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Abstract

On implementation, IFRS 9 increases credit loss (impairment) charges and reduces after-tax profits of banks. This makes retained earnings and hence capital resources lower than what they would be under IAS 39. To maintain their capital ratios under IFRS 9, banks could elect to hold higher levels of equity capital. This paper uses a modified version of CAPM, which accounts for the low-risk anomaly (as suggested by Baker and Wurgler (2015)), to estimate the impact of this potential increase in capital levels on the cost of funding of banks in six European countries, the UK, Germany, France, Italy, Spain and Switzerland.

We confirm the existence of low-risk anomaly for banks' equity in the six countries, except France. The magnitude of the anomaly varies across countries, but is generally low relative to the long-run cost of equity for banks. Our results show that, on day 1, the implementation of IFRS 9 has minor impact on the cost of funding of banks in the six countries.

Key words: IFRS 9, low-risk anomaly, cost of funding, cost of equity, leverage, expected loss model, asset beta.

JEL classification: D92, G21, G28, G31, L51.

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1. Introduction

In 2018, the International Accounting Standards Board's (IASB) Standard 9 (IFRS 9[4]) came into effect, replacing IAS 39[5] standard. IFRS 9 has important implications especially for banks, as they mostly hold financial assets. The *incurred loss* model of IAS 39 allows recognition of credit losses only when there is 'objective evidence' of credit impairment, causing delayed identification of potential credit losses. This, as many argue, could reinforce the pro-cyclicality effects of financial regulation (Novotny-Farkas (2016)). To mitigate the delayed recognition of credit losses, IFRS 9 introduces a forward-looking provisioning model, under which credit loss provisions (or impairment charges) are equal to the expected credit losses. The *expected loss* model of IFRS 9 is anticipated to reduce the pro-cyclicality of financial regulations, and hence improve financial stability.

IFRS 9 increases credit loss provisions charges for banks[6]. This rise in provision reduces after-tax profits and retained earnings, which represent a key component of Common Equity Tier 1 (CET1) resources for banks. Other things equal, this leads to higher levels of leverage. Adrian and Shin (2010) point out that a bank determines its leverage level depending on the *implicit maximum* leverage permitted by collateralized creditors. Hence, if the better asset quality transparency under IFRS 9 does not lower that implicit maximum level of leverage, banks would have to preserve their pre-IFRS 9 levels of leverage. To maintain their capital ratios under IFRS 9, banks may choose to hold higher levels of equity capital[7]. In a standard Modigliani-Miller environment, this increase in equity capital would not affect the overall cost of capital[8]. In efficient and integrated capital markets, the lower cost of equity and debt completely offsets the larger share of equity in the capital structure, leaving the weighted average cost of capital (WACC) unchanged. However, a number of inefficiencies or frictions have been

[4] International Financial Reporting Standards 9: Financial Instruments.

[5] International Accounting Standard 39: Financial Instruments: Recognition and Measurement.

[6] This is based on a naïve logic. Because it cover more loans in its scope (Stage 1 and Stage 2 loans), IFRS 9 would make impairment charges, in a given year, higher than what they would be under IAS 39. However, in certain circumstances, IFRS 9 might lead to lower impairment charges and higher profits. This could be the case in an upturn if the stock of loan loss provisions at the start of a year exceeds that required at the end of the year (due to more optimism in expectations).

[7] Banks could maintain their capital ratios by deleveraging and/or de-risking, rather than holding more equity capital.

[8] For example, Brigham and Ehrhardt (2014): "*As leverage increases, more weight is given to low-cost debt, but equity becomes riskier*. *Under* Modigliani-Miller *assumptions,* the cost of equity capital *increases by exactly enough to keep the* cost of capital *constant"* (p. 597).

observed in actual capital markets, challenging the validity of this proposition. One of these frictions, the "low-risk" anomaly, refers to the empirical observation that historical returns and, hence, realised cost of equity are higher for shares with lower betas. In other words, lower levels of leverage are not necessarily associated with *proportionally* lower cost of equity. This means that increasing the share of equity in the capital structure would increase WACC. Several authors find a negative relationship between the returns on equity and the systemic (Fama and French (1992), Baker eta al. (2011b), and Baker et al (2014)) and idiosyncratic risks (Ang et al. (2006)) of the issuer, suggesting that the low-risk anomaly appears in equity markets. The low-risk anomaly has been observed in each of the G7 countries (Ang et al. (2009)), and across 23 developed economies (Baker and Wurgler (2016)). Baker et al (2011a) attribute this anomaly to a combination of irrational investor demand for highly volatile shares[9] and limited arbitrage[10], resulting from "delegated investment management with fixed benchmarks and no leverage". Frazzini and Pedersen (2014) indicate that funding constraints (such as leverage constraints and margin requirements) affect risk-preferences of investors. They point out that while constrained investors tend to invest in risker shares, unconstrained investors hold portfolios with betas below one, on average. Karceski (2002) specifies an alternative explanation for the anomaly. He points out that the strategy of mutual fund managers of investing in high-beta stocks, which offer higher return in bull markets, reduces the risk premia for the high-beta shares, and can inverse the risk-return relationship.

We estimate the impact of the potentially higher levels of capital under IFRS 9 on the cost of funding of banks in six European countries, the UK, Germany, France, Italy, Spain and Switzerland. This would help us better understand the costs of IFRS 9[11]. These costs have to be compared to the benefits of earlier recognition of credit losses.

[9] Authors attribute this irrational preference for shares with higher volatility to investor overconfidence (Cornell (2008)), and lottery preferences (Kumar (2009), Barberis and Huang (2008), and Bali et al. (2011)).

[10] Baker et al (2011a) explain the limited arbitrage preventing sophisticated institutional investors from exploiting any low-risk anomaly by the following. First, shorting highly volatile shares can be hard, especially for smaller companies with small number of shares available to borrow in the market. Moreover, institutional investors do not act on their own behalf in most cases. As their customers want to ensure they can compare different investors among asset classes, the investors must perform relative to a benchmark. This benchmarking restricts their ability to exploit the low-risk anomaly.

[11] Our analysis covers the potential microeconomic costs only, and doesn't investigates the macroeconomic costs. For instance, if banks chose to pass the higher costs to their customers, this could lead to lower lending and possibly lower output.

We follow the method suggested by Baker and Wurgler (2015), which adopts a modified version of CAPM. This method allows us to check whether the low-risk anomaly exists for banks' equity, and to estimate the impact of changes in the capital structure of banks on their costs of funding, in the presence of such anomaly. This paper contributes to the literature studying the impact of capital structure on the cost of capital, especially those investigating the inadequacies of CAPM predictions. Consistent with past literature (for instance, Baker and Wurgler (2016) and Arakelyan and Karapetyan (2014)), our results confirm that low-risk anomaly exists for bank equity in the UK, Germany, Italy, Spain and Switzerland. However, the results do not provide a robust evidence of the anomaly for French banks' equity. The annual magnitude of the anomaly varies across countries, but is generally low relative to the long-run cost of equity for banks. We show that the possible higher capital levels under IFRS 9 may slightly increase banks cost of funding in the six countries except France, where the cost of funding may fall.

It is important to note that our estimates of IFRS 9 impact on the cost of funding should be viewed as the "day 1" impact. Their validity as estimates for the longer-term impact of IFRS 9 relies on two main factors that are out of the scope of this paper. First, our analysis does not investigate whether the impact of IFRS 9 on the level of equity capital would be stable across different stages of the credit cycle. Moreover, our analysis does not account for the potential increase in asset quality transparency under IFRS 9. Yet, our analysis provides important insights about the impact of IFRS 9 on the cost of funding.

The reminder of the paper proceeds as follows. Section 2 outlines our model, Section 3 describes the data we use in the estimation, Section 4 presents the empirical analysis, and Section 5 concludes.

2. The Model

For the purposes of measuring the low-risk anomaly, we use equity beta as a measure of equity risk, defined as the covariance of returns on equity with the risk premium of the market, divided by the variance of the risk premium of the market. Under CAPM, asset beta is the weighted average of equity and debt betas:

$$\beta_a = e.\beta_e + (1-e).\beta_d \quad (1)$$

Where, β_a: asset beta; β_e: equity beta; β_d: debt beta; and *e*: ratio of equity to total assets (the leverage ratio). By rearranging Equation (1), we can write β_e as follows:

$$\beta_e = \frac{1}{e}.\beta_a - \left(\frac{1}{e} - 1\right).\beta_d \quad (2)$$

Assuming approximately riskless debt, asset beta can be defined as the slope of the linear relationship between the inverse of leverage ratio and equity beta. As debt beta is normally significantly lower than asset beta, the estimation of β_a will allow us to assess how reasonable the assumption of riskless debt for banks is. Additionally, assuming the CAPM holds for equity and debt, the returns on equity and debt are:

$$r_e = r_f + \beta_e.r_p \quad (3)$$
$$r_d = r_f + \beta_d.r_p \quad (4)$$

Where: r_e: return on equity; r_d: return on debt; r_f: the risk-free rate; and r_p: excess return on the market portfolio. However, following Baker and Wurgler (2015), we assume that there is an anomaly in the sense that lower beta shares outperform their CAPM benchmark, whereas high beta shares under-perform it. That is:

$$r_e = \alpha + r_f + \beta_e.r_p \quad (5)$$

Where, $\alpha = \gamma.(\beta_e - 1)$ is the low-risk anomaly term, and $\gamma = \frac{d\alpha}{d\beta_e} < 0$ is the magnitude of the low-risk anomaly. Using the returns on equity and debt (Equations (4) and (5)) and equity beta (Equation (2)), WACC is given by the following[12]:

$$WACC = r_f + \beta_a.r_p + \beta_a.\gamma - \gamma[e + (1-e).\beta_d(e)] \quad (6)$$

Our aim is to calculate the impact of the potential increase in the level of equity capital, induced by the implementation of IFRS 9, on the cost of funding of banks. In other words, we are interested in calculating the change in WACC when the level of capital increases from *e* to *e**. We can derive the change in WACC from Equation (6) as follows:

$$\Delta WACC = \gamma.[e - e^* + (1-e).\beta_d(e) - (1-e^*).\beta_d(e^*)] \quad (7)$$

[12] The derivation of Equation (6) is in the appendix.

Our benchmark is the special case where bank debt is riskless ($\beta_d = 0$)[13]. In Equation (7), *ΔWACC* becomes a function of the low-risk anomaly and the change in the level of capital. That is:

$$\Delta WACC = \gamma.(e - e^{*}) \quad (8)$$

We also explore another plausible scenario, under which debt is risky ($\beta_d > 0$) but not very responsive to changes in leverage levels (β_d isn't sensitive to small changes in leverage). Hence, *ΔWACC* would be:

$$\Delta WACC = \gamma.(e - e^{*}).(1 - \beta_d) \quad (9)$$

For the purposes of this paper, we assume that there is no low-risk anomaly in debt markets, and that there are no government guarantees for bank debt. The presence of the low-risk anomaly in debt markets reduces the impact of the low-risk anomaly in share markets on the change of WACC[14]. If an anomaly existed in debt market with the same magnitude of that in equity markets, then changes in capital structure would not affect WACC. Frazzini and Pedersen (2014) and Baker and Wurgler (2016) indicate that the low-risk anomaly in debt markets, if existed, is much smaller than that in share markets. Conversely, the presence of government guarantees for bank debt (such as deposit insurance) in practice increases the low-risk anomaly impact on the change of WACC. This is because such guarantees reduce the riskiness of banks debt and weaken the relationship between the riskiness of debt and the level of leverage (debt beta does not fall as much as what CAPM would predict)[15]. Consequently, as Baker and Wurgler (2015) indicate, the estimated level of γ is a plausible approximation of the magnitude of the low-risk anomaly for banks.

3. The data

Our sample consists of 75 publicly traded banks from six European countries. It includes 10 UK banks, 8 German banks, 8 French banks, 9 Spanish banks, 17 Italian banks, and 23 Swiss banks. Other large banks could not be included as there is no publicly traded equity available for them. We collect daily data on banks' share price, market indices, and the yield of 10-year government bonds (used as the

[13] If bank debt were risky, the change in the cost of funding would be reduced to the extent that the increased level of capital reduces β_d, as Equation (7) shows. Although the assumption of riskless debt is a reasonable for banks, it does not hold true for very highly levered banks. Yet, we can drop such extreme cases, as banking regulations, which requires certain equity ratios, would prevent those cases.

