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Bank Leverage: Does Currency Diversification Really Matter?

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Bank leverage: does currency diversification really matter?

Justine Pedrono¹ and Aurélien Violon²

¹Aix-Marseille University (Aix-Marseille School of Economics), CNRS & EHESS

²Banque de France - ACPR

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ABSTRACT:

Theoretically, as currency diversification affects directly the total composition of banks collateral, it changes their debt capacity and their resilience to economic shocks. Thus, currency diversification should be relevant to the leverage and the leverage procyclicality. However, empirical investigations on this subject are still missing. Using very confidential data on credit institutions located in France between 1999 and 2014, we examine whether currency diversification is pertinent for both the leverage procyclicality and the determination of leverage. Our results confirm previous analysis on leverage procyclicality and capital structure decision. Regarding currency diversification, our results suggest that the currency dimension is relevant: higher currency diversification implies lower leverage. Finally, including the currency mismatch dimension in our analysis supports the theoretical conclusion. Currency mismatch is mostly irrelevant for the definition of the leverage.

JEL classification: F3, F4, G15

Keywords: procyclical leverage, capital structure, currency diversification, currency mismatch.

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Introduction

With the subprime crisis, leverage procyclicality and leverage determinants have redrawn researchers' intention. On one hand, numerous papers such as Adrian and Shin [2008, 2010], Adrian et al. [2012], Adrian and Shin [2013], Baglioni et al. [2013a] focus on the relationship between the leverage's dynamic and the economic and financial environment. This approach is linked to the financial accelerator theory developed by Bernanke and Gertler [1989]. Banks, and especially investment banks, use their financial assets as collateral to raise funds. As their financial assets are marked to market, they follow the dynamic of the business cycle. During economic boom, the value of asset increases and the banks' leverage goes up. By increasing their investment, banks feed the positive cycle on assets. This mechanism goes along with an endogenous process as developed in Adrian et al. [2012] and it implies that banks follow a Value at Risk rule. Thus, the pre-2008 period was characterized by a leveraging while the post subprime crisis is characterized by a deleveraging of investment banks. On the other hand, recent papers such as Gropp and Heider [2010], Kalemli-Ozcan et al. [2011] focus on the determinants of leverage. This part of the literature uses the classical capital structure theory which combined several lagged explanatory variables such as banks size, profitability and collateral. The attention is not in the leverage growth rate - as for the leverage procyclicality - but on the leverage taken in level. In so doing, they confirm, especially for investment banks, the importance of collateral as a determinant of the leverage.

Additionally, the recent subprime episode has also highlighted the international implication of European global banks on the US financial markets. Following Borio and Disyatat [2011], Baba et al. [2009], McGuire and Von Peter [2012], European banks were largely involved in US money markets by using their local subsidiaries as sources of funding. Because of their large investments in the United States, European banks

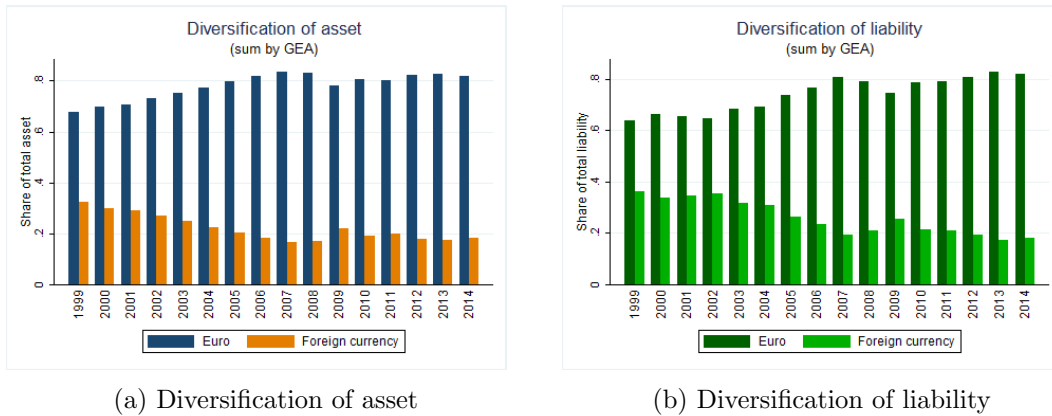


Figure 1: **Balance sheet diversification**

also contributed to the subprime bubble. Considering this international development, European banks are supposed to have some degree of currency diversification of both their assets and their liabilities. Figure 1 confirms this currency diversification for credit institutions located in France. It provides the average share of assets (a) and liabilities (b) denominated in foreign currency or in euro. Unsurprisingly, the euro is dominant over the period. Between 1999 and 2007, its share grown mainly due to the introduction and the enlargement of the currency area. However, currency diversification measuring by the share of assets or liabilities in foreign currency includes a significant part of the banks' balance sheet over the period and it regains weight since 2008.

A currency diversification of asset changes the composition of collateral and the bank's responsiveness to the business cycle. As developed in Pedrono [2015], a bank's balance sheet is expressed in domestic value thereby implying a converting process for assets initially denominated in foreign currency. Thus total collateral of the bank, which is part of total assets, is also affected by this conversion. Additionally to the diversification on credit risk, currency diversification introduces an exchange rate channel on the determination of the leverage. Depending on the exchange rate regime and the correlation between assets in the bank's portfolio, currency diversification affects leverage

determination. Theoretically, when the exchange rate regime is floating and the financial markets are not completely correlated, currency diversification should reduce leverage procyclicality.

Empirically, currency diversification has not been included neither in the analysis of the leverage procyclicality nor in the study of the leverage determinants. Past analyses such as Burgman [1996], Chen et al. [1997], Griffin and Karolyi [1998], Singh and Nejadmalayeri [2004], Akhtar [2005], include an international diversification dimension but, it focuses on the resident non-resident characteristic. Supposing that having external activities does not necessarily imply different currencies, this analysis does take into account the potential exchange rate channel.

Besides the recent renewed interest of academic literature in banking leverage issues, financial regulators have also been more and more focused on this topic over the past few years. In 2010, the Basel Committee on Banking Supervision (BCBS) introduced a leverage ratio as a key component of the Basel III framework.² At the time we are writing this paper, some jurisdictions such as the United States and the United Kingdom have already declared their will to implement a binding minimum leverage ratio requirement in line with the Basel approach. In the European Union, the leverage ratio requirement is still under review by the European Commission. Therefore, knowing that financial regulators are paying closer and closer attention to banking leverage, we believe that shedding light on the relations between currency diversification and leverage characteristics can also be of major interest for banking supervisors.

The purpose of this paper is to feed the current gap in the literature by developing

²In this paper, we define banking leverage as the ratio of assets divided by equity. In the regulatory perspective, the reverse is more frequently used: the leverage ratio divides a capital measure by an exposure measure. Therefore, setting a minimum requirement to the leverage ratio is strictly equivalent to setting a maximum on banking leverage. <http://www.bis.org/publ/bcbs189.pdf>

an empirical analysis on the link between bank leverage and currency diversification. We use innovative micro and confidential data which focus on credit institutions located in French between 1999 and 2014. Accessing to this kind of data gives us all information on the currency breakdown of each bank's balance sheet. To our knowledge this paper is the first attempt to link empirically currency diversification with leverage dynamics. This is the main contribution of this paper. Our results suggest that currency diversification is relevant in the leverage procyclicality and in the leverage's determination. Higher degree of currency diversification reduces the leverage and it affects the procyclicality of the leverage.

