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The recapitalization needs of European banks if a new financial crisis occurs

Eric Dor
IESEG School of Management (LEM-CNRS)

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Eric Dor

Director of Economic Studies at IESEG School of Management

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Introduction

This paper computes the total recapitalization needs of the banking sector of each European country in case of a new systemic financial crisis. These estimations are based on the estimated capital shortages of big individual banks published by the Volatility Laboratory of New York University Stern Business School and the Center for Risk Management of Lausanne.

The systemic risk methodology

Brownlees and Engle (2012) have recently proposed a sophisticated econometric methodology to estimate the expected capital shortfall that a bank would experience in case of a new global crisis. This estimated capital shortfall is the systematic risk index of the bank, or SRISK. A summary of the methodology is also presented by Acharya, Engle and Richardson (2012).

The SRISK index of a bank is computed as the expected capital shortage that this bank would experience in case of a global financial crisis. Such a crisis is defined as a 40% decline of the aggregate stock market index over a time horizon of half a year. The computation of the capital shortage depends on the assumption that the equity of a bank should always be maintained above a certain fraction of the assets. This fraction is at least 8% for US banks, and 5.5% for those of Europe. This discrepancy is explained by the differences in accounting rules applied by US and European banks. US banks use GAAP rules and their balance sheets present derivatives on a net basis. European banks use IFRS rules and their balance sheets report derivatives on a gross basis. It can be assumed that European banks assets computed under IFRS rules are 45% higher than those that would be estimated under GAAP rules. Therefore a capital asset ratio of 8% under GAAP rules corresponds to a capital asset ratio of 5.5% under IFSF rules.

The sum of the SRISKs of all the banks of a country represents their total potential need of recapitalization by the government with taxpayer money. Indeed experience has shown that when a systemic crisis occurs it is extremely difficult to convince private investors to recapitalize distressed banks. The percentage of bailout money that would be needed by a given bank is given by its share SRISK% in this total.

In order to compute how the equity of a bank would decline as a result of a financial crisis, the traditional stress tests methodology requires a detailed audit to compute all the losses that would be incurred for the different categories of assets that are held. Instead, the methodology proposed by Brownlees and Engle estimates the expected decline of the market value of equity of the bank that would result from the crisis. It is a quick and much cheaper method, which is only based on published data. This methodology is implemented at the VLAB of Stern Business School at New York University.

The SRISK of a bank depends on its size, the leverage ratio and the reaction of the value of equity to a decline of the market. Computing the SRISK of a bank thus implies to estimate how its equity is affected by a market decline using econometric methods. It requires the specification of a bivariate daily time series model of equity returns on a bank and on a broad market index, where volatilities and correlations change over time. The shocks on the returns of different banks and the market can be dependent on each other because there are good reasons to suspect that extreme values of these disturbances can occur simultaneously for systematically risky firms. The volatility of the shocks are supposed to be determined by a threshold autoregressive conditional heteroscedasticity model, to capture the tendency of volatility to experience a higher increase with negative news rather with good news. The correlations between the shocks are time varying and modeled using the dynamic conditional correlation model of Engle (2002). This broad econometric model allows the computation of several useful measures.

The Short Term Marginal Expected Shortfall, or MES, is the expected percentage of one day loss of the market value of equity if daily market returns are less than -2%. This one period ahead expectation is estimated from the data using econometric methods.

However to compute The SRISK it is necessary to know the value of a "long term" MES for a much larger time horizon and conditional on a much deeper decline of the market. The long term Marginal Expected Shortfall, or LRMES, is the expected percentage of cumulated drop of the market value of equity over a horizon of half a year if the cumulated market returns over that horizon are less than -40%. It is the "long term" or multi period MES. Using an earlier version of the model, labeled MES, the value of LRMES is approximated as a simple function of the current short term MES. Using a recent version of the model labeled MESSIM, the value of LRMES is computed on the basis of simulations of the later daily values of the equity returns of the bank and the market over a horizon of half a year. The values of LRMES obtained with these methods are published by the Volatility Laboratory of New York University Stern Business School VLAB for US banks insurance companies.