[14] Stronger low-risk anomaly in debt markets and/or higher riskiness of bank debt reduce the impact of the low-risk anomaly in share markets on WACC, as Baker and Wurgler (2015) indicate.

[15] Baker and Wurgler (2015) indicate that the "calibration with riskless debt remains a reasonable estimate in the presence of such factors".

risk-free rate) from Refinitiv Eikon®. Our dataset spreads over the period between 1997 and 2017, with about 322,000 daily observations across the 75 banks. Table 1 presents country-level statistics of the market data.

Table 1: Summary statistics of return data (1997 – 2017)

	No. of Banks	No. of Obs.	Share market index	Start date	Risk-free rate
UK	10	37,672	FTSE 100	01/04/1997	UK gov. 10Y
Germany	8	29,234	DAX 30	01/04/1997	German gov. 10Y
France	8	40,474	CAC 40	01/04/1997	French gov. 10Y
Italy	17	76,947	FTSE MIB	31/12/1997	Italian gov. 10Y
Spain	9	33,963	IBEX 35	01/04/1997	Spanish gov. 10Y
Switzerland	23	103,533	SMI	01/04/1997	Swiss gov. 10Y

Source: Refinitiv Eikon®

We also use quarterly balance sheet data between 1999 and 2017 from Eikon® to calculate three capital ratios used in the estimation of asset betas of the banks: the leverage ratio, common equity Tier-1 (CET1) ratio, and Tier-1 (T1) capital ratio. We define the leverage ratio as the ratio of total common equity to total assets, whereas CET1 and T1 capital ratios are calculated by dividing total common equity and T1 capital by total risk-weighted assets. The capital ratios dataset comprises around 5,000 observations across the 75 banks. Table 2 displays country level statistics of the balance sheet data. As the table shows, UK and Swiss banks were historically more levered on average than banks in the other four countries. This could be due to the lower asset risk, where the average risk weights[16] of the banks in UK and Switzerland were 48.66% and 40.36%, on average. Meanwhile, Italian and German banks were the least levered and had higher average risk weights (61.29% and 70.89%, respectively), on average. French and Spanish average risk weights were 51.68% and 60.83% on average, respectively.

Table 2: Summary statistics of capital ratios of the banks in the sample (1999 – 2017)

	Leverage ratio					CET1 ratio					Tier 1 ratio				
	Obs.	Max	Min	Avg.	St.dev	Obs.	Max	Min	Avg.	St.dev	Obs.	Max	Min	Avg.	St.dev
UK	578	21.61%	1.61%	6.37%	3.35%	535	24.06%	5.03%	13.09%	4.39%	535	22.03%	6.89%	11.74%	3.40%
Germany	544	33.77%	1.40%	7.94%	8.15%	227	24.74%	4.02%	11.20%	5.35%	227	22.98%	5.83%	10.88%	3.82%
France	568	17.50%	2.16%	7.55%	4.61%	388	28.02%	6.45%	14.61%	5.29%	380	21.28%	5.50%	11.98%	4.16%
Italy	1,192	47.24%	1.25%	8.20%	5.21%	994	86.04%	4.13%	13.38%	8.14%	986	80.71%	5.13%	10.90%	6.47%
Spain	528	32.10%	-2.20%	6.91%	5.01%	404	18.86%	-5.76%	11.36%	3.77%	404	15.08%	5.00%	10.10%	2.34%
Switzerland	1,576	24.76%	-0.11%	6.51%	3.34%	956	50.55%	4.33%	16.13%	7.92%	872	39.57%	8.00%	16.44%	4.57%

Source: Refinitiv Eikon®.

[16] We estimate the average risk weight by dividing the leverage ratio by the CET1 ratio.

For the impact of IFRS 9 on the level of equity capital, we use two sources: the European Banking Authority's (EBA) report on results from its second impact assessment of IFRS 9[17] (July 2017), and Mazars's quantified impacts of IFRS 9[18] (March 2018). Both studies estimate the impact of the IFRS 9 on the CET1 ratios of a sample of European banks. The EBA's estimates use a sample of 54 banks, compared to 27 banks in Mazars's analysis. However, Mazars's estimates are more recent and presents bank-level estimates, allowing us to extract the IFRS 9 impact for 20 of the banks in our sample. A common feature of the two studies is that banks at the top quartile have very large negative estimated impacts compared to the average and median in each of the samples. Table 3 presents the data extracted from the two studies.

Table 3: Impact of IFRS 9 on the CET1 ratio of sample of European banks

Source	Sample	Sample size	Average impact	Median impact	Maximum impact	Minimum impact	Standard deviation
EBA's report[1]	All banks	54	-45bps	-50bps	-150bps	+12.5bps	42bps
Mazars's study[2]	All banks	27	-24bps	-20bps	-102bps	+30bps	27bps
Our sample based on Mazars's study	UK	6[3]	-11.5bps	-17.5bps	-34bps	+30bps	24bps
	Germany	2	-41.5bps	-41.5bps	-75bps	-8bps	47.4bps
	France	4	-17.5bps	-15bps	-30bps	-10bps	8.7bps
	Italy	2	-71bps	-71bps	-102bps	-40bps	43.8bps
	Spain	4	-36.5bps	-25.5bps	-80bps	-0.15bps	29.8bps
	Switzerland	2	-20.5bps	-20.5bps	-41bps	0bps	29bps

Source: [1] Report on Results from the Second EBA Impact Assessment of IFRS 9.
[2] Quantified Impacts of IFRS 9: Initial Findings.
[3] The estimates for Santander UK parent (Banco Santander SA) are used.

4. Empirical Analysis and Results

We concentrate, in our estimation of the impact of the IFRS 9-induced potential increase in the level of equity capital on the cost of funding of banks, on the case where bank debt is riskless. We also explore another plausible scenario, under which debt is risky but not very responsive to changes in the level of leverage. As Equation 9 shows, the impact of IFRS 9 on the cost of funding would be lower, under this scenario, if debt beta is positive. Allowing the debt riskiness to vary with the level of leverage would decrease the impact of IFRS 9 on the cost of funding to the extent lower levels of leverage reduce the riskiness of bank debt.

[17] Available at: https://www.eba.europa.eu/-/eba-updates-on-the-impact-of-ifrs-9-on-banks-across-the-eu-and-highlights-current-implementation-issues.

[18] Available at: https://www.mazars.com/Home/News/Our-publications/Mazars-Insights/Quantified-impacts-of-IFRS-9-initial-findings.

4.1 Estimation of Asset Beta:

To estimate asset beta (Equation (1)), we regress equity betas on the inverse of leverage ratios for the banks in our sample, on quarterly basis. Equity betas are estimated by regressing the daily excess returns on equity for each bank on the excess returns of market indices over the two years preceding the observation period. We also estimate assets betas using other capital ratios, namely CET1 ratio and T1 capital ratio. Table 4 presents the average asset betas of banks in each of the six countries in our sample[19]. The asset beta values estimated using quarterly leverage ratios show that UK and Spanish banks have the lowest asset betas in our sample (about 0.06), whereas French and German banks have the highest asset betas on average (around 0.10). This is in line with our earlier observations about asset risk of UK and German banks.

Table 4: Average estimated asset betas

Capital ratio	UK	Germany	France	Italy	Spain	Switzerland
Leverage ratio	0.06	0.10	0.10	0.09	0.06	0.08
CET1 ratio	0.13	0.12	0.15	0.14	0.11	0.18
Tier-1 Capital ratio	0.15	0.12	0.19	0.18	0.12	0.17

Asset beta is the weighted average of equity and debt betas. For most banks in our sample, asset betas (Appendix A2) are close to zero and very low relative to equity betas (Appendix A7). This means debt betas are very close to zero, indicating that riskless debt assumption is a reasonable approximation for the banks in our sample. However, it is important to note here that leverage levels at banks are partially influenced by bank regulations. This weakens the relationship between risk and leverage and flattens the cross-sectional relationship between risk and leverage. Hence, as Baker and Wurgler (2015) indicate, estimated β_a would represent a plausible lower bound of asset beta.

4.2 Estimation of Magnitude of the Low-Risk Anomaly (γ)

To estimate γ, we start by estimating alphas and betas in Equation (4) for three portfolios[20] for each country: large banks (the largest 30% of the banks), small banks (the smallest 30%), and medium banks

[19] Appendix A2 includes more information about estimated asset betas for the banks in our sample. In that Appendix, we also re-estimate asset betas on annual basis.

[20] The weights in these portfolios (as well as those in Section 4.4) are calculated by dividing the total assets of each bank on the total assets of all banks in the portfolio, using end 2017 data.

(the remaining 40%). This is done by regressing excess returns on each of these portfolios on market excess returns. We then estimate the country-level values of γ by plotting the resulting alphas and betas for each country[21]. As the values in Table 5 indicate, the low-risk anomaly exists for banks equity in the six countries in our sample, except France, where γ value is positive. The magnitude of the anomaly is generally weak and varies across countries. The strongest anomaly of 14.68bps per annum appears for German banks' equity. This means that for every 1 percentage point increase in the share of equity in the capital structure, the cost of funding for German banks can rise by about 0.15 percentage points. Meanwhile, a similar change in the capital structure would increase the cost of capital by around 0.11 percentage points for UK and Spanish banks, 0.03 percentage points for Italian banks, and 0.02 percentage points for Swiss banks. Conversely, such an increase in the share of equity in the capital structure would reduce the cost of funding of French banks by about 4bps.

Table 5: Estimated annual magnitude of the low-risk anomaly

	UK	Germany	France	Italy	Spain	Switzerland
Riskless Debt	-10.61bps	-14.68bps	4.04bps	-3.45bps	-10.14bps	-1.54bps
Risky Debt	-10.98bps	-15.02bps	4.13bps	-3.55bps	-10.41bps	-1.57bps

To put these estimates in a context, we should relate them to the cost of equity of banks. King (2009) estimates the real cost of equity for banks in the UK, Germany and France at 6.6%, 9% and 7.3%, respectively. Based on these estimates, a percentage point increase in the share of equity in capital structure could raise the cost of funding of UK and German banks by about 1.61% (0.1061%/6.6%) and 1.63%, respectively. A similar increase in the share of equity capital could decrease the cost of funding of French banks by 0.53% of their long-term cost of equity. The annualised magnitude of the low-risk anomaly increases slightly, when debt is risky but not very responsive to changes in the level of leverage (Equation (9)), as Table 5 shows. This is because the weighted average of the debt betas of the country-level portfolios is negative in all countries[22].

[21] We present the estimated values of alphas and betas for the country-level portfolios, and the plots used to estimate γ values in Appendix A3.

[22] The debt betas of the country-level portfolios are calculated by substituting the equity and assets beta of each portfolio into Equation (1). Their values are presented in Appendix A3.

4.3 Estimation of the impact of IFRS 9 on the cost of funding

Having estimated the magnitude of the low-risk anomaly, we can assess the impact of the implementation of IFRS 9 on the cost of funding for banks. We do that by multiplying the annual magnitude of the low risk anomaly for each country (Table 5) by the average impacts of IFRS 9 on the levels of equity capital extracted from the EBA's report 9 and Mazars's study (Table 3). In addition to the two samples of banks reported in the two studies, we create country-level subsamples containing the banks included in Mazars's study from each of the six countries in our sample. Table 6 presents the estimated impact of IFRS 9 on banks' cost of funding in each country. As the Table shows, IFRS 9 may slightly affect the cost of funding of banks in the six countries[23]. Specifically, assuming that banks would fill any shortfalls by increasing equity, IFRS 9 may increase the cost of funding for all banks except French banks, whose cost of funding would fall. For example, based on the EBA's estimated impact of IFRS 9 on capital ratios, the cost of funding of UK banks may increase by about 5 bps. This impact decreases to about 3 bps when using Mazars's estimates.

