

Falling Short of Expectations? Stress-Testing the European Banking System

Viral V. Acharya (NYU Stern, CEPR and NBER)*

Sascha Steffen (ESMT)†

December 22, 2013

Motivation

The eurozone is mired in a recession. In 2013, the GDP of all 17 eurozone countries fell by 0.5% and the outlook for 2014 shows considerable risks across the region. To stabilize the common currency area and its (partly insolvent) financial system, a eurozone banking union is being established. An important part of the banking union is the Single Supervisory Mechanism (SSM), which will transfer the oversight of Europe's largest banks to the European Central Bank (ECB). Before the ECB takes over this responsibility, it plans to conduct an Asset Quality Review (AQR) in 2014, which will identify the capital shortfalls of these banks.¹

The banking systems in the eurozone have been severely under-capitalized since the 2007-2009 financial crisis. As a result, some banks loaded up on risky assets (and risky sovereign debt in particular). The worsening risk profile of these assets destabilized banks even further and resulted in substantial liquidity and solvency problems by the third quarter of 2011 (Acharya and Steffen, 2013). Too little capital in the banking systems appears to have also caused a misallocation of credit in the euro area, especially for small- and medium-sized enterprises (SMEs), preventing a widespread economic recovery.

A comprehensive and decisive AQR will most likely reveal a substantial lack of capital in many peripheral *and* core European banks. This study provides estimates of the capital shortfalls of banks that will be stress-tested under the AQR using publicly available data and a series of shortfall measures. We document which banks will most likely need capital, where a public back-stop is likely needed, and, as many countries are already highly leveraged, where a EU-wide backstop might be necessary.

Stress Test Sample

The ECB published a (preliminary) list of 124 euro area banks that will be part of the AQR in 2014 and subject to ECB supervision going forward.² We use a sample of 109 of these banks (41

* C.V. Starr Professor of Economics, Department of Finance, New York University, Stern School of Business, 44 West 4th St., New York, NY 10012, email:vacharya@stern.nyu.edu, phone: +1 (212) 998 - 0354 fax: +1(212) 995 - 4256. Acharya is also a Research Affiliate of the CEPR and a Research Associate in Corporate Finance at the NBER.

† ESMT European School of Management and Technology, Schlossplatz 1, 10178 Berlin (Germany), email: steffen@esmt.org, phone +49 (30) 21231 - 1544, fax: +49 (30) 21231 - 1281.

¹ The AQR is done jointly with a stress test and a supervisory assessment. For brevity, we simply use the abbreviation AQR in our analysis.

² A list of these banks is provided in Appendix I.

banks are publicly listed) where balance sheet information is available using SNL Financial data. We use the most recent data (i.e., as of either December 2012 or June 2013).

Table 1 shows that the banks in our stress tests have €22.9 trillion in total assets. Table 1 also provides an overview of all banks at the country level, showing mean regulatory capital ratios and bank characteristics. There is substantial cross-sectional heterogeneity in terms of risk-weighted assets among European banks, ranging from 24.5% of total assets (France) to more than 77% (Slovenia), with Deutsche Bank AG (the largest bank in the stress test) reporting that almost 84% of its assets are “riskless” (Table 2 and Appendix I). Further, the average market-to-book ratio of 0.66 suggests that the market is heavily discounting banks’ assets portfolios (Table 3), at least in part due to the relatively high risk of some of the “riskless” assets relative to the markdowns taken by banks on these assets against their book equity values.

Unstressed Capital Shortfall Measures

The four book capital ratios we employ are: (1) Core Tier 1 ratio (C Tier 1), which is core Tier 1 capital divided by risk weighted assets (RWA); (2) book equity divided by total assets (equity/assets); (3) tangible equity/tangible assets, which is book equity less intangible assets divided by total assets less intangibles assets; and (4) the International Financial Reporting Standards (IFRS) Tier 1 LVG ratio, which is C Tier 1 capital divided by tangible assets minus derivative liabilities.³

Our unstressed measures calculate capital shortfall as the gap of the current book capital measure relative to thresholds: (1) the C Tier 1 ratio relative to an 8% threshold as in the AQR⁴, (2) the equity/asset ratio relative to a 3% threshold, (3) the tangible equity/tangible asset ratio relative to a 3% threshold, and, (4) the IFRS Tier 1 LVG ratio relative to a 3% threshold. These measures are unstressed in that they are capital requirements without accounting for potential losses in future stress scenarios.

Using the four book capital measures and the unstressed thresholds mentioned above, we identify a capital shortfall of between €7.5 billion (using the C Tier 1 ratio and the AQR 8% threshold) and €66.8 billion (using the tangible equity/tangible asset ratio and a 3% threshold) even in the unstressed case (Table 2).

Stressed Capital Shortfall Measures

To account for potential losses in future stress scenarios, we employ four stressed capital shortfall measures. The first two measures raise the level of capital requirements, while the remaining two measures (also) account for losses:

1. Book Capital Shortfall: Using book values of equity and assets, the less stringent

³ This ratio accounts for the fact that IFRS (in contrast to the generally accepted accounting principles or GAAP in the U.S.) does not allow netting of derivative securities. This measure of assets is thus most comparable to U.S. financial institutions.

⁴ The AQR threshold of 8% is comprised of a 4.5% core Tier 1 ratio, a 2.5% capital conservation buffer, and a 1% surcharge at systemically relevant institutions.

benchmark is a leverage ratio (book equity/assets) of 4% and the more stringent benchmark is a 7% leverage ratio. Haldane (2012) reports that a 4% capital ratio (7% for the largest financial institutions) would have been necessary to guard against bank failure during the recent financial crisis.

2. **Market Capital Shortfall:** Similarly, using the market value of equity and assets, the less stringent benchmark is a leverage ratio (market equity/assets) of 4% and the more stringent benchmark is a 7% leverage ratio.
3. **SRISK or Capital Shortfall in a Systemic Crisis:** We assume a systemic financial crisis with a global stock market decline of 40%. SRISK 5.5% VLAB is our measure for a bank's capital shortfall in this scenario, assuming a 5.5% prudential capital ratio with losses estimated using the VLAB methodology to estimate the downside risk of bank stock returns.⁵ While this scenario and the resulting SRISK measure uses market data and market equity (instead of book equity) in determining leverage, the approach is conceptually similar to that of the EU stress tests, which is to estimate losses in a stress scenario and determine the capital shortfall between a prudential capital requirement and the remaining equity after losses.
4. **Capital Shortfall after Write-down:** We assume that banks have to write-down their entire non-performing loan portfolio net of reserves during a severe financial crisis. We account for this write-down when calculating the capital shortfall of the banks using our four book capital measures (which are adjusted for the write-downs) and comparing them to a threshold of 4%. This shortfall measure is motivated by theory that suggests that under-capitalized banks continue to provide funding to unhealthy borrowers to prevent a write-down of their loans ("zombie lending") and that a forced write-down can ameliorate the zombie lending problem.

Main Results on Stressed Capital Shortfall Estimates

1. The book capital shortfall estimates indicate a capital shortfall for all banks of between €82 billion and €176 billion (4% benchmark capital ratio) or between €509 billion and €767 billion (7% capital ratio, Table 4 and Figure 1).
2. The market capital shortfall estimates indicate a capital shortfall of €230 billion (4% benchmark capital ratio) or €620 billion (7% capital ratio) for the 41 publicly listed banks (Table 5 and Figure 2).
3. Estimates of SRISK or the capital shortfall in a systemic financial crisis (40% market decline over a six-month period) is €579 billion; 41% is due to downside correlation with the market, while 59% is due to the leverage of these institutions (Table 6).
4. Capital shortfall estimates when writing down their net non-performing loan portfolios

⁵ This capital shortfall measure has been implemented based on Acharya et al. (2012) and Brownlees and Engle (2013) and. The data are provided by New York University's VLAB (<http://vlab.stern.nyu.edu/welcome/risk/>). The theoretical motivation for the measure can be found in Acharya et al. (2010). SRISK has been documented to be a comprehensive measure that includes losses due to both a bank's investments in assets and its exposure to fragile liabilities, which in the current European context relate, respectively, to holdings of peripheral sovereign bonds and (short-term) funding risk such as U.S. money market fund withdrawals and other wholesale investors (Figure 5).

range from €232 billion (using the C Tier 1 ratio and a 8% threshold as in the AQR) and €435 billion (using the tangible equity/tangible assets ratio and a 4% threshold) (Table 7).

