is usually a factor in two main goals: (1) to quickly establish a strategic position in the international market and reinforce a bank's competitive position by increasing market share; and (2) to counter the strategic proposals of a troublesome competitor and acquire new trades.

The first of these was the goal of BNP Paribas (BNPP), HSBC, RBS, and BBVA, who attempted to penetrate the American market by their respective takeovers of BancWest

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<sup>1</sup> Several banks decide to join their holdings in order to constitute one corporation.

<sup>2</sup> The takeover of another bank or another trade.

<sup>3</sup> A takeover bid (TOB) in case the target bank is listed. This operation consists of offering to buy the shares of shareholders in the target bank, in return for a considerable bonus.

<sup>4</sup> A public exchange share offer (OPE). If the target bank is listed, the purchasing bank offers to exchange its respective shares by means of an interesting premium.



(2001), Household (2003), Charter One (2004) and Compass Bancshares (2007). Their driving forces differed, however. BNPP and RBS concentrated on obtaining mainly regional retail banks. HSBC preferred development through consumer credit banking, while BBVA chose to reinforce its operations in South America and, at the same time, to turn toward Texas and Florida.

Cross-border acquisitions are also ways of countering competition and acquiring new trades. They enable banks to lay out a new network abroad, or to create a niche market (Meier, 2011). To cope with the increase of non-banking competition in the 2000s, European banks (particularly French and, to a lesser extent, German banks) acquired real-estate agencies in order both to attract upstream customers and to counter new operators. Crédit Mutuel took over 220 Avis Immobilier agencies in 1999, Caisse d'Épargne took over 290 Lamy agencies in 2005 and Banque Populaire took over 300 Foncia agencies in 2007, while Crédit Agricole created the real-estate agencies group Square Habita in 2003.

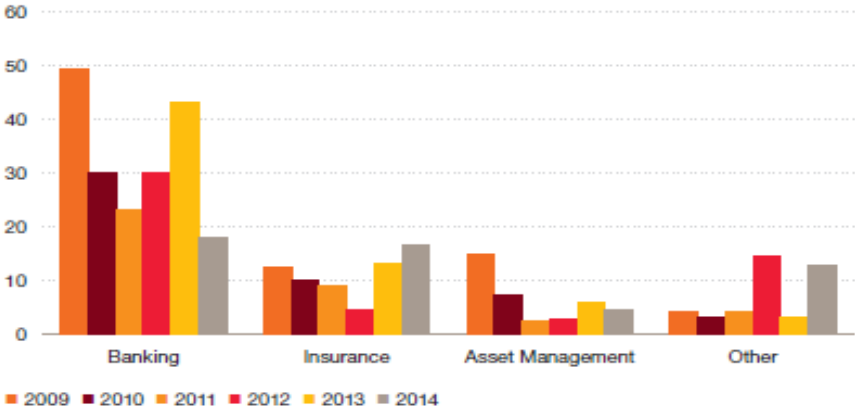
**Table 1 : Main Cross-Border Acquisitions 08-16 (Top 10)**

Acquiror name	Country	Target name	Country	Deal value (mil Eur)	Completed date
BANCO SANTANDER SA	SPAIN	Bank Zachodni wbk SA	RUSSIA	3,941,925.17	01/04/2011
SBERBANK ROSSII OAO	RUSSIA	DENIZBANK	TURKIA	2,801,619.93	28/09/2012
COMMERZBANK AG	DEUTCH	BRE BANK SA	POLAND	2,357,517.69	27/12/2012
BANCO SANTANDER SA	SPAIN	BANCO SANTANDER SA	BRESIL	1,829,462.00	31/10/2014
BANK AUSTRIA CREDITANSTALT AG	AUSTRIA	AKTSIONERNYY KOMERTSIYNY BANK SA	RUSSIA	1,525,00.00	23/01/2008
BANCO SANTANDER SA	SPAIN	SOVEREING BANCORP INC.	USA	1,476,110.00	30/01/2009
BANCO BILBAO VIZCAYA ARGENTARIA SA	SPAIN	CITIC INTERNATIONAL FINANCIAL HOLDING	HONG KONG	1,291,344.00	15/07/2010
SOCIETE GENERALE	FRANCE	AKTSIONERNYY KOMERTSIYNY BANK SA	RUSSIA	1,041,773.79	13/02/2008
BNP PARIBAS SA	FRANCE	BANK GOSPODARKI	POLAND	954,192,33	27/10/2014
SWEDBANK AB	SWEDEN	SWEDBANK AB	LATVIA	810,00,00	28/06/2011

Source: Zephir, Eastern Europe, Western Europe.

These strategies seem pertinent for increasing efficiency and performance. The idea of acquiring a niche position in a new market pushes banks to exploit new resources and to apply their knowledge in the target market.

**Figure 1 European M&A financial services total deal value (€bn) by subsector, 2009–14**



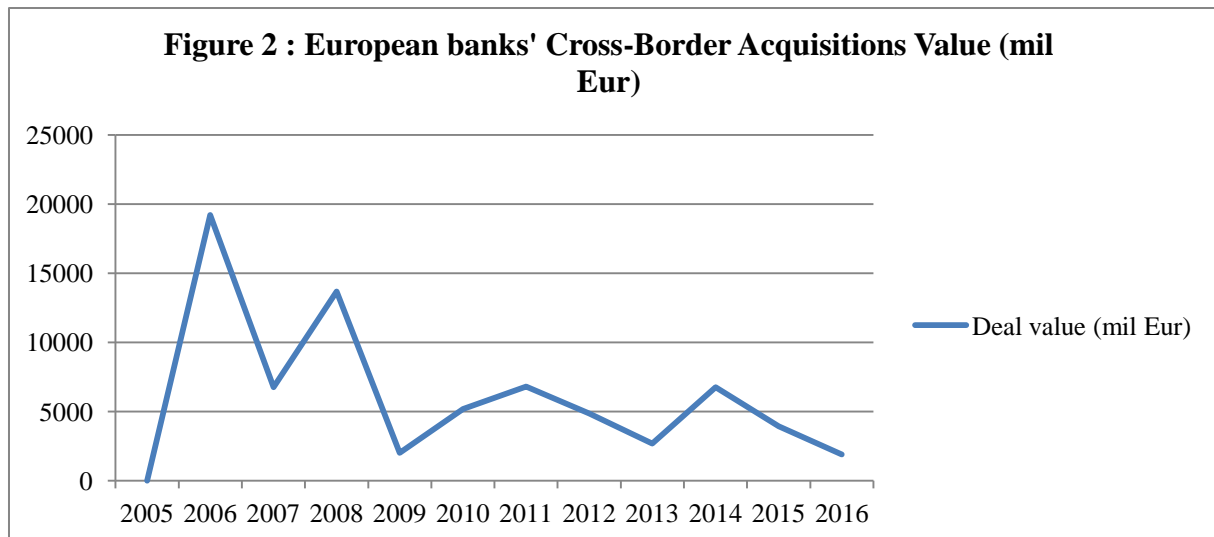
Source: Cann, A., Demoy, H., Bindoff, N., (2015). Sharing deal insight, PwC report, April 2015.<sup>5</sup>