Table 6: Estimated Average Impact of IFRS 9 the cost of funding of banks (in basis points)

	Riskless Debt			Risky Debt, low sensitivity to leverage		
Sample	**EBA**	**Mazras**	**Mazras (country)**	**EBA**	**Mazras**	**Mazras (country)**
UK	**4.77**	**2.55**	**1.22**	**4.94**	**2.63**	**1.26**
Germany	**6.61**	**3.52**	**6.09**	**6.76**	**3.61**	**6.23**
France	**-1.82**	**-0.97**	**-0.71**	**-1.86**	**-0.99**	**-0.72**
Italy	**1.55**	**0.83**	**2.45**	**1.60**	**0.85**	**2.52**
Spain	**4.56**	**2.43**	**3.70**	**4.69**	**2.50**	**3.80**
Switzerland	**0.69**	**0.37**	**0.32**	**0.71**	**0.38**	**0.32**

It is important here to note that we should interpret these estimates as the "day 1" impact of IFRS 9 on the cost of funding. Their validity as estimates for the longer-term impact of IFRS 9 relies on two main factors that are out of the scope of this paper. First, our analysis does not investigate whether the impact of IFRS 9 on the level of equity capital would be stable across different stages of the credit cycle. Moreover, our analysis does not account for the potential increase in asset quality transparency under IFRS 9. This increase in transparency might induce a reduction in the cost of equity and debt for banks at different levels of leverage[24]. Had this been the case, our estimates would have overstated

[23] Appendix A4 includes more details about the estimated impact of IFRS 9 on the cost of funding.

[24] The rise in asset quality transparency may increase or reduce the cost of funding by revealing the *true* riskiness of assets.

the impact of IFRS 9 on the cost of funding of banks. However, our analysis delivers important insights about the potential implications of IFRS 9. It also provides a good start for similar analyses in the future when IFRS 9 becomes more established.

4.4 Robustness checks

We re-estimate γ in five alternative ways. In the first experiment, we use excess returns on six portfolios including all the banks in each country. We estimate γ values by substituting the resulting alpha and beta into $\alpha = \gamma.(\beta_e - 1)$. In the second experiment, we use excess returns on two portfolios consisting of the largest 50% and smallest 50% of the banks, in each country. In the third experiment, we regress excess returns for each bank in the sample on market excess returns. As in the baseline case, we estimate γ in the second and third experiments by plotting the resulting alphas and betas. In the fourth experiment, we estimate alphas and betas using panels of excess returns for all banks in each country, and then estimate γ values as in the first experiment. As in the baseline, we use three portfolios in the fifth experiment. However, in this experiment, we classify banks in terms of their riskiness (equity betas), following Baker and Wurgler (2015). Thus, for each country, we create three portfolios: high-risk banks (the 30% most risky banks), low-risk banks (the 30% least risky banks), and medium-risk banks (the remaining 40% of the banks). Table 7 demonstrates the resulting values for γ under the five experiments[25]. As the Table shows, γ estimates across the five experiments are generally consistent with the baseline estimates for the UK, Spain and Switzerland. For German banks, the low-risk anomaly appears in the five experiments, but its magnitude is considerably higher than the baseline estimate in the first experiment and somehow lower in the fourth experiment. This could be due to a relatively higher anomaly for the largest two German banks in our sample (Deutsche Bank and Commerzbank), compared to other German banks. Compared to the baseline, the two banks have stronger influence on the magnitude of the anomaly in the first experiment and weaker influence in the fourth experiment[26]. Additionally, γ estimates for Italian banks are consistent with the baseline

[25] Appendices A5 to A9 includes more information about γ estimation under each of the five robustness experiments.

[26] In the first experiment, we have only one portfolio comprising all German banks, in which the two banks have combined weight of 96.5%. As a result, the two banks would have a stronger contribution to the values of the alpha and beta of the

estimates in the last three experiments but not in the first two experiments. This is especially true in the second experiment, when γ becomes positive. In the first experiment, γ is negative but has a very weak annual magnitude of 0.1bps. Lastly, γ estimates for French banks are strongly affected by the portfolio choice in each experiment. They are inconsistent and fluctuate in sign and magnitude across experiments. Overall, the results of the five experiments confirm our baseline assessment that the low-risk anomaly exists for banks equity in the six countries in our sample, except France.

Table 7: Estimated annualised γ values under the four experiments (bps)

	3 Portfolios (Baseline)		Portfolio of all banks (EXP1)		2 Portfolios (EXP2)		Individual Banks (EXP3)		Panel analysis (EXP4)		3 risk-based portfolios (EXP5)	
	Riskless Debt	Risky Debt	Riskless Debt	Risky Debt	Riskless Debt	Risky Debt	Riskless Debt	Risky Debt	Riskless Debt	Risky Debt	Riskless Debt	Risky Debt
UK	-10.61	-10.98	-6.78	-7.02	-6.15	-6.33	-15.15	-15.66	-10.16	-10.49	-9.82	-10.15
Germany	-14.68	-15.02	-46.85	-48.02	-15.78	-16.17	-12.57	-12.87	-2.12	-2.11	-16.71	-17.10
France	4.04	4.13	-26.55	-27.12	3.21	3.21	-3.06	-3.13	-13.86	-13.84	4.55	4.64
Italy	-3.45	-3.55	-0.1	-0.1	4.86	5.00	-4.19	-4.31	-2.51	-2.51	-2.97	-3.06
Spain	-10.14	-10.41	-7.96	-8.12	-19.06	-19.45	-10.06	-10.24	-19.57	-19.67	-10.41	-10.55
Switzerland	-1.54	-1.57	-7.41	-7.56	-1.26	-1.29	-3.92	-3.89	-5.90	-5.73	-5.01	-4.98

Table 8: Impact of IFRS 9 the cost of funding of UK banks; riskless debt; robustness checks (bps)

	3 size-based portfolios (Baseline)			All banks (EXP1)		
Sample	EBA	Mazras	Mazras (cntry)	EBA	Mazras	Mazras (cntry)
UK	4.77	2.55	1.22	3.05	1.63	0.78
Germany	6.61	3.52	6.09	21.08	11.24	19.44
France	-1.82	-0.97	-0.71	11.95	6.37	4.65
Italy	1.55	0.83	2.45	0.04	0.02	0.07
Spain	4.56	2.43	3.70	3.58	1.91	2.90
Switzerland	0.69	0.37	0.32	3.33	1.78	1.52
	2 portfolios (EXP2)			Individual banks (EXP3)		
Sample	EBA	Mazras	Mazras (cntry)	EBA	Mazras	Mazras (cntry)
UK	2.77	1.48	0.71	6.82	3.64	1.74
Germany	7.10	3.79	6.55	5.66	3.02	5.22
France	-1.44	-0.77	-0.56	1.38	0.74	0.54
Italy	-2.19	-1.17	-3.45	1.89	1.01	2.98
Spain	8.58	4.58	6.96	4.53	2.41	3.67
Switzerland	0.57	0.30	0.26	1.76	0.94	0.80
	Panel analysis (EXP4)			3 risk-based portfolios (EXP5)		
Sample	EBA	Mazras	Mazras (cntry)	EBA	Mazras	Mazras (cntry)
UK	4.57	2.44	1.17	4.42	2.36	1.13
Germany	0.95	0.51	0.88	7.52	4.01	6.94
France	-6.24	-3.33	-2.42	-2.05	-1.09	-0.80
Italy	1.13	0.60	1.78	1.34	0.71	2.11
Spain	8.81	4.70	7.14	4.68	2.50	3.80
Switzerland	2.66	1.42	1.21	2.25	1.20	1.02

portfolio, and hence the estimated magnitude of the low-risk anomaly. In the baseline, the two banks affect only one of three sets of alpha and beta which have equal impacts on the estimated anomaly, making their influence on it weaker. Their influence is even weaker in the fourth experiment where the banks have equal weights in the panel.

Table 8 displays the estimated impacts of IFRS 9 on the cost of funding calculated, under each of the five experiments, assuming bank debt is riskless[27]. As with the magnitude of the low-risk anomaly, these impacts are generally close to the baseline estimates for UK, Spanish and Swiss banks in the five experiments. They are also close to the baseline estimates for German banks (except in the first and the fourth experiments) and Italian banks (except in the first and the second experiments). The impact for French banks fluctuate across experiments in both direction and magnitude.

5. Conclusion

IFRS 9 replaces the *incurred loss* model of IAS 39 with a forward-looking *expected loss* model, under which credit loss provisions are equal to the expected credit losses. The expected loss model is likely to increase credit loss charges for banks, reducing after-tax profits, and, hence retained earnings; the main source of equity capital of banks. Thus, to maintain their capital ratios, banks may choose to hold higher levels of equity capital under IFRS 9. To estimate the impact of this IFRS 9-induced potential increase in equity capital on the cost of funding of banks, we followed Baker and Wurgler (2015) by adjusting CAPM to account for the low-risk anomaly.

Consistent with past literature, we confirm that the low-risk anomaly exists for bank equity in the UK, Germany, Italy, Spain and Switzerland. However, the results do not provide a robust evidence of the anomaly for French banks' equity. The annual magnitude of the anomaly varies across countries, but is generally low relative to the long-run cost of equity for banks. We show that the implementation of IFRS 9 may slightly increase the cost of funding for banks in the six countries except France, where the cost of funding for banks could fall.

Whether we can view this impact as an estimate of the longer-term impact of IFRS 9 depend on two elements, which are out of the scope of our analysis. First, we did not investigate whether the impact of IFRS 9 on the level of equity capital would be stable across different stages of the credit cycle. Likewise, we did not account for the potential positive effects of the early recognition of losses under

[27] We also calculate the estimated impacts of IFRS 9 in the second case we explore in this paper (i.e. when bank debt is risky but not very sensitive to leverage). We present these impacts in Appendices A10 to A14.

IFRS 9 on asset quality transparency. An increase in this transparency might reduce (or increase) the cost of equity and debt for banks at different levels of leverage. In this case, our estimates would have overstated the impact of IFRS 9. Nevertheless, our analysis provides important insights about the potential implications of IFRS 9 on the cost of funding of banks. It also represents a good start for similar analyses in the future when IFRS 9 becomes more established.

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Appendix

A1. Derivation of Equation (6)

- Start from the definition of WACC:

$$WACC = e.r_e + (1 - e).r_d$$

- Substitute in the values of r_e and r_d from Equations (5) and (4), respectively:

$$WACC = e.\left[\gamma.(\beta_e - 1) + r_f + \beta_e.r_p\right] + (1 - e).\left[r_f + \beta_d.r_p\right]$$

$$\Rightarrow WACC = \cancel{e.r_f} + e.\gamma.\beta_e - e.\gamma + e.\beta_e.r_p + r_f - \cancel{e.r_f} + \beta_d.r_p - e.\beta_d.r_p$$

$$\Rightarrow WACC = r_f - e.\gamma + e.\beta_e.\left(\gamma + r_p\right) + \beta_d.r_p - e.\beta_d.r_p$$

- Substitute in the value of β_e from Equation (2):

$$WACC = r_f - e.\gamma + (\beta_a - (1 - e).\beta_d).\left(\gamma + r_p\right) + \beta_d.r_p - e.\beta_d.r_p$$

$$\Rightarrow WACC = r_f - e.\gamma + \gamma.\beta_a + r_p.\beta_a - \gamma.(1 - e).\beta_d - (1 - e).\beta_d.r_p + \beta_d.r_p - e.\beta_d.r_p$$

$$\Rightarrow WACC = r_f - e.\gamma + \gamma.\beta_a + r_p.\beta_a - \gamma.(1 - e).\beta_d - \cancel{(1 - e).\beta_d.r_p} + \cancel{(1 - e).\beta_d.r_p}$$

$$\Rightarrow WACC = r_f + \gamma.\beta_a + r_p.\beta_a - e.\gamma - \gamma.(1 - e).\beta_d$$

$$\Rightarrow WACC = r_f + \beta_a.r_p + \beta_a.\gamma - \gamma[e + (1 - e).\beta_d]$$