The remainder of the paper is organized as follows. Section 1 provides some theory development on leverage procyclicality related to Adrian and Shin [2010, 2013], Pedrono [2015]. Section 2 describes the data set and provides details on the sample selection. Section 3 gives some descriptive statistics on variables we are interested in, with a specific focus on currency diversification. As we want to examine whether the currency diversification is relevant for both part of the literature, section 4 provides details on the two models we use. Results are given in section 5.

1 Theory on leverage procyclicality

Following Adrian and Shin [2010, 2013], the leverage procyclicality is derived from the definition of the Value at Risk (VaR) and the fact that banks are dynamic in the management of their balance sheet. Considering a random variable A for the value of asset at a given horizon, the VaR can be defined as the maximum loss V of asset value A_0 with given probability. Formally, the banks Value-at-Risk at confidence level c relative

to some base level A_0 is smallest non-negative number V such that:

$$Prob(A \leq A_0 - V) \leq 1 - c \quad (1)$$

Then, the VaR rule stipulates that banks maintain a sufficient amount of equity E to cover potential loss V such that:

$$E = V \quad (2)$$

To be solvent, bank adjusts its exposure when the situation is more risky. Thereby, bank brings its VaR back in line with its equity.

Bank's leverage λ is defined as a ratio of total asset over equity such that:

$$\lambda = \frac{A}{E} = \frac{A}{V} = \frac{1}{v} \quad (3)$$

$$\text{where : } v = \frac{V}{A}$$

Where v is the unit VaR that we can interpret as a risk premium. As demonstrated in Adrian and Shin [2010, 2013], v is counter-cyclical. It means that leverage goes positively with total asset.

Introducing currency diversification changes the definition of total asset. Note A the domestic asset in domestic currency and A^* the foreign asset in foreign currency. Thereby, total asset expressed in domestic currency is the sum of A and SA^* where S

is the exchange rate. The leverage becomes:

$$\lambda = \frac{A + SA^*}{E} = \frac{A + SA^*}{V} = \frac{1}{v} \quad (4)$$

$$\text{where : } v = \frac{V}{A + SA^*}$$

Adding a foreign asset changes the definition of the risk premium which now depends on both assets expressed in domestic currency. It follows that leverage is still positively related to total asset but this relationship depends on the degree of currency diversification. If both assets are positively correlated but not completely, and if the exchange rate regime is fixed, the introduction of a second asset diversifies the credit risk. The leverage procyclicality is thereby reduced.

Consider a floating exchange rate regime with a cyclical domestic currency as euro is supposed to be. Following Pedrono [2015], floating exchange rate implies additional space capacity on the bank's balance sheet. As balance sheets are expressed in domestic currency, the converting process affects the weight of assets within the bank's portfolio. Under these assumptions, a floating regime implies a growing share of the asset that offers higher returns. Space capacity on the bank's balance sheet is thereby going up. Compared to fixed exchange rate, it increases procyclicality. However, it results from the combination of the two effects a decrease in the leverage procyclicality.

Following this literature, currency diversification is challenging leverage procyclicality through its impact on total asset. Our main focus should be on the interaction term between total asset and currency diversification.

Additionally, the theoretical results suggest that currency mismatch is irrelevant for

the leverage procyclicality. As leverage is driven by the composition of assets, currency diversification of liability does not affect the relationship. This empirical analysis is a great opportunity to verify whether currency mismatch is pertinent.

2 Data set and sample selection

Our sample consists of french and foreign credit institutions located in France. Data are collected by the french banking supervision authority known as the ACPR. Data are on a yearly basis from 1999 to 2014 included.

A first sample selection is directly applied within the request conditions of the data. Thus, our data concern all institutions that are subject to the monetary statistic.³ For the other institutions, there is a selection on the total amount in foreign currency of their balance sheet: institutions with less than 800 million euros in foreign currency are excluded to the sample.

We add two other sample selections to built sub-samples. First, we keep credit institutions which have a minimum of 5 years occurrence over the period. It brings more stability on our sample. Second, we identify investment banks and commercial banks by following the methodology of Baglioni et al. [2013b]. Contrary to the United States, banks in France can make both operations under the same entity. There is no distinction between commercial and investment banks. Under these circumstances, they are called universal. However, according to Adrian and Shin [2013] investment banks are supposed to be more procyclical. Thus, a credit institution is identified as a commercial bank if its ratio interest product to net banking income is higher than the median value of the total sample.

³It includes all institutions that are large enough to be under the scope of the ECB for the monetary policy.

Because of bankruptcies, sample selection and merger acquisitions, our panel is unbalanced. Figure 1 illustrates the evolution of our sample. We have a total of 529 observations over the period for the all sample (red line) with a minimum of 21 observations in 2013 and a maximum of 43 observations in 2006. The decline in observations since 2006 can be partly explained by the concentration of the french banking system. Introducing the constraint of a 5 years occurrence (blue line) reduces the sample size for each period.

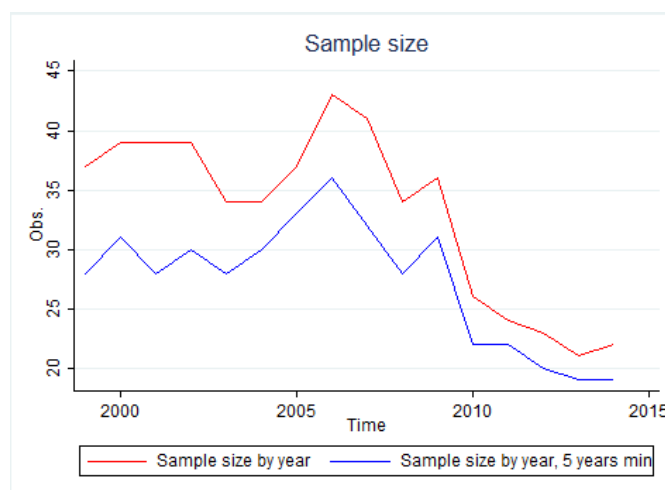


Figure 2: **Sample size.** The red line consists of credit institutions located in France. Institutions are either subject to monetary statistics or they have at least 800 million euros in foreign currency in their balance sheet. The blue line illustrates the institutions that have at least a five years occurrence over the period.

The final data set brings together two types of data. First, we focus on classical accounting data such as total asset, collateral, equity, net income and interest product. Those data can be collected at a different level of consolidation depending on the credit institution. For large and international institutions, data are consolidated using the IFRS accounting standards. Smaller parent institutions provide consolidated data and

use french accounting standards (FRGAAP). Finally, stand-alone institutions provide unconsolidated data.

As we are interested in the global banks' strategy, we institute a prioritization rule which says that the higher level of consolidation will be always preferred for each period. With years, consolidated data becomes more and more dominant. In 2014, all the data are consolidated. As the three different levels of consolidation may imply different rules and definitions of the balance sheet components, we control for it in our analysis.

The second type of data includes foreign currency exposures. On the asset side, we get the currency breakdown of credits and debt securities, while the liability is composed of total deposits and debt issued. The currency breakdown is given for 5 major currencies known as the euro, the US dollar, the Japanese yen, the Swiss franc and the Pound sterling.⁴ As data are expressed in euro, the exchange rate channel is already included in the final degree of currency diversification.

Exposures in currencies are unconsolidated. As our interest is on the global analysis of banking groups, we need to build a proxy of consolidated diversification. The solution we choose consists in adding up currency exposures of all affiliates in the same banking group. Thereby, currency diversification of a banking group is measured through a ratio of total amount denominated in a given currency relative to the total amount in all currencies.

This measure may have two issues. First, there is a risk of a double counting because of intra-group flows. However, as long as diversification is a ratio, the double counting issue appears in both the numerator and the denominator. It mitigates the risk. Second,

⁴The Pound sterling is only available since 2003. Before 2003, it was included in the "other" category.

