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Date: **July-2016**

**WORKING PAPER SERIES: 2/2016**
CÁTEDRA CEU-MM
Madrid (Spain)
ISSN online: 2530-0237

# Effects of IFRS-13 on relevance of fair value adjusted by credit risk

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**Abstract**

Accounting harmonization in Europe by International Accounting Standards adoption is a recurrent object of study in the accounting literature. In this paper the consequences of the adoption of IFRS-13 are analyzed. In particular, we study the effects of financial leverage, own probability default (Debt Value Adjusted) and financial institutions credit risk (Credit Value Adjusted) have on the excess risk of non-financial companies on the market risk, before and after the adoption of the accounting standard on fair value. Our empirical study focuses on member companies of the EUROSTOXX-50 to avoid other risk factors (such as exchange rate or different risk free rate) and at the same time, easily identify the market portfolio. To overcome the problems of endogeneity in the panel data, we use the technique GMM-sys with instrumental variables to estimate the parameters. Our results show that the leverage effect on excess risk does not change after adopting the standard, however, the own and the financial institutions default probabilities become statistically significant. Furthermore, our proposal allows estimate sectorial asset betas and, we obtain in all cases asset betas lower than equity betas and, found an average debt beta of 0.4 for the sample period.

*Keywords:* fair value, Credit Value Adjust, Debt Value Adjust, volatility.
*JEL:* D82, G12, G34, M41.

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[1]Acknowledgement: This work has been supported by the Spanish Ministry of Economics and Competitiveness through grant MINECO/FEDER ECO2015-65826-P, and Cátedra Universidad CEU San Pablo - Mutua Madrileña insurance company.

## 1. Introduction

Since the beginning of the accounting harmonization process in Europe, many studies have analyzed the impacts of IFRS adoption. Mostly, these works seek evidence on improving the usefulness of accounting information. Some studies materialize its objective in checking the quality of the financial information of companies. So, Chen et al. (2010) observed that improving accounting quality is attributable to IFRS, rather than changes in managerial incentives, institutional features of capital markets, and general business environment, among others.

Others empirical works identify this usefulness with the accounting information influence on capital market. For example, Devalle et al. (2010) show that, after IFRS adoption, the influence of earnings and equity book value have increased and decreased, respectively. In this line, Aubert & Grudnitski (2011) found a statistically significant relationship between accounting information and market returns.

So, as part of this process of accounting harmonization, we focus on the effects of IFRS-13. The International Accounting Standard Board (IASB), by International Financial Reporting Standard 13 (IFRS-13) provides, for all fiscal years ended from 1 January 2013, the way for estimating the fair value of assets and liabilities. Thus, IASB supplements International Accounting Standar 39 (IAS-39) on financial assets and liabilities.

This standard has two notable aspects: firstly, defines the category of the variables used in estimating fair value, and on the other includes credit risk in the estimation.

Regarding the variables used, the standard establishes three levels: data of liquid markets, data of similar market and, historical data series and models. Logically, the rule gives more prominence to market information, and as you descend a level, the information required is greater.

In respect to credit risk, the standard establishes the need to incorporate an adjusted in the valuation of financial asset and liabilities, i.e., counterparty risk on asset or Credit Value Adjusted (CVA) and, own credit risk on liabilities or Debt Value Adjusted (DVA). Thus, this rule is in line marked by BIS-III for financial institutions.

Then, there is a double perspective, the financial, concerning the data and models used for credit risk adjustment, and other accounting, relating to the effect of this adjustment on the financial statements and, if this information is relevant for investors.

On the analysis of accounting information, there are two offsetting effects, on the one hand, a direct effect arising from change in asset value and, the other hand, an indirect effect arising from change in debt value. The first effect is relation between asset value and equity value in absence of debt; the second effect is the wealth transfer between equity holders and debt holders arising from a change in asset risk. Then, when the IFRS-13 provides recognition of gains and losses result from changes in the recognized amount of debt, it is accounting for indirect effect.

In this context, the accounting literature has examined the relevance of accounting information of these adjustments for credit risk by different ways. Barth & Stubben (2008) is the most remarkable work, which is based on Merton (1974) model, to test whether equity value changes associated with credit risk changes are attenuated by debt value changes associated with the credit risk changes. Merton (1974) found that the relation between equity returns and credit risk changes is significantly less negative or firms with more debt. But, in our view, this study has two debatable issues: on the one hand, Barth & Stubben (2008) uses as credit risk proxy the credit rating built by rating agencies, but the recent crisis has demonstrated the lack of predictability of such ratings and, the other hand, while the model of Merton (1974) is formulated in terms of market prices, Barth & Stubben (2008) replaced the asset market price by the asset book value.

The significance of the variable depend on their level was showed by Riedl & Serafeim (2011). They examines whether financial reporting systems provide information that allows users to ascertain the valuation parameters underlying a particular asset, i.e., a poor information leads to higher cost of capital. For so doing, they distinguish between three levels of inputs used to derive fair value estimates: level 1, reflecting observable inputs consisting of quoted prices in active markets for identical assets or liabilities; level 2, reflecting observable inputs other than quoted prices; and level 3, reflecting unobservable inputs. They considered that higher-quality information about a firm's future cash flows lowers cost of capital through a reduction in the assessed covariances with other firms' future cash flows, then equity beta (CAPM) weighted by the equity asset ratio, as measure of risk, should be function of information quality. They found that firms with greater exposure to more opaque financial assets and liabilities, reflected in the level 3 fair value designation, show higher betas.