5. There is a high rank correlation between the shortfalls based on book and market capital ratio measures. However, we find *no* significant correlation between shortfalls calculated using regulatory (i.e., risk-weighted asset-based) capital ratios and shortfalls calculated under market or book capital ratios. Similar to Acharya et al. (2013), this highlights how flawed risk-weighted asset-based measures can be (Table 8 and Figure 3). This is a significant operational risk in that even a well-intentioned AQR can under-estimate the true capital shortfall of the banking sector by not addressing the problem of static and out-of-date risk weights, especially for risky sovereign bonds.
6. Cross-country variation in our capital shortfall estimates indicate that:
 - a. French banks are leading each book and market capital shortfall measure, both in absolute euro amounts and relative to its GDP. The capital shortfall ranges from €31 billion (using the equity/asset ratio and a 4% threshold) to €285 billion (using the tangible equity/tangible asset ratio and a 7% threshold) (Table 3). The SRISK stress scenario suggests a shortfall of €222 billion, which corresponds to almost 13% of the country's GDP (Table 6).
 - b. German banks are close seconds, although they benefit from a stronger domestic economy with a higher GDP and capacity for public backstops (Table 6 and Figure 4).
 - c. Spanish and Italian banks appear to have large capital shortfalls when non-performing assets are fully written down. Both countries account for about a third of the total shortfall after write-downs (Table 7). Market-based measures such as SRISK amount to about 6.5%–7.6% of the GDP of both countries (Table 6).
7. The capital shortfalls are large as a multiple of the banks' market value of equity; in particular, assuming a 4% stressed capital ratio and impairment of the non-performing loan portfolio (Table 9), they range from multiples of 1.4 (IFRS Tier 1 LVG ratio) to 18.2 (SRISK). The market value of equity reflects the maximum amount of capital a bank can raise today in private markets based on the current market valuation of the firm. If we add subordinated debt as the next group of creditors that is going to be bailed-in, the shortfalls still range as a multiple of the banks' market value of equity and subordinated debt (Table 9 and Figure 5) from 0.9 (IFRS Tier 1 LVG ratio) to 1.5 (SRISK).
 - a. Banks in Belgium, Cyprus, and Greece are leading the group of banks with the largest capital shortfall estimates, with shortfalls as a multiple of the banks' market value of equity and subordinated debt up to 11 (Belgium, SRISK).
 - b. France and Germany are among the five countries with the largest capital shortfall estimates for their banks. The shortfall estimates range as a multiple of the banks' market value of equity and subordinated debt from 0.3 (Germany, IFRS Tier 1 LVG ratio) to 1.1 (France, SRISK).
 - c. Capital shortfalls for Italian and Spanish banks range as a multiple of the banks' market value of equity and subordinated debt from 0.1 for Spain (market equity/assets) to 0.91 for Italy (tangible equity/tangible assets).

Implications

As portfolio (micro-level) data of banks' individual exposures is not publicly available, our estimates of capital shortfalls employ publicly available book capital and market data and are motivated by empirical evidence and theory. We believe these estimates provide an interesting benchmark against which the AQR stress tests should be evaluated.

Our results suggest that with common equity issuance (e.g., through deep-discount rights issues) and haircuts on subordinated creditors (e.g., through bail-ins), it should be possible to deal with many banks' capital needs; some will, however, require public backstops, especially if bail-ins are difficult to implement without imposing losses on bondholders, who may themselves be other banks and systemically important financial institutions. The banking sectors in Belgium, Cyprus, and Greece seem likely to require backstops.

Our results also suggest large shortfalls in core European countries such as France and Germany; Germany has many government-owned institutions that may require capital issuances and/or bail-ins. Interestingly, market measures of equity imply significantly greater capital shortfalls for France and Germany than book measures do. Moreover, while Italy's capital shortfalls are much higher relative to the market value of equity than Spain's, the two look similar when allowing for bail-ins on subordinated debt, due to greater subordinated bond holdings of Italian banks.

National governments might be inclined to influence the design of the AQR to prevent these banks from being singled out in the stress tests. This raises the difficult question as to whether the AQR will eventually live up to expectations and restore confidence and creditability in the ECB as a single supervisor. Objective capital shortfall estimates such as ours can provide a valuable defense mechanism against any such political efforts to blunt the effectiveness of the proposed AQR and the intended recapitalization of the euro area banking system.

Note that on December 18, 2013, the EU finance ministers agreed to set up a common resolution fund of €55 billion financed through contributions of banks. This fund becomes fully operational after 10 years and is supposed to pay for the restructuring or resolution of failing banks after bank shareholders and creditors have been bailed in. Our results suggest that these funds might be insufficient in a severe financial crisis and public back-stops (e.g. through the European Stability Mechanism (ESM)) might still be necessary.

References

Acharya, V., L. Pedersen, L. Philippon, and M. Richardson (2010). Measuring Systemic Risk, Working Paper, NYU Stern School of Business.

Acharya, V., R. Engle, and M. Richardson (2012). Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks. *American Economic Review Papers & Proceedings* 102:3, 59–64.

Acharya, V., R. Engle, and D. Pierret (2013). Testing Macro-prudential Stress Tests: The Risk of Regulatory Risk Weights, Working Paper, NYU Stern School of Business.

Acharya, V., and S. Steffen (2013). The “Greatest” Carry Trade Ever? Understanding Eurozone Bank Risks. Working Paper, NYU Stern School of Business.

Brownlees, C., and R. Engle (2013). Volatility, Correlation and Tails for Systemic Risk Measurement. Working Paper, NYU Stern School of Business.

Haldane, A. (2012). The Dog and the Frisbee. Bank of England speech, August 31, 2012.

Figure 1 Capital Shortfall Using Stressed Book Capital Measures

This figure shows the banks' capital shortfall using stressed book capital measures of 7%. Equity/Assets is book equity over total assets. IFRS Tier 1 LVG is C Tier 1 Capital divided by total assets minus intangible assets minus derivative liabilities. Tangible Equity/Tangible Assets is defined as book equity minus intangible assets divided by total assets minus intangible assets. Shortfalls are reported in million euros and are summed over all banks in each country. Countries with zero shortfall under the respective measure are omitted.

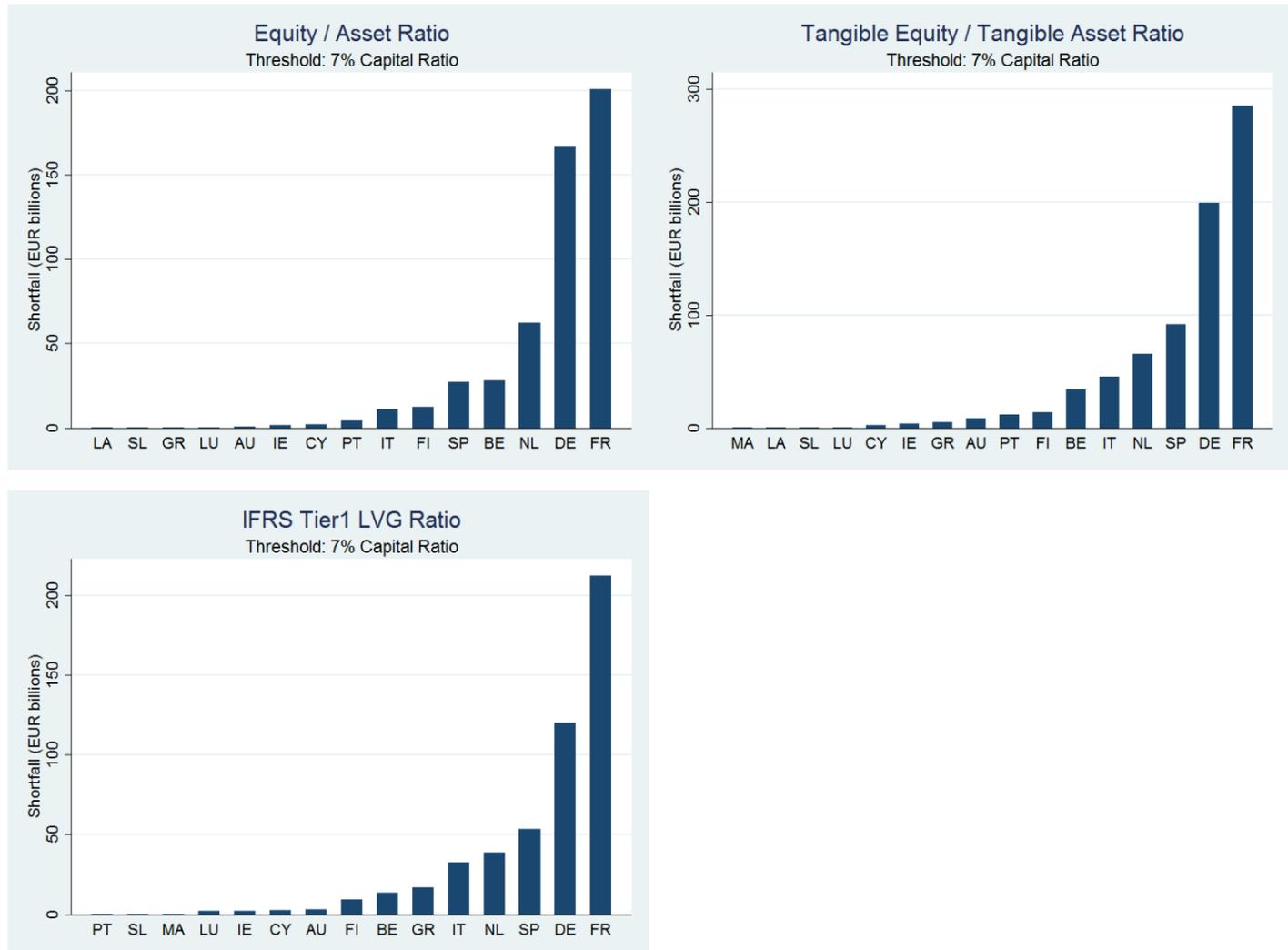


Figure 2
Capital Shortfall Using Stressed Market Capital Measures

This figure shows the banks' capital shortfall using two stressed market based measures: (1) SRISK is the shortfall in case of an aggregate market decline of 40% assuming a prudential capital ratio of 5.5%. (2) The second measure is a market leverage ratio (market equity/assets) and a threshold of 7%. Market equity/assets is market equity divided by asset minus book equity plus market equity. Countries with zero shortfall under the respective measure are omitted.