- For a given level of β_a, Since β_d is a function of e:

$$WACC = r_f + \beta_a.r_p + \beta_a.\gamma - \gamma[e + (1 - e).\beta_d(e)]$$

A2. Asset betas of the banks in the sample

A2.1 Asset betas for UK banks

	the leverage ratio		CET1 ratio		Tier-1 Capital ratio	
Bank	quarterly data	annual data	quarterly data	annual data	quarterly data	annual data
Barclays	0.03 (0.002)	0.03 (0.003)	0.10 (0.006)	0.10 (0.012)	0.09 (0.005)	0.09 (0.010)
HSBC	0.06 (0.001)	0.06 (0.003)	0.13 (0.004)	0.13 (0.007)	0.11 (0.003)	0.11 (0.007)
Lloyds	0.04 (0.002)	0.04 (0.003)	0.10 (0.007)	0.10 (0.015)	0.10 (0.005)	0.10 (0.010)
RBS	0.04 (0.002)	0.05 (0.004)	0.12 (0.007)	0.12 (0.014)	0.10 (0.005)	0.10 (0.010)
Standard Chartered	0.06 (0.002)	0.06 (0.003)	0.11 (0.004)	0.11 (0.009)	0.10 (0.004)	0.10 (0.008)
Santander UK	0.05 (0.002)	0.05 (0.003)	0.10 (0.005)	0.10 (0.009)	0.11 (0.004)	0.11 (0.008)
CYBG	0.09 (0.003)	0.09 (0.004)	0.20 (0.006)	0.19 (0.010)	0.17 (0.007)	0.15 (0.012)
Virgin Money	0.04 (0.001)	0.04 (0.002)	0.19 (0.005)	0.20 (0.015)	0.20 (0.007)	0.21 (0.018)
Metro Bank	0.08 (0.004)	0.08 (0.008)	0.23 (0.013)	0.23 (0.023)	0.19 (0.010)	0.19 (0.018)
Close Brothers	0.15 (0.004)	0.15 (0.007)	0.18 (0.003)	0.18 (0.007)	0.15 (0.003)	0.15 (0.006)

Standard errors in parentheses.

A2.2 Asset betas for German banks

	the leverage ratio		CET1 ratio		Tier-1 Capital ratio	
Bank	quarterly data	annual data	quarterly data	annual data	quarterly data	annual data
Deutsche Bank	0.03 (0.001)	0.03 (0.002)	0.13 (0.003)	0.13 (0.007)	0.11 (0.003)	0.11 (0.006)
Commerzbank	0.04 (0.001)	0.04 (0.003)	0.10 (0.004)	0.10 (0.008)	0.10 (0.003)	0.10 (0.006)
DT.Pfandbriefbank	0.05 (0.001)	0.05 (0.002)	0.21 (0.003)	0.21 (0.005)	0.18 (0.002)	0.18 (0.004)
Procredit Holding	0.12 (0.001)	0.12 (0.003)	0.15 (0.001)	0.15 (0.002)	0.14 (0.000)	0.14 (0.000)
Umweltbank	0.04 (0.003)	0.05 (0.008)	0.05 (0.001)	0.05 (0.002)	0.09 (0.002)	0.08 (0.004)
Enercity PAR	0.36 (0.016)	0.35 (0.032)				
Merkur Bank	0.06 (0.004)	0.06 (0.007)	0.06 (0.002)	0.06 (0.004)	0.09 (0.005)	0.09 (0.010)
Quirin Privatbk	0.11 (0.007)	0.12 (0.015)				

Standard errors in parentheses.

A2.3 Asset betas for French banks

	the leverage ratio		CET1 ratio		Tier-1 Capital ratio	
Bank	quarterly data	annual data	quarterly data	annual data	quarterly data	annual data
BNP Paribas	0.03 (0.001)	0.03 (0.001)	0.10 (0.003)	0.10 (0.005)	0.09 (0.002)	0.09 (0.005)
Crédit Agricole	0.03 (0.001)	0.02 (0.003)	0.13 (0.006)	0.13 (0.016)	0.10 (0.005)	0.09 (0.013)
Société Générale	0.03 (0.001)	0.03 (0.001)	0.11 (0.003)	0.11 (0.007)	0.09 (0.002)	0.09 (0.005)
Natixis	0.03 (0.001)	0.03 (0.002)	0.12 (0.003)	0.12 (0.007)	0.10 (0.003)	0.10 (0.006)
Caisse Credit	0.18 (0.009)	0.18 (0.016)	0.31 (0.012)	0.31 (0.025)	0.26 (0.008)	0.26 (0.019)
CRCAM Nord CCI	0.15 (0.008)	0.15 (0.015)	0.24 (0.011)	0.26 (0.000)	0.22 (0.010)	0.23 (0.000)
Crcam Normandie	0.18 (0.009)	0.18 (0.018)	0.26 (0.014)	0.26 (0.028)	0.17 (0.011)	0.17 (0.023)
CRCAM ILLE-VIL	0.17 (0.009)	0.17 (0.017)	0.24 (0.051)	0.23 (0.132)	0.17 (0.038)	0.17 (0.099)

Standard errors in parentheses.

A2.4 Asset betas for Italian banks

	the leverage ratio		CET1 ratio		Tier-1 Capital ratio	
Bank	quarterly data	annual data	quarterly data	annual data	quarterly data	annual data
Unicredit	0.05 (0.001)	0.05 (0.002)	0.09 (0.002)	0.09 (0.004)	0.08 (0.003)	0.08 (0.006)
Intesa Sanpaolo	0.06 (0.001)	0.06 (0.003)	0.11 (0.004)	0.11 (0.009)	0.08 (0.003)	0.08 (0.007)
BANCO BPM	0.07 (0.002)	0.07 (0.004)	0.13 (0.004)	0.13 (0.008)	0.09 (0.003)	0.09 (0.007)
B. Monte dei Paschi	0.04 (0.003)	0.05 (0.005)	0.08 (0.006)	0.10 (0.009)	0.07 (0.005)	0.09 (0.005)
Unione di Banche IT	0.08 (0.002)	0.08 (0.005)	0.13 (0.003)	0.12 (0.007)	0.09 (0.002)	0.09 (0.004)
Mediobanca	0.12 (0.003)	0.12 (0.006)	0.15 (0.003)	0.15 (0.007)	0.13 (0.004)	0.13 (0.008)
BPER Banca	0.07 (0.003)	0.07 (0.006)	0.10 (0.004)	0.10 (0.009)	0.10 (0.005)	0.10 (0.010)
Credito Emiliano	0.06 (0.001)	0.06 (0.002)	0.12 (0.004)	0.12 (0.009)	0.10 (0.003)	0.10 (0.006)
Banca Poplare	0.10 (0.007)	0.09 (0.014)	0.13 (0.007)	0.13 (0.014)	0.12 (0.007)	0.12 (0.013)
Banca Piccolo	0.09 (0.002)	0.08 (0.005)	0.13 (0.003)	0.13 (0.006)	0.11 (0.003)	0.11 (0.007)
Banca Carige	0.11 (0.007)	0.11 (0.014)	0.17 (0.010)	0.17 (0.021)	0.10 (0.005)	0.10 (0.010)
Finecobank	0.03 (0.001)	0.03 (0.002)	0.35 (0.007)	0.35 (0.012)	0.22 (0.003)	0.22 (0.006)
B. Desio & Brianza	0.10 (0.004)	0.10 (0.008)	0.15 (0.005)	0.15 (0.010)	0.14 (0.005)	0.14 (0.009)
Banco di Sardegna	0.12 (0.004)	0.12 (0.007)	0.16 (0.005)	0.17 (0.010)	0.15 (0.005)	0.15 (0.010)
Dobank	0.09 (0.001)	0.10 (0.000)	0.36 (0.003)	0.36 (0.000)	0.25 (0.002)	0.25 (0.000)
Banca Finnat	0.30 (0.018)	0.30 (0.037)	0.45 (0.009)	0.45 (0.014)	0.31 (0.006)	0.31 (0.015)
Banca Profilo	0.10 (0.006)	0.10 (0.011)	0.29 (0.021)	0.29 (0.046)	0.28 (0.020)	0.29 (0.043)

Standard errors in parentheses.

A2.5 Asset betas for Spanish banks

	the leverage ratio		CET1 ratio		Tier-1 Capital ratio	
Bank	quarterly data	annual data	quarterly data	annual data	quarterly data	annual data
Santander	0.05 (0.001)	0.05 (0.002)	0.10 (0.003)	0.10 (0.006)	0.08 (0.002)	0.08 (0.005)
BBVA	0.05 (0.001)	0.05 (0.003)	0.09 (0.003)	0.09 (0.005)	0.08 (0.002)	0.08 (0.005)
CaixaBank	0.13 (0.017)	0.14 (0.037)	0.17 (0.003)	0.17 (0.005)	0.13 (0.003)	0.13 (0.005)
B. de Sabadell	0.07 (0.003)	0.07 (0.007)	0.13 (0.004)	0.13 (0.007)	0.11 (0.003)	0.11 (0.006)
Bankia	0.05 (0.006)	0.05 (0.012)	0.12 (0.013)	0.12 (0.028)	0.12 (0.005)	0.12 (0.012)
B. Popular	0.07 (0.002)	0.07 (0.004)	0.11 (0.004)	0.11 (0.009)	0.10 (0.003)	0.10 (0.006)
Caja de Ahorros	0.04 (0.021)	0.04 (0.039)				
Bankinter	0.05 (0.001)	0.05 (0.002)	0.10 (0.004)	0.10 (0.009)	0.09 (0.003)	0.09 (0.007)
Liberbank	0.07 (0.002)	0.06 (0.005)	0.15 (0.004)	0.14 (0.010)	0.13 (0.004)	0.13 (0.009)

Standard errors in parentheses.

A2.6 Asset betas for Swiss banks

	the leverage ratio		CET1 ratio		Tier-1 Capital ratio	
Bank	quarterly data	annual data	quarterly data	annual data	quarterly data	annual data
UBS	0.03 (0.002)	0.03 (0.004)	0.16 (0.007)	0.16 (0.015)	0.12 (0.005)	0.12 (0.010)
Schweizerische	0.12 (0.012)	0.12 (0.024)				
Credit Suisse	0.03 (0.001)	0.03 (0.003)	0.12 (0.004)	0.12) (0.008)	0.12 (0.005)	0.12 (0.012)
Julius Baer	0.08 (0.004)	0.08 (0.008)	0.34 (0.013)	0.35 (0.028)	0.21 (0.006)	0.20 (0.012)
B. Cnt. Vaudoise	0.09 (0.003)	0.09 (0.005)	0.20 (0.005)	0.20 (0.009)	0.21 (0.007)	0.20 (0.013)
EFG Bank	0.08 (0.005)	0.09 (0.011)	0.27 (0.012)	0.29 (0.028)	0.17 (0.005)	0.18 (0.011)
Basler KntB.	0.07 (0.006)	0.07 (0.012)	0.10 (0.009)	0.10 (0.016)	0.16 (0.005)	0.16 (0.007)
Luzerner KntB.	0.07 (0.004)	0.07 (0.007)	0.13 (0.007)	0.13 (0.013)	0.17 (0.007)	0.17 (0.013)
ST. Galler KntB.	0.09 (0.004)	0.09 (0.008)	0.17 (0.007)	0.17 (0.014)	0.16 (0.005)	0.15 (0.011)
Berner KntB.	0.07 (0.004)	0.07 (0.008)	0.17 (0.011)	0.17 (0.022)	0.21 (0.015)	0.20 (0.029)
Valiant	0.10 (0.006)	0.10 (0.011)	0.18 (0.008)	0.18 (0.017)	0.16 (0.007)	0.15 (0.014)
Graubündener	0.09 (0.004)	0.09 (0.008)	0.16 (0.008)	0.18 (0.055)	0.21 (0.011)	0.21 (0.020)
Basellandschaftlich	0.05 (0.005)	0.05 (0.009)	0.08 (0.001)	0.08 (0.001)	0.19 (0.002)	0.19 (0.002)
Vontobel	0.11 (0.008)	0.11 (0.016)	0.32 (0.012)	0.31 (0.025)	0.25 (0.012)	0.25 (0.024)
B. Cnt. Geneve	0.08 (0.003)	0.08 (0.006)				
Thurgauer KntB.	0.05 (0.000)	0.05 (0.001)	0.10 (0.001)	0.10 (0.002)	0.18 (0.001)	0.18 (0.002)
Bank CLER	0.08 (0.006)	0.08 (0.011)	0.12 (0.005)	0.13 (0.011)	0.16 (0.003)	0.16 (0.005)
B. Cnt. JURA	0.07 (0.004)	0.06 (0.008)	0.10 (0.002)	0.10 (0.005)	0.16 (0.004)	0.16 (0.009)
Zuger KntB.	0.05 (0.004)	0.05 (0.007)	0.10 (0.011)	0.10 (0.020)	0.16 (0.009)	0.15 (0.018)
Bank Linth	0.09 (0.006)	0.09 (0.011)	0.15 (0.007)	0.14 (0.014)	0.15 (0.008)	0.15 (0.015)
Glarner KntB.	0.04 (0.000)	0.04 (0.001)	0.09 (0.001)	0.09 (0.001)	0.18 (0.002)	0.18 (0.005)
Cembra Money B.	0.18 (0.002)	0.18 (0.004)	0.22 (0.002)	0.23 (0.005)	0.20 (0.002)	0.20 (0.004)
Hypothekarbank	0.09 (0.004)	0.09 (0.008)	0.14 (0.003)	0.15 (0.005)	0.17 (0.003)	0.17 (0.006)

Standard errors in parentheses.