So, to avoid the first drawback, any study has to use market data, more in line with the requirements of Level 1 variables of IFRS-13, for example the Credit Default Swap (CDS) quote shows the market price of credit risk hedging.

Moreover, Merton (1974) defined the equity as a call option issued by creditors, and to exercise the option, the shareholders have to pay the strike price (face value of debts). Then, as a key factor in the valuation of an option is the volatility of the underlying asset, this work use this factor to test the relevance of financial information for investors.

Within the accounting literature that examines the relevance of fair value, there is a line that does not directly analyze the effect on the market, but by experiments designed for that purpose. For example, Gaynor et al. (2011) carried out an experiment to test whether users of financial information have an asymmetric interpretation between increases and decreases of the own credit risk and the effects on the income statement that it causes through changes in the value of liabilities. They found that financial information users were unable to associate a gain (loss) arising from a change in the fair value of the liability to an increase (decrease) in credit risk.

In this way, Koonce et al. (2011), through several experiments, discussed the importance that investors attach to the endpoint using fair value. They found that investors consider fair value as more relevant for assets than for liabilities and these differential fair values relevance is translated into differences about firm value, but they observe no difference in fair value relevance between gains and losses. This difference justifies to analyze separately the own credit risk and the credit risk of counterparties.

But, while Koonce et al. (2011) showed that investors give more importance to fair value for transactions not held to maturity, Linsmeier (2011) indicates that the amortized cost model is adjusted only when management determines that credit losses are probable or that the assets are otherwise impaired.

Another line of research focuses on financial institutions, as those negotiated directly with the credit risk and they are subject to specific rules on it (BIS-II and BIS-III). So, Allen & Carletti (2008) showed, by a model, that a shock in the insurance sector can cause the current value of banks' assets to be less than the current value of their liabilities so the banks are insolvent. In contrast, if historic cost accounting is used, banks are allowed to continue and can meet all their future liabilities. Thus, mark-to-market accounting can thus lead to contagion where none would occur with historic cost accounting. Barth et al. (2012) analyzed the effects of fair value accounting in banking; on the one hand, the increased volatility that it generates in some accounting variables, and the other hand, whether it reduces the possibility of discretionary earnings management. Their results show evidence of earnings management related to regulatory capital requirements and the sales of available for sale securities for banks with positive earnings. Blankespoor et al. (2013) studied whether financial statements using fair values for financial instruments describe suitably banks' credit risk. They found that leverage measured using the fair values of financial instruments explains more variation of credit risk (bond yield spreads) than other measures.

Finally, Ow Yong et al. (2012) found a positive correspondence between fair value liability gains and losses and stock returns, i.e., such gains and losses, by the inclusion of a firm's own credit risk when measuring the fair value of liabilities, are perceived as economic income by investors. Besides, they observed a positive relation between fair value liability results and firm's beta as a market risk proxy.

So, a consequence of IFRS-13 is that a company's credit risk increases (decreases), the company reports a gain (loss) for changes in liabilities fair value. The recent financial crisis has shown that the historical values do not report the reality of the market. As a result two conflicting lines emerge: a position advocates applying mark-to-market for all financial assets and liabilities, and other point to the increased volatility of accounting numbers and the consequent instability of the companies's solvency. But the truth is that so far, while investors suffer the volatility of markets, the accounting and the historical cost have been a protective shell for any companies.

In this context, our aim is to test whether after effective date on IFRS-13, the relevance of financial information on the fair value has changed for investors. For that, we use Merton (1974) model, implicit volatility option and CDS market quote, i.e., input data of level 1. So, while Bhat & Segal (2014), comparings the pricing of credit risk information conveyed by accounting numbers under IFRS, find that the adoption of IFRS did not change the credit risk informativeness of accounting variables as reflected in CDS spreads, our goal is to test whether CDS and accounting information have different effects on market risk (as measured by the stock return volatility) before and after the IFRS-13 adoption.

Besides, whilst there are empirical studies for banking industry, abovementioned, as a result of the new banking rules (BIS-III) ; there are no studies on European non-financial companies. For that, our empirical sample is non-financial companies of EURO STOXX 50 from 2010 to 2015, both inclusive.

The rest of the paper is structured as follows. Section II proposes the model, methodology and hypotheses.

Next, Section III displays the data, Section IV shows the results, and Section V offers concluding remarks.

## 2. Model, Methodology and Hypothesis

### *2.1. The Model*

To contrast any hypothesis that involved market information as a measure of investor expectations, it is necessary to accomplish the study under some theoretical model to explain the relationships among variables, otherwise we would simply be facing a statistical analysis with non-significant results out of the sample. So, our study lies in the theoretical environment defined by Merton (1974).