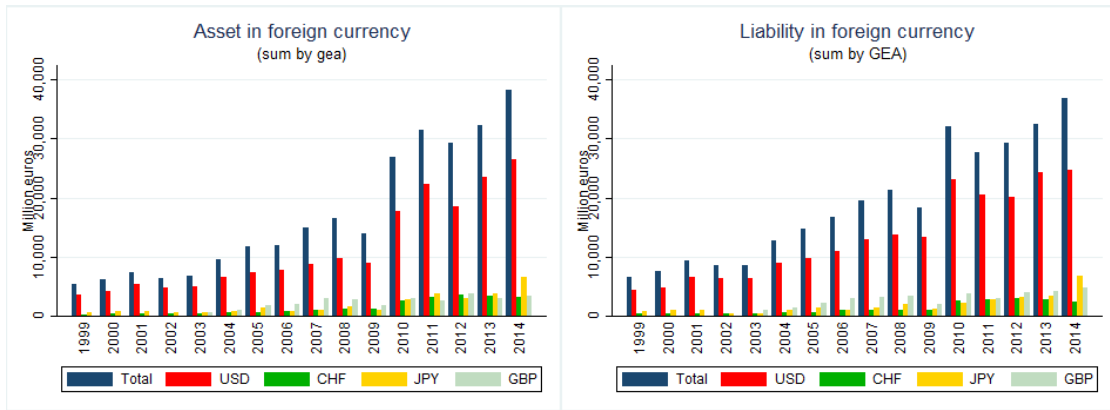
unconsolidated data do not include exposures of affiliates abroad. Thus, this measure of currency diversification might underestimate the true degree of diversification of a banking group.

An alternative of this measure of currency diversification consists in keeping the exposures of the head of the group only. However, this alternative shows really thin differences with our measure, except for cooperative banking groups. As cooperative banking groups are more decentralized, we believe that our measure better captures the overall currency diversification of these groups.

3 Descriptive statistics

Figure 3 provides the foreign currency breakdown of assets and liabilities over the past fifteen years. For both sides of the balance we observe a growing trend of activities denominated in foreign currencies as developed in Borio and Disyatat [2011], Baba et al. [2009], McGuire and Von Peter [2012]. Despite this global progression, two main shocks are observable. The financial crisis and the US dollar shortage stand out with the slow-down of 2008 and the decline of 2009, while the disturbances due to the euro area debt crisis show up in 2011 and 2012.

With no surprise, the US dollar is the first foreign currency for both assets and liabilities. Another currency also emerges from figure 3 especially in the recent years, the Japanese yen. As observed in McGuire and Von Peter [2012], the Japanese yen has always been part of the foreign assets and liabilities for the past twenty years. However, before the crisis European banks were also highly dependent on US money markets even for non US areas like Asian countries thereby creating an asymmetry in their balance sheet. In the recent years, Japanese yen gains weight which might translate an adjustable



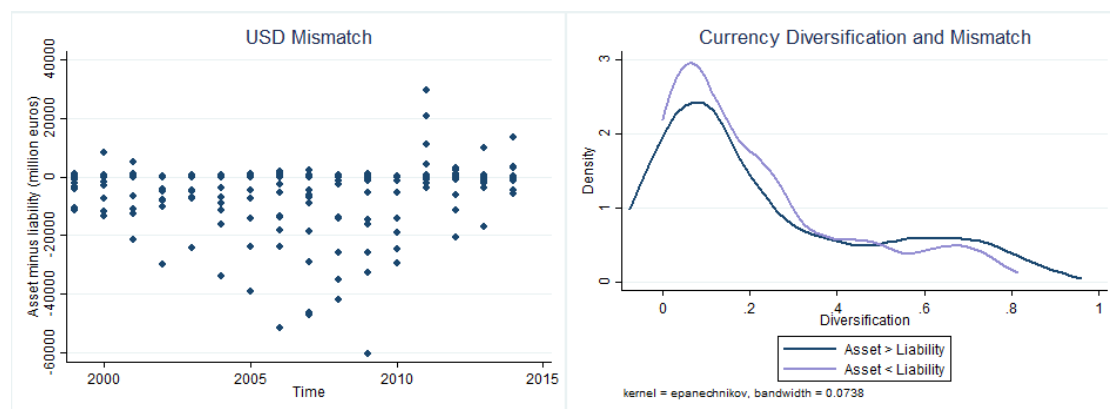
(a) Asset

(b) Liability

Figure 3: **Currency breakdown of foreign currency exposures**

strategy from European banks. It becomes the second foreign currency for assets in 2011 2013 and 2014 as illustrated in figure 5)a, and it is the second foreign funding currency in 2014 as illustrated in in figure 5)b. This recent evolution of the Japanese yen is also generalized worldwide. Between 2010 and 2013, Japanese yen has known the most important jump in trading activity according to BIS-Survey [2013]. Since the last survey in 2010, trading in Japanese yen increased by 63% and the turnover in the USD/JPY pair rose by 70% in this period. As a result, the yen expended its worldwide share in FX trading by 4%. The confirming recovery of banking activity in 2014 highlighted in BIS-Quarterly-Review [March 2015] has probably contributed to the 2014 yen boom in France. Among the advanced economies, the revival of cross-border bank lending to Japan stands out with a annual percentage changes higher than 15% for the second half of 2014. Additionally, between the end of 2010 and the end of 2014, the annual percentage changes of cross-border claims in Japanese yen was positive while the US dollar fluctuated between positive and negative percentage rates. Finally, the combination of large cross-border claims to Japan with accommodating monetary policy in Japan may have encourage french banks' funding in Japanese yen in 2014 as observed in figure 5)b.

Figure 3 also highlights a potential currency mismatch between assets and liabilities with a dominance of the latter. These results might seem different to McGuire and Von Peter [2012] - where net foreign positions for French banks is positive - but it is not. We are looking at the positions in foreign currency where euro is excluded while it is included in the McGuire and Von Peter [2012] all currencies net positions. Focusing on US dollar exposures, figure 4)a. confirms the currency mismatch by plotting the difference between assets and liabilities denominated in US dollar. Despite the heterogeneity between credit institutions, the pre-crisis period is characterized by a growing US dollar currency mismatch which confirms the balance sheet asymmetry. In McGuire and Von Peter [2012], we find also negative foreign positions in US dollar in several periods before 2009.⁵ In both analysis, the crisis seems to have a readjustment effect where currency mismatches reduces since 2007.



