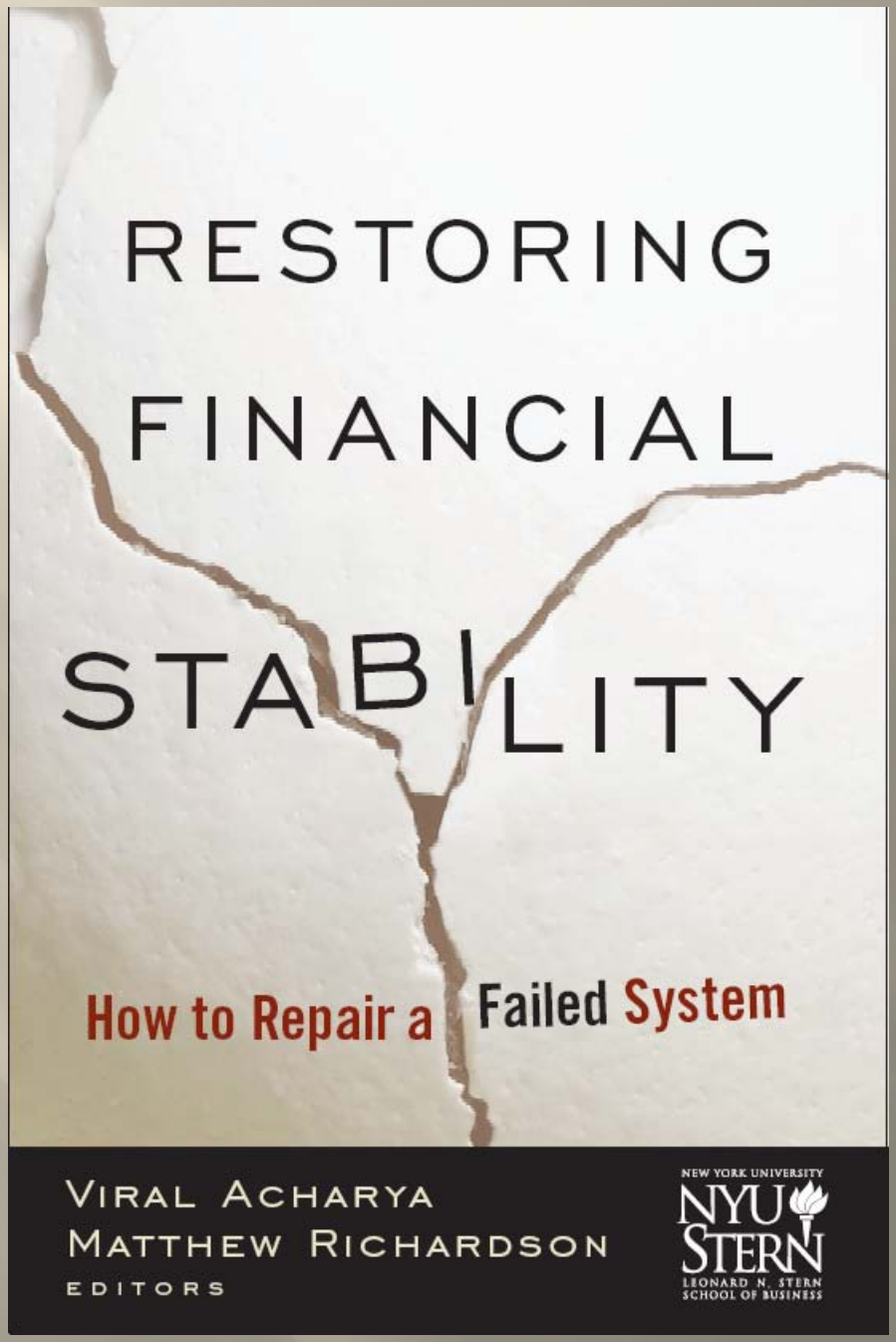
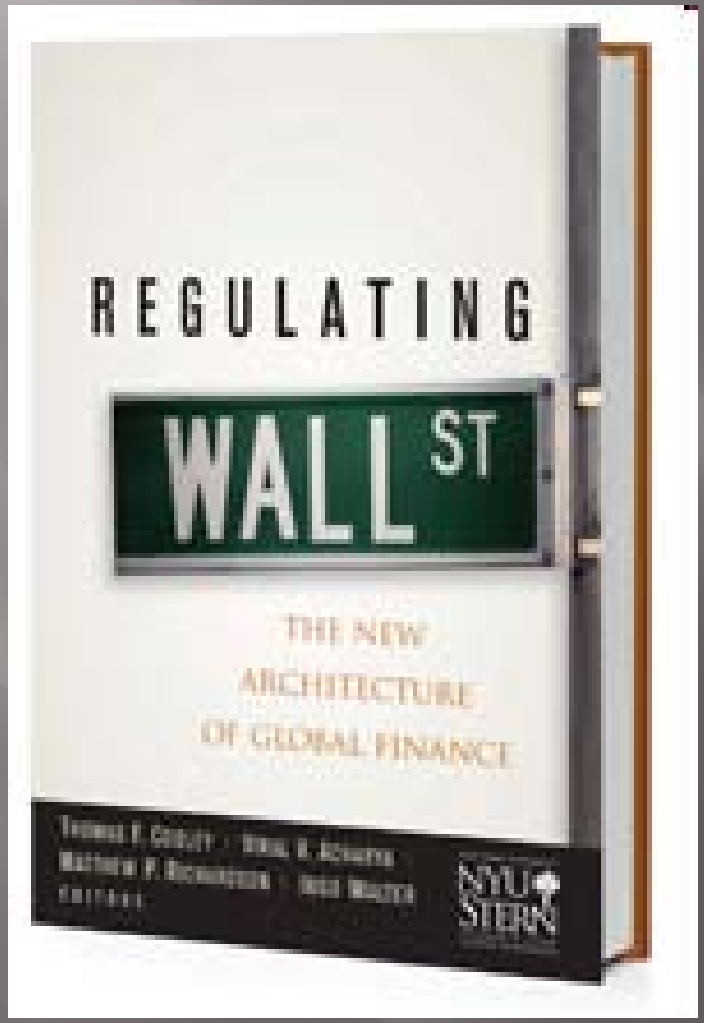
MEASURING AND MANAGING GLOBAL SYSTEMIC RISK