This model considers that the company' equity value is equivalent to a call option, i.e., when a firm borrows, it sells a part of asset to creditors, based on the financial leverage, with an option to repurchase which strike is the payment of debt face value. Thus, the value of this option is:

$$\begin{aligned} E_0 &= A_0 \cdot \mathbf{N}(d) - K \cdot \exp(-r \cdot T) \cdot \mathbf{N}(d - \sigma_A \cdot \sqrt{T}) \\ d &= \frac{\ln(\frac{A_0}{K}) + (r + 0.5 \cdot \sigma_A^2) \cdot T}{\sigma_A \cdot \sqrt{T}} \end{aligned} \tag{1}$$

Where $E$ and $A$ are market value of equity and asset, respectively; $K$ is face value of debt; $r$ is the risk-free rate; $T$ is maturity of debt;$\sigma_A$ is the volatility of asset market value and $\mathbf{N}$ is standard normal distribution.

But, as $A$ and $\sigma_A$ are unobservable in the market, the expression 1 is completed with the relationship between these variables and their equivalents observable values for the equity, i.e., $E$ and $\sigma_E$. This relation results to apply Itô stochastic calculus.

$$E_0 \cdot \sigma_E = \frac{\partial E}{\partial A} \cdot A_0 \cdot \sigma_A = \mathbf{N}(d) \cdot A_0 \cdot \sigma_A \tag{2}$$

From 2 we obtain the unobservable market value of asset.

$$A_0 = \frac{E_0}{\mathbf{N}(d)} \cdot \frac{\sigma_E}{\sigma_A} \tag{3}$$

Then, substituting its value in 1

$$E_0 = E_0 \cdot \frac{\sigma_E}{\sigma_A} - K \cdot \exp(-r \cdot T) \cdot \mathbf{N}(d - \sigma_A \cdot \sqrt{T}) \tag{4}$$

Now, we define $L$ as book debt to market equity.

$$L_0 = \frac{K \cdot \exp(-r \cdot T)}{E_0} \tag{5}$$

And replacing this expression in 4 results 6.

$$\frac{\sigma_E}{\sigma_A} = 1 + L_0 \cdot \mathbf{N}(d - \sigma_A \cdot \sqrt{T}) \tag{6}$$

In Merton (1974), the probability of default ($PD$) is defined as 7.

$$PD = 1 - \mathbf{N}(d - \sigma_A \cdot \sqrt{T}) \tag{7}$$

Finally, replacing 7 in 6 results 8.

$$\frac{\sigma_E}{\sigma_A} = 1 + L_0 \cdot (1 - PD) \tag{8}$$

*2.2. The Methodology and Hypothesis*

Under IFRS-13, a company has to adjust the financial contract value with counterparty and own credit risks. When these contracts are always liabilities or assets, i.e., short or long position in options respectively, these adjusts are direct, for example Merton (1974) model. Then, Expected Loss ($EL$) depends on the market values of option ($E^+$), the $PD$ and the Loss Given Default ($LGD$).

$$\begin{aligned} E_0^+ &= \max(0, A_T - K) = E_T \cdot \exp(-s_T \cdot T) \\ EL_T &= E_0^+ \cdot PD \cdot (1 - LGD) \end{aligned} \tag{9}$$

Where $s$ is the spread or CDS quote for hedging credit risk. So, the default intensity ($\lambda$) and $PD$ are (see Hull (2015), expressions 23.1 and 23.2):

$$\begin{aligned} \lambda_T &= \frac{s_T}{(1 - LGD)} \\ PD &= 1 - \exp(-\lambda_T \cdot T) \end{aligned} \tag{10}$$

Now, operating with 8, we obtain[2]:

$$\begin{aligned} \ln(\sigma_E) &= \ln(\sigma_A) + \ln\left[1 + L_0 \cdot (1 - PD)\right] \\ &= \ln(\sigma_A) + \ln(L_0) + \ln(1 - PD) + \ln\left[1 + \frac{1}{L0 \cdot (1 - PD)}\right] \\ &= \ln(\sigma_A) + \ln(L_0) + \ln(PD) + \ln\left[1 + \frac{1}{L0 \cdot (1 - PD)}\right] + \ln\left[\frac{1}{PD} - 1\right] \\ &= \ln(\sigma_A) + \ln(L_0) + \ln(PD) + \kappa_1 \end{aligned} \tag{11}$$

Where $\kappa_1 = \ln\left[1 + \frac{1}{L0 \cdot (1-PD)}\right] + \ln\left[\frac{1}{PD} - 1\right]$ shows the approximation error.

Aditionally, Choi & Richardson (2016) show:

$$\begin{aligned} \sigma_E^2 &= \beta_E^2 \cdot \sigma_{mkt}^2 + \sigma_i^2 \\ \sigma_A^2 &= \beta_A^2 \cdot \sigma_{mkt}^2 + \sigma_i^2 \end{aligned} \tag{12}$$

Where $mkt$ is market factor, $i$ means idiosyncratic and $\beta_E \geq \beta_A$ as consequence of the leverage effect. Then, as Choi & Richardson (2016), we operate on 12 and obatin:

$$\begin{aligned} \ln(\sigma_A^2) &= \ln(\beta_A^2 \cdot \sigma_{mkt}^2) + \ln\left(1 + \frac{\sigma_i^2}{\beta_A^2 \cdot \sigma_{mkt}^2}\right) \\ \ln(\sigma_A) &= \ln(\beta_A) + \ln(\sigma_{mkt}) + 0.5 \cdot \ln\left(1 + \frac{\sigma_i^2}{\beta_A^2 \cdot \sigma_{mkt}^2}\right) \\ \ln(\sigma_A) &= \ln(\beta_A) + \ln(\sigma_{mkt}) + \kappa_2 \end{aligned} \tag{13}$$