However, these strategies are very difficult to realize. In fact, banks have to cope with the uncertainties linked to an unknown local market, higher costs, and important risks.

Figure 1 shows the number of mergers and acquisitions in the financial area between 2009 and 2014. We realize that the banking sector has experienced most M&A during this period. However, bank M&A experienced a decrease in 2014. This drop does not necessarily mean that the activity is weakening, since the values of bank operations for the year 2013 have been severely inflated by the Greek, Spanish, and Dutch recapitalizations (see Cann, A., Demoy, H., Bindoff, N., (2015). Sharing deal insight, PwC report, April 2015).

Figure 2 shows the value of cross-border acquisitions in the banking sector between 2005 and 2016. We also notice that the banking sector has experienced the most cross border M&A between 2005 and 2012. Banks cross-border M&A experienced a drop since the end of 2011. This steep fall is due to the subprime and debt crisis in 2008 and 2012 respectively.

<sup>5</sup> All M&A taken into account (i.e. both cross-border and domestic).



Source : Zephir.

**Affiliated banks, subsidiaries, branches, and representative offices:** As underlined successively by Marois (1979), Sautter (1982), Heinkel and Levi (1992), Blandon (1998), Bain *et al.* (2003), and more recently by Fiechter *et al.* (2011) and Liang, H.-Y *et al.* (2013), operations abroad are generally organized through four main forms of company establishment: affiliated bank, subsidiary, branch, and representative office. Affiliated banks and subsidiaries have a certain degree of independence from the parent company. In general, the director of the affiliated bank is a native of the target country. The activities of this entity depend on the legislation of the country concerned. A subsidiary is often the result of the acquisition of a local bank or the creation of a new entity, and the parent company holds more than 50% of its capital. Subsidiaries are more independent than affiliated banks. They also represent a complete take-to-market approach, according to Blandon (1998). In fact, for the parent company, subsidiaries are a way to develop several business units in the target country.

Branches and representative offices are not stand-alone entities. The parent company holds 100% of the branch's capital. Although branches allow the parent company to penetrate a new market, this can be a complex procedure, as the credit restrictions imposed by the targeted countries have to be complied with. Branches and representative offices ensure a

presence in the target country and contribute to creating a link with local customers. They also enable access to in-depth information about the local market, which allows the parent company to adapt its services with the aim of creating a subsidiary. The parent company holds 100% of the capital of a branch or representative office.

According to Lozano-Vivas and Weill (2015), in the banking area entry mode needs to be considered seriously as far as gaining a foothold abroad is concerned. Indeed, because of the wave of liberalization, the financial markets tend to use two principal modes of entry, are either the creation of subsidiaries and branches abroad or simply the acquisition of existing overseas banks (M&A). In general, the subsidiary *creatio ex nihilo* (e.g. Greenfield Bank) is specialized in just one sector, as we can see within sales subsidiaries.

Since the end of the 2000s, French banks have intensified their operations overseas. Today they own about 2000 subsidiaries throughout the world and their activities outside France represent about 30% of the consolidated GNP (Table 2).

<b>Table 2: International operations of French banks</b>				
	<b>World</b>	<b>European Union (except</b>	<b>Outside the European</b>	<b>World (except France)</b>
Consolidated GNP (€billions)	129.70	24.10	15.00	39.10
Staff (millions)	0.62	0.10	0.10	0.20
Number of subsidiaries	1930.00	600.00	480.00	1080.00
Part of consolidated GNP (in %)	100.00	18.60	11.60	30.20
Part of staff (in %)	100.00	16.10	16.10	32.20
Part of number of subsidiaries	100.00	31.10	24.90	56.00

Source: INSEE, March 2011.

Moreover, banks emigrate, thanks to cross-border partnerships, which take different forms.

**Strategic partnerships and alliances:** These represent a third means of international expansion and fall into the category of joint growth. Joint growth is a way for a bank to form

an alliance with another establishment in a relatively formalized manner to carry out a commercial or industrial project. This simple commercial relationship can be developed into a strategic partnership or alliance.

Meier (2011) sees many advantages of this kind of operation overseas. First, it offers the possibility of having many more partners and, consequently, allows access to a wider choice of activity. Moreover, the cross-border agreement gives the bank the option of a “niche” in the new market it wants to penetrate; it is more flexible than cross-border M&A. Banks must take into account all the activities of the target partner, even if they are not profitable. However, one advantage of a partnership is less involvement: the bank can withdraw its membership when it wants. There are four different forms of partnership: technical and commercial agreement,<sup>6</sup> joint venture,<sup>7</sup> equity investment,<sup>8</sup> or framework agreement,<sup>9</sup> The most common forms are joint venture and equity investment. Strategic alliances symbolize an adapted response to internationalization or even to a dimensional criterion. They represent an alternative to an internal growth or M&A strategy, which may be much more difficult to apply.

Nevertheless, an alliance can pose a danger to the bank because it results in the partial propagation of knowledge (information, data bases) and know-how (methods, processes, competences) to a partner that is, often, still competitive. Moreover, shared power can lead to

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<sup>6</sup> This form of partnership can be concluded with another bank or financial institution. It allows banks to penetrate new markets by creating new products. The commercial agreement can lead to the creation of a subsidiary or joint venture.

<sup>7</sup> A contractual arrangement between two parties originating from different countries, in order to create a new entity or to purchase a joint subsidiary.

<sup>8</sup> Becoming a shareholder or an associate of an entity, by subscribing to titles.