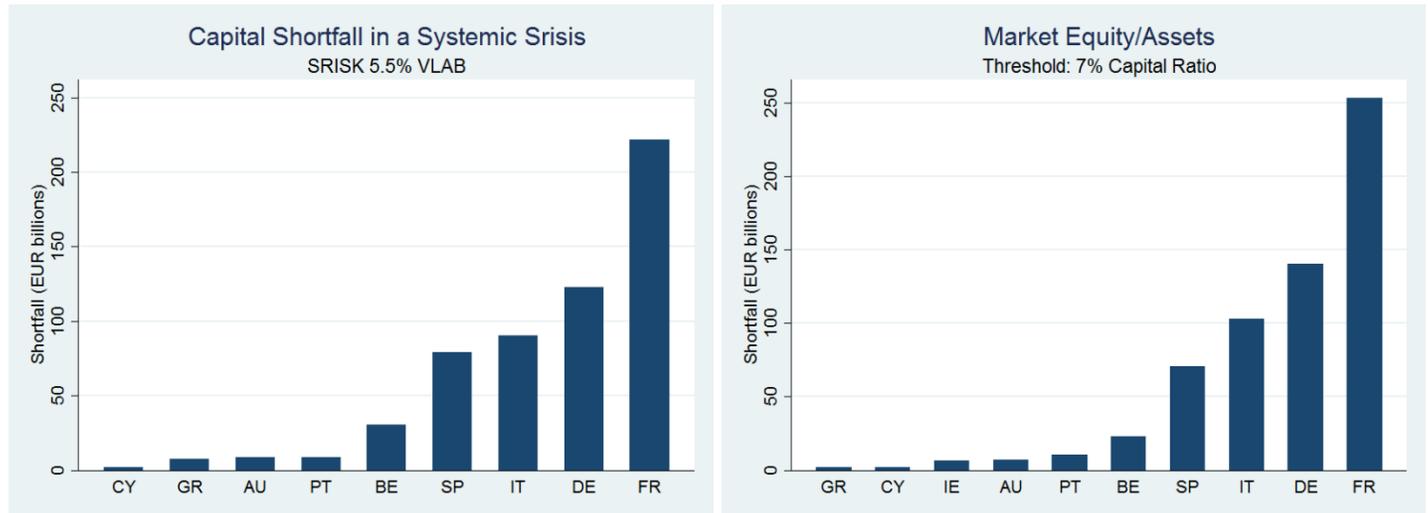


Figure 3 Correlation of Capital Shortfalls

This figure shows the correlation of banks' capital shortfall assuming that banks need to write-down their net non-performing loans ("loan impairment") and SRISK. C Tier 1 is the Common Tier 1 ratio and defined as Common Tier 1 Capital over Risk-Weighted Assets (RWA). Equity/Assets is book equity over total assets. IFRS Tier 1 LVG is C Tier 1 Capital divided by total assets minus intangible assets minus derivative liabilities. Tangible Equity/Tangible Assets is book equity minus intangible assets divided by total assets minus intangible assets. SRISK is the shortfall in case of an aggregate market decline of 40% assuming a prudential capital ratio of 5.5%. Shortfalls are reported in million euros and are summed over all banks in each country.

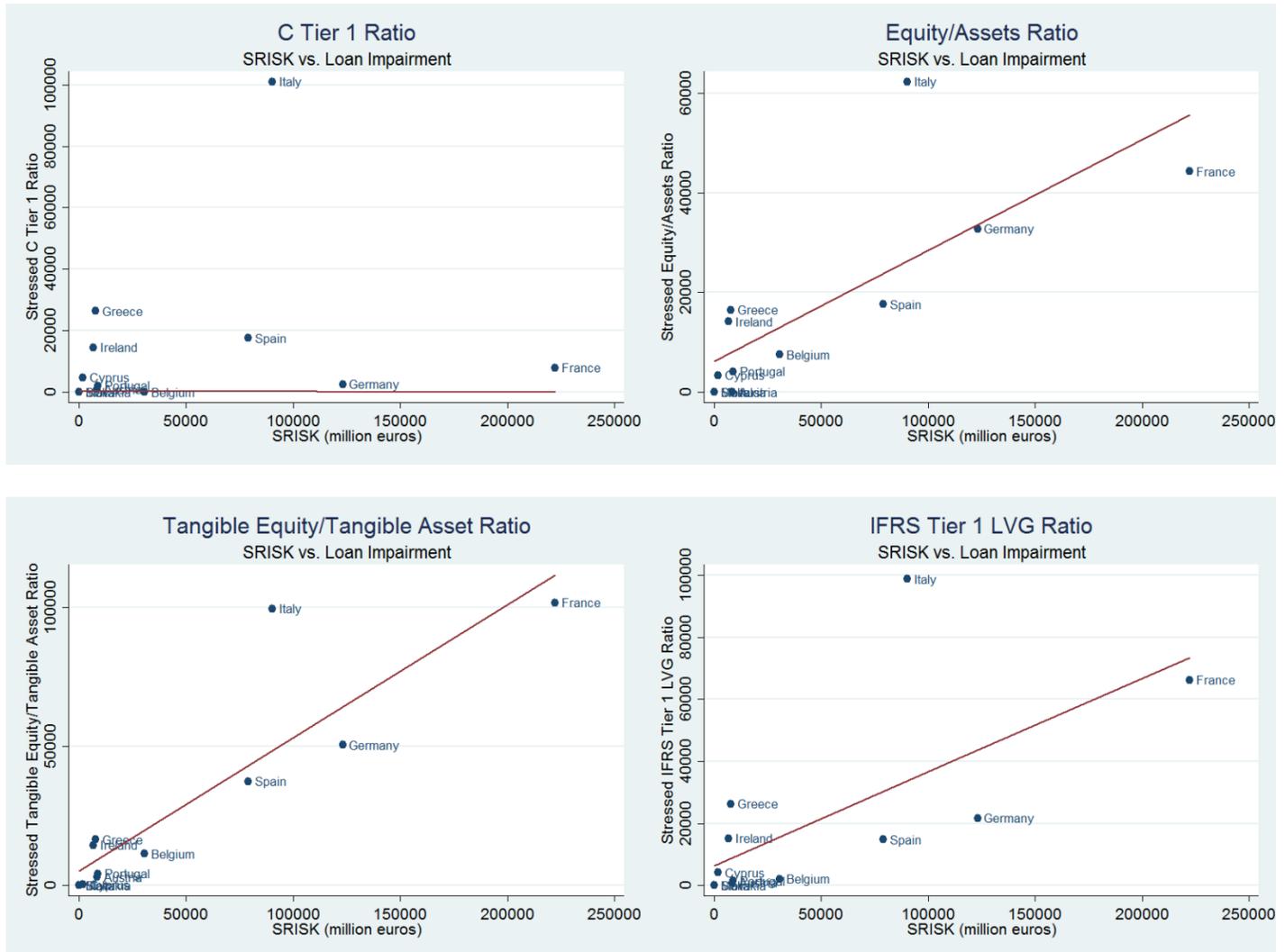


Figure 4

Capital Shortfall Using Stressed Market Capital Measures (Scaled by GDP and Market Equity)

This figure shows the banks' capital shortfall using stressed market-based measures. SRISK is the shortfall in case of an aggregate market decline of 40%, assuming a prudential capital ratio of 5.5%. The shortfall is scaled by the country's GDP and the banks' total capitalization. Countries with zero shortfall under the respective measure are omitted.