[2]Note that $\ln(a + b) = \ln(a) + \ln(1 + \frac{b}{a})$ and $\ln(a - b) = \ln(a) + \ln(\frac{b}{a} - 1)$

Now, applying 10, we obtain $PD$ from CDS quote and then, for $N$ individuals and $T$ time series observations and, using sthe substitute expressions 11 and 13, our empirical specification of 8 is:

$$\begin{aligned} \forall t &= 1, \ldots, T \\ \forall i &= 1, \ldots, N \\ \ln\left(\sigma_{E,i,t}\right) - \ln\left(\sigma_{mkt,t}\right) &= \alpha_{0,i} + \alpha_1 \cdot \ln\left(L_{i,t}\right) + \alpha_2 \cdot \ln\left(PD_{i,t}\right) + \epsilon_{i,t} \\ y_{i,t} &= \alpha_{0,g} + \alpha_1 \cdot X_{1,i,t} + \alpha_2 \cdot X_{2,i,t} + \epsilon_{i,t} \end{aligned} \tag{14}$$

Note in 14 that:

- $y_i$ is excess volatitility on market risk.
- Since $\beta_{A,i}$ is independent of the financial structure of the company (or leverage) and only depends on the activity, we define $g = 1, \ldots, G$ as a variable indicating the productive sector of the company (group), ie we assume that the asset beta is the same for all companies in each sector or $\beta_{A,i} = \beta_g$ and, as $\alpha_{0,g} = \ln\left(\beta_g\right)$ then $\beta_g = \exp\left(\alpha_{0,g}\right)$.
- $\epsilon_{i,t}$ includes $\kappa_{i,1,t}$ and $\kappa_{i,2,t}$.

But, since companies have, in their balance sheets, short (current) and long term (no current) debts, the liability definition of the model as a zero coupon bond is a significant drawback. To solve this constraint, as Crosbie & Bohn (2002), we rely on the KMV proposal[3]. So, this methodology divides the strike price of the option into two components, thus the expression 5 is defined as book value of current liabilities ($L^s$) and a portion[4] ($0 \leq \omega_L \leq 1$) of non-current liabilities ($L^l$):

$$\begin{aligned} L_0 \simeq L_0^s + \omega_L \cdot L_0^l &= \omega \cdot L_0 \\ \omega &\leq 1 \end{aligned} \tag{15}$$

Then, in 14, we expected found that $\alpha_1 \leq 1$.

But, as IFRS-13 consider CVA, we need to include a new variable to control counterparty credit risk in financial asset. For that, we defining $X_3$ as average CDS quote ($s$) for hedging credit risk with financial institutions ($j = 1, \ldots, J$):

$$X_{3,t} = \frac{1}{J} \cdot \sum_{j=1}^{J} s_{j,t} \tag{16}$$

Replacing 16 into 14 and, including a dummy variable to test the effects of IFRS-13, we reached the

[3]In 1989 Kealhofer, McQuown and Vasicek founded company KMV, which later, in 2002 it was sold to Moody's, and in 2007, this practical solution was renamed to Moody's Analytics.

[4]KMV proposal takes $\omega_L = 0.5$.

following empirical modeling:

$$\begin{aligned} d_t &= \begin{cases} 1 & \text{if } t \geq 2013 \\ 0 & \text{otherwise} \end{cases} \\ y_{i,t} &= \alpha_{0,g} + \alpha_1 \cdot X_{1,i,t} + \alpha_2 \cdot X_{2,i,t} + \alpha_3 \cdot X_{3,t} + \\ &+ \gamma_1 \cdot d_t \cdot X_{1,i,t} + \gamma_2 \cdot d_t \cdot X_{2,i,t} + \gamma_3 \cdot d_t \cdot X_{3,t} + \xi_{i,t} \end{aligned} \tag{17}$$

In 17 note that:

$$\begin{aligned} \xi_{i,t} &= \kappa_{i,1,t} + \kappa_{i,2,t} + u_{i,t} \\ \kappa_{i,1,t} &= f(L^s_{i,t}, L^l_{i,t}, PD^s_{i,t}, PD^l_{i,t}) \\ \kappa_{i,2,t} &= f(\ln(\beta_{A,i}), \ln(\sigma_{mkt})) \\ u_{i,t} &\sim i.i.d.(0, \sigma^2_u) \end{aligned} \tag{18}$$