For European banks the econometric methodology must be adjusted to incorporate non synchronous trading in multiple markets, using the dynamic conditional beta model of Engle (2012). This is the version GMES of the model, and they are also published by VLAB for US and European banks and insurance companies. The Center for Risk Management of Lausanne CRML also publishes estimates of LRMES for European banks using an adjusted methodology of Engle, Jondeau and Rockinger (2012).
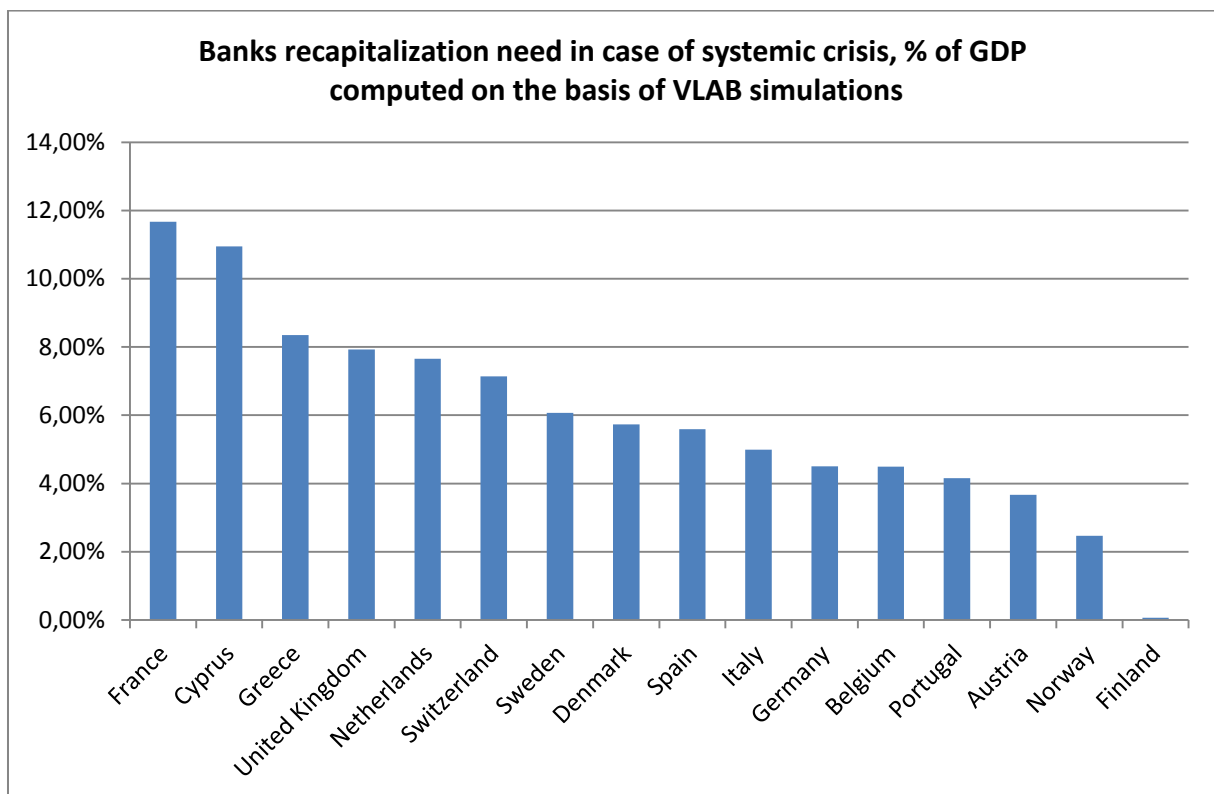
Recapitalization needs of European banks in the event of a crisis