<sup>9</sup> Financing agreements between several banks and financial institutions in order to put a line of credit at the disposal of their customers.

conflict between stakeholders and reduce the possibility of action, due to the increased dependence between the two partners.

Although the literature on banks' international strategies is well developed, no consensus has really been reached on the benefits. The theory explains that, on one hand, diversification gives banks credibility as financial intermediaries and on the other, it is a warranty for depositors about the security of their funds (Diamond, 1984). Most of the literature focuses on two types of diversification: (1) among several banking activities, and (2) over several geographical areas.

Some empirical studies, therefore, lean on the effects of geographical expansion (Cubo-Ottone & Murgia, 2000; Focarelli, Panetta, & Salleo, 2000; Hayden, Porath, & Westernhagen, 2006; Mercieca, Schaeck, & Wolfe, 2007). Others focus on the consequences for performance and the risk of diversification through different banking business lines, such as insurance (Wall & Eisenbeis, 1984; Kwast, 1989), or even consumer credit (Sinkey & Nash, 1993). Finally, some authors look at both dimensions, that is, diversification in different geographical areas and diversification through several trades (Stiroh and Rumble, 2006; Iskandar-Datta & McLaughlin, 2007; Berger, Hasan, & Zhou, 2010). Berger, Hasan, and Zhou (2010) are interested in the diversification of Chinese banks (in terms of trade and geographical area) and note that both dimensions of diversification result in reduced profits and increased costs. Other studies look at the different modes of entry of banks into foreign markets. Some focus on "physical" operations, such as subsidiaries and branches, while others compare entry through cross-border M&A and alliances.

Cerutti, Dell'Ariccia, and Martinez Peria (2007) have studied the relation between a bank's overseas operations and the economic level of the host country, distinguishing between operations through subsidiaries and operations through branches. They demonstrate that the behavior of the parent company differs according to the economic level of the host country.

Banks prefer to set up subsidiaries, rather than branches, in countries with a higher GDP because their banking and financial systems are generally more developed. Schoenmaker and van Laecke (2007) focus on the factors of overseas operations of 60 commercial banks. They discover a significant relationship between the concentration level of the banking sector and the economic size of the host country. Their results match those of Miller and Parkhe (1998) who study the factors of choice relating to subsidiaries and branches and show that choice is linked to the size of the banking sector in the targeted country.

Meyer *et al.* (2009) compare modes of entry into four different countries (India, Vietnam, South Africa, and Egypt). They explain how the form of entry chosen will depend on the prevailing institutional context in the host market. Lehner (2009) compares access to a foreign country through new investment to access through acquisition of a local bank. He shows that the form of entry chosen depends not only on performance but also on the level of development in the host market. Petrou (2009) uses a model based on the perspectives of administrators involved in 124 entries into foreign markets to examine how they establish their choices. More recently, Fiechter *et al.* (2011) propose an in-depth analysis of the choice of operation and compare the establishment of a subsidiary to setting up a branch.

In the following section, we detail the method used to analyze the efficiency (or otherwise) of these various forms of operation in internationalization strategies.

### **3. Methodology**

Our sample includes nine years' financial information (2004–12) about 42 capitalized commercial European banks, representing a total of 378 observations. In order to overcome inflation problems that may distort our results, we have deflated all our data (basis of 100 in 2004). These data were obtained from two main sources, Bankscope and Zéphir, supplemented by the banks' annual reports (2004–12). We focused on establishments with

subsidiaries outside their country of origin. Our sample includes banks originating in Cyprus (1), Denmark (2), France (4), Germany (6), Greece (2), Ireland (1), Italy (4), Luxemburg (1), the Netherlands (2), Portugal (3), Spain (7), Sweden (3), Switzerland (1), Turkey (2), and the United Kingdom (3). These represent 51% of the banks that went through the European Banking Authority stress test in 2011.

We used the model specification developed in the study of Acharya et al (2006) and Berger et al. (2010). Acharya et al (2006) worked on the link between the performance and internationalization on 105 Italian banks. The model specification is of that work is represented by the following equation:

$$\text{Return}_t = \alpha_0 + \beta_1 I\text{-HHI}_t + \beta_2 A\text{-HHI}_t + \beta_3 G\text{-HHI}_t + \epsilon_t \quad (1)$$

In this equation, the Return variable represents the performance measures (ROE, ROA, stock return and the market beta. *I-HHI*, *A-HHI*, et *G-HHI* represents three geographic diversification indexes (Hirschman Herfindahl). We also used the Berger et al (2010) regressions of the performance (ROA, ROE and costs assets) on “the more conventional measures of diversification”<sup>10</sup>.

Consequently, we determined three types of overseas operation, for which we chose six measures: expansion through subsidiaries, expansion through cross-border partnerships, expansion through cross-border M&A, performance, credit risk, and bank size.

Consequently, we tested our variables using panel data methodologies. The following equations represent the regressions made on our sample where, *i* and *t* signify the bank and the year.

$$\text{Performance} = \alpha_0 + \beta_1 CMA_{it} + \beta_2 PARTN_{it} + \beta_3 HERF\_AD_{it} + \beta_4 LNASSET_{it} + U_{it} \quad (2)$$

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<sup>10</sup> See Berger et al page 1423



$$\text{Performance} = \alpha_0 + \beta_1 CMA_{it} + \beta_2 PARTN_{it} + \beta_3 HERF\_LD_{it} + \beta_4 LNASSET_{it} + U_{it} \quad (3)$$

$$\text{Performance} = \alpha_0 + \beta_1 CMA_{it} + \beta_2 PARTN_{it} + \beta_3 HERF\_DD_{it} + \beta_4 LNASSET_{it} + U_{it} \quad (4)$$

For performance we chose four measures: return on equity (ROE), return on assets (ROA), operating ratio, and credit risk. ROE and ROA are the performance ratios used most regularly by banks. ROE takes into account investment returns made for shareholders. To complete these two measures, we propose an efficiency measure, based on the operating ratio. This measure helps to overcome ROE limitations, calculated from the net result. The operating ratio allows us to obtain an overview of the evolution of the banks' general and administrative expenditure. Credit risk is also a performance criterion. It can be managed through the credit offer or through clarification of the application circuit. In order to measure credit risk, we have chosen the **non-performing loans on total loans ratio**.