A3. Estimation of the magnitude of the low-risk anomaly

A3.1 Estimated alphas and betas for the country-level portfolios

	UK				Germany			
Portfolio	Alpha (t value)	Beta (t statistic)	R^2	F statistic	Alpha (t value)	Beta (t statistic)	R^2	F statistic
Large	0.00007996 (0.48)	1.255646341 (100.95)	0.6538	10189.98	-0.00030123 (-1.37)	1.16238125 (87.07)	0.5842	7580.46
Medium	0.00007535 (0.36)	1.359731891 (87.26)	0.5852	7613.78	0.00042376 (1.97)	0.22039425 (16.85)	0.0500	284.07
Small	0.00031695 (1.21)	0.756605962 (38.73)	0.2175	1499.84	0.00013307 (0.34)	0.17096583 (7.19)	0.0105	51.74
	France				Italy			
Portfolio	Alpha (t value)	Beta (t statistic)	R^2	F statistic	Alpha (t value)	Beta (t statistic)	R^2	F statistic
Large	0.00024605 (1.18)	1.24875869 (93.99)	0.6208	8833.44	-0.00000773 (-0.05)	1.28442512 (120.13)	0.7346	14432.12
Medium	0.00021748 (1.02)	1.19172844 (87.50)	0.5866	7655.86	0.00003959 (0.29)	0.75748201 (83.75)	0.5736	7014.55
Small	0.00007069 (0.47)	0.21859914 (22.96)	0.0890	527.08	0.00011240 (0.66)	0.45057130 (40.50)	0.2393	1640.37
	Spain				Switzerland			
Portfolio	Alpha (t value)	Beta (t statistic)	R^2	F statistic	Alpha (t value)	Beta (t statistic)	R^2	F statistic
Large	0.00011749 (1.05)	1.28315469 (173.59)	0.8482	30135.03	0.000101014 (0.67)	1.041655 (89.24)	0.5962	7964.32
Medium	-0.00040377 (-1.06)	1.62023896 (64.63)	0.4364	4176.83	0.000169958 (2.53)	0.273482 (52.54)	0.3384	2759.94
Small	0.00001484 (0.07)	0.72996240 (51.98)	0.3337	2701.78	0.000139421 (1.51)	0.173911967 (24.33)	0.0989	592.02

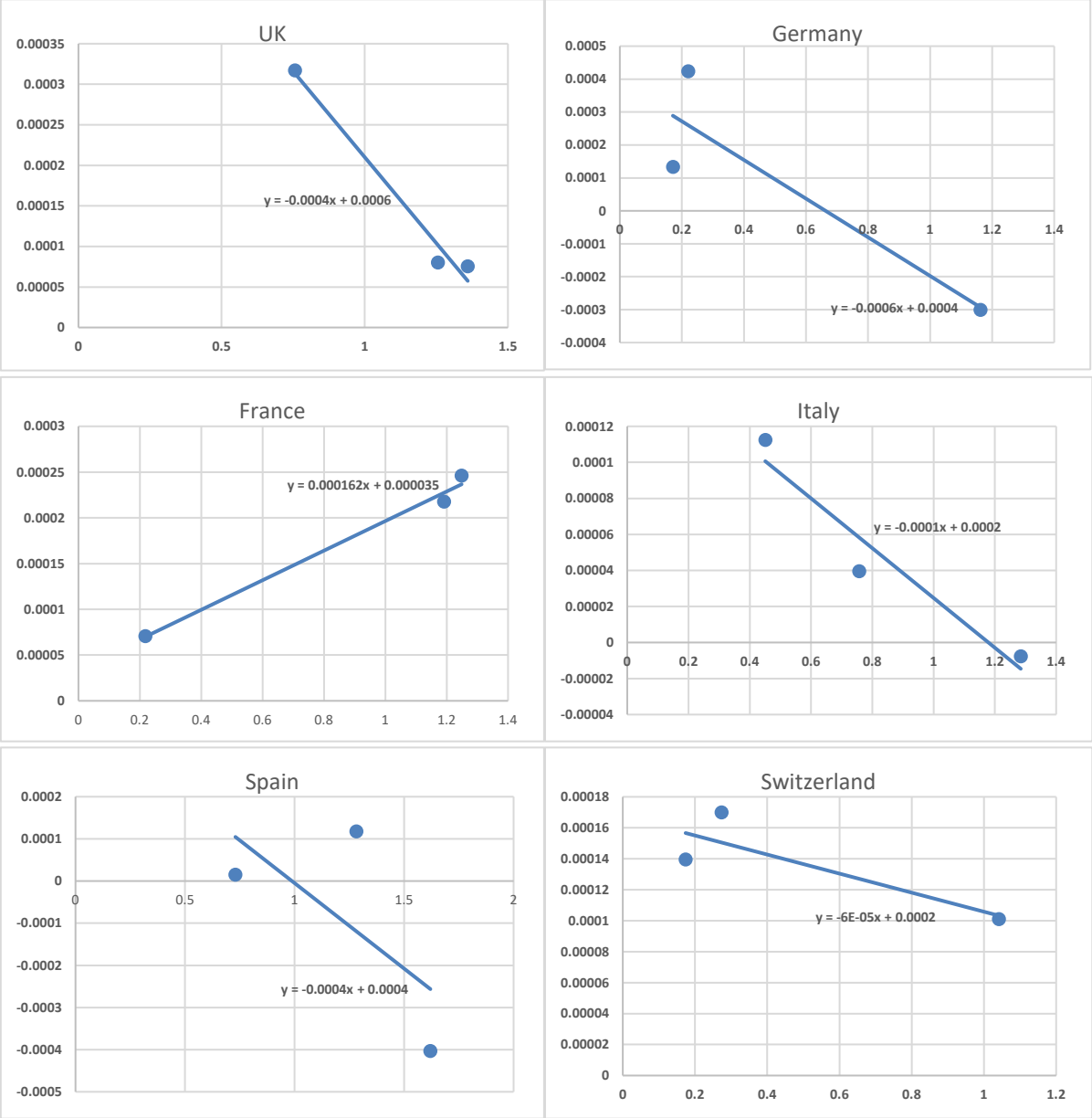
A3.2 Portfolio weights in the country-level portfolios

	UK		Germany		France	
Port_large	HSBC	56.45%	Deutsche Bank	76.56%	BNP Paribas	55.82%
	Barclays	25.37%	Commerzbank	23.44%	Crédit Agricole	44.18%
	Lloyds	18.18%	.	.	.	.
Port_medium	RBS	41.94%	DT Pfandbriefbank	84.68%	Société Générale	68.75%
	Standard Chartered	37.70%	Procredit	8.04%	Natixis	28.06%
	Santander UK	17.90%	Umweltbank	5.10%	CRCAM Nord CCI	1.61%
	CYBG	2.46%	Enercity PAR	2.18%	Caisse Credit	1.05%
Port_small	Virgin Money	61.59%	Merkur Bank	68.36%	Crcam Normandie	55.07%
	Metro Bank	24.50%	Quirin Privatbk	31.64%	CRCAM ILLE-VIL	44.93%
	Close Brothers	13.91%	.	.	.	.
	Italy		Spain		Switzerland	
Port_large	Unicredit	40.74%	Santander	57.55%	UBS	32.69%
	Intesa Sanpaolo	38.65%	BBVA	27.35%	Schweizerische	30.44%
	BANCO BPM	7.74%	CaixaBank	15.10%	Credit Suisse	28.73%
	B. Monte dei Paschi	6.72%	.	.	Julius Baer	3.53%
	Unione di Banche IT	6.15%	.	.	B. Cnt. Vaudoise	1.64%
	.	.	.	.	EFG Bank	1.50%
	.	.	.	.	Basler KntB.	1.47%
Port_medium	Mediobanca	24.31%	B. de Sabadell	40.67%	Luzerner KntB.	14.76%
	BPER Banca	23.77%	Bankia	38.51%	ST. Galler KntB.	13.41%
	Credito Emiliano	14.04%	B. Popular	20.82%	Berner KntB.	12.05%
	Banca Poplare	13.99%	.	.	Valiant	11.34%
	Banca Piccolo	8.26%	.	.	Graubündener	10.54%
	Banca Carige	8.06%	.	.	Basellandschaftlich	9.96%
	Finecobank	7.58%	.	.	Vontobel	9.41%
	.		.	.	B. Cnt. Geneve	9.33%
	.		.	.	Thurgauer KntB.	9.19%
Port_small	B. Desio & Brianza	43.38%	Caja de Ahorros	45.70%	Bank CLER	24.90%
	Banco di Sardegna	39.31%	Bankinter	36.91%	B. Cnt. JURA	22.14%
	Dobank	6.39%	Liberbank	17.39%	Zuger KntB.	20.83%
	Banca Finnat	5.64%	.	.	Bank Linth	9.68%
	Banca Profilo	5.28%	.	.	Glarner KntB.	8.02%
	.	.	.	.	Cembra Money B.	7.25%
	.	.	.	.	Hypothekarbank	7.17%

A3.3 Estimated asset and debt betas for the country-level portfolios

	UK			Germany		
Beta	Large banks	Medium banks	Small banks	Large banks	Medium banks	Small banks
Asset	0.050524909	0.05239728	0.065428302	0.031315585	0.058572877	0.04826616
Debt	-0.03031258	-0.049222917	0.021770995	-0.025720845	0.073096031	0.066387664
	France			**Italy**		
Beta	Large banks	Medium banks	Small banks	Large banks	Medium banks	Small banks
Asset	0.030069272	0.035584653	0.178482482	0.053490445	0.087202311	0.121290348
Debt	-0.02384	-0.01934	0.172433	-0.03839916	0.026569404	0.090282171
	Spain			**Switzerland**		
Beta	Large banks	Medium banks	Small banks	Large banks	Medium banks	Small banks
Asset	0.061475716	0.062376636	0.049590832	0.06177318	0.08003	0.076294297
Debt	-0.02604737	-0.03988731	0.001046695	-0.032172189	0.066333459	0.070174168

A3.4 Estimation of country-level gammas



A4. The impact of IFRS 9 on the cost of funding

A4.1 The impact of IFRS 9 on the cost of funding of UK banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	4.77	5.30	15.91	-1.33	2.78	6.77	4.94	5.49	16.47	-1.37	2.88	7.01
Mazras	2.55	2.12	10.82	-3.18	1.26	3.83	2.63	2.20	11.20	-3.29	1.31	3.96
Mazras (UK)	1.22	1.86	3.61	-3.18	0.08	2.36	1.26	1.92	3.73	-3.29	0.08	2.44