These estimations are obtained by aggregating for each country the capital shortages of its banks, as published by the Volatility Laboratory of New York University Stern Business School and the Center for Risk Management of Lausanne. These data were updated on September 27, 2013. The estimates
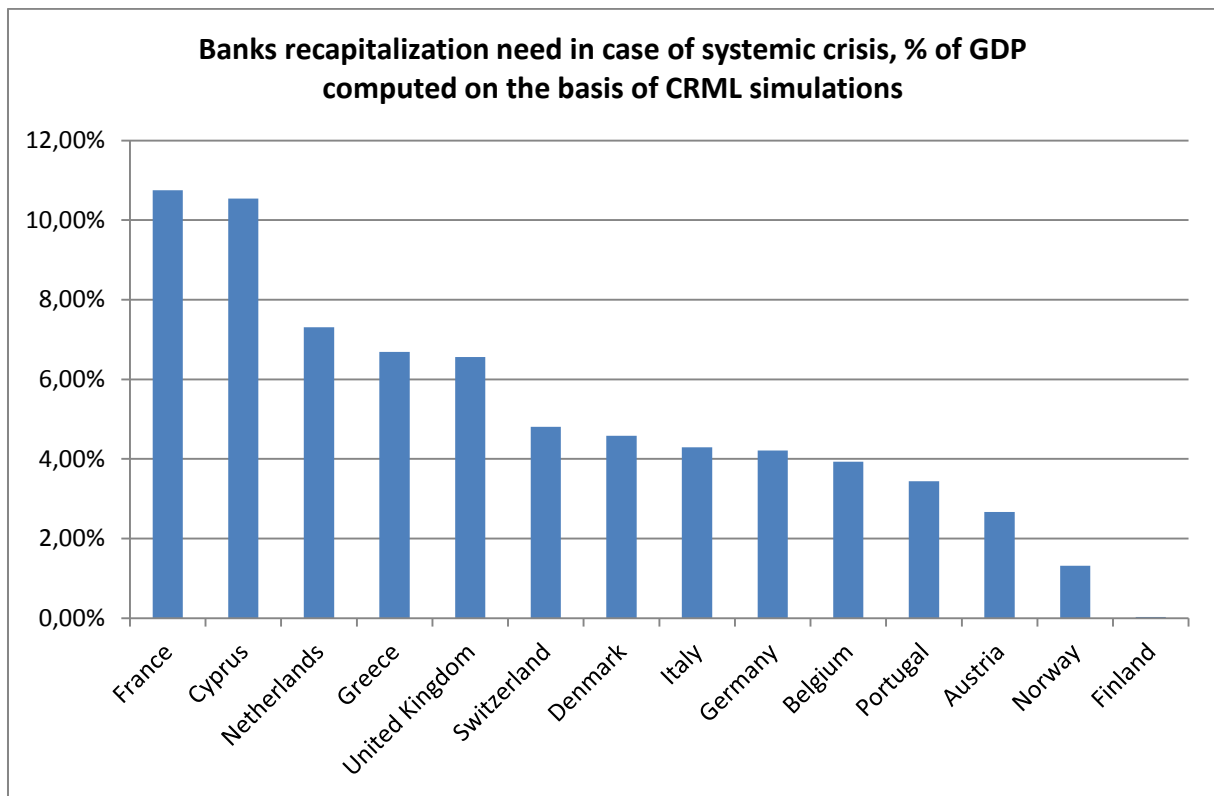
provided by these centers are generally close to each other, even if that they are very different for a few banks. On average the capital shortages provided by VLAB are larger than those reported by CRML. For each country only the banks who would incur a capital shortage in the event of a crisis are retained to compute the aggregate. Then the national aggregate capital shortages are expressed in percentage of nominal gross domestic product for each country. The estimates of nominal gross domestic product for 2013 are those of the European Commission, as published by the data base AMECO.

This ratio represents the increase of public debt, in percentage of GDP, that would result from a recapitalization of the big national banks by each country. As shown by graph 1 and graph 2, it is France which would incur the highest cost in percentage of GDP, if the big banks of the country had to be recapitalized with public funds. This cost would represent 11.67% of GDP according to VLAB, and 10.75% of GDP according to CRML.