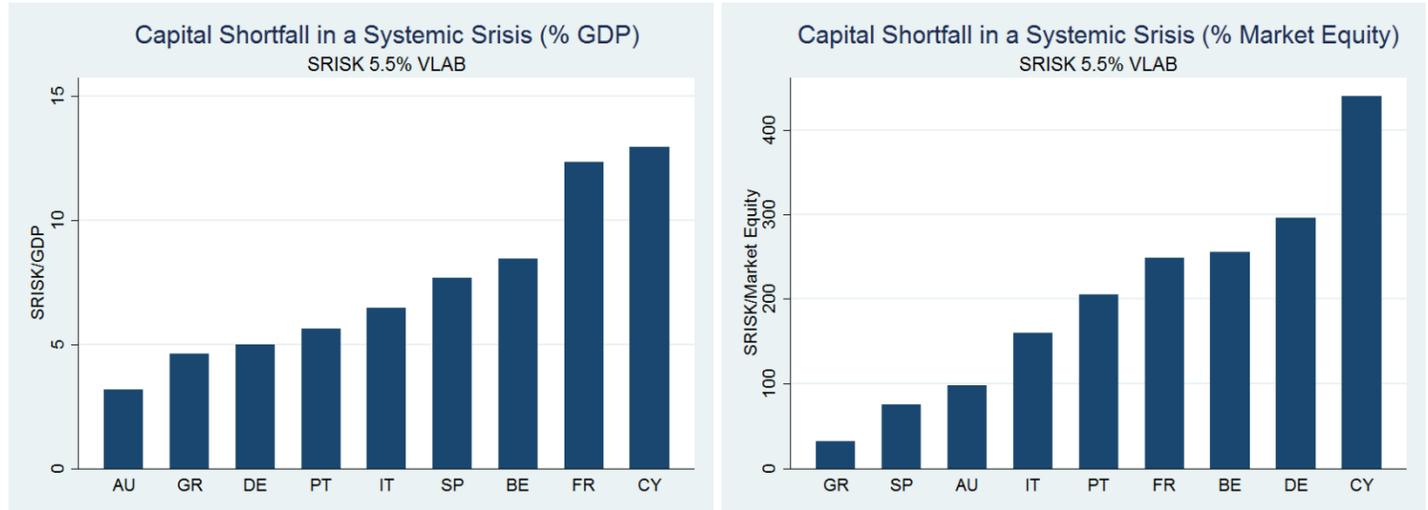


Figure 5 Shortfalls Relative to Market Equity and Subordinated Debt

This figure shows the banks' capital shortfall relative to market equity plus subordinated debt (including hybrid capital) using stressed book- and market-based measures and incorporating a full write-down of the non-performing loan portfolios. For all measures, we assume a 4% target capital threshold. SRISK is the shortfall in case of an aggregate market decline of 40% assuming a prudential capital ratio of 4%. Market Equity/Assets is market equity divided by asset minus book equity plus market equity. Equity/Assets is book equity divided by total assets. IFRS Tier 1 LVG is C Tier 1 Capital divided by total assets minus intangible assets minus derivative liabilities. Countries with no capital shortfall are omitted.

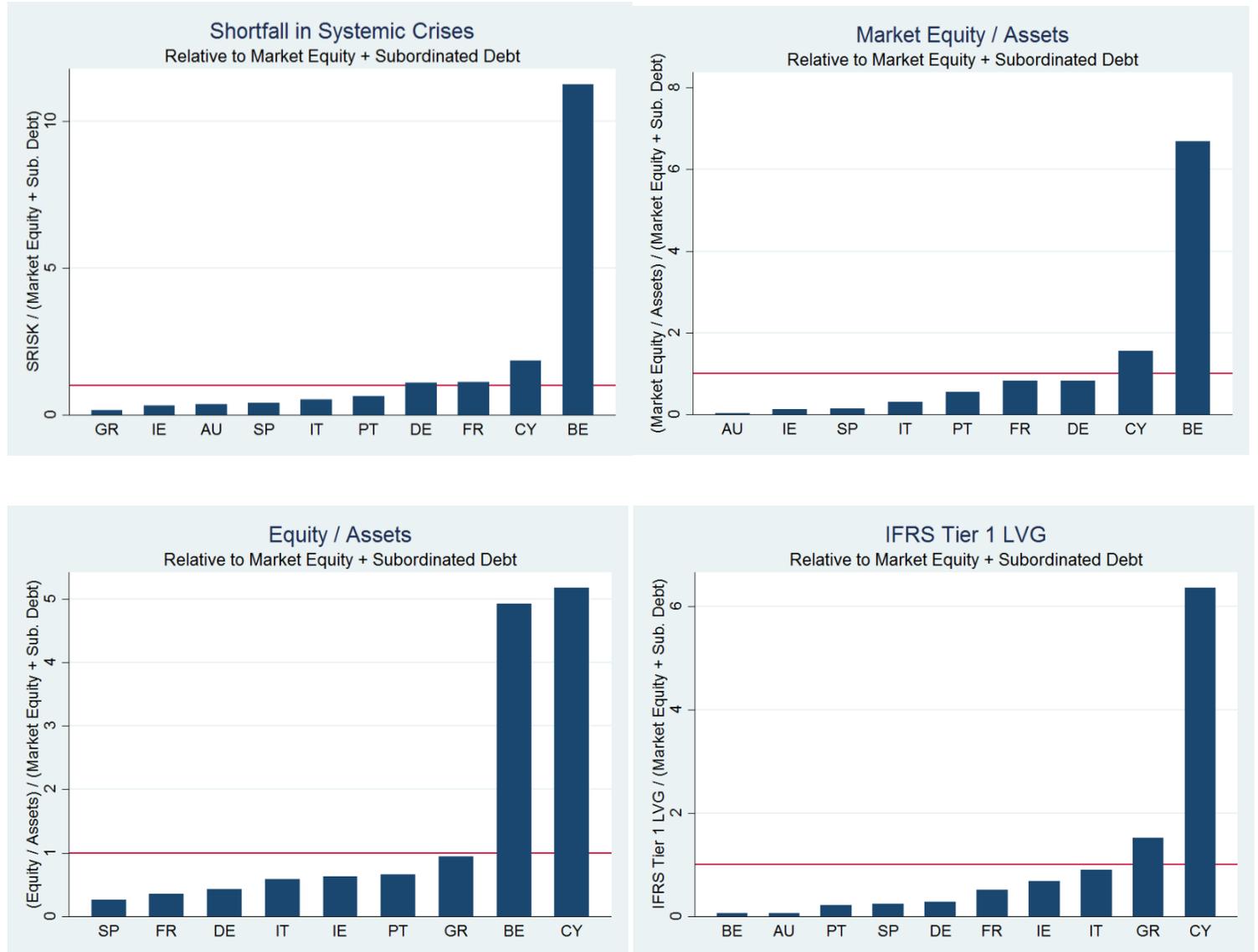


Table 1
Descriptive Statistics

This table reports descriptive statistics of the banks included in the Asset Quality Review (AQR) conducted by the European Central Bank (ECB) in 2014 (data are available for 109 out of the 128 banks included in the AQR). C Tier 1 is the Common Tier 1 ratio and is Common Tier 1 Capital divided by Risk-Weighted Assets (RWA). Equity/Assets is book equity over total assets. IFRS Tier 1 LVG is C Tier 1 Capital divided by total assets minus intangible assets minus derivative liabilities. Tangible Equity/Tangible Assets is defined as book equity minus intangible assets divided by total assets minus intangible assets. RWA/Assets is RWA divided by total assets. Net Impaired Loans/C Tier 1 Capital is the amount of impaired loans net of reserves over Common Tier 1 Capital. Assets are total assets and measured in million euros. Banks are the number of banks per country that are included in the AQR and for which data are available. Data are from H1 2013 if available or EOY 2012.

Country	C Tier 1	Equity/Assets	IFRS Tier1 LVG	Tangible Equity/Tangible Assets	RWA/Assets	Net Impaired Loans/C Tier 1 Capital	Assets	Banks
France	11.60	4.00	3.06	3.29	24.56	0.26	7,136,917	7
Germany	14.11	4.78	4.20	4.30	30.99	0.46	5,211,695	24
Spain	9.07	5.20	4.11	3.93	45.88	0.96	3,242,570	15
Italy	9.32	6.61	5.09	5.34	55.68	1.27	2,409,718	14
Netherlands	28.88	3.19	3.07	4.76	28.96	0.85	2,007,259	6
Belgium	16.30	3.28	2.76	4.29	22.85	0.29	788,188	5
Austria	11.04	7.46	5.26	6.26	54.91	0.34	482,921	6
Finland	14.90	6.10	5.62	6.00	37.26	0.13	435,429	3
Greece	9.05	8.81	6.60	2.96	61.68	2.22	347,075	4
Ireland	14.23	10.33	9.80	8.33	60.35	1.29	333,898	4
Portugal	12.34	6.05	3.45	7.62	61.33	0.68	326,572	4
Luxembourg	13.69	7.27	6.80	3.85	26.77	0.08	71,803	3
Cyprus	3.08	3.88	2.69	1.84	65.12	-2.11	37,671	2
Slovakia	16.32	10.80	9.89	8.70	55.59	0.16	31,968	3
Slovenia	7.52	6.51	5.41	5.87	77.33	2.84	19,042	2
Malta	9.90	7.44	6.65	4.83	49.46	0.55	12,965	2
Estonia	33.11	19.00	18.97	16.80	50.49	0.09	12,914	2
Latvia	16.97	12.15	12.00	14.77	63.09	0.18	11,796	3
Total	13.97	7.38	6.41	6.32	48.46	0.59	22,920,400	109

Table 2**Capital Shortfall Using Unstressed Book Capital Measures**

This table reports the banks' capital shortfall using unstressed capital shortfall measures. The 8% C Tier 1 threshold is used in the AQR. We assume a benchmark capital ratio for other book measures of leverage of 3%. C Tier 1 is the Common Tier 1 ratio and is Common Tier 1 Capital over Risk-Weighted Assets (RWA). Equity/Assets is book equity divided by total assets. Tangible Equity/Tangible Assets is book equity minus intangible assets divided by total assets minus intangible assets. IFRS Tier 1 LVG is C Tier 1 Capital divided by total assets minus intangible assets minus derivative liabilities. Assets are total assets and measured in million euros. Shortfalls are reported in million euros and are summed over all banks in each country.