(a) Currency mismatch

(b) Mismatch and distributions (1999-2014)

Figure 4: **Currency mismatch**

Theoretically, currency mismatch is not supposed to affect the leverage procyclicality. However, we include this dimension in our analysis in order to see whether it is relevant

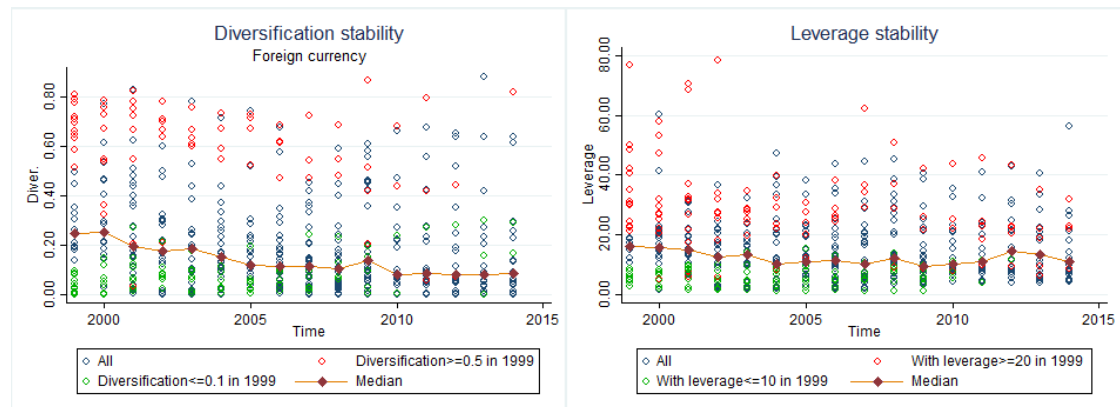
⁵Especially for 2001-2002Q2, 2003Q2-2003Q3, 2004Q4, 2005Q4, and 2008. However, they focus on net foreign positions while we focus on net positions including domestic and foreign positions.

or not. We identify with a dummy credit institutions that have a positive mismatch with higher assets in foreign currency and credit institutions with a negative currency mismatch. With such a distinction, we might think that the dummy would capture the degree of currency diversification of asset but it is not. Figure 4)b. plots the currency diversification of asset for the two types of credit institutions. As both distributions include high degree of currency diversification and similar shape, the introduction of the mismatch position should not diminish the effect of diversification in estimations.

Despite the growing trend of activities in foreign currency, banking activities denominated in euro have grown rapidly because of the euro area development. Thereby reasoning in ratio as for the currency diversification, there is a general decline of currency diversification as illustrated in figure 5)a. with the median.

Figure 5) also highlights two characteristics of the two variables we are interested in. For both the currency diversification of asset figure 5)a. and the leverage figure 5)b., graphs show the presence of heterogeneity. For each variable there is a concentration of institutions below the median while the upper distribution of the two variables is less concentrated. Second, distributions of each variable are quite stable over time. In figure 5)a. red circles consist of credit institutions that had a currency diversification higher than 0.5 in 1999, while green circles represent institutions with a currency diversification lower than 0.1 in 1999. Figure 5)a. suggests that there is no reversal of the situation. The highest diversified institutions stay highly diversified over time while the lowest diversified institutions stay in the bottom distribution except for some institutions in the recent years. This assessment is also true for the leverage in figure 5)b. Credit institutions with leverage higher than 20 in 1999 are in red while institutions with leverage lower than 10 in 1999 are in green. The stability in the leverage distribution has been well documented by Lemmon et al. [2008]. According to this analysis, the stability in

distributions might imply some identification issues when using banks fixed effect methods in regressions.



(a) Currency diversification of asset

(b) Leverage

Figure 5: **Heterogeneity and constant distributions**

Finally, table 1 presents summary statistics for all variables included in our analysis where size is the logarithm of total asset, Δ Leverage and Δ Asset are the annual growth rate of leverage and asset respectively. Profit. is a ratio of net income over total asset and it measures the profitability of credit institutions. Diver is the currency diversification for either the total foreign currency or the US dollar.⁶ The standard deviation, minimum and maximum confirm the presence of heterogeneity in our sample. For instance, the collateral ratio, defined as a ratio of all debt securities over total asset, highlights the presence of heterogeneity. Some credit institutions do not have any collateral while others mainly have financial assets in their total asset with a maximum of 81%.

⁶The complete definitions of variables are provided in the appendix.

Table 1: **Summary statistics**

These summary statistics are for the complete sample over the period 1999-2014. This table presents variable averages, standard deviation, minimum and maximum. Variable definitions are provided in the appendix.

Variable	Mean	Std. Dev.	Min.	Max.	N
Leverage	16.04	12.67	1.14	78.68	529
Size	8.52	2.81	2.76	14.5	529
Δ Leverage	-0.02	0.25	-1.43	1.19	444
Δ Asset	0.03	0.22	-1.6	1.1	444
Profit.	0.01	0.02	-0.05	0.2	529
Coll. Ratio	0.2	0.2	0	0.81	529
Diver_DEV	0.23	0.23	0	0.88	529
Diver_USD	0.17	0.2	0	0.84	529
Mismatch position	0.5	0.5	0	1	529
Conso	0.63	0.48	0	1	529
IFRS	0.23	0.42	0	1	529
Off BS	0.29	0.48	0	4.02	529

4 Models

There are two approaches available for this analysis. First, we focus on the approach proposed by Adrian and Shin [2008]. They focus on the procyclicality of the leverage while the second approach looks at the determinants of the leverage in level.

4.1 Leverage procyclicality and currency diversification:

Adrian and Shin [2008] develop a dynamic model which links changes in leverage with changes asset thereby confirming the procyclicality of the leverage. By showing a strong and positive relationship, they demonstrate that financial intermediaries adjust their balance sheet actively. In their model, the dependent variable is the log difference of leverage Δ Leverage and the variable of interest is the log difference of total asset Δ Asset. Thanks to this specification they also highlight that the leverage is a mean reverting process with a negative relationship between the dependent variable and the

lagged value of leverage in log.

As explained in section 1 currency diversification should challenge leverage procyclicality through its impact on total asset. We introduce in this model an interaction variable between changes in asset and currency diversification at the previous period thereby capturing the impact of currency diversification. We add *Divers* which measures the degree of currency diversification at the previous period. *Divers* is part of the control variables as our interest is really on the interaction term. The complete specification is of the form:

$$\begin{aligned} \Delta Leverage_{i,t} = & \alpha + \beta_1 \ln(Leverage_{i,t-1}) + \beta_2 \Delta Asset_{i,t} \\ & + \beta_3 (\Delta Asset_{i,t} \times Divers_{t-1}) + \delta Controls + \gamma FE_{time} + u_{i,t} \end{aligned} \tag{PRO}$$

Where Δ represents the difference between t and $t - 1$. We introduced three control variables in *Controls* in addition to *Diver*. First, we define a ratio of total off-balance to total asset and we keep the log-difference of it. This variable would control for extra financial instruments such as financial derivatives and guarantees. Second, we use a dummy *Conso* which is equal to 1 if the data are consolidated. Finally, we introduce another dummy *IFRS* which is equal to 1 if credit institutions are under the IFRS accounting standards. These two dummies control for the different sources we have explained in section 2. They are also taken in difference. As we want to see whether the mismatch position is relevant or not for the leverage procyclicality, we introduce a dummy *Mis. pos* which is equal to 1 if total asset denominated in foreign currency is higher than total liability denominated in foreign currency. Finally, we control time fixed effect in order to capture crisis and changes in regulation. $u_{i,t}$ is the term of error.

Despite its interesting approach, this first specification may have several econometric issues. First, the lagged value of leverage might be linked to the error term because of the dynamic specification thereby introducing an endogenous issue. Second, as the dependent variable and the explanatory variable *Asset* are contemporaneous, it is difficult to identify the causality of the relationship. As an alternative, we develop a second approach relative to the literature on capital structure.

4.2 Currency diversification as a determinant of the leverage:

The capital structure approach focuses on the determinants of the leverage in level. In this global approach, all variables are in level and the explanatory variables are lagged as in Gropp and Heider [2010]. This specification reduces the endogeneity issue encountered by the first approach. Two main theories feed this approach, the trade-off theory from Kraus and Litzenberger [1973] and the pecking order theory from Myers and Majluf [1984]. All together, they identify four main determinants of the leverage.

The trad-off theory suggests that *Size* affects positively the leverage. Larger institutions benefit from an implicit protection against bankruptcy because of their too big to fail position. There is less risk for creditors and the cost of raising debt decreases. Banks have thereby an incentive to increase their leverage.