A4.2 The impact of IFRS 9 on the cost of funding of German banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	6.61	7.34	22.03	-1.84	6.17	3.85	6.76	7.51	22.53	-1.88	6.31	3.94
Mazras	3.52	2.94	14.98	-4.41	3.96	1.75	3.61	3.00	15.32	-4.51	4.06	1.79
Mazras (Gr)	6.09	6.09	11.01	1.17	6.96	2.98	6.23	6.23	11.27	1.20	7.12	3.05

A4.3 The impact of IFRS 9 on the cost of funding of French banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	-1.82	-2.02	-6.06	0.51	-1.70	-1.06	-1.86	-2.06	-6.19	0.52	-1.73	-1.08
Mazras	-0.97	-0.81	-4.12	1.21	-1.09	-0.48	-0.99	-0.83	-4.21	1.24	-1.11	-0.49
Mazras (Fr)	-0.71	-0.61	-1.21	-0.40	-0.35	-0.55	-0.72	-0.62	-1.24	-0.41	-0.36	-0.56

A4.4 The impact of IFRS 9 on the cost of funding of Italian banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	1.55	1.73	5.18	-0.43	1.45	0.90	1.60	1.78	5.33	-0.44	1.49	0.93
Mazras	0.83	0.69	3.52	-1.04	0.93	0.41	0.85	0.71	3.62	-1.07	0.96	0.42
Mazras (It)	2.45	2.45	3.52	1.38	1.51	1.77	2.52	2.52	3.62	1.42	1.56	1.83

A4.5 The impact of IFRS 9 on the cost of funding of Spanish banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	4.56	5.07	15.22	-1.27	4.26	2.66	4.69	5.21	15.62	-1.30	4.37	2.73
Mazras	2.43	2.03	10.35	-3.04	2.74	1.21	2.50	2.08	10.62	-3.12	2.81	1.24
Mazras (Sp)	3.70	2.59	8.11	1.52	3.02	2.35	3.80	2.66	8.33	1.56	3.10	2.41

A4.6 The impact of IFRS 9 on the cost of funding of Swiss banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	0.69	0.77	2.31	-0.19	0.65	0.40	0.71	0.79	2.36	-0.20	0.66	0.41
Mazras	0.37	0.31	1.57	-0.46	0.42	0.18	0.38	0.31	1.60	-0.47	0.42	0.19
Mazras (Sw)	0.32	0.32	0.63	0.00	0.45	0.12	0.32	0.32	0.64	0.00	0.46	0.12

A5. Robustness checks; Experiment 1 – Country-level portfolios of all banks

A5.1 Portfolio weights in the country-level portfolios

	UK		Germany		France	
Port_all banks	HSBC	40.07%	Deutsche Bank	73.86%	BNP Paribas	36.36%
	Barclays	18.01%	Commerzbank	22.62%	Crédit Agricole	28.77%
	Lloyds	12.90%	DT Pfandbriefbank	2.91%	Société Générale	23.62%
	RBS	11.73%	Procredit	0.28%	Natixis	9.64%
	Standard Chartered	10.54%	Umweltbank	0.18%	CRCAM Nord CCI	0.55%
	Santander UK	5.01%	Enercity PAR	0.08%	Caisse Credit	0.36%
	CYBG	0.69%	Merkur Bank	0.06%	Crcam Normandie	0.28%
	Virgin Money	0.65%	Quirin Privatbk	0.03%	CRCAM ILLE-VIL	0.23%
	Metro Bank	0.26%	.	.	.	.
	Close Brothers	0.15%	.	.	.	.
	Italy		**Spain**		**Switzerland**	
Port_all banks	Unicredit	35.09%	Santander	44.54%	UBS	29.37%
	Intesa Sanpaolo	33.28%	BBVA	21.17%	Schweizerische	27.34%
	BANCO BPM	6.67%	CaixaBank	11.69%	Credit Suisse	25.81%
	B. Monte dei Paschi	5.79%	B. de Sabadell	6.73%	Julius Baer	3.17%
	Unione di Banche IT	5.30%	Bankia	6.38%	B. Cnt. Vaudoise	1.47%
	Mediobanca	3.04%	B. Popular	3.45%	EFG Bank	1.35%
	BPER Banca	2.98%	Caja de Ahorros	2.76%	Basler KntB.	1.32%
	Credito Emiliano	1.76%	Bankinter	2.23%	Luzerner KntB.	1.16%
	Banca Poplare	1.75%	Liberbank	1.05%	ST. Galler KntB.	1.06%
	Banca Piccolo	1.03%	.	.	Berner KntB.	0.95%
	Banca Carige	1.01%	.	.	Valiant	0.89%
	Finecobank	0.95%	.	.	Graubündener	0.83%
	B. Desio & Brianza	0.59%	.	.	Basellandschaftlich	0.79%
	Banco di Sardegna	0.53%	.	.	Vontobel	0.74%
	Dobank	0.09%	.	.	B. Cnt. Geneve	0.74%
	Banca Finnat	0.08%	.	.	Thurgauer KntB.	0.72%
	Banca Profilo	0.07%	.	.	Bank CLER	0.57%
	.	.	.	.	B. Cnt. JURA	0.50%
	.	.	.	.	Zuger KntB.	0.47%
	.	.	.	.	Bank Linth	0.22%
	.	.	.	.	Glarner KntB.	0.18%
	.	.	.	.	Cembra Money B.	0.17%
	.	.	.	.	Hypothekarbank	0.16%

A5.2 Estimated alphas and equity, asset, and debt betas for the country-level portfolios

	UK	Germany	France	Italy	Spain	Switzerland
Alpha	0.0000768	0.0002959	0.000231294	0.0000008	0.0000656	-0.00001078
Beta	1.2830039	1.1582509	1.218080276	1.2097841	1.2062280	0.9636282
Asset beta	0.050846592	0.032287016	0.032719773	0.058629095	0.060906783	0.063543099
Debt beta	-0.034698153	-0.02501598	-0.021628174	-0.029854501	-0.019983026	-0.020235869
Gamma (annual)	-0.0006785	-0.0046848	-0.002654983	-0.0000097	-0.0007957	-0.000741

A6. Robustness checks; Experiment 2 – Two portfolios (large and small banks)

A6.1 Portfolio weights in the country-level portfolios

	UK		Germany		France	
Port_larger	HSBC	42.97%	Deutsche Bank	74.11%	BNP Paribas	36.95%
	Barclays	19.31%	Commerzbank	22.69%	Crédit Agricole	29.24%
	Lloyds	13.84%	DT Pfandbriefbank	2.92%	Société Générale	24.01%
	RBS	12.58%	Procredit	0.28%	Natixis	9.80%
	Standard Chartered	11.31%	.	.	.	.
Port_smaller	Santander UK	74.12%	Umweltbank	52.98%	CRCAM Nord CCI	38.61%
	CYBG	10.17%	Enercity PAR	22.69%	Caisse Credit	25.32%
	Virgin Money	9.67%	Merkur Bank	16.63%	Crcam Normandie	19.86%
	Metro Bank	3.85%	Quirin Privatbk	7.70%	CRCAM ILLE-VIL	16.21%
	Close Brothers	2.18%	.	.	.	.
	Italy		**Spain**		**Switzerland**	
Port_larger	Unicredit	37.37%	Santander	52.94%	UBS	31.28%
	Intesa Sanpaolo	35.45%	BBVA	25.16%	Schweizerische	29.12%
	BANCO BPM	7.10%	CaixaBank	13.89%	Credit Suisse	27.48%
	B. Monte dei Paschi	6.16%	B. de Sabadell	8.00%	Julius Baer	3.38%
	Unione di Banche IT	5.64%	.	.	B. Cnt. Vaudoise	1.57%
	Mediobanca	3.24%	.	.	EFG Bank	1.43%
	BPER Banca	3.17%	.	.	Basler KntB.	1.41%
	Credito Emiliano	1.87%	.	.	Luzerner KntB.	1.24%
	.	.	.	.	ST. Galler KntB.	1.13%
	.	.	.	.	Berner KntB.	1.01%
	.	.	.	.	Valiant	0.95%
Port_smaller	Banca Poplare	28.73%	Bankia	40.19%	Graubündener	13.62%
	Banca Piccolo	16.97%	B. Popular	21.73%	Basellandschaftlich	12.88%
	Banca Carige	16.55%	Caja de Ahorros	17.40%	Vontobel	12.17%
	Finecobank	15.56%	Bankinter	14.06%	B. Cnt. Geneve	12.06%
	B. Desio & Brianza	9.63%	Liberbank	6.62%	Thurgauer KntB.	11.88%
	Banco di Sardegna	8.72%	.	.	Bank CLER	9.31%
	Dobank	1.42%	.	.	B. Cnt. JURA	8.28%
	Banca Finnat	1.25%	.	.	Zuger KntB.	7.79%
	Banca Profilo	1.17%	.	.	Bank Linth	3.62%
	.	.	.	.	Glarner KntB.	3.00%
	.	.	.	.	Cembra Money B.	2.71%
	.	.	.	.	Hypothekarbank	2.68%

A6.2 Estimated alphas and equity, asset, and debt betas for the country-level portfolios

	UK		Germany		France	
	Larger banks	Smaller banks	Larger banks	Smaller banks	Larger banks	Smaller banks
Alpha	0.0000733	0.0001471	- 0.0002981	0.0003290	0.0002327	0.0001005
Beta	1.2870241	0.9868373	1.1611747	0.1669420	1.2324249	0.2017739
Asset beta	0.050628584	0.053857134	0.031988451	0.122202714	0.030716631	0.171380168
Debt beta	-0.035117426	-0.01188665	-0.025246076	0.116977523	-0.022728645	0.166799842
Gamma	-0.00061539		-0.001578		0.00032	
	Italy		**Spain**		**Switzerland**	
	Larger banks	Smaller banks	Larger banks	Smaller banks	Larger banks	Smaller banks
Alpha	0.00000727	-0.00013123	-0.00011929	0.00023372	0.00010589	0.00014364
Beta	1.24804504	0.53569811	1.28019335	0.81680636	1.00893967	0.26167914
Asset beta	0.056412825	0.092762623	0.062326689	0.053376969	0.062677288	0.076878554
Debt beta	-0.035436746	0.060169662	-0.024298119	0.001485163	-0.023759572	0.07271048
Gamma	0.00048594		-0.001906		-0.000126	

A7. Robustness checks; Experiment 3 – Individual banks

A7.1 Estimated alphas and equity and debt betas for the banks in the sample

UK				Germany				France			
Bank	alpha	beta	Debt beta	Bank	alpha	beta	Debt beta	Bank	alpha	beta	Debt beta
HSBC	0.00008	1.09932	-0.0111	Deutsche Bank	-0.00025	1.17299	-0.0216	BNP Paribas	0.00026	1.27322	-0.0292
Barclays	0.00017	1.51455	-0.0572	Commerzbank	-0.00047	1.12773	-0.0386	Crédit Agricole	0.00016	1.26633	-0.0194
Lloyds	-0.00004	1.37979	-0.0471	DT Pfandbriefbank	0.00029	0.90382	0.0014	Société Générale	0.00020	1.32362	-0.0318
RBS	-0.00001	1.41945	-0.0504	Procredit	0.00016	0.39605	0.0826	Natixis	0.00026	0.95796	0.0007
Standard Chartered	0.00012	1.35097	-0.0522	Umweltbank	0.00056	0.22280	0.0376	CRCAM Nord CCI	0.00019	0.16923	0.1773
Santander UK	-0.00002	1.24457	-0.0368	Enercity PAR	0.00023	0.11894	0.4716	Caisse Credit	0.00004	0.24266	0.1317
CYBG	0.00065	1.20838	-0.0104	Merkur Bank	0.00022	0.11971	0.0527	Crcam Normandie	0.00007	0.25942	0.1699
Virgin Money	0.00010	1.09359	-0.0092	Quirin Privatbk	-0.00006	0.31178	0.0882	CRCAM ILLE-VIL	0.00005	0.21185	0.1689
Metro Bank	0.00093	0.96725	0.0183	.	.	.	.	.	.	.	.
Close Brothers	0.00026	0.75103	0.0737	.	.	.	.	.	.	.	.