Country	Assets	C Tier 1	Equity/Assets	Tangible Equity/Tangible Assets	IFRS Tier 1 LVG
		8% AQR	3%	3%	3%
France	7,136,917	0	9,470	32,491	15,476
Germany	5,211,695	413	1,646	21,177	2,171
Spain	3,242,570	3,167	662	1,819	3,710
Italy	2,409,718	1,010	0	950	82
Netherlands	2,007,259	0	1,316	1,511	0
Belgium	788,188	0	5,239	5,964	190
Austria	482,921	0	0	55	0
Finland	435,429	0	153	256	0
Greece	347,075	769	0	0	9,616
Ireland	333,898	0	0	0	0
Portugal	326,572	0	0	1,330	0
Luxembourg	71,803	0	0	0	14
Cyprus	37,671	2,134	595	1,226	1,329
Slovakia	31,968	0	0	0	0
Slovenia	19,042	60	0	0	0
Malta	12,965	0	0	0	0
Estonia	12,914	0	0	0	0
Latvia	11,796	0	0	0	0
Total	22,920,400	7,553	19,082	66,777	32,589

Table 3
Descriptive Statistics: Market Capitalization

This table reports summary statistics of market based measures of capitalization on a country level. MES is the co-movement of the banks' stock return with the market index in a financial crisis over a one-day period. Variance is the daily variance of the equity return. Beta is the beta of the firm with respect to the MSCI World Index. Correlation is correlation of the firm with respect to the MSCI World Index. Market-to-Book is market value over book value of equity as of June 30, 2013. Market Equity/Assets is a market leverage ratio and defined as market equity divided by asset minus book equity plus market equity. Assets are total assets and measured in million euros. Market Cap is the market value of equity on June 30, 2013 measured in million euros. Banks are the number of public banks in each country.

Country	MES	Variance	Beta	Correlation	Market- to-Book	Market Equity/Assets	Assets	Market Cap	Banks
France	3.95%	0.05%	1.39	0.58	0.44	1.81%	4,900,325	89,346	3
Germany	3.77%	0.06%	1.32	0.55	0.44	1.79%	2,591,184	41,596	3
Spain	3.03%	0.11%	1.07	0.44	0.59	3.63%	2,520,831	105,521	6
Italy	3.43%	0.10%	1.20	0.42	0.36	2.66%	2,315,944	56,493	11
Belgium	2.73%	3.81%	0.95	0.23	0.38	2.38%	500,507	11,946	2
Greece	4.71%	1.44%	1.65	0.20	0.87	7.36%	347,075	24,385	4
Ireland	2.81%	0.25%	0.99	0.22	1.33	9.21%	292,986	37,426	3
Austria	3.22%	0.47%	1.13	0.28	0.54	3.42%	235,054	8,781	2
Portugal	2.49%	0.10%	0.88	0.37	0.42	2.19%	213,888	4,233	3
Cyprus	1.43%	0.08%	0.49	0.20	0.63	0.99%	37,671	437	2
Slovakia	0.74%	0.16%	0.25	0.05	0.65	8.16%	11,375	848	1
Malta	0.61%	0.02%	0.21	0.13	1.25	9.56%	7,217	681	1
Total	2.74%	0.55%	0.96	0.31	0.66	4.43%	13,974,058	381,692	41

Table 4
Book Capital Shortfall

This table reports the banks' capital shortfall under stressed book capital measures. We assume a benchmark capital ratio for other book measures of leverage of 4% as well as 7%. C Tier 1 is the Common Tier 1 ratio and defined as Common Tier 1 Capital over Risk-Weighted Assets (RWA). Equity/Assets is book equity divided by total assets. Tangible Equity/Tangible Assets is book equity minus intangible assets divided by total assets minus intangible assets. IFRS Tier 1 LVG is C Tier 1 Capital divided by total assets minus intangible assets minus derivative liabilities. Assets are total assets and measured in million euros. Shortfalls are reported in million euros and are summed over all banks in each country.

Country	Assets	Shortfall assuming a 4% threshold			Shortfall assuming a 7% threshold		
		Equity/Assets	Tangible Equity/Tangible Assets	IFRS Tier 1 LVG	Equity/Assets	Tangible Equity/Tangible Assets	IFRS Tier 1 LVG
France	7,136,917	31,382	78,309	41,675	201,056	285,365	212,662
Germany	5,211,695	28,035	54,223	19,392	167,145	199,374	120,264
Spain	3,242,570	2,681	12,473	5,285	27,385	91,853	53,782
Italy	2,409,718	2,388	3,730	800	10,857	45,344	32,775
Netherlands	2,007,259	6,118	6,925	738	62,477	65,702	38,915
Belgium	788,188	10,233	11,036	658	28,026	33,876	13,705
Austria	482,921	0	382	0	544	8,308	3,143
Finland	435,429	3,219	3,321	984	12,417	13,709	9,144
Greece	347,075	0	654	10,666	131	5,184	17,109
Ireland	333,898	0	0	0	1,671	3,953	2,181
Portugal	326,572	0	3,029	0	4,073	11,445	34
Luxembourg	71,803	0	0	212	296	359	2,023
Cyprus	37,671	906	1,536	1,636	1,858	2,506	2,690
Slovakia	31,968	0	0	0	0	0	0
Slovenia	19,042	0	0	0	79	194	149
Malta	12,965	0	0	0	0	63	266
Estonia	12,914	0	0	0	0	0	0
Latvia	11,796	0	0	0	59	67	0
Total	22,920,400	84,962	175,616	82,046	518,074	767,303	508,841

Table 5
Book Capital vs. Market Capital Based Measures

This table reports the banks' capital shortfall using stressed book and market measures. Equity / Assets is book equity over total assets. Market Equity / Assets is a market leverage ratio and defined as market equity over asset minus book equity + market equity. The less stringent benchmark is a leverage ratio of 4% and the more stringent benchmark is a 7% ratio. For comparison, we report the shortfall using the unstressed capital ratios (Equity/Assets and Market Equity/Assets) of 3%. Shortfalls are reported in million euros and are summed over all banks in each country.

Country	Book Capital Ratio Stress Test			Market Capital Ratio Stress Test		
	Equity / Assets	Equity / Assets	Equity / Assets	Market Equity/ Assets	Market Equity/ Assets	Market Equity/ Assets
Benchmark	3%	4%	7%	3%	4%	7%
France	7,883	25,732	150,117	57,491	106,494	253,504
Germany	0	18,660	94,784	37,017	62,929	140,665
Spain	0	653	17,860	3,554	9,768	70,401
Italy	0	1,963	8,907	13,665	34,265	103,192
Belgium	3,856	6,328	15,498	7,393	9,865	22,959
Greece	0	0	131	0	0	2,118
Ireland	0	0	1,671	219	1,630	6,802
Austria	0	0	544	43	291	7,325
Portugal	0	0	3,291	2,112	4,237	10,654
Cyprus	595	906	1,858	730	1,107	2,237
Slovakia	0	0	0	0	0	0
Malta	0	0	0	0	0	0
Total	12,335	54,242	294,661	122,224	230,587	619,856

Table 6**SRISK or Capital Shortfall in a Systemic Crisis**

This table reports European banks' capital shortfall if there is a systemic crisis (defined as 40% drop in the market index over a six-month period). Market Equity is the total market capitalization of publicly listed AQR banks as of 30 June 2013 in million euros. Market Equity / Total Assets is market capitalization over total assets. LRMES is the long run marginal expected shortfall which is the percentage loss in market capitalization in a systemic crisis over a 6 month period. LRMES*Market Equity is the absolute market value loss in a systemic financial crisis in million euros. SRISK is the expected shortfall of a bank in a systemic crisis over a six-month period considering both LRMES and LVG. SRISK 5.5% VLAB is SRISK calculated assuming a 5.5% prudential capital ratio (which is the measure available on the NYU Stern Volatility Lab website). SRISK 3%, 4%, 7% are capital shortfall estimates in a systemic crisis under different prudential capital ratio assumptions. Panel A reports the absolute shortfalls in million euros for each country sorted by the largest absolute SRISK 5.5% VLAB value (in bold). Panel B reports the shortfalls scaled by each country's GDP and sorted by the highest relative SRISK.