$$ROE = \frac{\text{Net result}}{\text{Average Equity}} ; = \frac{\text{Net result}}{\text{Total Asset}} ; \text{costincome} = \frac{\text{Operating costs}}{\text{Net banking income}} \text{ and } \text{Credit risk} = \frac{\text{non-performing loans}}{\text{total loans ratio}}$$

For the expansion through subsidiaries measure,<sup>11</sup> we considered subsidiaries set up abroad to be held at more than 50%. To calculate these geographical diversification indexes, we propose, like Acharya *et al.* (2006) and Berger *et al.* (2010), to use the Herfindahl index. We present three types of breakdown: a breakdown at the level bank assets (HERF\_AD)<sup>12</sup>; a breakdown at the level of bank loans (HERF\_LD); and a breakdown at the level of bank deposits (HERF\_DD).

$$\sum_{i=0}^n \left( \frac{\text{loans in area } i}{\text{total assets}} \right)^2 ; \sum_{i=0}^n \left( \frac{\text{assets in area } i}{\text{total assets}} \right)^2 \text{ and } \sum_{i=0}^n \left( \frac{\text{deposits in area } i}{\text{total assets}} \right)^2 .$$

<sup>11</sup> We will not focus on the subsidiaries *editio ex nihilo* since our interest is geared toward subsidiaries developing several sectors.

<sup>12</sup> In our case  $n = 3$ , because we have three areas (Europe, national and international). The nearer this index is to 1, the lower the geographic diversification.

Expansion through cross-border partnerships (PARTN) refers to the percentage of the value (in € millions) of partnerships established abroad (involving credit establishments or non-financial companies), compared to the entire value (in € millions) of partnerships. The partnerships selected using Zéphir data correspond to joint ventures, implying the creation of a new corporation by two parties, a bank and another (financial or non-financial) establishment, and equity investments (a case in which the purchaser has bought a number of shares in the target, where the stake is to own less than 50% of these shares).

$$PARTN = \frac{\text{Value in € million of cross – border partnerships}}{\text{total value in € million of partnerships}}$$

The expansion through cross-border mergers and acquisitions (CMA) strategy is represented by the value (in € millions) of CMA (involving credit establishments located in foreign countries), compared to the total value (in € millions) of domestic and cross-border M&A achieved. We consider here any business in which the purchaser ends up with 50% or more of the target's capital. Even if the acquired investment is very low at the beginning, where the final stake is 50% or more the agreement is still considered to be an acquisition.

$$CMA = \frac{\text{Value in € million of cross – border acquisitions}}{\text{total value in € million of acquisitions}}$$

Size is an important criterion that defines the capacity of multinational banks to adapt to the market [see Berger et al (2010)]. We measure bank size by means of a logarithm of the total assets, *Bank size* = *LNASSET*.

In order to deal with the differences between years and countries we considered dummy variables<sup>13</sup> to generate time fixed<sup>14</sup> and country fixed effects<sup>15</sup>. The following equations represent the regressions made on our sample with dummy variables.

<sup>13</sup> see Gujarati, D., & Porter, D. Essentials of Econometrics, 2011

<sup>14</sup> For time fixed effects we determined n-1 dummy variables, where n is the time periods of the regressions: dt\_2 for the year 2, dt\_3 for the year 3 etc..

$$\text{Performance} = \alpha_0 + \beta_1 CMA_{it} + \beta_2 PARTN_{it} + \beta_3 HERF\_AD_{it} + \beta_4 LNASSET_{it} \\ + \text{year dummies} + \text{country dummies} + U_{it} \quad (5)$$

$$\text{Performance} = \alpha_0 + \beta_1 CMA_{it} + \beta_2 PARTN_{it} + \beta_3 HERF\_LD_{it} + \beta_4 LNASSET_{it} \\ + \text{year dummies} + \text{country dummie} + U_{it} \quad (6)$$

$$\text{Performance} = \alpha_0 + \beta_1 CMA_{it} + \beta_2 PARTN_{it} + \beta_3 HERF\_DD_{it} + \beta_4 LNASSET_{it} \\ + \text{year dummies} + \text{country dummies} + U_{it} \quad (7)$$

In order to avoid correlation problems between the variables HERF\_AD, HERF\_LD, and HERF\_DD, we established three different regressions each time. The statistical tests we carried out<sup>16</sup> on the data demonstrated that we can use either a fixed-effect model or a random-effect model (see the Hausman tests for each equation in Appendix 1). In order to deal with heteroskedasticity, serial correlation, and cross-sectional dependence (see Appendices 2B, 2C and 2D) we used the procedures for heteroskedasticity consistent (HC) and for heteroskedasticity and autocorrelation consistent (HAC) covariance estimation that have been suggested in the econometrics literature (White 1980; Andrews 1991).<sup>17</sup>

#### 4. Results and discussion

##### 1. Results

Tables 3 and 4 show the results (see also Appendices 2, 3, and 4). Table 3 shows first that the variable LNASSET is between 15.11 and 10.22. This demonstrates that the banks in our European sample are significant in terms of assets. Second, it shows that our

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<sup>15</sup> For country fixed effects, in order to avoid multicollinearity problems we have considered 3 different areas in Europe (North, South and East). Therefore, we determined m-1 dummy variables for the fixed country effects, where m is the number areas in Europe : (dc\_1 for area 1 and dc-2 for area 2).

<sup>16</sup> We used the system for statistical computation and graphics “R.” See <http://www.r-project.org/>

<sup>17</sup> See also [cran.r-project.org/web/packages/.../sandwich.pdf](http://cran.r-project.org/web/packages/.../sandwich.pdf)

concentration indexes (HERF\_AD, HERF\_LD, HERF\_DD) for the whole sample are close to 1, which means that the selected banks are very focused on a single region (European, national, or international) when they set up subsidiaries. Table 3 also indicates that the percentage of cross-border partnerships and cross-border acquisitions is low on average. The mean is respectively 0.198 and 0.163 with a standard deviation of 0.35 and 0.34. This means that on average 19.8% and 16.3% of European banks' partnerships and acquisitions (in our sample) are carried out with foreign countries.