Graph 1

Graph 2

Banks recapitalization need in case of systemic crisis, % of GDP computed on the basis of CRML simulations
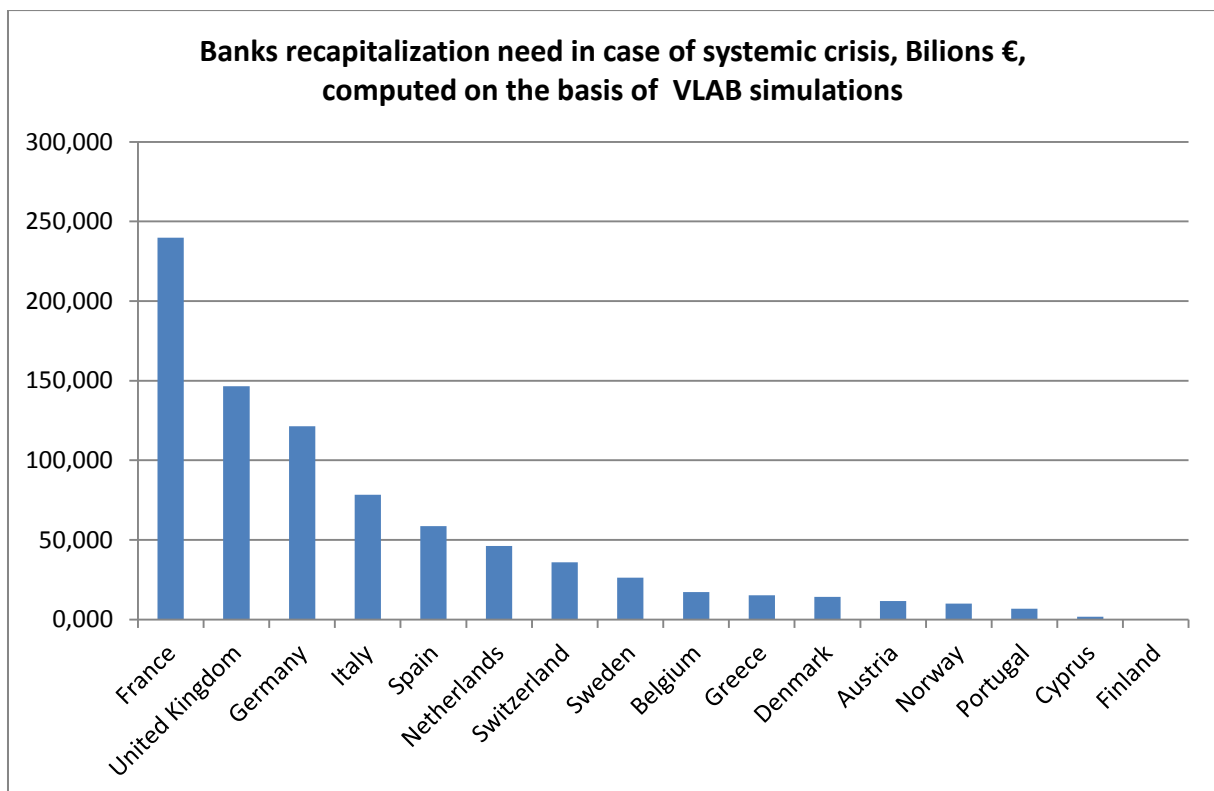
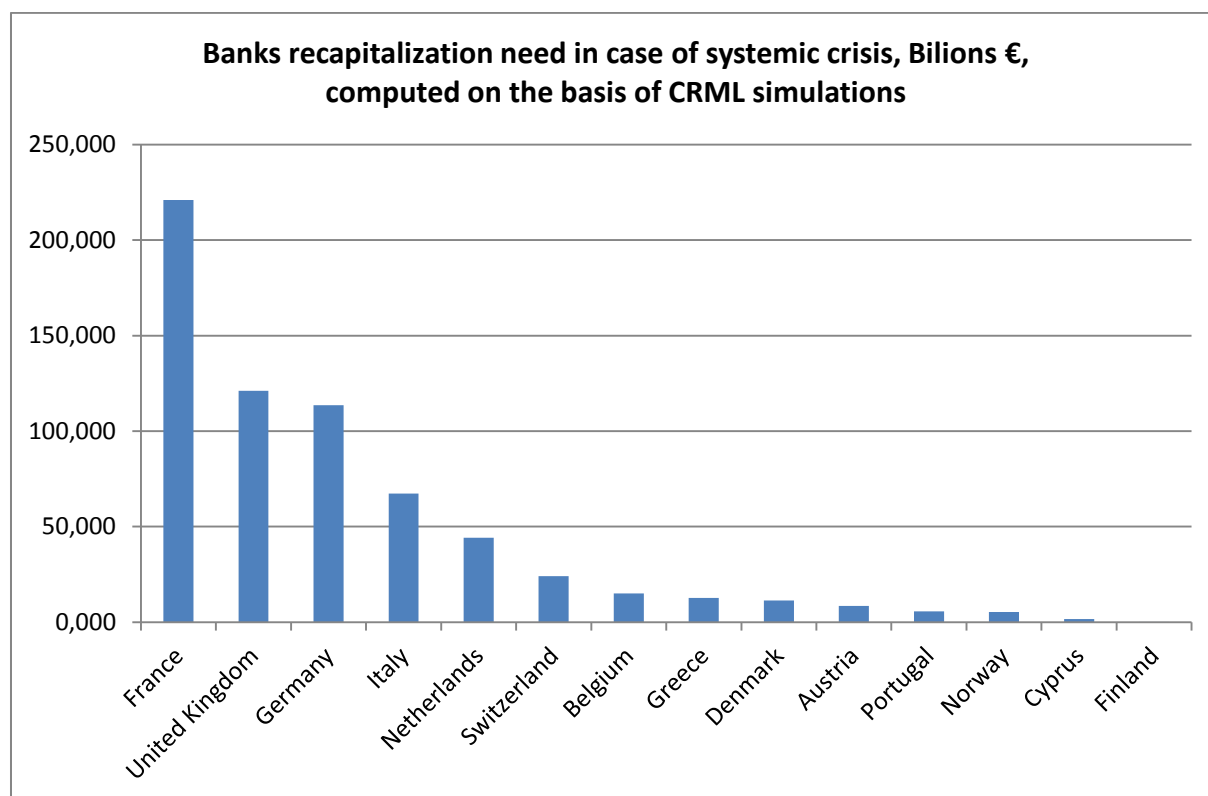