Then, while $u_{i,t} + \beta_{A,i}$ shows a random effects panel data, $\xi_{i,t}$ also adds simplification errors ($\kappa_1$ and $\kappa_2$). So, in case of random effects the appropriate estimation is Generalized Least Square (within-between) to avoid drawbacks with standard errors without clustered by firm, without controls for heteroscedasticity and intertemporal firm-specific dependence in regression residuals. But in our case, we need to solve endogeneity problems, since covariance among regressors and $\xi_{i,t}$ are not zero. To do this, the System Generalized Method of Moments (GMM-sys) is specially designed for panel data with endogeneity problems (see Arellano & Bover (1995) and Blundell & Bond (1998)). Specifically, we use the two-step GMM-sys estimator (Windmeijer (2005)) to fit the regression with heteroskedasticity robust standard errors. GMM-sys estimator improves the GMM estimator, combining the standard set of equations in first differences with an additional set of equations in levels with appropriate lagged first differences as instruments. The endogeneity problem is addressed by using as instruments (see Larcker & Rusticus (2010)), the lagged variables of right-hand side in the model. To test the statistical independence required of disturbance process, we check the adequacy of instruments with a test of over-identifying restrictions (Sargan test), under the null hypothesis that all instruments are uncorrelated with the disturbance process. Moreover, as Arellano & Bover (1995) pointed out, the consistency of the GMM estimators depends on second-order serial uncorrelation in the first-difference residuals, so we also test it.

Finally, the tested hypothesis on 17 are:

1. The leverage component ($L$ or debt level) of the DVA, before and after IFRS-13 adoption, is not explanatory risk, then $H_1$ is: $\alpha_1 = \gamma_1 = 0$.
2. If $H_1$ is rejected, then leverage effects before and after IFRS-13 adoption are the same, $H_2$ is: $\gamma_1 = 0$.
3. If $H_1$ is rejected, then the effect on call option strike price of long debts is the same than short debts, so $H_3$ is: $\alpha_1 - 1 = 0$.
4. If $H_3$ is rejected, then befor IFRS-13 adoption, the effect on call option strike price of long debts is the same than short debts, $H_4$ is: $\alpha_1 + \gamma_1 - 1 = 0$.

5. The default probability component ($PD$) of the DVA, before and after IFRS-13 adoption, is not explanatory risk, then $H_5$ is: $\alpha_2 = \gamma_2 = 0$.
6. If $H_5$ is rejected, then default probability effects before and after IFRS-13 adoption are the same, $H_6$ is: $\gamma_2 = 0$.
7. The CVA component, before and after IFRS-13 adoption, is not explanatory risk, then $H_7$ is: $\alpha_3 = \gamma_3 = 0$.
8. If $H_7$ is rejected, then CVA component effects before and after IFRS-13 adoption are the same, $H_8$ is: $\gamma_3 = 0$.

Additionally, if $\alpha_0 \neq 0$, we know that $\beta_A = \frac{1}{1+L} \cdot \beta_E + \frac{L}{1+L} \cdot \beta_D$, ie asset beta is a weighted average, depending on the leverage ($L$), of equity ($E$) and debts ($D$) betas. So, operating we obtain $\beta_E = (1+L) \cdot \beta_A - L \cdot \beta_D$, then defining $z_i = \beta_E - (1+L) \cdot \beta_A$, we estimate the following relationship in cross-section:

$$\begin{aligned} &\forall i = 1, \ldots, N \\ &z_i = \phi_0 + \phi_1 \cdot L_i + e_i \end{aligned} \tag{19}$$

Where, if previous estimations are suitable, we expected $\phi_0 = 0$ and $\phi_1 = -\beta_D$ or mean debt beta.

## 3. Data

The selection of the sample is determined by three issues:

- The company should be part of a market index, for easy identification of the market portfolio and its implied volatility as the measure of systematic risk ($\sigma_{mkt}$).
- Needs to be available market information on companies, in particular: prices, options (implied volatility) and CDS.
- Since the dependent variable is the market risk of the company, it is necessary that unless systematic risk, there is no other risk factors, such as exchange rates or different risk-free rates, that may damage the results.

Under these restrictions, our data selection is on the EMU zone (European Monetary Union, Euro), specifically the sample is composed of company members EUROSTOXX-50 index. This guarantees the same currency, the same risk-free rate (Euribor) and the same systematic risk or market portfolio (EUROSTOXX-50). Companies are grouped into two blocks: non-financial (37 individuals) and financial (13 individuals). On the first group we test the hypotheses, and the second group is used to determine CVA finacial institutions defined in 16 as variable $X_3$. Thus, we achieve that the whole sample belongs to the same market.

The study period is from 2010 to 2015, so we have the same number of years before and after (3 years) of the IFRS-13 adoption. Data are collected on an annual basis (at the end of each fiscal year), thus accounting variables used come from audited financial statements. All information is extracted from Bloomberg to avoid inconsistencies among different sources of information.

The index covers 50 stocks from 12 Eurozone countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. The companies are in Table(1).