Table 3 : Variables										
	CMA	COSTINCOME	CREDITRISK	HERF_AD	HERF_DD	HERF_LD	LNASSET	PARTN	ROA	ROE
Mean	0.16	61.68	2.75	0.80	0.79	0.81	10.22	0.20	0.53	8.11
Median	0.00	60.56	2.37	0.84	0.82	0.86	10.56	0.00	0.48	10.24
Maximum	1.00	346.82	18.36	1.00	1.00	1.00	15.11	1.00	4.94	32.92
Minimum	0.00	13.00	0.14	0.35	0.31	0.06	7.60	0.00	-6.49	-166.00
Std. Dev.	0.35	22.15	2.19	0.19	0.19	0.19	2.49	0.36	0.99	16.40
Sum	60.38	22760.52	1013.51	293.59	288.38	298.83	3771.73	73.22	195.75	2992.17
Sum Sq. Dev.	44.83	180613.10	1763.25	13.45	13.05	13.72	2285.21	46.66	359.50	98939.59

Table 4 shows the coefficients of the different explanatory variables ( $\beta_1$  to  $\beta_4$ ). These statistics allow us to make a final decision about the significance or otherwise of our coefficients. The regressions made from the ROE show a positive link between HERF\_DD and ROE at about 10% and the intercept at about 1% (see also Appendix 4.1).

This implies that if the subsidiaries of European banks are geographically concentrated (HERF\_DD is closer to 1), the return on equity goes up. This means statistically that the ROE is about 12 percentage points higher when the banks are geographically concentrated.

The intercept represents the expected means value of ROE when all the independent variables equal to zero. This implies that the ROE would have approached the mean of -10.03%. Thus, our conclusion is consistent.

The regressions made with ROE show a positive link between our variable cross-border partnerships, at 5% and 10% (see also Appendix 4.2). This means that the higher the percentage of cross-border partnerships, the higher the ROE. This indicates that statistically

that the ROE is about 5 percentage points higher when the banks use the cross-border partnerships entry modes.

These results imply that geographic diversification through subsidiaries could have a negative impact on the performance of European banks, whereas cross-border partnerships could have a positive one. This conclusion is consistent. Partnerships offer less involvement.

**Table 4 : Panel data results**

	ROE		ROA		Costincome		Creditrisk	
	Estimate	Pr(> t )	Estimate	Pr(> t )	Estimate	Pr(> t )	Estimate	Pr(> t )
(Intercept)	-1.68	0.11	0.01	0.98	65.46	0.00***	4.49	0.00***
CMA	-1.41	0.43	-0.07	0.31	0.46	0.83	-0.21	0.07*
Partn	5.42	0.09*	0.10	0.39	-2.55	0.30	-0.46	0.16
HERF_AD	14.13	0.17	-0.34	0.41	3.02	0.76	0.79	0.46
LNASSET	2.14	0.00***	0.08	0.02**	-0.56	0.37	-0.22	0.00***
Observation	378.00		378.00		378.00		378.00	
Adjusted R-squared	0.11		0.01		0.01		0.09	
(Intercept)	-10.03	0.02***	-0.24	0.50	64.60	0.00***	3.61	0.00***
CMA	-3.08	0.13	-0.05	0.42	0.54	0.80	-0.16	0.17
Partn	4.16	0.04**	0.10	0.36	-2.60	0.29	-0.46	0.16
HERF_LD	-3.84	0.33	0.00	0.99	4.16	0.64	1.95	0.02**
LNASSET	2.05	0.00***	0.07	0.03**	-0.57	0.36	-0.23	0.00***
Observation	378.00		378.00		378.00		378.00	
Adjusted R-squared	0.10		0.01		0.01		0.10	
(Intercept)	1.45	0.12	-0.06	0.90	59.98	0.00***	4.63	0.00***
CMA	-1.68	0.42	-0.06	0.38	0.77	0.73	-0.24	0.03**
Partn	5.46	0.10	0.10	0.38	-2.49	0.31	-0.46	0.16
HERF_DD	12.67	0.08**	-0.20	0.56	9.95	0.40	0.49	0.66
LNASSET	2.15	0.00***	0.07	0.02**	-0.56	0.36	-0.21	0.00***
Observation	378.00		378.00		378.00		378.00	
Adjusted R-squared	0.10		0.05		0.01		0.09	

Signif. codes: 0.01 '\*\*\*' 0.05 '\*\*' 0.1 '\*'

Cross-border partnerships therefore give banks flexibility that subsidiaries or acquisitions do not offer. Both of these involve significant administrative costs. These costs are essentially linked to the needs of aligning the group's salary policies, taking into account the local market, where salary levels can be very high.

However, cross-border partnerships could have a higher risk than cross-border acquisitions due to conflict between the stakeholders. Besides, the regressions made from the credit risk ratio could confirm this argument. These regressions show a positive link with the cross-border partnerships variable at 1% (see also Appendix 4.4). This means that the credit risk is about 1.5 point higher with the cross border partnership entry mode.

These regressions show a positive link with the intercept at 1% too. This implies that if all the independent variables approach zero the mean value of the credit risk will approach a mean of 6 (see table 4). This result also seems consistent. The regressions made with the cost to income ratio also show a positive link with the intercept at 1%. We think that these results seem logical as well. This indicates that the mean value of the cost income ratio would have approached a mean of 60 (closed to the median), if all the independent variables were closed to zero.

We can also highlight that regressions made with ROE and ROA demonstrate a positive link with our variable LNASSET at 1% and 5%. The credit risk ratio also has a significant link with this variable, with a negative sign at 1% and 5%. This proves that banks with the largest assets have higher performance and the lowest credit risk ratio.

The regressions that include the dummy variables (see Appendix 5) show a positive link between the performance variables (ROE and ROA) and the cross-border partnerships variable at 5%. This confirms our results described above. The results also highlight that statistically the ROE is about 10 percentage points lower in 2008 (represents by the time dummy variable "dt-5") than the other years. Furthermore, the credit risk is about 0.34 point for the same year. These results could be explained by the subprime crisis at the end of 2007. For the country dummies we did not find any positive link. This can be enlightened by the fact that we chose a sample of banks that come from a same world area Europe.

## **2. Discussion**

In this article, we chose to test three equations in order to understand the relation between the various strategies of internationalization of a number of European banks and their performance. Thus, the results of this study can be summarized in three points.