Panel A: Absolute SRISK (in million euros)

CountryName	MarketCap	Market Equity/ Assets	LRMES	LRMES* Market Equity	SRISK	Prudential Capital Ratio			
						5.50% VLAB	3%	4%	7%
						France	89,346	1.81%	50.92%
Germany	41,596	1.79%	48.90%	26,926	123,123	57,646	83,837	162,409	
Italy	56,493	2.66%	45.31%	33,982	90,253	35,408	57,346	123,161	
Spain	105,521	3.63%	41.72%	64,593	79,038	17,849	42,227	115,849	
Belgium	11,946	2.38%	36.31%	8,406	30,520	14,150	20,698	40,342	
Portugal	4,233	2.19%	34.72%	2,048	8,701	3,537	5,603	11,800	
Austria	8,781	3.42%	38.40%	6,851	8,639	3,112	5,323	11,956	
Greece	24,385	7.36%	56.88%	18,293	7,731	807	2,943	12,660	
Cyprus	437	0.99%	22.72%	130	6,796	2,216	4,048	9,545	
Slovakia	848	8.16%	12.52%	138	1,924	896	1,307	2,540	
Malta	681	9.56%	10.34%	92	0	0	0	0	
Ireland	37,426	9.21%	39.62%	18,328	0	0	0	0	
Total	381,692	4.43%	36.53%	239,116	578,854	236,872	372,934	784,915	

Panel B: Relative SRISK (scaled by GDP)

CountryName	MarketCap	Market Equity/ Assets	LRMES	LRMES* Market Equity	SRISK	Prudential Capital Ratio			
						5.5% VLAB	3%	4%	7%
						Cyprus	437	0.99%	22.72%
France	89,346	1.81%	50.92%	3.29%	12.33%	5.62%	8.30%	16.36%	
Belgium	11,946	2.38%	36.31%	2.32%	8.44%	3.91%	5.72%	11.15%	
Spain	105,521	3.63%	41.72%	6.26%	7.66%	1.73%	4.09%	11.22%	
Italy	56,493	2.66%	45.31%	2.44%	6.47%	2.54%	4.11%	8.83%	
Portugal	4,233	2.19%	34.72%	1.32%	5.63%	2.29%	3.62%	7.63%	
Germany	41,596	1.79%	48.90%	1.09%	4.99%	2.34%	3.40%	6.59%	
Greece	24,385	7.36%	56.88%	10.90%	4.61%	0.48%	1.75%	7.54%	
Ireland	37,426	9.21%	39.62%	11.54%	4.28%	1.40%	2.55%	6.01%	
Austria	8,781	3.42%	38.40%	2.53%	3.19%	1.15%	1.96%	4.41%	
Malta	681	9.56%	10.34%	1.66%	0.00%	0.00%	0.00%	0.00%	
Slovakia	848	8.16%	12.52%	1.66%	0.00%	0.00%	0.00%	0.00%	
Total	381,692	4.43%	36.53%	3.82%	5.88%	2.29%	3.69%	8.07%	

Table 7**Write-Down of Non-Performing Loan Portfolio**

This table reports the banks' capital shortfall assuming that banks need to write-down their net impaired loans. The 8% C Tier 1 scenario as used in the AQR remains unchanged. C Tier 1 is the Common Tier 1 ratio and defined as Common Tier 1 Capital over Risk Weighted Assets (RWA). Equity / Assets is book equity over total assets. Tangible Equity / Tangible Assets is defined as book equity minus intangible assets over total assets minus intangible assets. IFRS Tier 1 LVG is C Tier 1 Capital over total assets minus intangible assets minus derivative liabilities. We assume a capital threshold of 4% for the Equity/Assets, Tangible Equity/Assets, and IFRS Tier 1 LVG ratios. Shortfalls are reported in million euros and are summed over all banks in each country.

Country	C Tier 1	Equity / Assets	Tangible Equity / Tangible Assets	IFRS Tier 1 LVG	Assets
Threshold	8%	4%	4%	4%	
	AQR				
France	8,872	50,232	118,945	86,934	7,136,917
Germany	12,326	54,674	77,372	45,660	5,211,695
Spain	45,391	29,897	57,294	30,517	3,242,570
Italy	105,886	66,195	104,576	104,081	2,409,718
Netherlands	2,489	10,415	10,713	7,644	2,007,259
Belgium	0	13,118	17,197	4,414	788,188
Austria	2,921	0	3,139	842	482,921
Finland	0	4,293	4,394	2,058	435,429
Greece	26,324	16,496	16,497	26,293	347,075
Ireland	14,518	14,178	14,392	15,124	333,898
Portugal	4,828	6,654	7,236	3,223	326,572
Luxembourg	0	0	0	284	71,803
Cyprus	4,799	3,404	336	4,126	37,671
Slovakia	0	0	0	0	31,968
Slovenia	3,738	3,165	3,194	3,316	19,042
Malta	114	0	24	123	12,965
Estonia	0	0	0	0	12,914
Latvia	0	0	0	0	11,796
	232,204	272,720	435,310	334,641	22,920,400

Table 8
Rank-Correlation

This table reports the rank-correlation between the shortfalls based on book and market capital ratio measures.. Panel A reports the results computing the rank-correlation between the capital shortfall under stressed book capital measures using a 7% threshold and SRISK. Panel B reports the results computing the rank-correlation between the shortfalls after write-down of the non-performing loan portfolios and SRISK. Panel C reports the results computing the rank-correlation between the shortfalls using a stressed book capital measure of 7% (“7% Capital Ratio”) and assuming that banks need to write-down their net impaired loans and a 4% target capital threshold of 4% (“Impaired Loans”). **, * indicate significance levels at 1% and 5%, respectively.

Panel A: Rank-Correlation: Shortfalls using book capital stressed measures of 7% and SRISK

	SRISK	SRISK	SRISK	SRISK
C Tier 1	-0.147			
Equity / Assets		0.916***		
Tangible Equity / Tangible Assets			0.993***	
IFRS Tier 1 LVG				0.795***

Panel B: Rank-Correlation: Shortfall using book capital stressed measured after write-down of non-performing loans and a 4% threshold SRISK

	SRISK	SRISK	SRISK	SRISK
C Tier 1	0.409			
Equity / Assets		0.825***		
Tangible Equity / Tangible Assets			0.888***	
IFRS Tier 1 LVG				0.684**

Panel C: Rank-Correlation of stressed book capital shortfall measures

	C Tier 1	Equity / Assets	Impaired Loans Tangible Equity / Tangible Assets	IFRS Tier 1 LVG
C Tier 1	0.536	0.324	0.395	0.596*
Equity / Assets		0.755**		
Tangible Equity / Tangible Assets			0.874**	
IFRS Tier 1 LVG				0.826**

Table 9
Shortfall and “Bail-Ins”

This table reports the banks’ capital shortfall relative to market equity (Panel A) and market equity plus subordinated debt (Panel B) assuming that banks need to write-down their net impaired loans and a 4% capital threshold for each measure. SRISK is the shortfall in case of an aggregate market decline of 40% assuming a prudential capital ratio of 4%. Market Equity / Assets is defined as market equity over asset minus book equity + market equity. Equity / Assets is book equity over total assets. Tangible Equity / Tangible Assets is defined as book equity minus intangible assets over total assets minus intangible assets. IFRS Tier 1 LVG is C Tier 1 Capital over total assets minus intangible assets minus derivative liabilities.

Panel A: Shortfalls relative to market equity

Shortfall assuming a 4% threshold (relative to Market Equity)					
Country	SRISK	Market Equity / Assets	Equity / Assets	Tangible Equity / Tangible Assets	IFRS Tier 1 LVG
Belgium	20844.0%	12520.9%	9209.9%	9692.0%	8.8%
Cyprus	301.6%	255.6%	769.2%	92.1%	928.3%
France	221.7%	173.4%	86.3%	163.8%	110.1%
Germany	206.8%	157.9%	83.1%	125.8%	56.1%
Portugal	150.0%	124.4%	220.5%	218.9%	75.0%
Italy	122.6%	82.3%	175.0%	244.2%	234.7%
Austria	60.4%	4.4%	0.0%	37.5%	10.4%
Spain	48.7%	16.5%	29.9%	51.8%	27.1%
Ireland	43.1%	18.1%	81.5%	82.3%	88.0%
Greece	14.7%	0.0%	98.3%	98.0%	157.6%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%
Slovakia	0.0%	0.0%	0.0%	0.0%	0.0%
Total	1834.5%	1112.8%	896.1%	900.5%	141.3%

Panel B: Shortfalls relative to market equity plus subordinated debt

Shortfall assuming a 4% threshold (relative to Market Equity + Subordinated Debt)					
Country	SRISK	Market Equity / Assets	Equity / Assets	Tangible Equity / Tangible Assets	IFRS Tier 1 LVG
Belgium	1124.9%	669.4%	493.0%	527.4%	5.6%
Cyprus	185.0%	156.4%	517.5%	16.0%	636.0%
France	111.4%	82.1%	35.6%	77.2%	51.5%
Germany	110.2%	82.4%	42.9%	66.2%	28.0%
Portugal	63.4%	54.1%	65.6%	65.1%	22.3%
Italy	51.3%	31.3%	58.1%	91.0%	90.1%
Spain	39.8%	14.4%	25.6%	42.4%	23.9%
Austria	36.4%	2.3%	0.0%	22.9%	6.4%
Ireland	31.6%	13.3%	62.8%	63.4%	67.8%
Greece	14.5%	0.0%	94.6%	94.3%	151.6%
Malta	0.0%	0.0%	0.0%	0.0%	0.0%
Slovakia	0.0%	0.0%	0.0%	0.0%	0.0%
Total	147.4%	92.1%	116.3%	88.8%	90.3%

Appendix I

This table is a list of all banks participating in the AQR and for which data are available from SNL Financial.