The values of these aggregate capital shortcuts in the event of a crisis are presented in billions € by graph 3 and 4.

Graph 3

Banks recapitalization need in case of systemic crisis, Bilions €, computed on the basis of VLAB simulations

Graph 4

Banks recapitalization need in case of systemic crisis, Bilions €, computed on the basis of CRML simulations

The values of these aggregate capital shortages of the big banks of each country are presented in tables 1 and 2, in percentage of GDP and in billions €, in decreasing order.

Table 1 Banks recapitalization need in the event of a systemic crisis

computed on the basis of VLAB simulations

	% of GDP		Billions €
France	11.67%	France	239.920
Cyprus	10.95%	United Kingdom	146.537
Greece	8.35%	Germany	121.315
United Kingdom	7.93%	Italy	78.283
Netherlands	7.65%	Spain	58.762
Switzerland	7.13%	Netherlands	46.244
Sweden	6.07%	Switzerland	35.886
Denmark	5.73%	Sweden	26.375
Spain	5.59%	Belgium	17.217
Italy	4.99%	Greece	15.315
Germany	4.50%	Denmark	14.287
Belgium	4.49%	Austria	11.658
Portugal	4.15%	Norway	10.070
Austria	3.67%	Portugal	6.832
Norway	2.47%	Cyprus	1.799
Finland	0.07%	Finland	0.133

Table 2 Banks recapitalization need in the event of a systemic crisis

computed on the basis of CRML simulations

	% of GDP		Billions €
France	10,75%	France	220.880
Cyprus	10,54%	United Kingdom	121.175
Netherlands	7,31%	Germany	113.594
Greece	6,69%	Italy	67.356
United Kingdom	6,56%	Netherlands	44.168
Switzerland	4,81%	Switzerland	24.179
Denmark	4,58%	Belgium	15.051
Italy	4,29%	Greece	12.714
Germany	4,22%	Denmark	11.423
Belgium	3,93%	Austria	8.491
Portugal	3,44%	Portugal	5.656
Austria	2,67%	Norway	5.385
Norway	1,32%	Cyprus	1,732
Finland	0,03%	Finland	0.061

Table 3 provides the detailed data of potential capital shortage in the event of a crisis for each bank that has been taken into account to compute the national recapitalization needs.

Table 3 Capital shortages of big European banks in the event of a systemic crisis, Millions €

		VLAB	CRML
Denmark	Danske Bank A/S	13,874	11,423
Denmark	Jyske Bank A/S	0,193	-
Denmark	Sydbank A/S	0,169	0,013
Denmark	Spar Nord Bank A/S	0,051	-
Germany	Deutsche Bank AG	82,879	78,103
Germany	Commerzbank AG	28,332	26,695
Germany	Deutsche Postbank AG	3,502	2,918
Germany	Aareal Bank AG	1,623	1,461
Germany	Wuestenrot & Wuerttembergische AG	2,861	2,614
Germany	IKB Deutsche Industriebank AG	1,359	1,312
Germany	Oldenburgische Landesbank AG	0,365	0,281
Germany	DVB Bank SE	0,297	0,186
Germany	DAB Bank AG	0,096	0,024
Austria	Erste Group Bank AG	6,443	4,158
Austria	Raiffeisen Bank International AG	4,417	3,629
Austria	Oesterreichische Volksbanken AG	0,743	0,697
Austria	Bank fuer Tirol & Vorarlberg AG	0,064	0,007
Finland	Alandsbanken PLC	0,076	0,061
Finland	Pohjola Bank PLC	0,057	-
Netherlands	ING Groep NV	43,568	43,911