Table 1: Sample Companies

| Non-Financial Group | | |
|---|---|---|
| Name | Sector | Country |
| ANHEUSER-BUSCH INBEV | Food & Beverage | Belgium |
| BASF | Chemicals | Germany |
| BAYER | Chemicals | Germany |
| BMW | Automobiles& Parts | Germany |
| DAIMLER | Automobiles & Parts | Germany |
| DEUTSCHE POST | Industrial Goods & Services | Germany |
| DEUTSCHE TELEKOM | Telecommunications | Germany |
| E.ON | Utilities | Germany |
| FRESENIUS | Health Care | Germany |
| SAP | Technology | Germany |
| SIEMENS | Industrial Goods & Services | Germany |
| VOLKSWAGEN PREF | Automobiles & Parts | Germany |
| IBERDROLA | Utilities | Spain |
| INDITEX | Retail | Spain |
| TELEFONICA | Telecommunications | Spain |
| NOKIA | Technology | Finland |
| AIR LIQUIDE | Chemicals | France |
| AIRBUS GROUP SE | Industrial Goods & Services | France |
| CARREFOUR | Retail | France |
| DANONE | Food & Beverage | France |
| ENGIE | Utilities | France |
| ESSILOR INTERNATIONAL | Health Care | France |
| L'OREAL | Personal & Household Goods | France |
| LVMH MOET HENNESSY | Personal & Household Goods | France |
| ORANGE | Telecommunications | France |
| SAFRAN | Industrial Goods & Services | France |
| SAINT GOBAIN | Construction & Materials | France |
| SANOFI | Health Care | France |
| SCHNEIDER ELECTRIC | Industrial Goods & Services | France |
| TOTAL | Oil & Gas | France |
| VINCI | Construction & Materials | France |
| VIVENDI | Media | France |
| ENEL | Utilities | Italy |
| ENI | Oil & Gas | Italy |
| ASML HLDG | Technology | Holland |
| PHILIPS | Industrial Goods & Services | Holland |
| UNILEVER NV | Personal & Household Goods | Holland |
| Financial Group | | |
| Name | Sector | Country |
| ALLIANZ | Insurance | Germany |
| ASSICURAZIONI GENERALI | Insurance | Italy |
| AXA | Insurance | France |
| BCO BILBAO VIZCAYA ARGENTARIA | Banks | Spain |
| BCO SANTANDER | Banks | Spain |
| BNP PARIBAS | Banks | France |
| DEUTSCHE BANK | Banks | Germany |
| GRP SOCIETE GENERALE | Banks | France |
| ING GRP | Banks | Holland |
| INTESA SANPAOLO | Banks | Italy |
| MUENCHENER RUECK | Insurance | Germany |
| UNICREDIT | Banks | Italy |
| UNIBAIL-RODAMCO | Real Estate | France |

Table(2) shows a summary of the statistical sample. Note that non-financial companies are only 33 individuals, because CDS are not quoted for Inditex, L'Oreal, SAP and Safran. Finally, note that to estimate the default probability ($PD$) according to 10, all traded CDS are standard with a recovery rate of 40% or $(1 - LGD) = 40\%$.

Table 2: Statistical data

| Statistics | mean | desv. stand. | max. | min. | observations | years | individuals |
|---|---|---|---|---|---|---|---|
| Volatility Equity (in %) | 25.083 | 6.722 | 59.599 | 14.434 | 198 | 6 | 33 |
| Debt current per share | 26.614 | 42.417 | 296.211 | 1.622 | 198 | 6 | 33 |
| Debt non-current per share | 31.735 | 51.804 | 468.871 | 1.018 | 198 | 6 | 33 |
| Total debt per share | 56.004 | 83.409 | 585.811 | 2.641 | 198 | 6 | 33 |
| Price share | 42.465 | 35.963 | 195.578 | 2.600 | 198 | 6 | 33 |
| L-short | 0.738 | 0.576 | 3.363 | 0.076 | 198 | 6 | 33 |
| L-long | 0.962 | 1.341 | 16.998 | 0.047 | 198 | 6 | 33 |
| L | 1.615 | 1.194 | 5.730 | 0.123 | 198 | 6 | 33 |
| CDS 1 year (in basis points) | 31.182 | 38.287 | 261.436 | 3.735 | 198 | 6 | 33 |
| PD 1 year | 0.77% | 0.93% | 6.33% | 0.09% | 198 | 6 | 33 |
| Volatility market (in %) | 22.161 | 5.035 | 29.164 | 14.418 | 6 | 6 | 1 |
| Bank CDS 1 year (in basis points) | 179.750 | 590.689 | 5034.541 | 5.959 | 78 | 6 | 13 |

## 4. Results

First, in table(3), we show a comparative of estimation method for 17.

Table 3: Comparative estimation method

| Estimation method | $R^2$ adjusted | AR(1) test | AR(2) test | Sargan test |
|---|---|---|---|---|
| OLS | 0.5885 | 2.954 [0.003] ** | -2.356 [0.018]* | |
| GLS(w/b) | 0.5407 | 2.400 [0.016]* | -2.170 [0.030]* | |
| GMM-sys | 0.5472 | 1.674 [0.094] | 0.1172 [0.907] | 18.05 [0.958] |

Note: $*$ and $**$ mean statistically significant at 5% and 1%, respectively.

While the goodness of fit ($R^2$) is similar for all methods, the Arellano-Bond test for autorregresive (AR) in first differences of errors shows as GMM-sys is the only method that solves the endogeneity. Besides Sargan test indicates that instrumental variables used are suitable.

Next, the estimated parameters are in table(4).