Institution	Contry	Ticker	Assets	C Tier 1	Equity / Assets	RWA / Assets
Erste Group Bank AG	Austria	EBS	210,201	11.82%	7.72%	48.00%
Raiffeisen Zentralbank Österreich AG	Austria		139,500	10.20%	8.37%	62.39%
Raiffeisenlandesbank Oberösterreich AG	Austria		38,983	9.12%	8.82%	70.46%
Bank für Arbeit und Wirtschaft und Öster.Postsparkasse AG	Austria		38,197	13.35%	7.23%	47.15%
Raiffeisenlandesbank Niederösterreich-Wien AG	Austria		31,186	10.77%	7.79%	44.07%
Österreichische Volksbanken-AG	Austria	VBPS	24,854	10.98%	4.81%	57.40%
KBC Group NV	Belgium	KBC	253,297	14.55%	6.31%	37.05%
Dexia SA	Belgium	DEXB	247,210	20.45%	1.44%	20.15%
Belfius Banque SA	Belgium		212,947	13.33%	2.52%	23.60%
AXA Bank Europe SA	Belgium		39,217	16.52%	2.10%	12.54%
Argenta Bank- en Verzekeringsgroep SA	Belgium		35,517	16.63%	4.02%	20.71%
Bank of Cyprus Public Company Limited	Cyprus		31,032	-1.89%	1.08%	69.54%
Hellenic Bank Public Company Limited	Cyprus	HB	6,639	8.05%	6.67%	80.05%
Swedbank AS	Estonia		8,718	32.91%	20.39%	50.81%
SEB Pank AS	Estonia		4,196	33.32%	17.61%	50.17%
Nordea Bank Finland Plc	Finland		306,598	15.92%	2.95%	16.95%
OP-Pohjola Group	Finland		100,461	14.57%	7.21%	37.49%
Danske Bank Oyj	Finland		28,370	14.20%	8.15%	57.35%
BNP Paribas SA	France	BNP	1,861,338	12.18%	5.05%	30.25%
Crédit Agricole SA	France	ACA	1,784,905	8.61%	2.56%	18.28%
Société Générale SA	France	GLE	1,254,082	11.12%	4.25%	25.02%
Groupe BPCE	France		1,161,639	10.43%	4.79%	33.66%
Crédit Mutuel Group	France		645,216	13.30%	5.95%	29.96%
HSBC France	France		224,702	14.38%	2.29%	13.31%
La Banque Postale	France		205,035	11.18%	3.11%	21.41%
Deutsche Bank AG	Germany	DBK	1,909,879	13.26%	3.02%	16.46%
Commerzbank AG	Germany	CBK	636,963	12.06%	4.16%	32.39%
Deutsche Zentral-Genossenschaftsbank AG	Germany		396,016	10.86%	3.36%	22.00%
Landesbank Baden-Württemberg	Germany		306,807	14.02%	4.26%	29.07%
Bayerische Landesbank	Germany		265,764	12.32%	5.82%	35.48%
NORD/LB Norddeutsche Landesbank Girozentrale	Germany		208,242	9.84%	3.78%	34.89%
Landesbank Hessen-Thüringen Girozentrale	Germany		180,906	10.13%	3.84%	33.16%
Hypo Real Estate Holding AG	Germany		168,977	30.91%	3.69%	10.84%
NRW.BANK	Germany		149,086	39.92%	12.26%	27.95%
DekaBank Deutsche Girozentrale	Germany		121,455	12.81%	3.03%	19.49%
HSH Nordbank AG	Germany		120,852	12.00%	4.47%	31.69%
Landesbank Berlin Holding AG	Germany		115,313	9.73%	2.29%	23.39%
Westdeutsche Genossenschafts-Zentralbank AG	Germany		93,264	11.40%	3.47%	18.87%
Landwirtschaftliche Rentenbank	Germany		81,580	23.91%	3.48%	16.62%
Wüstenrot & Württembergische AG	Germany	WUW	75,442		4.30%	
Landeskreditbank Baden-Württemberg-Förderbank	Germany		70,630	14.15%	4.06%	26.02%
KfW IPEX-Bank GmbH	Germany		46,335	13.49%	7.34%	50.63%
Aareal Bank AG	Germany	ARL	44,342	14.21%	5.38%	30.42%
Hamburger Sparkasse AG	Germany		40,998	7.20%	6.50%	
Volkswagen Bank GmbH	Germany		39,165	13.90%	11.77%	74.47%
SEB AG	Germany		37,390	12.92%	5.54%	33.13%
Deutsche Apotheker- und Ärztebank eG	Germany		35,657	13.28%	5.50%	40.10%
Münchener Hypothekbank eG	Germany		35,543	5.70%	2.34%	22.22%
IKB Deutsche Industriebank AG	Germany		31,090	6.60%	1.10%	53.11%
National Bank of Greece SA	Greece	ETE	110,434	8.30%	6.88%	58.42%
Piraeus Bank SA	Greece	TPEIR	95,026	13.79%	9.96%	63.30%
Alpha Bank AE	Greece	ALPHA	74,229	6.26%	10.78%	56.01%
Eurobank Ergasias SA	Greece	EUROB	67,386	7.87%	7.60%	50.61%
Bank of Ireland	Ireland	BIR	134,237	14.14%	5.91%	38.07%
Allied Irish Banks, Plc	Ireland	AIB	120,602	15.42%	8.79%	54.25%
Ulster Bank Ireland Limited	Ireland		40,912	11.42%	20.16%	110.70%
Permanent TSB Group Holdings Plc	Ireland	IL0	38,147	15.93%	6.47%	38.38%
UniCredit SpA	Italy	UCG	889,632	11.41%	7.32%	46.18%
Intesa Sanpaolo SpA	Italy	ISP	647,785	11.14%	7.66%	44.36%
Banca Monte dei Paschi di Siena SpA	Italy	BMPS	214,918	11.44%	3.09%	39.24%
Banco Popolare Società Cooperativa	Italy	BP	131,999	10.13%	6.99%	41.45%
Unione di Banche Italiane SCpA	Italy	UBI	127,930	12.08%	8.36%	48.88%
Mediobanca - Banca di Credito Finanziario SpA	Italy	MB	79,637	11.84%	8.98%	68.65%
Banca popolare dell'Emilia Romagna SC	Italy	BPE	62,578	8.22%	7.43%	71.73%
Banca Popolare di Milano Scarl	Italy	PMI	50,966	7.45%	7.09%	82.46%
Iccrea Holding SpA	Italy		47,773	9.73%	3.11%	28.70%
Banca Carige SpA - Cassa di Risparmio di Genova e Imperia	Italy	CRG	46,638	6.23%	8.28%	51.56%
Veneto Banca SCpA	Italy		42,226	7.00%	7.14%	60.26%
Banca Popolare di Sondrio SCpA	Italy	BPSO	32,661	7.76%	6.00%	73.32%
Credito Emiliano SpA	Italy	CE	31,200	9.56%	6.48%	53.62%
Banca Popolare di Spoleto SpA	Italy	SPO	3,775	6.45%	4.58%	69.09%

Swedbank AS	Latvia		4,835	25.82%	20.07%	72.01%
AS SEB banka	Latvia		3,766	15.43%	11.22%	69.64%
ABLV Bank, AS	Latvia		3,194	9.67%	5.16%	45.48%
Banque et Caisse d'Epargne de l'Etat, Luxembourg	Luxembourg		38,515	16.30%	9.22%	28.69%
Banque Internationale à Luxembourg SA	Luxembourg		20,298	12.88%	5.54%	21.36%
KBL European Private Bankers SA	Luxembourg		12,989	11.90%	7.05%	31.66%
Bank of Valletta Plc	Malta	BOV	7,217	10.90%	7.55%	50.81%
HSBC Bank Malta Plc	Malta	HSB	5,748	8.90%	7.34%	49.28%
ING Bank NV	Netherlands		829,933	11.83%	4.25%	33.45%
Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A.	Netherlands		552,651	13.15%	4.32%	40.32%
ABN AMRO Group NV	Netherlands		402,317	13.32%	3.36%	28.74%
SNS Bank NV	Netherlands		77,632	12.22%	2.98%	23.68%
Nederlandse Waterschapsbank N.V.	Netherlands		73,772	111.06%	1.69%	1.50%
Royal Bank of Scotland N.V.	Netherlands		70,954	11.69%	2.54%	46.14%
Caixa Geral de Depósitos SA	Portugal		112,684	11.38%	6.31%	60.05%
Espirito Santo Financial Group SA	Portugal	ESF	86,777	10.18%	8.77%	73.42%
Banco Comercial Português SA	Portugal	BCP	83,944	12.51%	4.07%	58.08%
Banco BPI SA	Portugal	BPI	43,167	15.30%	5.07%	53.79%
Slovenska Sporitelna, a.s.	Slovakia		11,528	19.04%	10.30%	44.30%
Všeobecná úverová banka, a.s.	Slovakia	1VUB02AE	11,375	16.30%	11.54%	60.01%
Tatra banka, a.s.	Slovakia	1TAT01DE	9,066	13.63%	10.56%	62.47%
Nova Ljubljanska Banka d.d.	Slovenia		13,843	8.51%	7.54%	76.74%
Nova Kreditna banka Maribor d.d.	Slovenia	KBMR	5,200	6.52%	5.47%	77.92%
Banco Santander SA	Spain	SAN	1,223,118	11.11%	6.65%	42.78%
Banco Bilbao Vizcaya Argentaria, SA	Spain	BBVA	618,503	11.26%	7.66%	53.53%
Caja de Ahorros y Pensiones de Barcelona	Spain		361,550	11.08%	7.13%	44.62%
Banco Financiero y de Ahorros SA	Spain		290,335	10.47%	3.78%	35.71%
Banco de Sabadell, SA	Spain	SAB	170,751	9.61%	5.38%	46.91%
Banco Popular Español SA	Spain	POP	160,297	10.46%	6.52%	54.66%
Catalunya Banc, SA	Spain		69,163	3.55%	3.10%	35.70%
Kutxabank, SA	Spain		65,735	10.98%	7.32%	59.82%
Bankinter SA	Spain	BKT	57,827	11.17%	5.71%	42.28%
Banco Mare Nostrum, SA	Spain		52,893	9.60%	3.86%	50.44%
Liberbank, SA	Spain	LBK	46,791	9.53%	3.38%	40.61%
Ibercaja Banco, SA	Spain		44,189	10.66%	5.01%	42.87%
Cajas Rurales Unidas, Sociedad Cooperativa de Crédito	Spain		43,874	10.53%	6.03%	53.75%
Banco de Caja España de Inversiones, Salamanca	Spain		37,544	-3.06%	1.24%	49.82%
Monte de Piedad y Caja de Ahorros de Ronda, Cádiz,	Spain					

Appendix III

This table is a ranking of the public banks in each country sorted by their systemic expected capital shortfall.