Netherlands	Delta Lloyd NV	2,320	-
Netherlands	Van Lanschot NV	0,356	0,257
Switzerland	Credit Suisse Group AG	20,356	15,086
Switzerland	UBS AG-REG	15,386	9,078
Switzerland	Bank Coop AG	0,093	0,010
Switzerland	Banque Cantonale de Geneve	0,050	0,005
Greece	Bank of Greece	8,309	8,283
Greece	Piraeus Bank SA	2,261	0,457
Greece	EFG Eurobank Ergasias SA	2,122	1,924
Greece	Agricultural Bank of Greece	1,215	1,187
Greece	TT Hellenic Postbank SA	0,802	0,796
Greece	Alpha Bank AE	0,502	-
Greece	Attica Bank	0,104	0,067
Cyprus	Bank of Cyprus Plc	1,486	1,429
Cyprus	Hellenic Bank PLC	0,312	0,303
France	Credit Agricole SA	82,671	78,594
France	BNP Paribas	61,264	55,441
France	Societe Generale	51,172	45,694
France	Natixis	22,872	20,608
France	Dexia SA 47%	10,212	10,185
France	Credit Industriel et Commercial	8,497	7,700
France	Credit Agricole Nord de France	0,904	0,851
France	Credit Agricole Alpes Provence	0,521	0,452
France	Credit Agricole Atlantique Vendee	0,338	0,239
France	Credit Agricole Sud Rhone Alpes	0,298	0,260
France	Credit Agricole du Morbihan	0,271	0,237
France	Credit Agricole de la Touraine et du Poitou	0,237	0,195
France	Caisse Regionale Credit Agricole Mutuel d'Ille et Vilaine	0,224	0,190
France	Credit Agricole de Normandie Seine	0,204	0,121
France	Credit Agricole Loire Haute-Loire	0,170	0,113
France	Credit Agricole Ile de France	0,065	-
Portugal	Banco Comercial Portugues SA	3,067	2,862
Portugal	Banco Espirito Santo SA	2,429	1,585
Portugal	Banco BPI SA	1,336	1,209
Belgium	53 % Dexia SA	11,516	11,485
Belgium	KBC Groep NV	5,701	3,566
Norway	DNB NOR ASA	7,920	3,589
Norway	Storebrand ASA	1,957	1,672
Norway	SpareBank 1 SMN	0,193	0,124
Sweden	Nordea Bank AB	14,490	9,837
Sweden	Skandinaviska Enskilda Banken AB	6,919	4,620
Sweden	Svenska Handelsbanken-AB	3,481	0,530
Sweden	Swedbank AB	1,484	-
Italy	UniCredit SpA	30,654	26,435

Italy	Intesa Sanpaolo SpA	18,775	15,101
Italy	Banca Monte dei Paschi di Siena SpA	9,493	9,351
Italy	Banco Popolare SC	5,575	5,260
Italy	Unione di Banche Italiane SCPA	4,541	3,763
Italy	Banca Popolare dellEmilia Romagna Scrl	1,985	1,591
Italy	Banca Popolare di Milano Scarl	1,776	1,556
Italy	Banca Carige SpA	1,517	1,440
Italy	Piccolo Credito Valtellinese Scarl	1,216	1,170
Italy	Banca Popolare di Sondrio SCARL	0,811	0,723
Italy	Credito Emiliano SpA	0,689	0,446
Italy	Mediobanca SpA	0,575	-
Italy	Banco di Sardegna SpA	0,310	0,267
Italy	Banco di Desio e della Brianza SpA	0,255	0,227
Italy	Credito Bergamasco SpA	0,110	0,026
Spain	Banco Santander SA	25,741	21,447
Spain	CaixaBank	8,310	-
Spain	Bankia SAU	7,077	-
Spain	Banco Bilbao Vizcaya Argentari	6,338	3,062
Spain	Banco de Sabadell SA	5,589	3,829
Spain	Banco Popular Espanol	4,741	4,318
Spain	Bankinter SA	0,966	0,640
United Kingdom	Barclays PLC	94,853	65,816
United Kingdom	Royal Bank of Scotland Group PLC	61,022	39,423
United Kingdom	Lloyds Banking Group PLC	26,617	14,219
United Kingdom	HSBC Holdings PLC	12,073	1,295
United Kingdom	Standard Chartered PLC	3,583	0,422