Table 4: Parameters estimation

| Regressors | pooled OLS estimation | | GLS(w/b) estimation | | GMM-sys estimation | |
|---|---|---|---|---|---|---|
| | Coefficient | t-value | Coefficient | t-value | Coefficient | t-value |
| $X_1$ | 0.1145 | 3.01 (**) | 0.1089 | 2.57 (*) | 0.1276 | 2.04 (*) |
| $d \cdot X_1$ | -0.0391 | -0.85 | -0.0409 | -1.26 | -0.0113 | -0.02 |
| $X_2$ | -0.1192 | -1.32 | -0.1253 | -1.03 | -0.1028 | -1.67 |
| $d \cdot X_2$ | 0.2614 | 3.89 (**) | 0.2616 | 2.94 (**) | 0.2231 | 2.76 (**) |
| $X_3$ | -0.0627 | -1.11 | -0.0122 | -0.49 | -0.0818 | -1.14 |
| $d \cdot X_3$ | 0.5772 | 6.65 (**) | 0.5215 | 6.34(**) | 0.5469 | 3.58 (**) |

Note: $*$ and $**$ mean statistically significant at 5% and 1%, respectively.

By GMM-sys results of table(4), we test our hypothesis:

- On $L$ hypothesis we observe that $0 \neq \alpha_1 = 0.1276 < 0$ and $\gamma_1 = 0$, thus we rejected $H_1$, $H_3$ and $H_4$ and accept $H_2$, that is, $L$ or leverage effect is the same before and after IFRS-13 adoption, and its weight in lower than 1. Therefore, the call option strike price is less than the total debt accounting value of the company.

- For $PD$ hypothesis we note that $\alpha_2 = 0$ and $0 \neq \gamma_2 = 0.2231$ then, we rejected $H_5$ and $H_6$, that is,

$PD$ or probability default effect is null before IFRS-13 adoption, but after it is positive. So, when the default probability increases, so does the excess risk on systematic risk.

- About $CVA$ hypothesis we test that $\alpha_3 = 0$ and $0 \neq \gamma_3 = 0.5469$ then, we rejected $H_7$ and $H_8$, that is, $CVA$ or credit risk (of financial institutions) adjusted on financial assets leads to increased the excess risk on systematic risk, but only after the IFRS-13 adoption.

In summary, we found that the adoption of IFRS-13 has meant that the excess risk on systematic risk being affected by $PD$ and $CVA$ factors.

Table(5) shows the sectorial equity beta[5] and asset betas for different estimation methods. Note that only asset betas from GMM-sys satisfy with $\beta_A \leq \beta E$ for all cases, including the equity beta minimum. The Retail and Health Care sectors have the maximum and minimun asset beta, respectively.

Finally, table(6) shows estimation for expression 19 and note that constant is null and the average debt beta ($\beta_D$) for non-financial companies in the index, during the sample period (2010-2015), was 0.4.

## 5. Conclusions

Since beginning of the accounting harmonization process in Europe, the accounting literature has been concerned with studying the effects of the International Accounting Standards adoption.

In this context, we have studied the effects of the IFRS-13 adoption (January, 2013) on the estimation of fair value. In the IFRS-13 are two fundamental aspects: firstly, the preference of Standard by the use of market variables or Level 1, and secondly, the considerations of counterparty credit risk (CVA) and own credit risk (DVA) in estimation of value for financial assets and liabilities.

In line with the above, the aim of this study is to test the effects of IFRS-13 adoption relating to the CVA and DVA (or implied default probabilities); using for this market data, in particular the Credit Default Swap quotes(CDS).

For the study, we have supported, as previous work (Barth & Stubben (2008)), on the model Merton (1974) which defines equity as a call option on the company assets. Thus, our dependent variable is the excess risk on systematic or market risk, and the independent variables are leverage (accounting liability on equity market ratio), the own default probability and the credit risk of financial institutions, as main counterpart of the assets and liabilities of non-financial companies. In addition, our proposal allows estimating an asset beta for each sector. Note the originality of our proposal, since from a theoretical financial model, we reached to link the risk of a company with accounting variables and other variables of level 1.

The sample analyzed consists of 33 non-financial companies for which CDS are traded, and the 13 financial institutions. All of them are part of the EUROSTOXX -50. The choice of this portfolio is a result of avoiding

[5]The equity beta is estimated by OLS for our sample period, regressing each monthly return stock on the monthly return index.

Table 5: Sectorial $\beta_{Asset}$

| SECTORS | companies | Mean $\beta_E$ | Min $\beta_E$ |
|---|---|---|---|
| Automobiles & Parts | 3 | 1.1708 | 1.0778 |
| Chemicals | 3 | 0.8557 | 0.6922 |
| Construction & Materials | 2 | 1.0460 | 0.9801 |
| Food & Beverage | 2 | 0.4677 | 0.4533 |
| Health Care | 3 | 0.5036 | 0.3923 |
| Industrial Goods & Services | 5 | 0.9706 | 0.9317 |
| Media | 1 | 0.7222 | 0.7222 |
| Oil & Gas | 2 | 0.8992 | 0.8940 |
| Personal & Household Goods | 2 | 0.6493 | 0.4040 |
| Retail | 1 | 1.1918 | 1.1918 |
| Technology | 2 | 1.0155 | 0.7601 |
| Telecommunications | 3 | 0.8859 | 0.7500 |
| Utilities | 4 | 0.8219 | 0.4920 |