InstitutionName	Country	Ticker	Market Equity	Market Equity/	LRMES *	SRISK
				Assets	Market Equity	5.5%
						VLAB
Erste Group Bank AG	Austria	EBS	8,077	4.01%	5,169	7,890
Österreichische Volksbanken-AG	Austria	VBPS	703	2.83%	90	749
Dexia SA	Belgium	DEXB	39	0.01%	7	22,573
KBC Group NV	Belgium	KBC	11,908	4.76%	6,446	7,947
Bank of Cyprus Public Company Limited	Cyprus	BOCY	373	1.10%	85	1,573
Hellenic Bank Public Company Limited	Cyprus	HB	64	0.88%	14	351
Crédit Agricole Group	France	ACA	16,467	0.92%	8,217	90,173
BNP Paribas SA	France	BNP	52,057	2.76%	26,520	76,881
Société Générale SA	France	GLE	20,821	1.74%	10,808	55,073
Deutsche Bank AG	Germany	DBK	32,905	1.66%	16,993	91,945
Commerzbank AG	Germany	CBK	7,623	1.23%	3,095	29,324
Aareal Bank AG	Germany	ARL	1,068	2.47%	581	1,855
National Bank of Greece SA	Greece	ETE	5,982	5.43%	3,592	3,472
Piraeus Bank SA	Greece	TPEIR	6,229	6.96%	3,431	1,936
Alpha Bank AE	Greece	ALPHA	4,689	6.54%	2,338	1,466
Eurobank Ergasias SA	Greece	EUROB	7,485	10.51%	4,682	857
Bank of Ireland	Ireland	BIR	4,723	3.23%	2,024	5,225
Permanent TSB Group Holdings Plc	Ireland	ILO	959	2.43%	376	1,571
Allied Irish Banks, Plc	Ireland	AIB	31,744	21.97%	11,669	0
UniCredit SpA	Italy	UCG	20,806	2.44%	9,640	35,257
Intesa Sanpaolo SpA	Italy	ISP	20,010	3.19%	9,258	23,243
Banca Monte dei Paschi di Siena SpA	Italy	BMPS	2,274	1.09%	904	10,069
Banco Popolare Società Cooperativa	Italy	BP	1,593	1.31%	849	5,911
Unione di Banche Italiane SCpA	Italy	UBI	2,505	2.08%	1,166	5,222
Banca popolare dell'Emilia Romagna SC	Italy	BPE	1,484	2.55%	908	2,575
Banca Popolare di Milano Scarl	Italy	PMI	990	2.03%	545	2,209
Mediobanca - Banca di Credito Finanziario SpA	Italy	MB	3,439	4.67%	1,660	2,177
Banca Carige SpA - Cassa di Risparmio di Genova	Italy	CRG	1,010	2.23%	315	1,783
Banca Popolare di Sondrio SCpA	Italy	BPSO	1,174	3.68%	380	939
Credito Emiliano SpA	Italy	CE	1,209	4.05%	462	869
Bank of Valletta Plc	Malta	BOV	681	9.56%	70	0
Banco Comercial Português SA	Portugal	BCP	1,889	2.19%	857	3,659
Espirito Santo Financial Group SA	Portugal	ESF	1,084	1.35%	155	3,487
Banco BPI SA	Portugal	BPI	1,260	3.03%	560	1,555
Všeobecná úverová banka, a.s.	Slovakia	1VUB02AE	848	8.16%	106	0
Banco Santander SA	Spain	SAN	52,901	4.30%	25,718	39,106
Banco Bilbao Vizcaya Argentaria, SA	Spain	BBVA	35,596	5.81%	17,578	14,717
Banco Financiero y de Ahorros SA	Spain	BKIA	6,830	2.28%	2,281	11,769
Banco Popular Español SA	Spain	POP	4,029	2.66%	1,709	5,913
Banco de Sabadell, SA	Spain	SAB	3,767	2.45%	1,277	5,885
Bankinter SA	Spain	BKT	2,398	4.28%	1,021	1,648

Appendix IV

This table is a ranking of the public banks sorted by their systemic expected capital shortfall.

InstitutionName	Country	Ticker	Market Equity	Market Equity/ Assets	LRMES * Market Equity	SRISK 5.5% VLAB
Deutsche Bank AG	Germany	DBK	32,905	1.66%	16,993	91,945
Crédit Agricole Group	France	ACA	16,467	0.92%	8,217	90,173
BNP Paribas SA	France	BNP	52,057	2.76%	26,520	76,881
Société Générale SA	France	GLE	20,821	1.74%	10,808	55,073
Banco Santander SA	Spain	SAN	52,901	4.30%	25,718	39,106
UniCredit SpA	Italy	UCG	20,806	2.44%	9,640	35,257
Commerzbank AG	Germany	CBK	7,623	1.23%	3,095	29,324
Intesa Sanpaolo SpA	Italy	ISP	20,010	3.19%	9,258	23,243
Dexia SA	Belgium	DEXB	39	0.01%	7	22,573
Banco Bilbao Vizcaya Argentaria, SA	Spain	BBVA	35,596	5.81%	17,578	14,717
Banco Financiero y de Ahorros SA	Spain	BKIA	6,830	2.28%	2,281	11,769
Banca Monte dei Paschi di Siena SpA	Italy	BMPS	2,274	1.09%	904	10,069
KBC Group NV	Belgium	KBC	11,908	4.76%	6,446	7,947
Erste Group Bank AG	Austria	EBS	8,077	4.01%	5,169	7,890
Banco Popular Español SA	Spain	POP	4,029	2.66%	1,709	5,913
Banco Popolare Società Cooperativa	Italy	BP	1,593	1.31%	849	5,911
Banco de Sabadell, SA	Spain	SAB	3,767	2.45%	1,277	5,885
Bank of Ireland	Ireland	BIR	4,723	3.23%	2,024	5,225
Unione di Banche Italiane SCpA	Italy	UBI	2,505	2.08%	1,166	5,222
Banco Comercial Português SA	Portugal	BCP	1,889	2.19%	857	3,659
Espirito Santo Financial Group SA	Portugal	ESF	1,084	1.35%	155	3,487
National Bank of Greece SA	Greece	ETE	5,982	5.43%	3,592	3,472
Banca popolare dell'Emilia Romagna SC	Italy	BPE	1,484	2.55%	908	2,575
Banca Popolare di Milano Scarl	Italy	PMI	990	2.03%	545	2,209
Mediobanca - Banca di Credito Finanziario SpA	Italy	MB	3,439	4.67%	1,660	2,177
Piraeus Bank SA	Greece	TPEIR	6,229	6.96%	3,431	1,936
Aareal Bank AG	Germany	ARL	1,068	2.47%	581	1,855
Banca Carige SpA - Cassa di Risparmio di Genova	Italy	CRG	1,010	2.23%	315	1,783
Bankinter SA	Spain	BKT	2,398	4.28%	1,021	1,648
Bank of Cyprus Public Company Limited	Cyprus	BOCY	373	1.10%	85	1,573
Permanent TSB Group Holdings Plc	Ireland	ILO	959	2.43%	376	1,571
Banco BPI SA	Portugal	BPI	1,260	3.03%	560	1,555
Alpha Bank AE	Greece	ALPHA	4,689	6.54%	2,338	1,466
Banca Popolare di Sondrio SCpA	Italy	BPSO	1,174	3.68%	380	939
Credito Emiliano SpA	Italy	CE	1,209	4.05%	462	869
Eurobank Ergasias SA	Greece	EUROB	7,485	10.51%	4,682	857
Österreichische Volksbanken-AG	Austria	VBPS	703	2.83%	90	749
Hellenic Bank Public Company Limited	Cyprus	HB	64	0.88%	14	351
Všeobecná úverová banka, a.s.	Slovakia	1VUB02AE	848	8.16%	106	0
Bank of Valletta Plc	Malta	BOV	681	9.56%	70	0
Allied Irish Banks, Plc	Ireland	AIB	31,744	21.97%	11,669	0