Regarding profitability captured by the variable *Profit*, the trade-off theory predicts that higher profitability decreases the cost of raising debt because of the good signal sent to creditors. Thus, the relationship should be positive. On the contrary, the pecking-order theory suggests a negative relationship. Institutions with large profits would prefer to use this resource instead of new to debt or additional equity. In fact issuing new debt or increasing equity is quite costly for the bank.

According to the trade-off theory, the collateral measured by the variable *Coll. ratio* gives a guarantee for the creditors of the institution. Considering that more collateral reduces the cost of debt, banks should have higher leverage.

Literature on multinational companies⁷ put forward two potential and opposite effects on leverage through the internationalization. According to the trade-off theory, internationalization should allow to reduce bankruptcy costs due to the diversification advantages such as credit risk diversification. Thus, considering currency diversification as a proxy of internationalization we might expect a positive relationship between leverage and currency diversification. However, the agency cost theory also predicts that multinational firms should have more difficulties to monitor their total activities thereby increasing the agency costs. This last effect should discourage leverage. Supposing that currency diversification with *Diver* might be a proxy of internationalization, the expected sign of the relationship is not clear because of the two effects.

Finally, as our interest in on the effect of currency diversification on leverage through the value of total collateral, we introduce an interaction term between the collateral ratio and the currency diversification. We expect to have a negative sign of the coefficient β_5 .

The final specification is of the form:

$$\begin{aligned} \text{Leverage}_{i,t} = & \alpha + \beta_1 \text{Size}_{i,t-1} + \beta_2 \text{Profit}_{i,t-1} + \beta_3 \text{Coll. ratio}_{i,t-1} + \beta_4 \text{Divers}_{i,t-1} \\ & + \beta_5 (\text{Coll. ratio}_{i,t-1} \times \text{Divers}_{i,t-1}) + \delta \text{Controls} + \gamma FE_{time} + u_{i,t} \end{aligned} \tag{CAP}$$

Where the *Controls* variable includes same variables as in the first approach *Off BS*, *Conso*, *IFRS* and *Mis. pos* except that they are in level.

⁷Burgman [1996], Chen et al. [1997], Griffin and Karolyi [1998], Akhtar [2005]

5 Empirical findings

We use three econometric methods. We start with Ordinary Least Squares (OLS) with time fixed effect. As our sample includes a long period where banks faced regulatory changes and crisis, the time fixed effects may capture that changes over time. Then, we use the Least Squares Dummy Variable (LSDV) with time fixed effect and pooled sample by nationality. Depending on the nationality of the bank, the decision of capital structure or the leverage responsiveness to asset might be different. Thus, the pooled sample would control for these specificities. Finally, we introduce bank fixed effect (FE) with time fixed effect. As our sample implies a lot of heterogeneity, we introduce these last fixed effects to control for the banks' unobserved heterogeneity.

For each method, four samples are studied. In (1) we include all observations without additional restrictions. It corresponds to credit institutions subject to monetary statistics or credit institutions with at least 800 million euros in foreign currency in their balance sheet. Then, we keep in (2) only institutions with a minimum of 5 years occurrence over the period. As previous empirical research have shown difference in leverage between investment banks and commercial banks, (3) only includes institutions that have been identified as commercial banks. In the last sample (2+3), we combine the last two constrains and keep commercial banks with at least 5 years occurrence. Finally, standard errors are clustered and we performed unit root tests on each variable.

5.1 Currency diversification and leverage procyclicality:

Table 4 reproduces similar results as in Adrian and Shin [2008]. With a negative and significant coefficient for all specifications, we can confirm the mean reverting process

of the leverage. All coefficients relative to the growth rate of asset are positive and significant. It validates the theory of procyclicality.

When we focus on commercial banks at in (3), coefficients relative to asset growth rate increase. It suggests that commercial banks are more procyclical which contradicts the previous results in the literature. However, imposing a distinction between the two type of banks might be questionable. For instance, the biggest institutions are clearly involved in both activities.

Our main variable of interest is the interaction term between the growth rate of asset and the lagged value of currency diversification. It is supposed to capture the effect of currency diversification on leverage procyclicality through its impact on asset growth rate. However, coefficients alternate between positive and negative values and they are not significant for any sample and methods. This absence of result may come from the combination of the two opposite effects of the currency diversification we explained in section 1. It can be also explained by the construction of the variable which multiplies two variable close to 0.

The second variable of interest is the lagged currency diversification. For all specification and samples, coefficients are negative. Once we control for the nationality of credit institutions the coefficient becomes significant. The value of coefficient continues to increase with the bank fixed effect. Higher currency diversification leads to a decrease in leverage growth rate.

We introduce the mismatch position in table 5. Although the theory suggests that currency mismatch should not enter in the leverage dynamic, all coefficients are negative and some of them are significant. However, they are significant only for three specifica-

tions over the twelve developed here and their coefficients are between -0.03 and -0.05.

5.2 Currency diversification and capital structure:

Capital structure decision tries to identify determinants of leverage. Table 6 brings together results from the different methods and sample when the mismatch position is not included.

Regarding the three main determinants identified by the literature - known as size, profitability and collateral - our results confirm both theories depending on the variable. Size is positive and significant for all specifications thereby confirming the trade-off theory. The largest institutions may benefit from an implicit protection which reduces their cost of raising debt. Thus, larger institutions tend to have higher leverage. The profitability is negative and significant for all samples in OLS and LSDV. These results confirm the pecking order theory where banks prefer to use their profit instead of raising new debt. The collateral ratio is positive and significant for all the OLS and the LSDV thereby supporting the trade-off theory. Considering that collateral offers a protection for the creditors, banks benefit from lower cost of debt which leads to higher leverage.

With positive and significant coefficients for all OLS and the complete sample in LSDV, currency diversification seems to provide diversification advantages such as credit risk diversification.

The interaction term between the collateral ration and the currency diversification is supposed to capture the effect of currency diversification on leverage through the collateral ratio. The coefficient of this interaction term is negative for all specifications and significant for commercial banks using OLS, for commercial banks with a minimum of

5 years occurrence using OLS and for all LSDV. These results support the theoretical conclusion of Pedrono [2015]. Currency diversification affects the leverage responsiveness to collateral.

According to the differences in adjusted R^2 between the OLS and the LSDV, the nationality of banking groups seems to be relevant in our analysis. For each sample, the introduction of the nationality clearly improved the adjusted R^2 . It also consists of an intermediate step before the banks' fixed effects.

Most of the significant results developed in the previous lines are not valid when we introduce banks' fixed effects. This assessment is in line with the previous literature such as Gropp and Heider [2010], Lemmon et al. [2008]. As explained in Lemmon et al. [2008], the lack of variations in variables makes it difficult to distinguish them from the banks fixed effects. Figure 5 in section 3 illustrates this stability for the currency diversification and the leverage.

Results including the mismatch position are developed in table 7. As expected in the theory, currency mismatch is not pertinent except for the complete sample in banks' fixed effects. Despite our attentions developed in section 3, its introduction may have captured part of the currency diversification effect. Currency diversification is no more significant for the commercial banks using OLS, the commercial banks with a minimum of 5 years occurrence using OLS, and the complete sample using LSDV.

5.3 Additional findings

Instead of looking at the total foreign currency, we focus on the US dollar diversification. The coefficients and the significance of the variable *Diver* increases in the PRO specification while it implies lower coefficients and significance in the CAP specification.