First, the most concentrated banks in our sample have the highest ROE and the weakest credit risk ratio. Therefore we cannot claim that geographic diversification via the subsidiary increases bank performance (at least in terms of ROE and ROA). A subsidiary would not be the best way to gain a foothold abroad. In general, the literature on banking internationalization finds a negative relation between performance and geographic diversification. Indeed, the work of Parada, Alemany and Planellas (2009) shows that internationalization did not secure profit for the banking firm. Berger, Hasan and Zhou (2010) show that geographic diversification measured in the deposits, loans and credit of Chinese banks does not return benefits. In other words, for these authors, the most targeted banks are associated with higher profits, lower costs, and greater profit.

Our results are also in agreement with the literature on the organizational form of internationalization. Fiechter *et al.* (2011) explain why the costs of internationalization could be higher when the banking group is established through a subsidiary rather than a branch. Indeed, to maintain self-sufficiency and to limit the risk of back-contagion for the parent company in the event of failure, it is necessary for the subsidiary to maintain a level of liquidity as well as high capital. For Fiechter *et al.* (2011) this requirement inhibits capital transfer within the banking group. More recently, Liang *et al.*(2013) analyzed the impact of internationalization through two types of strategy (branch and representative office) in 45 European banks. They concluded that foreign development within a branch has a positive impact on ROA and ROE and that a representative office is better able to control costs than a branch.

We maintain that the choice of form of establishment is paramount when a bank decides to establish itself overseas and that a subsidiary is not the best strategy for European banks to improve ROE and ROA. A limited commitment is more to bring benefits for

European banks operating overseas and will also limit contagion in a crisis. This observation is supported by the internationalization strategy of the banks in our sample over the last 15 years, a strategy similar to that of automotive companies (Harris, 2002). The banks in our sample looked to impose themselves as a brand. In addition, during this period, the publicity around their brand increased. For example, the most international French banks extended “French” retail banking in developed as well as emergent markets through the establishment of subsidiaries, which proved to be an expensive mistake.

Second, our results show that a larger number of partnerships with foreign banks resulted in higher ROA, confirming our theory that partnership is a lighter organizational form. Marois (1997) argues that partnership, as a mode of international expansion, is less compelling than M&A or subsidiaries as it is less formal and the parties can disengage more easily. Partnership meets the criteria of size and resource (human, financial and technological) sharing in internationalization. Consequently, for Nekhili and Karyotis (2008) and Meier (2011), partnership represents an alternative way to M&A policies and internal development.

Meyer *et al.* (2009) compare mode of entry in four different countries (India, Vietnam, South Africa, Egypt). They explain that these alternative modes of entry allow the companies to overcome various types of market dysfunction related to resources and institutional context. Within a “weak” institutional framework, joint ventures are frequently used to access resources. However, within a sustained reinforced institutional framework there are fewer joint ventures.

We find that partnership also allows the purchaser to make a limited commitment, from which the purchaser can withdraw easily if and when necessary. Cooperation agreements undertaken by European banks in our sample, especially the French banks,



actually represent acquisitions of holdings rather than genuine partnerships, moving from a “technical” and commercial commitment to a “joint venture.”

Finally, there is a negative link between the percentage of M&A carried out with foreign companies and our measurement of credit risk. This means that CMA would reduce credit risk. As De Backer *et al.* (2008) emphasize, banks have been considering merging in order to avoid an increase in competition since the end of 1999. The goals of CMA, beyond size and economy of scale, are to create synergies of income and thus reduce risk. We did not find a positive link between our index of M&A and bank performance. This result is not surprising, given that the literature stipulates that CMA play an important part in accessing intangible resources (Meyer *et al.*, 2009). For an acquisition to be successful, coherence is needed between the strategies of both parties in domestic and cross-border M&A (Altunbas *et al.*, 2008). A lack of coherence in capitalization, the use of technology and financial innovation strategy has a negative effect on profitability. We find that M&A is too heavy a load for a bank to establish itself and hope for profitability in terms of ROE and ROA. Nevertheless, CMA can reduce risk. Moreover, Berger, Hasan and Zhou (2010) hypothesize that there could be a nonlinear relation between geographic diversification, performance, and risk.

## **5. Conclusion**

The goal of our research is to understand and analyze the existing links between international banking operations and profit. The result of our research into the relation between different types of operation, banking performance, and credit risk brings to light an important point: international expansion through subsidiaries can lead to a lower return on equity and reduce the credit risk ratio. Cross-border acquisitions could also reduce the credit risk ratio.

Conversely, geographic diversification through partnerships could improve performance. Our findings are interesting in light of the literature, which states that partnerships offer the possibility of several partners and, consequently, access to a large choice of operations. But it should be pointed out that the organizational forms of subsidiaries and M&A could reduce the credit risk. Even if our results cannot be extended to the whole banking sector, these findings show that each strategy has a different impact on risk and performance.

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## Appendices

### 1. Fixed-effect or random effect models: Hausman Tests. \*

Equations	Hausman Test	Meaning
Equation 1.1 : ROE ~ CMA + Partn + HERF_AD + LNASSET	chisq = 10.3043, df = 4, p-value = 0.0356	Fixed effect model is appropriate
Equation 1.2 : ROE ~ CMA + Partn + HERF_LD + LNASSET	chisq = 7.2928, df = 4, p-value = 0.1212	Random effect model is appropriate
Equation 1.3: ROE ~ CMA + Partn + HERF_DD + LNASSET	chisq = 10.202, df = 4, p-value = 0.03716	Fixed effect model is appropriate
Equation 2.1 : ROA ~ CMA + Partn + HERF_AD + LNASSET	chisq = 4.8885, df = 4, p-value = 0.2989	Random effect model is appropriate
Equation 2.2: ROA ~ CMA + Partn + HERF_LD + LNASSET	chisq = 3.7064, df = 4, p-value = 0.4472	Random effect model is appropriate
Equation 2.3: ROA ~ CMA + Partn + HERF_DD + LNASSET	chisq = 5.1194, df = 4, p-value = 0.2753	Random effect model is appropriate
Equation 3.1: Costincome ~ CMA + Partn + HERF_AD + LNASSET	chisq = 4.3738, df = 4, p-value = 0.3578	Random effect model is appropriate
Equation 3.2: Costincome ~ CMA + Partn + HERF_LD + LNASSET	chisq = 3.0794, df = 4, p-value = 0.5446	Random effect model is appropriate
Equation 3.3: Costincome ~ CMA + Partn + HERF_DD + LNASSET	chisq = 3.6552, df = 4, p-value = 0.4547	Random effect model is appropriate
Equation 4.1: creditrisk ~ CMA + Partn + HERF_AD + LNASSET	chisq = 3.1079, df = 4, p-value = 0.5399	Random effect model is appropriate
Equation 4.2: creditrisk ~ CMA + Partn + HERF_LD + LNASSET	chisq = 3.3098, df = 4, p-value = 0.5074	Random effect model is appropriate
Equation 4.3: creditrisk ~ CMA + Partn + HERF_DD + LNASSET	chisq = 2.6728, df = 4, p-value = 0.614	Random effect model is appropriate