Sources of the data VLAB: conversion into euro's of the results in dollars updated on September 27 as published by the Volatility Laboratory VLAB of New York University Business School, model GMES
CRML: computations updated on September 27 as published by the Center for Risk Management CRML of Lausanne

The huge potential capital shortage of certain European banks is often partly explained by a very high degree of indebtedness, and thus a low leverage ratio. The FDIC has recently reformulated the balance sheets of US banks under the IFRS rules, to allow comparison with those of Europe. On the basis of these harmonized balance sheets using IFRS rules, the FDIC has computed the leverage rations of US and European banks for the second quarter 2013. The Leverage Ratio is the ratio of adjusted tangible equity to adjusted tangible assets. Adjusted tangible equity, adjusted tangible assets subtract goodwill, other intangibles, and deferred tax assets. The results are presented on graph 5

Graph 5

Leverage ratio of systemic banks using harmonized accounts based on IFRS rules 2nd quarter 2013
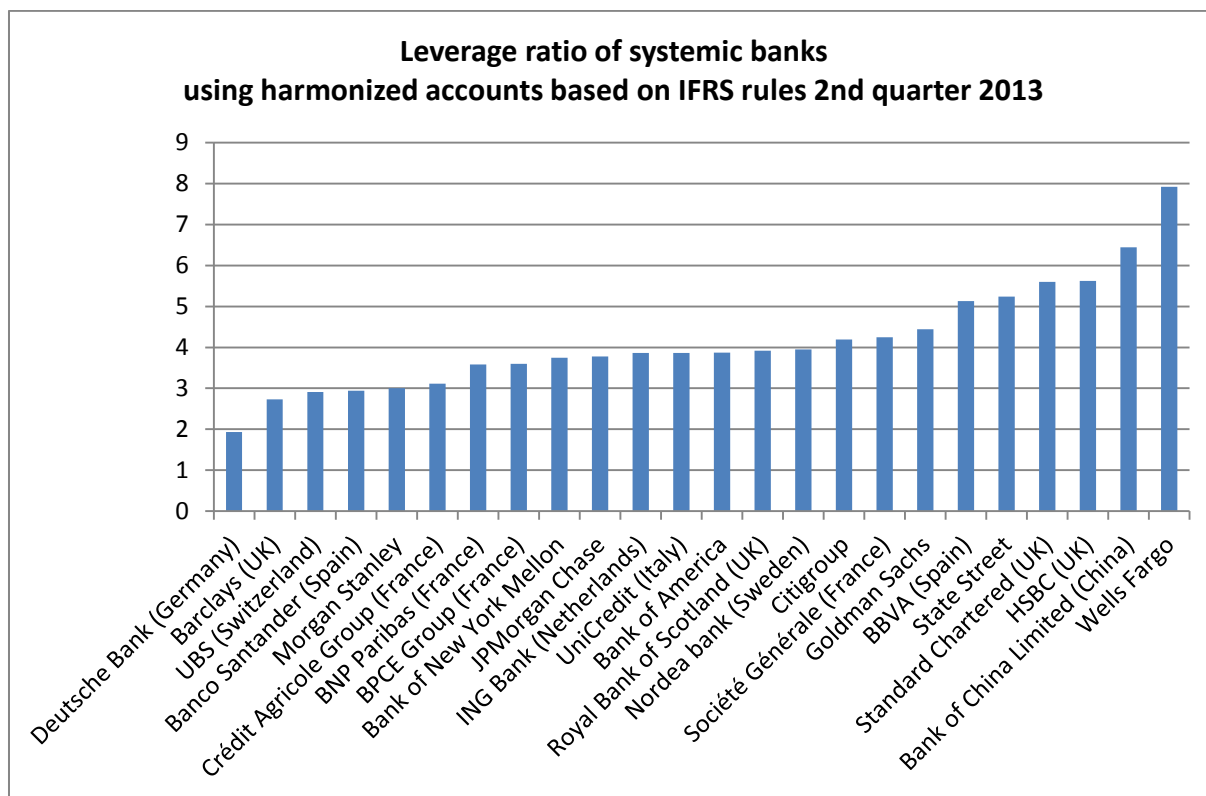
Source of the data: FDIC