The data we have start in 1998. However, the period we focus on is 1999-2014. As we have lagged explanatory variables, the first observation of leverage is in 2000. Changing the period from 1999-2014 to 1998-2014 implies that some explanatory variables are outside the euro area period thereby introducing potential structural issues. However, including the all period from 1998 to 2014 does not change the coefficients but it impacts the significance of a limited number of coefficients.

Instead of using the accounting definition of the leverage, we might adopt a definition more in line with the regulatory framework. Such an alternative is the Basel III definition which replaces equity by TIER1 and adds the off balance sheet to asset. With this new definition, leverage is less procyclical or even no procyclical. These results are also highlighted in the past literature.

The dummy *Mis. pos* is quite limited in its definition because it does not capture the size of the mismatch. An alternative is to define a ratio of the currency mismatch over total asset. However, this new measurement definitely captures the degree of currency diversification of asset.

Conclusion

Using a very confidential data set on credit institutions located in France between 1999 and 2014 enables us to examine whether currency diversification is relevant for both the leverage procyclicality and the determination of leverage. Theoretically, as currency diversification affects directly the total composition of banks collateral, it changes their debt capacity and the determination on their leverage.

This paper implies two main contributions. First, it feeds a gap in the empirical literature which does not include currency diversification in the determinants of the leverage. Second, these micro data are very innovative. They provide information on the currency breakdown of each credit institution's balance sheet.

Our results confirm previous analysis on leverage procyclicality and leverage determinants. It suggests also that currency diversification is relevant for determination of leverage. Higher degree of currency diversification seems to reduce leverage. Moreover, the currency diversification affects leverage through the collateral. This last result supports previous theoretical findings developed in Pedrono [2015].

Concerning the leverage procyclicality, our conclusions do not meet our expectations. Currency diversification is composed of two opposite effects. We still need to concentrate our efforts on this potential decomposition in order to distinguish the two effects.

The descriptive statistics in section 3 highlighted several breaks in global trends starting with the crisis in 2008. For instance currency diversification regains weight in the recent years, and the leverage distribution shows more volatility. It might be interesting to control for the two periods around the crisis.

Furthermore, the study of procyclicality may imply some issues relative to endogeneity and contemporaneous causality. Further investigations on econometric methods are necessary to threat these potential issues.

References

- T. Adrian and H. S. Shin. Liquidity and financial cycles. *BIS WP 256*, 2008.
- T. Adrian and H. S. Shin. Liquidity and leverage. *Journal of financial intermediation.*, 2010.
- T. Adrian and H. S. Shin. Procyclical leverage and value-at-risk. *NBER WP 18943*, 2013.
- T. Adrian, H. S. Shin, and J.-P. Zigrand. Procyclical leverage and endogenous risk. *Princeton University*, 2012.
- S. Akhtar. The determinants of capital structure for australian multinational and domestic corporations. *Australian journal of management*, 30:321–341, 2005.
- N. Baba, R. McCauley, and S. Srichander Ramaswamy. Us dollar money market funds and non-us banks. *BIS Quarterly Review*, 2009.
- A. Baglioni, E. Beccalli, A. Boitani, and A. Monticini. Is the leverage of european banks procyclical? *Empirical Economics*, 45:1251–1266, 2013a.
- A. Baglioni, E. Beccalli, A. Boitani, and A. Monticini. Is the leverage of european banks procyclical? *Empirical Economics*, 43:1251–1266, 2013b.
- B. Bernanke and M. Gertler. Agency costs, net worth, and business fluctuations. *American Economic Review*, 79:14–31, 1989.
- BIS-Quarterly-Review. Highlights of global financing flows. *BIS Quarterly Review*, March 2015.
- BIS-Survey. Foreign exchange turnover in april 2013: preliminary global results. *Triennial Central Bank Survey, BIS*, 2013.

- C. Borio and P. Disyatat. Global imbalances and the financial crisis: Link or no link? *BIS WP 346*, 2011.
- T. Burgman. An empirical examination of multinational corporate capital structure. *Journal of international business studies*, 27:553–570, 1996.
- C. Chen, A. Cheng, J. He, and J. Kim. An investigation of the relationship between international activities and capital structure. *Journal of international business studies*, 28:563–577, 1997.
- J. Griffin and A. Karolyi. Another look at the role of the industrial structure of markets for international diversification strategies. *Journal of financial economics*, 50:351–373, 1998.
- R. Gropp and F. Heider. The determinants of bank capital structure. *Review of finance*, 14:587 – 622, 2010.
- S. Kalemli-Ozcan, B. Sorensen, and S. Yesiltas. Leverage across firms, banks and countries: some evidence from banks. *NBER WP 17354*, 2011.
- A. Kraus and R. Litzenberger. A state-preference model of optimal financial leverage. *Journal of Finance*, 28:911–922, 1973.
- M. Lemmon, M. Roberts, and J. Zender. Back to the beginning: persistence and the cross-section of corporate capital-structure. *Journal of Finance*, 63:1575–1608, 2008.
- P. McGuire and G. Von Peter. The us dollar shortage in global banking and the international policy response. *International Finance*, 15:155–178, 2012.
- S. Myers and N. Majluf. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13:187–221, 1984.

J. Pedrono. Banking leverage with currency diversification. *AMSE WP*, 2015.

M. Singh and A. Nejadmalayeri. Internationalization, capital structure, and cost of capital: evidence from french corporations. *Journal of multinational financial management*, 14:153–169, 2004.

6 Appendix

.1 Variable definitions

Table 2: Variable definitions

<i>Leverage</i>	$\frac{Asset}{Equity}$
Δ <i>Leverage</i>	Growth rate of leverage
Δ <i>Asset</i>	Growth rate of asset
<i>Size</i>	$\ln(Asset)$
<i>Profit.</i>	$\frac{Net\ income}{Asset}$
<i>Coll. ratio</i>	$\frac{Collateral}{Asset}$
<i>Divers</i>	$\frac{Asset\ denominated\ in\ foreign\ currency}{Asset}$
<i>Commer.</i>	=1 if $\left(\frac{Interest\ product}{Net\ Banking\ Income}\right)_i > \left(\frac{Interest\ product}{Net\ Banking\ Income}\right)_{median(i...N)}$
<i>Conso</i>	=1 if data are consolidated
Δ <i>Conso</i>	Changes in <i>Conso</i>
<i>IFRS</i>	=1 if banks report data using IFRS standards
Δ <i>IFRS</i>	Changes in <i>IFRS</i>
<i>Off BS</i>	$\frac{Off-balance\ sheet}{Asset}$
Δ <i>Off BS</i>	growth rate of <i>Off BS</i>

.2 Correlation

Table 3: Variance co-variance matrix (1999-2014)

	<i>Leverage</i>	Δ <i>Leverage</i>	<i>Size</i>	Δ <i>Asset</i>	<i>Profit</i>	<i>Coll. ratio</i>	<i>Divers.</i>	<i>Off BS</i>	<i>Mis Pos</i>
<i>Leverage</i>	1.0000								
	529								
Δ <i>Leverage</i>	0.1993*	1.0000							
	0.0000								
	529	444							
<i>Size</i>	0.4931*	0.0337	1.0000						
	0.0000	0.4792							
	529	444	529						
Δ <i>Asset</i>	0.2127*	0.6229*	0.1776*	1.0000					
	0.0000	0.0000	0.0002						
	529	444	529	444					
<i>Profit</i>	-0.3287*	-0.0832	-0.1815*	0.0235	1.0000				
	0.0000	0.0799	0.0000	0.6213					
	529	444	529	444	529				
<i>Coll. ratio</i>	0.1891*	-0.0225	0.1693*	0.0270	0.1261*	1.0000			
	0.0000	0.6359	0.0001	0.5708	0.0037				
	529	444	529	444	529	529			
<i>Divers.</i>	-0.0378	-0.0219	-0.3192*	-0.0630	-0.1171*	-0.2143*	1.0000		
	0.3852	0.6459	0.0000	0.1852	0.0070	0.0000			
	529	444	529	444	529	529	529		
<i>Off BS</i>	-0.1273*	-0.0612	-0.0091	-0.0613	-0.0032	-0.1231*	-0.1323*	1.0000	
	0.0034	0.1979	0.8348	0.1971	0.9408	0.0046	0.0023		
	529	444	529	444	529	529	529	529	
<i>Mis Pos</i>	-0.1864*	-0.0148	-0.1974*	-0.1131*	0.0811	-0.1130*	0.0664	0.0437	1.0000
	0.0000	0.7552	0.0000	0.0171	0.0623	0.0093	0.1272	0.3155	
	529	444	529	444	529	529	529	529	529