\*With alternative hypothesis: one model is inconsistent

### 2. Testing for cross-sectional dependence/contemporaneous correlation: using Breusch-Pagan LM test of independence\* and Pasaran CD test\*\*

Equations	Breusch-Pagan LM test	Pesaran CD test	meaning
Equation 1.1 : ROE ~ CMA + Partn + HERF_AD + LNASSET	chisq = 1185.129, df = 820, p-value = 8.547e-16	z = 13.7068, p-value < 2.2e-16	cross-sectional dependence
Equation 1.2 : ROE ~ CMA + Partn + HERF_LD + LNASSET	chisq = 1213.625, df = 820, p-value < 2.2e-16	z = 16.5425, p-value < 2.2e-16	cross-sectional dependence
Equation 1.3: ROE ~ CMA + Partn + HERF_DD + LNASSET	chisq = 1161.286, df = 820, p-value = 3.303e-14	z = 14.1328, p-value < 2.2e-16	cross-sectional dependence
Equation 2.1 : ROA ~ CMA + Partn + HERF_AD + LNASSET	chisq = 1419.855, df = 820, p-value < 2.2e-16	z = 14.0193, p-value < 2.2e-16	cross-sectional dependence
Equation 2.2: ROA ~ CMA + Partn + HERF_LD + LNASSET	chisq = 1414.164, df = 820, p-value < 2.2e-16	z = 13.4339, p-value < 2.2e-16	cross-sectional dependence
Equation 2.3: ROA ~ CMA + Partn + HERF_DD + LNASSET	chisq = 1381.242, df = 820, p-value < 2.2e-16	z = 14.0328, p-value < 2.2e-16	cross-sectional dependence
Equation 3.1: Costincome ~ CMA + Partn + HERF_AD + LNASSET	chisq = 1286.97, df = 820, p-value < 2.2e-16	z = 9.5205, p-value < 2.2e-16	cross-sectional dependence
Equation 3.2: Costincome ~ CMA + Partn + HERF_LD + LNASSET	chisq = 1280.649, df = 820, p-value < 2.2e-16	z = 9.4656, p-value < 2.2e-16	cross-sectional dependence
Equation 3.3: Costincome ~ CMA + Partn + HERF_DD + LNASSET	chisq = 1293.29, df = 820, p-value < 2.2e-16	z = 9.7729, p-value < 2.2e-16	cross-sectional dependence
Equation 4.1: creditrisk ~ CMA + Partn + HERF_AD + LNASSET	chisq = 2359.748, df = 820, p-value < 2.2e-16	z = 7.3516, p-value = 1.959e-13	cross-sectional dependence
Equation 4.2: creditrisk ~ CMA + Partn + HERF_LD + LNASSET	chisq = 2233.85, df = 820, p-value < 2.2e-16	z = 8.7336, p-value < 2.2e-16	cross-sectional dependence
Equation 4.3: creditrisk ~ CMA + Partn + HERF_DD + LNASSET	chisq = 2307.109, df = 820, p-value < 2.2e-16	z = 5.9065, p-value = 3.495e-09	cross-sectional dependence

\* and \*\*: Alternative hypothesis: cross-sectional dependence

### 3. Testing for serial correlation/ heteroskedasticity: using Breusch-Godfrey/Wooldridge test and Breusch-Pagan test<sup>\*</sup>.

Equations	Breusch-Godfrey/Wooldridge test	Breusch-Pagan test	meaning
Equation 1.1 : ROE ~ CMA + Partn + HERF_AD + LNASSET	chisq = 42.3101, df = 8, p-value = 1.184e-06	BP = 1553.267, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 1.2 : ROE ~ CMA + Partn + HERF_LD + LNASSET	chisq = 36.1134, df = 8, p-value = 1.674e-05	BP = 1534.864, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 1.3: ROE ~ CMA + Partn + HERF_DD + LNASSET	chisq = 32.8867, df = 8, p-value = 6.455e-05	BP = 1576.288, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 2.1 : ROA ~ CMA + Partn + HERF_AD + LNASSET	chisq = 30.392, df = 8, p-value = 0.0001802	BP = 1130.212, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 2.2: ROA ~ CMA + Partn + HERF_LD + LNASSET	chisq = 83.5995, df = 8, p-value = 9.194e-15	BP = 1140.619, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 2.3: ROA ~ CMA + Partn + HERF_DD + LNASSET	chisq = 79.9693, df = 8, p-value = 4.959e-14	BP = 1153.467, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 3.1: Costincome ~ CMA + Partn + HERF_AD + LNASSET	chisq = 30.392, df = 8, p-value = 0.0001802	BP = 3537.953, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 3.2: Costincome ~ CMA + Partn + HERF_LD + LNASSET	chisq = 30.8538, df = 8, p-value = 0.0001492	z = 9.4656, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 3.3: Costincome ~ CMA + Partn + HERF_DD + LNASSET	chisq = 24.1915, df = 8, p-value = 0.002128	BP = 3497.64, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 4.1: creditrisk ~ CMA + Partn + HERF_AD + LNASSET	chisq = 124.7147, df = 8, p-value < 2.2e-16	BP = 1289.785, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 4.2: creditrisk ~ CMA + Partn + HERF_LD + LNASSET	chisq = 126.5254, df = 8, p-value < 2.2e-16	BP = 1310.855, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation
Equation 4.3: creditrisk ~ CMA + Partn + HERF_DD + LNASSET	chisq = 125.791, df = 8, p-value < 2.2e-16	BP = 1324.076, df = 44, p-value < 2.2e-16	Presence of heteroskedasticity and serial correlation