pooled OLS estimation

| SECTORS | Coefficient | t-value | $\beta_A$ |
|---|---|---|---|
| Automobiles & Parts | -0.1848 | -1.37 | 0.8312 |
| Chemicals | -0.3192 | -2.34 (*) | 0.7267 |
| Construction & Materials | -0.3106 | -2.36 (*) | 0.7330 |
| Food & Beverage | -0.3645 | -2.91 (**) | 0.6946 |
| Health Care | -0.4016 | -3.15 (**) | 0.6693 |
| Industrial Goods & Services | -0.3070 | -2.19 (*) | 0.7356 |
| Media | -0.4257 | -3.39 (**) | 0.6533 |
| Oil & Gas | -0.4832 | -3.69 (**) | 0.6168 |
| Personal & Household Goods | -0.4079 | -2.23 (*) | 0.6651 |
| Retail | -0.0236 | -0.18 | 0.9767 |
| Technology | 0.1925 | 1.69 | 1.2123 |
| Telecommunications | -0.3972 | -3.02 (**) | 0.6722 |
| Utilities | -0.4256 | -2.92 (**) | 0.6534 |

GLS(w/b) estimation

| SECTORS | Coefficient | t-value | $\beta_A$ |
|---|---|---|---|
| Automobiles & Parts | -0.2116 | -1.58 | 0.8093 |
| Chemicals | -0.3594 | -2.77 (**) | 0.6981 |
| Construction & Materials | -0.3392 | -2.47 (*) | 0.7124 |
| Food & Beverage | -0.4020 | -3.06 (**) | 0.6690 |
| Health Care | -0.4415 | -3.44 (**) | 0.6431 |
| Industrial Goods & Services | -0.3404 | -2.74 (**) | 0.7115 |
| Media | -0.4571 | -3.01 (**) | 0.6331 |
| Oil & Gas | -0.5146 | -3.81 (**) | 0.5977 |
| Personal & Household Goods | -0.4506 | -3.21 (**) | 0.6372 |
| Retail | -0.0499 | -0.33 | 0.9514 |
| Technology | 0.1587 | 1.29 | 1.1720 |
| Telecommunications | -0.4243 | -3.30 (**) | 0.6542 |
| Utilities | -0.4493 | -3.37 (**) | 0.6381 |

GMM-sys estimation

| SECTORS | Coefficient | t-value | $\beta_A$ |
|---|---|---|---|
| Automobiles & Parts | -0.5785 | -2.81 (**) | 0.5608 |
| Chemicals | -0.6645 | -3.77 (**) | 0.5145 |
| Construction & Materials | -0.6869 | -3.36 (**) | 0.5031 |
| Food & Beverage | -0.8284 | -3.98 (**) | 0.4368 |
| Health Care | -0.9520 | -4.32 (**) | 0.3860 |
| Industrial Goods & Services | -0.6733 | -3.52 (**) | 0.5100 |
| Media | -0.8241 | -4.35 (**) | 0.4386 |
| Oil & Gas | -0.8751 | -4.53 (**) | 0.4168 |
| Personal & Household Goods | -0.9570 | -2.2 (*) | 0.3840 |
| Retail | -0.3264 | -1.97 (*) | 0.7215 |
| Technology | -0.4614 | -2.01 (*) | 0.6304 |
| Telecommunications | -0.7990 | -3.92 (**) | 0.4498 |
| Utilities | -0.8240 | -3.63 (**) | 0.4387 |

Note: $*$ and $**$ mean statistically significant at 5% and 1%, respectively. Mean $\beta_E$ and Min $\beta_E$ show the average of the equity betas and the minimum equity beta from companies in each sector, respectively

Table 6: Testing of Debts beta

| Parameters | Coefficient | t-value |
|---|---|---|
| $\phi_0$ | 0.0336 | 0.53 |
| $\phi_1$ | -0.4019 | -12.80(**) |
| $R^2$ adjusted | 0.8401 | |

Note: * and ** mean statistically significant at 5% and 1%, respectively.

interference from different risks than market (exchange rate vs. Euro currency, or different risk-free rates vs. Euribor), and at the same time, easily identify the market portfolio (EUROSTOXX-50).

The estimation on annual balanced panel data (2010-2015) has been done by GMM-sys, since by construction, there were problems of endogeneity. In this regard, autoregressive test on residuals shows clearly the superiority of this technique versus OLS and GLS. On the other hand, the results show that the leverage effect has not change after the IFRS-13 adoption, and exercise price of the call option, which determines the distance to the bankruptcy of the company, is less than the total book debt, as postulated KMV proposal. Instead, the effects of own default probability and credit risk of financial institutions arise after the Standard adoption, particularly both credit risks increase the excess risk of companies on market risk.

In addition, the sectorial asset betas estimated are always lower than the equity betas equity, as postulated financial theory. In this regard we obtain that the Retail sector has the highest asset risk (highest asset beta) and Health Care presents the lowest risk. We have also contrasted, in cross-section and for the entire study period, if the asset beta is a weighted average of the equity and debt betas. Regarding the latter, we have found that its mean value was 0.4.

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