Macroeconomic consequences

The above results show that the potential recapitalization needs of the banking sector would be extremely high for certain European countries like France, in the event of a new systemic financial crisis. Given their already high level of indebtedness, increasing the public debt ratio by 5 to 10% would certainly trigger a sharp increase of interest rates on government bonds. An extremely severe fiscal austerity should be implemented, leading to a new recession.

The current means of the European Union seem to be insufficient as compared to the huge potential capital shortages and recapitalization needs that have been reported for the banks. The possibility of direct recapitalizations of the biggest banks by the ESM is subject to a very strong conditionality and is limited to a total amount of 60 Billions €. There remains the possibility to rely on a special programme of ESM which lends money to the governments to recapitalize the banks with a conditionality that focus on this industry, like what is currently implemented in Spain. Anyway these bailouts by ESM simply mutualize the risks and deteriorate the debt ratios of all the European countries. The current prospects of a European banking union offer limited means to address the loop linking banks and governments, as shown by Lemangnen (2013). Therefore bail-ins should certainly be conducted in the event of a new systemic crisis, at least for 8% of the liabilities according to the results of current negotiation. The problem is that the new resolution fund, which is supposed to finance restructurings, must be financed by the banks through a tax of 0.5% of guaranteed deposits and needs at least 10 years before reaching its target size.

Regulatory implications

The above approach to compute potential capital shortages is based on the assumption that banks should always maintain equity above a certain fraction of total assets. This principle differs from the actual practice of regulatory authorities. The Basel III international agreements about banking regulation still privilege the approach of compelling bank to detain different forms of equity as a percentage of risk weighted assets. The huge limitations and risks of the RWA approach are very well described by Hoenig (2013), of the Federal Deposit Insurance Corporation FDIC. Acharya, Engle and Pierret (2013) also show that the required capitalization of financial firms in recent European and US stress tests using regulatory risk weights are low and inadequate. The continued reliance on regulatory risk weights in stress tests thus maintains banks under-capitalized. It also provides incentives to excessively expose the banks to the assets that have arbitrarily been assigned low risk weights like public debts.

Therefore it is better to define required capital as a percentage of the total unweighted assets. This is the approach underlying the computations of the SRISK indexes.

Conclusion

The potential capital shortages of the banking sectors of many European countries in the event of a new systemic crisis are very high. It is for France that the recapitalization needs would be the highest as a percentage of gross domestic product. Such results are based on a definition of the required equity of banks as a percentage of total unweighted assets, to avoid the limitations of the usual stress test methodology. Most European governments thus remain exposed to their banks.

References

Acharya, V. V., Engle, R., & Pierret, D. (2013). *Testing macroprudential stress tests: The risk of regulatory risk weights* (No. w18968). National Bureau of Economic Research.

Acharya, V., Engle, R., & Richardson, M. (2012). Capital shortfall: A new approach to ranking and regulating systemic risks. *The American Economic Review*, *102*(3), 59-64.

Brownlees, Christian T. and Engle, Robert F., Volatility, Correlation and Tails for Systemic Risk Measurement (October 15, 2012). Available at SSRN: http://ssrn.com/abstract=1611229 or http://dx.doi.org/10.2139/ssrn.1611229

Engle, R. (2012). Dynamic conditional beta, New York University.

Engle, R., Jondeau, E., & Rockinger, G. M. (2012). Systemic Risk in Europe. *Swiss Finance Institute Research Paper*, (12-45).

Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business & Economic Statistics*, *20*(3), 339-350.

Hoenig, Thomas M., 2013, Basel III Capital: A Well-Intended Illusion, International Association of Deposit Insurers 2013 Research Conference, April 9, http://www.fdic.gov/news/news/speeches/spapr0913.html

Lemangnen, A., 2013, The banking union in two pages, Natixis Special Report, October 2