\* Alternative hypothesis: serial correlation in idiosyncratic errors

#### 4.1. Regressions made with ROE, autocorrelation consistent (HAC) covariance estimation.

Model = "fixed effect"

t test of coefficients	Estimate	Std. Error	t value	Pr(> t )
Intercept	-1.675124	1.043504	1.605287	0.1102



CMA	-1.41318	1.79915	-0.7855	0.43275
Partn	5.42052	3.21369	1.6867	0.09263
HERF_AD	14.13053	10.33170	1.3677	0.17236
LNASSET	2.14473	0.51543	4.1610	4.067e-05***

R-Squared: 0.12014

Adj. R-Squared: 0.10545

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

---



---

**Model = "random effect"**

t test of coefficients	Estimate	Std. Error	t value	Pr(> t )
Intercept	-10.02863			
CMA	- 3.08009			
Partn	4.15580			
HERF_AD				
LNASSET				

R-Squared: 0.12014

Adj. R-Squared: 0.10545

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

model = "random effect"

t test of coefficients:

Estimate	Std. Error	t value	Pr(> t )
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```

(Intercept) -10.02863  4.19102  -2.3929  0.01722 *
CMA         -3.08009  2.00778  -1.5341  0.12588
Partn       4.15580  2.05138   2.0259  0.04351 *
HERF_LD    -3.84262  3.97707  -0.9662  0.33459
LNASSET     2.04522  0.45188   4.5260  8.158e-06 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.098903
Adj. R-Squared: 0.097559

```

```

model = "fixed effect"

t test of coefficients:

      Estimate Std. Error  t value  Pr(>|t|)
Intercept  1.449373 0.935318  1.549604  0.1247
CMA        -1.68458  2.10044  -0.8020  0.42314
Partn      5.45845  3.33379   1.6373  0.10255
HERF_DD    12.66927  7.19313   1.7613  0.07914 .
LNASSET     2.14876  0.46254   4.6456  4.955e-06 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.11531
Adj. R-Squared: 0.10113

```

#### 4.2. Regressions made with ROA, autocorrelation consistent (HAC) covariance estimation.

```

model = "random effect"

t test of coefficients:

      Estimate Std. Error  t value  Pr(>|t|)

```

(Intercept)	0.013191	0.502811	0.0262	0.97909
CMA	-0.065838	0.064827	-1.0156	0.31050
Partn	0.097250	0.112766	0.8624	0.38904
HERF_AD	-0.338309	0.407468	-0.8303	0.40693
LNASSET	0.076140	0.031872	2.3889	0.01741 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.010838

Adj. R-Squared: 0.0095129

model = "random effect"

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.2371870	0.3475518	-0.6825	0.49539
CMA	-0.0504817	0.0623409	-0.8098	0.41861
Partn	0.1028924	0.1122893	0.9163	0.36011
HERF_LD	-0.0032484	0.4295152	-0.0076	0.99397
LNASSET	0.0742120	0.0334037	2.2217	0.02692 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.005306

Adj. R-Squared: 0.0052339

model = "random effect"

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.055608	0.446454	-0.1246	0.90095

CMA	-0.056030	0.064108	-0.8740	0.38271
Partn	0.098152	0.111784	0.8781	0.38050
HERF_DD	-0.201364	0.344356	-0.5848	0.55908
LNASSET	0.072345	0.031949	2.2644	0.02415 *

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.054271

Adj. R-Squared: 0.04758

#### 4.3. Regressions made with Costincome, autocorrelation consistent (HAC) covariance estimation.

model = "random effect"

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	65.45889	7.33019	8.9300	<2e-16 ***
CMA	0.46437	2.18220	0.2128	0.8316
Partn	-2.54675	2.45095	-1.0391	0.2995
HERF_AD	3.01522	10.03000	0.3006	0.7639
LNASSET	-0.56139	0.62923	-0.8922	0.3729

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.010838

Adj. R-Squared: 0.0095129

model = "random effect"

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )
--	----------	------------	---------	----------

(Intercept)	64.60413	6.28064	10.2862	<2e-16 ***
CMA	0.53619	2.13918	0.2507	0.8022
Partn	-2.59965	2.46196	-1.0559	0.2917
HERF_LD	4.15726	8.76722	0.4742	0.6357
LNASSET	-0.57256	0.62594	-0.9147	0.3609
---				
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
R-Squared: 0.005306				
Adj. R-Squared: 0.0052339				

model = "random effect"				
t test of coefficients:				
	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	59.98281	7.94015	7.5544	3.491e-13 ***
CMA	0.77444	2.24622	0.3448	0.7305
Partn	-2.49366	2.44593	-1.0195	0.3086
HERF_DD	9.95027	11.74671	0.8471	0.3975
LNASSET	-0.56437	0.61156	-0.9228	0.3567
---				
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
R-Squared: 0.0070384				
Adj. R-Squared: 0.0069422				

**4.4. Regressions made with CREDITRISK, autocorrelation consistent (HAC) covariance estimation.**

model = "random effect"				
T test of coefficients:				
	Estimate	Std. Error	t value	Pr(> t )

(Intercept)	4.49444	0.97139	4.6268	5.175e-06 ***
CMA	-0.21334	0.11712	-1.8215	0.0693522 .
Partn	-0.45783	0.32223	-1.4208	0.1562318
HERF_AD	0.78822	1.05469	0.7473	0.4553363
LNASSET	-0.21976	0.06530	-3.3653	0.0008462 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.092356

Adj. R-Squared: 0.091101

model = "random effect"

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	3.610367	0.858324	4.2063	3.274e-05 ***
CMA	-0.157249	0.113690	-1.3831	0.1674728
Partn	-0.460790	0.325196	-1.4170	0.1573512
HERF_LD	1.949961	0.853253	2.2853	0.0228697 *
LNASSET	-0.227229	0.063576	-3.5741	0.0003989 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.10263

Adj. R-Squared: 0.10123

model = "random effect"

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	4.62759	1.02358	4.5210	8.359e-06 ***
CMA	-0.23958	0.10857	-2.2067	0.027962 *
Partn	-0.46024	0.32508	-1.4158	0.157701
HERF_DD	0.49412	1.13399	0.4357	0.663291
LNASSET	-0.21024	0.06464	-3.2524	0.001252 **

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

R-Squared: 0.088101

Adj. R-Squared: 0.078426