Italy				Spain				Switzerland			
Bank	alpha	beta	Debt beta	Bank	alpha	beta	Debt beta	Bank	alpha	beta	Debt beta
Unicredit	-0.00002	1.36470	-0.0472	Santander	-0.00012	1.32701	-0.0422	UBS	0.00000	1.41137	-0.0526
Intesa Sanpaolo	0.00021	1.30379	-0.0332	BBVA	-0.00007	1.29228	-0.0437	Schweizerische	-0.00039	0.22801	0.1003
BANCO BPM	-0.00027	1.08182	-0.0111	CaixaBank	-0.00021	0.94533	0.0776	Credit Suisse	0.00009	1.54761	-0.0543
B. Monte dei Paschi	-0.00098	1.04188	-0.0430	B. de Sabadell	0.00006	0.79288	0.0251	Julius Baer	-0.00009	1.27647	0.0014
Unione di Banche IT	-0.00009	1.18964	-0.0357	Bankia	0.00080	1.02161	-0.0205	B. Cnt. Vaudoise	-0.00018	0.48601	0.0549
Mediobanca	0.00023	0.98904	-0.0131	B. Popular	0.00057	0.95058	0.0188	EFG Bank	0.00017	1.18931	0.0345
BPER Banca	0.00005	0.69652	0.0237	Caja de Ahorros	0.00049	0.15187	0.0368	Basler KntB.	-0.00008	0.20926	0.0683
Credito Emiliano	0.00028	0.90151	0.0019	Bankinter	-0.00023	0.94737	-0.0103	Luzerner KntB.	-0.00022	0.19452	0.0641
Banca Poplare	0.00009	0.48475	0.0693	Liberbank	0.00016	1.11085	-0.0252	ST. Galler KntB.	-0.00024	0.34775	0.0686
Banca Piccolo	-0.00049	0.65780	0.0492	.	.	.	.	Berner KntB.	-0.00005	0.17191	0.0649
Banca Carige	-0.00073	0.62540	0.0570	.	.	.	.	Valiant	-0.00015	0.26786	0.0885
Finecobank	0.00087	0.80613	0.0085	.	.	.	.	Graubündener	-0.00021	0.13455	0.0856
B. Desio & Brianza	0.00010	0.45969	0.0761	.	.	.	.	Basellandschaftlich	-0.00011	0.11594	0.0513
Banco di Sardegna	0.00010	0.45969	0.0869	.	.	.	.	Vontobel	-0.00025	0.83050	0.0602
Dobank	0.00004	0.39038	0.0609	.	.	.	.	B. Cnt. Geneve	-0.00001	0.22866	0.0657
Banca Finnat	0.00052	0.46678	0.2818	.	.	.	.	Thurgauer KntB.	-0.00019	0.20788	0.0413
Banca Profilo	0.00022	0.82608	0.0260	.	.	.	.	Bank CLER	0.00001	0.18114	0.0720
.	.	.	.	.	.	.	.	B. Cnt. JURA	-0.00024	0.15583	0.0604
.	.	.	.	.	.	.	.	Zuger KntB.	-0.00017	0.19025	0.0488
.	.	.	.	.	.	.	.	Bank Linth	-0.00010	0.13753	0.0864
.	.	.	.	.	.	.	.	Glarner KntB.	-0.00058	0.25530	0.0342
.	.	.	.	.	.	.	.	Cembra Money B.	-0.00036	0.54831	0.0971
.	.	.	.	.	.	.	.	Hypothekarbank	-0.00018	0.16363	0.0832

A8. Robustness checks; Experiment 4 – Panels of banks in each country

A8.1 Estimated alphas and equity, asset, and debt betas for the country-level panels

	UK	Germany	France	Italy	Spain	Switzerland
Alpha	0.0001006	-0.0000377	0.0001587	-0.000018	-0.00000796	-0.0001355
Beta	1.247605	0.554894	0.713867	0.82079	0.989824	0.425921
Asset beta	0.050846592	0.032287016	0.032947678	0.058629095	0.060906783	0.063543099
Debt beta	-0.032240524	0.005690286	0.00151519	0.000046	-0.004699176	0.029813365
Gamma (annual)	-0.001016	-0.000212	0.001386	-0.000251	-0.001957	-0.000590

A9. Robustness checks; Experiment 5 – Three risk-based portfolios (high, medium and low risk)

A9.1 Portfolio weights in the country-level portfolios

	UK		Germany		France	
Port_high-risk	Barclays	42.23%	Deutsche Bank	76.56%	Société Générale	39.38%
	RBS	27.50%	Commerzbank	23.44%	BNP Paribas	60.62%
	Lloyds	30.26%	.	.	.	.
Port_medium-risk	Standard Chartered	18.72%	DT Pfandbriefbank	85.92%	Crédit Agricole	73.67%
	Santander UK	8.89%	Procredit	8.15%	Natixis	24.68%
	CYBG	1.22%	Quirin Privatbk	0.75%	Crcam Normandie	0.72%
	HSBC	71.17%	Umweltbank	5.17%	Caisse Credit	0.92%
	Virgin Money	61.59%	Merkur Bank	42.28%	CRCAM ILLE-VIL	29.56%
	Metro Bank	24.50%	Enercity PAR	57.72%	CRCAM Nord CCI	70.44%
	Close Brothers	13.91%	.	.	.	.
	Italy		**Spain**		**Switzerland**	
Port_high-risk	Unicredit	40.74%	Santander	66.72%	Credit Suisse	41.57%
	Intesa Sanpaolo	38.65%	BBVA	31.71%	UBS	47.31%
	Unione di Banche IT	6.15%	Liberbank	1.57%	Julius Baer	5.11%
	BANCO BPM	7.74%	.	.	EFG Bank	2.17%
	B. Monte dei Paschi	6.72%	.	.	Vontobel	1.20%
	.	.	.	.	Cembra Money B.	0.27%
	.	.	.	.	B. Cnt. Vaudoise	2.37%
Port_medium-risk	Mediobanca	28.08%	Bankia	52.89%	ST. Galler KntB.	3.12%
	Credito Emiliano	16.21%	B. Popular	28.60%	Valiant	2.64%
	Banca Profilo	0.66%	Bankinter	18.50%	Glarner KntB.	0.54%
	Finecobank	8.75%	.	.	B. Cnt. Geneve	2.17%
	BPER Banca	27.45%	.	.	Schweizerische	80.67%
	Banca Piccolo	9.54%	.	.	Basler KntB.	3.90%
	Banca Carige	9.31%	.	.	Thurgauer KntB.	2.14%
	.	.	.	.	Luzerner KntB.	3.43%
	.	.	.	.	Zuger KntB.	1.40%
Port_low-risk	Banca Poplare	57.75%	CaixaBank	55.18%	Bank CLER	14.11%
	Banca Finnat	2.52%	B. de Sabadell	31.79%	Berner KntB.	23.62%
	B. Desio & Brianza	19.35%	Caja de Ahorros	13.03%	Hypothekarbank	4.06%
	Banco di Sardegna	17.53%	.	.	B. Cnt. JURA	12.55%
	Dobank	2.85%	.	.	Bank Linth	5.49%
	.	.	.	.	Graubündener	20.65%
	.	.	.	.	Basellandschaftlich	19.52%

A9.2 Estimated asset and debt betas for the country-level portfolios

	UK			Germany		
	High-risk banks	Med-risk banks	Low-risk banks	High-risk banks	Med-risk banks	Low-risk banks
Alpha	0.000053285	0.000092101	0.000316948	-0.000301226	0.000531524	0.000238925
Beta	1.447610925	1.157368055	0.756605962	1.162381247	0.239129952	0.125855111
Asset beta	0.037659642	0.060558091	0.065428302	0.031315585	0.05230876	0.230783285
Debt beta	-0.052418256	-0.0203645	0.021770995	-0.025720845	0.041558909	0.257840929
Gamma	-0.000392571			-0.00067		
	France			**Italy**		
	High-risk banks	Med-risk banks	Low-risk banks	High-risk banks	Med-risk banks	Low-risk banks
Alpha	0.000238905	0.000171013	0.000039424	-0.000006257	0.000033190	0.000093498
Beta	1.293069018	1.043939989	0.233554649	1.284346691	0.805673277	0.462209120
Asset beta	0.03262408	0.030009791	0.175915945	0.053490445	0.085838369	0.10728338
Debt beta	-0.030219279	-0.009061907	0.169488404	-0.038393305	0.01815138	0.079069368
Gamma	0.000182			-0.00012		
	Spain			**Switzerland**		
	High-risk banks	Med-risk banks	Low-risk banks	High-risk banks	Med-risk banks	Low-risk banks
Alpha	0.000106622	-0.000275516	0.000423736	-0.000026080	0.000350786	0.000121414
Beta	1.315207924	0.934885601	0.564517588	1.434843764	0.230105858	0.146499937
Asset beta	0.048840802	0.054352481	0.102663175	0.036382071	0.112068411	0.073790854
Debt beta	-0.042651085	-0.003570594	0.071119136	-0.046077797	0.092574689	0.068892649
Gamma	-0.000416038			0.0501%		

A10. The impact of IFRS 9 under Experiment 1 – Country-level portfolios of all banks

A10.1 The impact of IFRS 9 on the cost of funding of UK banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	3.05	3.39	10.18	-0.85	1.78	4.33	3.16	3.51	10.53	-0.88	1.84	4.48
Mazras	1.63	1.36	6.92	-2.04	0.81	2.45	1.68	1.40	7.16	-2.11	0.84	2.53
Mazras (UK)	0.78	1.19	2.31	-2.04	0.05	1.51	0.81	1.23	2.39	-2.11	0.05	1.56

A10.2 The impact of IFRS 9 on the cost of funding of German banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	21.08	23.42	70.27	-5.86	19.68	12.27	21.61	24.01	72.03	-6.00	20.17	12.58
Mazras	11.24	9.37	47.78	-14.05	12.65	5.58	11.52	9.60	48.98	-14.41	12.97	5.72
Mazras (Gr)	19.44	19.44	35.14	3.75	22.19	9.50	19.93	19.93	36.01	3.84	22.75	9.74

A10.3 The impact of IFRS 9 on the cost of funding of French banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	11.95	13.27	39.82	-3.32	11.15	6.95	12.21	13.56	40.69	-3.39	11.39	7.10
Mazras	6.37	5.31	27.08	-7.96	7.17	3.16	6.51	5.42	27.67	-8.14	7.32	3.23
Mazras (Fr)	4.65	3.98	7.96	2.65	2.30	3.62	4.75	4.07	8.14	2.71	2.35	3.69

A10.4 The impact of IFRS 9 on the cost of funding of Italian banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	0.04	0.05	0.15	-0.01	0.04	0.03	0.04	0.05	0.15	-0.01	0.04	0.03
Mazras	0.02	0.02	0.10	-0.03	0.03	0.01	0.02	0.02	0.10	-0.03	0.03	0.01
Mazras (Fr)	0.07	0.07	0.10	0.04	0.04	0.05	0.07	0.07	0.10	0.04	0.04	0.05

A10.5 The impact of IFRS 9 on the cost of funding of Spanish banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	3.58	3.98	11.93	-0.99	3.34	2.08	3.65	4.06	12.17	-1.01	3.41	2.13
Mazras	1.91	1.59	8.12	-2.39	2.15	0.95	1.95	1.62	8.28	-2.43	2.19	0.97
Mazras (Sp)	2.90	2.03	6.37	1.19	2.37	1.84	2.96	2.07	6.49	1.22	2.42	1.88

A10.6 The impact of IFRS 9 on the cost of funding of Swiss banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	3.33	3.70	11.11	-0.93	3.11	1.94	3.40	3.78	11.34	-0.94	3.17	1.98
Mazras	1.78	1.48	7.56	-2.22	2.00	0.88	1.81	1.51	7.71	-2.27	2.04	0.90
Mazras (Fr)	1.52	1.52	3.04	0.00	2.15	0.56	1.55	1.55	3.10	0.00	2.19	0.57

A11. The impact of IFRS 9 under Experiment 2 – Two portfolios (large and small banks)