.3 Empirical results

Table 4: Procyclical leverage and currency diversification

Dependant variable :

$\Delta Leverage$

Four sample are studied. (1) corresponds to the global sample without restriction. (2) only includes institutions with a minimum of 5 years occurrence. (3) includes institutions that have been identified as commercial banks. Three methods are used: Ordinary Least Squared (OLS) with time fixed effect ; Least Squares Dummy Variable (LSDV) with time fixed effect and pooled sample by nationality ; bank fixed effect (FE) with time fixed effect. Standard errors are clustered.

	OLS (1)	OLS (2)	OLS (3)	OLS (2+3)	LSDV (1)	LSDV (2)	LSDV (3)	LSDV (2+3)	FE (1)	FE (2)	FE (3)	FE (2+3)
$\ln(Leverage_{t-1})$	-0.03*** (0.01)	-0.03*** (0.01)	-0.06*** (0.02)	-0.05*** (0.02)	-0.04*** (0.01)	-0.04*** (0.01)	-0.08*** (0.02)	-0.07*** (0.02)	-0.21*** (0.05)	-0.20*** (0.05)	-0.14** (0.06)	-0.15** (0.06)
$\Delta Asset_t$	0.72*** (0.11)	0.79*** (0.12)	0.79*** (0.14)	0.86*** (0.16)	0.74*** (0.06)	0.81*** (0.06)	0.83*** (0.09)	0.91*** (0.09)	0.79*** (0.10)	0.77*** (0.11)	0.91*** (0.16)	0.89*** (0.16)
$(\Delta Asset_t \times Divers_{t-1})$	0.07 (0.26)	0.06 (0.28)	-0.16 (0.43)	-0.30 (0.46)	0.05 (0.20)	0.04 (0.20)	-0.17 (0.28)	-0.30 (0.31)	-0.03 (0.21)	0.13 (0.19)	-0.37 (0.39)	-0.37 (0.38)
$Divers_{t-1}$	-0.04 (0.05)	-0.06 (0.05)	-0.06 (0.10)	-0.05 (0.09)	-0.07* (0.04)	-0.11*** (0.04)	-0.14** (0.07)	-0.14** (0.07)	-0.47*** (0.17)	-0.53*** (0.18)	-0.84** (0.39)	-0.87** (0.39)
$\Delta Off BS$	.	.	.	.	.	.	.	.	.	.	.	.
$\Delta IFRS$	.	.	+	+	.	+	+	+	.	.	+	.
$\Delta conso$	.	.	.	.	.	.	.	.	.	.	.	.
Constant	0.07** (0.03)	0.07** (0.03)	0.12** (0.06)	0.10* (0.06)	0.12** (0.05)	0.15*** (0.05)	0.26*** (0.09)	0.26*** (0.09)	0.61*** (0.13)	0.58*** (0.13)	0.52** (0.21)	0.55** (0.22)
FE Time	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Polled FR	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO
Adjusted R ²	0.44	0.49	0.48	0.48	0.44	0.50	0.50	0.51				
Within R ²									0.63	0.63	0.72	0.71
Nbre d'obs.	412	367	209	196	412	367	209	196	412	367	209	196

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 5: Procyclical leverage and currency diversification with currency mismatch position

Dependant variable :

$\Delta Leverage$

Four sample are studied. (1) corresponds to the global sample without restriction. (2) only includes institutions with a minimum of 5 years occurrence. (3) includes institutions that have been identified as commercial banks. Three methods are used: Ordinary Least Squared (OLS) with time fixed effect ; Least Squares Dummy Variable (LSDV) with time fixed effect and pooled sample by nationality ; bank fixed effect (FE) with time fixed effect. Standard errors are clustered.

	OLS (1)	OLS (2)	OLS (3)	OLS (2+3)	LSDV (1)	LSDV (2)	LSDV (3)	LSDV (2+3)	FE (1)	FE (2)	FE (3)	FE (2+3)
$\ln(Leverage_{t-1})$	-0.03*** (0.01)	-0.04*** (0.01)	-0.07*** (0.02)	-0.05*** (0.02)	-0.04*** (0.01)	-0.04*** (0.01)	-0.08*** (0.02)	-0.08*** (0.02)	-0.21*** (0.05)	-0.20*** (0.05)	-0.14** (0.05)	-0.15*** (0.05)
$\Delta Asset_t$	0.71*** (0.11)	0.78*** (0.12)	0.76*** (0.13)	0.83*** (0.15)	0.73*** (0.06)	0.80*** (0.06)	0.80*** (0.09)	0.88*** (0.09)	0.78*** (0.10)	0.77*** (0.11)	0.88*** (0.14)	0.86*** (0.14)
$(\Delta Asset_t \times Divers_{t-1})$	0.09 (0.25)	0.07 (0.28)	-0.15 (0.42)	-0.29 (0.46)	0.07 (0.20)	0.05 (0.20)	-0.16 (0.28)	-0.29 (0.31)	-0.01 (0.20)	0.15 (0.18)	-0.29 (0.33)	-0.29 (0.33)
$Divers_{t-1}$	-0.04 (0.05)	-0.06 (0.06)	-0.06 (0.10)	-0.05 (0.10)	-0.07* (0.04)	-0.11*** (0.04)	-0.14** (0.07)	-0.14** (0.07)	-0.45*** (0.17)	-0.51*** (0.17)	-0.79** (0.35)	-0.82** (0.35)
$Mis Post_{t-1}$	-0.03* (0.02)	-0.02 (0.02)	-0.05 (0.04)	-0.04 (0.04)	-0.03* (0.02)	-0.01 (0.02)	-0.05* (0.03)	-0.04 (0.03)	-0.02 (0.02)	-0.02 (0.02)	-0.06 (0.04)	-0.06 (0.04)
$\Delta Off BS$	.	.	.	.	.	.	.	.	.	.	.	.
$\Delta IFRS$	.	.	+	+	.	+	+	+	.	.	+	+
$\Delta Conso$	.	.	.	.	.	.	.	.	.	.	.	.
Constant	0.09** (0.04)	0.08** (0.04)	0.19** (0.08)	0.15* (0.07)	0.14** (0.06)	0.14** (0.05)	0.33*** (0.10)	0.31*** (0.10)	0.61*** (0.13)	0.60*** (0.13)	0.52** (0.21)	0.54** (0.21)
FE Time	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Polled FR	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO
Adjusted R ²	0.44	0.49	0.49	0.49	0.45	0.50	0.51	0.52				
Within R ²									0.64	0.64	0.73	0.72
Nbre d'obs.	412	367	209	196	412	367	209	196	412	367	209	196

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 6: Leverage determinant and currency diversification

Dependant variable :

Leverage

Four sample are studied. (1) corresponds to the global sample without restriction. (2) only includes institutions with a minimum of 5 years occurrence. (3) includes institutions that have been identified as commercial banks. Three methods are used: Ordinary Least Squared (OLS) with time fixed effect ; Least Squares Dummy Variable (LSDV) with time fixed effect and pooled sample by nationality ; bank fixed effect (FE) with time fixed effect. Standard errors are clustered.