A11.1 The impact of IFRS 9 on the cost of funding of UK banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	2.77	3.08	9.23	-0.77	1.61	3.93	2.86	3.18	9.54	-0.80	1.67	4.06
Mazras	1.48	1.23	6.28	-1.85	0.73	2.22	1.53	1.27	6.49	-1.91	0.76	2.30
Mazras (UK)	0.71	1.08	2.09	-1.85	0.05	1.37	0.73	1.11	2.16	-1.91	0.05	1.41

A11.2 The impact of IFRS 9 on the cost of funding of German banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	7.10	7.89	23.67	-1.97	6.63	4.13	7.28	8.09	24.26	-2.02	6.79	4.24
Mazras	3.79	3.16	16.10	-4.73	4.26	1.88	3.88	3.23	16.50	-4.85	4.37	1.93
Mazras (Gr)	6.55	6.55	11.84	1.26	7.48	3.20	6.71	6.71	12.13	1.29	7.66	3.28

A11.3 The impact of IFRS 9 on the cost of funding of French banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	-1.44	-1.60	-4.81	0.40	-1.35	-0.84	-1.47	-1.64	-4.91	0.41	-1.37	-0.86
Mazras	-0.77	-0.64	-3.27	0.96	-0.87	-0.38	-0.79	-0.65	-3.34	0.98	-0.88	-0.39
Mazras (Fr)	-0.56	-0.48	-0.96	-0.32	-0.28	-0.44	-0.57	-0.49	-0.98	-0.33	-0.28	-0.45

A11.4 The impact of IFRS 9 on the cost of funding of Italian banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	-2.19	-2.43	-7.29	0.61	-2.04	-1.27	-2.25	-2.50	-7.50	0.63	-2.10	-1.31
Mazras	-1.17	-0.97	-4.96	1.46	-1.31	-0.58	-1.20	-1.00	-5.10	1.50	-1.35	-0.60
Mazras (Sp)	-3.45	-3.45	-4.96	-1.94	-2.13	-2.50	-3.55	-3.55	-5.10	-2.00	-2.19	-2.57

A11.5 The impact of IFRS 9 on the cost of funding of Spanish banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	8.58	9.53	28.59	-2.38	8.01	4.99	8.75	9.72	29.17	-2.43	8.17	5.09
Mazras	4.58	3.81	19.44	-5.72	5.15	2.27	4.67	3.89	19.84	-5.83	5.25	2.32
Mazras (Sp)	6.96	4.86	15.25	2.86	5.67	4.42	7.10	4.96	15.56	2.92	5.79	4.51

A11.6 The impact of IFRS 9 on the cost of funding of Swiss banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	0.57	0.63	1.89	-0.16	0.53	0.33	0.58	0.64	1.93	-0.16	0.54	0.34
Mazras	0.30	0.25	1.29	-0.38	0.34	0.15	0.31	0.26	1.31	-0.39	0.35	0.15
Mazras (Sp)	0.26	0.26	0.52	0.00	0.37	0.09	0.26	0.26	0.53	0.00	0.37	0.10

A12. The impact of IFRS 9 under Experiment 3 – Individual banks

A12.1 The impact of IFRS 9 on the cost of funding of UK banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	6.82	7.57	22.72	-1.89	3.97	9.67	7.05	7.83	23.50	-1.96	4.10	9.99
Mazras	3.64	3.03	15.45	-4.54	1.80	5.47	3.76	3.13	15.98	-4.70	1.87	5.65
Mazras (UK)	1.74	2.65	5.15	-4.54	0.11	3.37	1.80	2.74	5.33	-4.70	0.12	3.48

A12.2 The impact of IFRS 9 on the cost of funding of German banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	5.66	6.28	18.85	-1.57	5.28	3.29	5.79	6.43	19.30	-1.61	5.40	3.37
Mazras	3.02	2.51	12.82	-3.77	3.39	1.50	3.09	2.57	13.13	-3.86	3.47	1.53
Mazras (Gr)	5.22	5.22	9.43	1.01	5.95	2.55	5.34	5.34	9.65	1.03	6.10	2.61

A12.3 The impact of IFRS 9 on the cost of funding of French banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	1.38	1.53	4.60	-0.38	1.29	0.80	1.41	1.56	4.69	-0.39	1.31	0.82
Mazras	0.74	0.61	3.12	-0.92	0.83	0.36	0.75	0.63	3.19	-0.94	0.84	0.37
Mazras (Fr)	0.54	0.46	0.92	0.31	0.27	0.42	0.55	0.47	0.94	0.31	0.27	0.43

A12.4 The impact of IFRS 9 on the cost of funding of Italian banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	1.89	2.10	6.29	-0.52	1.76	1.10	1.94	2.16	6.47	-0.54	1.81	1.13
Mazras	1.01	0.84	4.27	-1.26	1.13	0.50	1.03	0.86	4.40	-1.29	1.16	0.51
Mazras (It)	2.98	2.98	4.27	1.68	1.84	2.15	3.06	3.06	4.40	1.72	1.89	2.21

A12.5 The impact of IFRS 9 on the cost of funding of Spanish banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	4.53	5.03	15.09	-1.26	4.23	2.64	4.61	5.12	15.36	-1.28	4.30	2.68
Mazras	2.41	2.01	10.26	-3.02	2.72	1.20	2.46	2.05	10.44	-3.07	2.76	1.22
Mazras (Sp)	3.67	2.57	8.05	1.51	2.99	2.33	3.74	2.61	8.19	1.54	3.05	2.37

A12.6 The impact of IFRS 9 on the cost of funding of Swiss banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	1.76	1.96	5.88	-0.49	1.65	1.03	1.75	1.95	5.84	-0.49	1.64	1.02
Mazras	0.94	0.78	4.00	-1.18	1.06	0.47	0.93	0.78	3.97	-1.17	1.05	0.46
Mazras (Sw)	0.80	0.80	1.61	0.00	1.14	0.29	0.80	0.80	1.60	0.00	1.13	0.29

A13. The impact of IFRS 9 under Experiment 4 – Panels of banks in each country

A13.1 The impact of IFRS 9 on the cost of funding of UK banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	4.57	5.08	15.24	-1.27	2.66	6.48	4.72	5.25	15.74	-1.31	2.75	6.69
Mazras	2.44	2.03	10.37	-3.05	1.21	3.67	2.52	2.10	10.70	-3.15	1.25	3.79
Mazras (UK)	1.17	1.78	3.46	-3.05	0.08	2.26	1.21	1.84	3.57	-3.15	0.08	2.33

A13.2 The impact of IFRS 9 on the cost of funding of German banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	0.95	1.06	3.18	-0.26	0.89	0.55	0.95	1.05	3.16	-0.26	0.88	0.55
Mazras	0.51	0.42	2.16	-0.64	0.57	0.25	0.51	0.42	2.15	-0.63	0.57	0.25
Mazras (Gr)	0.88	0.88	1.59	0.17	1.00	0.43	0.87	0.87	1.58	0.17	1.00	0.43

A13.3 The impact of IFRS 9 on the cost of funding of French banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	-6.24	-6.93	-20.78	1.73	-5.82	-3.63	-6.23	-6.92	-20.75	1.73	-5.81	-3.62
Mazras	-3.33	-2.77	-14.13	4.16	-3.74	-1.65	-3.32	-2.77	-14.11	4.15	-3.74	-1.65
Mazras (Fr)	-2.42	-2.08	-4.16	-1.39	-1.20	-1.89	-2.42	-2.08	-4.15	-1.38	-1.20	-1.88

A13.4 The impact of IFRS 9 on the cost of funding of Italian banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	1.13	1.26	3.77	-0.31	1.05	0.66	1.13	1.26	3.77	-0.31	1.05	0.66
Mazras	0.60	0.50	2.56	-0.75	0.68	0.30	0.60	0.50	2.56	-0.75	0.68	0.30
Mazras (It)	1.78	1.78	2.56	1.00	1.10	1.29	1.78	1.78	2.56	1.00	1.10	1.29

A13.5 The impact of IFRS 9 on the cost of funding of Spanish banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	8.81	9.79	29.36	-2.45	8.22	5.13	8.85	9.83	29.50	-2.46	8.26	5.15
Mazras	4.70	3.91	19.97	-5.87	5.28	2.33	4.72	3.93	20.06	-5.90	5.31	2.34
Mazras (Sp)	7.14	4.99	15.66	2.94	5.83	4.54	7.18	5.01	15.73	2.95	5.85	4.56

A13.6 The impact of IFRS 9 on the cost of funding of Swiss banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	2.66	2.95	8.85	-0.74	2.48	1.55	2.58	2.86	8.59	-0.72	2.41	1.50
Mazras	1.42	1.18	6.02	-1.77	1.59	0.70	1.37	1.15	5.84	-1.72	1.55	0.68
Mazras (Sw)	1.21	1.21	2.42	0.00	1.71	0.44	1.17	1.17	2.35	0.00	1.66	0.43

A14. The impact of IFRS 9 under Experiment 5 – Three risk-based portfolios

A14.1 The impact of IFRS 9 on the cost of funding of UK banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	4.42	4.91	14.73	-1.23	2.57	6.27	4.57	5.07	15.22	-1.27	2.66	6.48
Mazras	2.36	1.96	10.02	-2.95	1.17	3.54	2.44	2.03	10.35	-3.04	1.21	3.66
Mazras (UK)	1.13	1.72	3.34	-2.95	0.07	2.18	1.17	1.78	3.45	-3.04	0.08	2.26

A14.2 The impact of IFRS 9 on the cost of funding of German banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	7.52	8.36	25.07	-2.09	7.02	4.38	7.69	8.55	25.65	-2.14	7.18	4.48
Mazras	4.01	3.34	17.05	-5.01	4.51	1.99	4.10	3.42	17.44	-5.13	4.62	2.04
Mazras (Gr)	6.94	6.94	12.53	1.34	7.92	3.39	7.10	7.10	12.82	1.37	8.10	3.47

A14.3 The impact of IFRS 9 on the cost of funding of French banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	-2.05	-2.27	-6.82	0.57	-1.91	-1.19	-2.09	-2.32	-6.96	0.58	-1.95	-1.21
Mazras	-1.09	-0.91	-4.64	1.36	-1.23	-0.54	-1.11	-0.93	-4.73	1.39	-1.25	-0.55
Mazras (Fr)	-0.80	-0.68	-1.36	-0.45	-0.39	-0.62	-0.81	-0.70	-1.39	-0.46	-0.40	-0.63

A14.4 The impact of IFRS 9 on the cost of funding of Italian banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	1.34	1.49	4.46	-0.37	1.25	0.78	1.38	1.53	4.59	-0.38	1.28	0.80
Mazras	0.71	0.59	3.03	-0.89	0.80	0.35	0.73	0.61	3.12	-0.92	0.83	0.36
Mazras (It)	2.11	2.11	3.03	1.19	1.30	1.53	2.17	2.17	3.12	1.22	1.34	1.57

A14.5 The impact of IFRS 9 on the cost of funding of Spanish banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	4.68	5.20	15.61	-1.30	4.37	2.73	4.75	5.28	15.83	-1.32	4.43	2.76
Mazras	2.50	2.08	10.61	-3.12	2.81	1.24	2.53	2.11	10.76	-3.17	2.85	1.26
Mazras (Sp)	3.80	2.65	8.33	1.56	3.10	2.41	3.85	2.69	8.44	1.58	3.14	2.44

A14.6 The impact of IFRS 9 on the cost of funding of Swiss banks (in basis points)

	Riskless Debt						Risky Debt, low sensitivity to leverage					
Sample	mean	median	max	min	99.9% Conf. Intrv.		mean	median	max	min	99.9% Conf. Intrv.	
EBA	2.25	2.51	7.52	-0.63	2.10	1.31	2.24	2.49	7.47	-0.62	2.09	1.31
Mazras	1.20	1.00	5.11	-1.50	1.35	0.60	1.20	1.00	5.08	-1.49	1.35	0.59
Mazras (Sw)	1.03	1.03	2.05	0.00	1.45	0.38	1.02	1.02	2.04	0.00	1.44	0.37