	OLS (1)	OLS (2)	OLS (3)	OLS (2+3)	LSDV (1)	LSDV (2)	LSDV (3)	LSDV (2+3)	FE (1)	FE (2)	FE (3)	FE (2+3)
<i>Size</i> _{<i>t</i>-1}	2.29*** (0.42)	2.28*** (0.46)	1.90*** (0.61)	1.81*** (0.63)	2.76*** (0.24)	2.98*** (0.25)	2.81*** (0.40)	2.74*** (0.39)	7.87*** (2.22)	8.21*** (2.31)	8.95*** (2.38)	9.71*** (2.41)
<i>Profit</i> _{<i>t</i>-1}	-130.97*** (48.86)	-128.20** (56.21)	-267.34*** (95.34)	-377.53*** (87.83)	-78.23*** (23.35)	-59.55** (23.75)	-147.23** (57.56)	-212.41*** (70.59)	-29.00* (14.90)	-24.54 (17.50)	29.11 (98.07)	68.56 (93.91)
<i>Coll. ratio</i> _{<i>t</i>-1}	16.94* (9.80)	18.33* (10.44)	42.81*** (15.33)	47.10*** (16.26)	16.09*** (3.23)	18.27*** (3.20)	34.58*** (5.78)	38.59*** (5.78)	6.19 (4.45)	7.25 (4.95)	14.37 (9.65)	16.97 (10.29)
<i>Divers</i> _{<i>t</i>-1}	7.79** (3.61)	7.35* (3.89)	10.58* (6.18)	12.38* (6.52)	4.62* (2.78)	3.95 (2.83)	1.83 (4.50)	3.94 (4.45)	-9.37* (5.03)	-9.27* (5.22)	-12.21* (6.59)	-10.60 (6.80)
<i>(Coll.xDivers)</i> _{<i>t</i>-1}	-24.53 (31.21)	-24.84 (32.13)	-72.76* (39.63)	-82.88* (42.04)	-31.74** (12.38)	-37.62*** (12.03)	-66.89*** (18.65)	-76.29*** (18.44)	-6.16 (17.24)	-8.64 (18.25)	-25.99 (27.58)	-37.22 (28.06)
<i>Conso</i> _{<i>t</i>-1}	.	.	.	.	.	.	.	.	+	+	+	+
<i>Off BS</i> _{<i>t</i>-1}	.	.	.	.	.	.	.	.	.	.	.	.
<i>IFRS</i> _{<i>t</i>-1}	.	.	.	.	.	.	.	.	.	.	.	.
<i>Constant</i>	-10.78*** (3.66)	-10.86** (4.27)	-11.26* (6.62)	-9.55 (6.15)	-10.23*** (2.97)	-10.73*** (3.02)	-9.15** (4.17)	-6.79 (4.60)	-45.90** (18.34)	-49.69** (19.81)	-65.78*** (23.84)	-73.96*** (24.09)
FE Time	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Polled FR	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO
Adjusted R ²	0.39	0.40	0.43	0.46	0.47	0.52	0.54	0.57				
Within R ²									0.27	0.27	0.29	0.31
Nbre d'obs.	412	367	209	196	412	367	209	196	412	367	209	196

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 7: Leverage determinant and currency diversification with currency mismatch position

Dependant variable :

Leverage

Four sample are studied. (1) corresponds to the global sample without restriction. (2) only includes institutions with a minimum of 5 years occurrence. (3) includes institutions that have been identified as commercial banks. Three methods are used: Ordinary Least Squared (OLS) with time fixed effect ; Least Squares Dummy Variable (LSDV) with time fixed effect and pooled sample by nationality ; bank fixed effect (FE) with time fixed effect. Standard errors are clustered.

	OLS (1)	OLS (2)	OLS (3)	OLS (2+3)	LSDV (1)	LSDV (2)	LSDV (3)	LSDV (2+3)	FE (1)	FE (2)	FE (3)	FE (2+3)
<i>Size</i> _{<i>t</i>-1}	2.24*** (0.41)	2.25*** (0.44)	1.80*** (0.61)	1.74** (0.64)	2.74*** (0.24)	3.02*** (0.25)	2.79*** (0.41)	2.77*** (0.41)	8.02*** (2.27)	8.39*** (2.38)	9.38*** (2.38)	10.03*** (2.40)
<i>Profit</i> _{<i>t</i>-1}	-128.57** (49.03)	-127.90** (56.47)	-264.48*** (97.14)	-377.97*** (90.06)	-77.91*** (23.38)	-58.97** (23.77)	-147.10** (57.72)	-211.30*** (70.89)	-28.51* (15.99)	-23.84 (19.09)	12.93 (94.33)	46.44 (88.50)
<i>Coll. ratio</i> _{<i>t</i>-1}	16.23* (9.69)	17.96* (10.27)	41.82*** (15.02)	46.41*** (15.98)	15.83*** (3.26)	18.71*** (3.25)	34.42*** (5.85)	38.85*** (5.87)	5.60 (4.08)	6.48 (4.49)	14.32 (8.91)	16.50* (9.39)
<i>Divers</i> _{<i>t</i>-1}	7.37* (3.76)	7.08* (4.09)	9.81 (6.64)	11.76 (7.16)	4.50 (2.79)	4.22 (2.85)	1.71 (4.56)	4.17 (4.53)	-7.74* (4.42)	-7.66 (4.61)	-7.19 (6.63)	-6.29 (6.90)
<i>(Coll.xDivers)</i> _{<i>t</i>-1}	-22.85 (30.20)	-23.91 (31.02)	-69.72* (38.19)	-80.68* (40.81)	-31.03** (12.45)	-38.92*** (12.15)	-66.32*** (18.93)	-77.25*** (18.81)	-6.28 (17.26)	-8.34 (18.20)	-34.64 (28.54)	-43.50 (28.86)
<i>Mis Post</i> _{<i>t</i>-1}	-1.49 (1.44)	-0.62 (1.62)	-1.37 (2.22)	-0.87 (2.35)	-0.56 (0.92)	0.75 (0.94)	-0.27 (1.38)	0.40 (1.41)	-1.58* (0.94)	-1.71 (1.04)	-2.81 (1.76)	-2.59 (1.74)
<i>Conso</i> _{<i>t</i>-1}	.	.	.	.	.	.	.	.	-	-	-	-
<i>Off BS</i> _{<i>t</i>-1}	.	.	.	.	.	.	.	.	.	.	.	.
<i>IFRS</i> _{<i>t</i>-1}	.	.	.	.	.	.	.	.	.	.	.	.
<i>Constant</i>	-9.31** (3.79)	-10.19** (4.49)	-9.30 (6.39)	-8.11 (6.50)	-9.68*** (3.10)	-11.54*** (3.19)	-8.78* (4.60)	-7.43 (5.14)	-46.90** (18.62)	-51.05** (19.91)	-69.73*** (23.63)	-76.72*** (23.81)
FE Time	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Polled FR	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R ²	0.39	0.40	0.43	0.46	0.47	0.52	0.54	0.57				
Within R ²									0.28	0.29	0.32	0.33
Nbre d'obs.	412	367	209	196	412	367	209	196	412	367	209	196

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$