NYU Stern School of Business – VLAB
vlab.stern.nyu.edu
November 2011


RESTORING
FINANCIAL
STABILITY
How to Repair a Failed System
VIRAL ACHARYA
MATTHEW RICHARDSON
EDITORS
NEW YORK UNIVERSITY
NYU STERN
LEONARD N. STERN SCHOOL OF BUSINESS

STERN VIEW OF DODD-FRANK



Released
November 2010

Outline

- What have we learned about systemic risk?
- How should we regulate systemic risk?
- NYU Stern Systemic Rankings going GLOBAL!
- Examples
  - Top 10
  - BNP Paribas, Dexia, …
  - Relation to stress tests
  - Sorts by size, leverage, downside exposure
  - A lookback
  - Trends in overall systemic risk
- Implications for Basel III, firm behavior
- Open issues

FAILURE OF FINANCIAL INSTITUTIONS

- We learned that the failure of large complex financial institutions can have disastrous effects on the global economy.
- Should we rescue such firms? Should we have rescued Lehman?
- If firms count on being rescued, they will take on too much risk.
- A better choice – reduce the risk by regulating "too systemic to fail" institutions.

WHAT DO BANKS DO?

- Borrow money from depositors and short term and long term institutional investors, and combine it with cash on hand (net worth or equity value) to invest it in loans, securities, and businesses such as providing financial services.
- If assets payoff well, there will be additional cash available at the start of the next planning period and some will be distributed as dividends. If not, then the firm may face a liquidity or insolvency crisis. Its business will be impacted and its ability to raise new private capital will be limited.

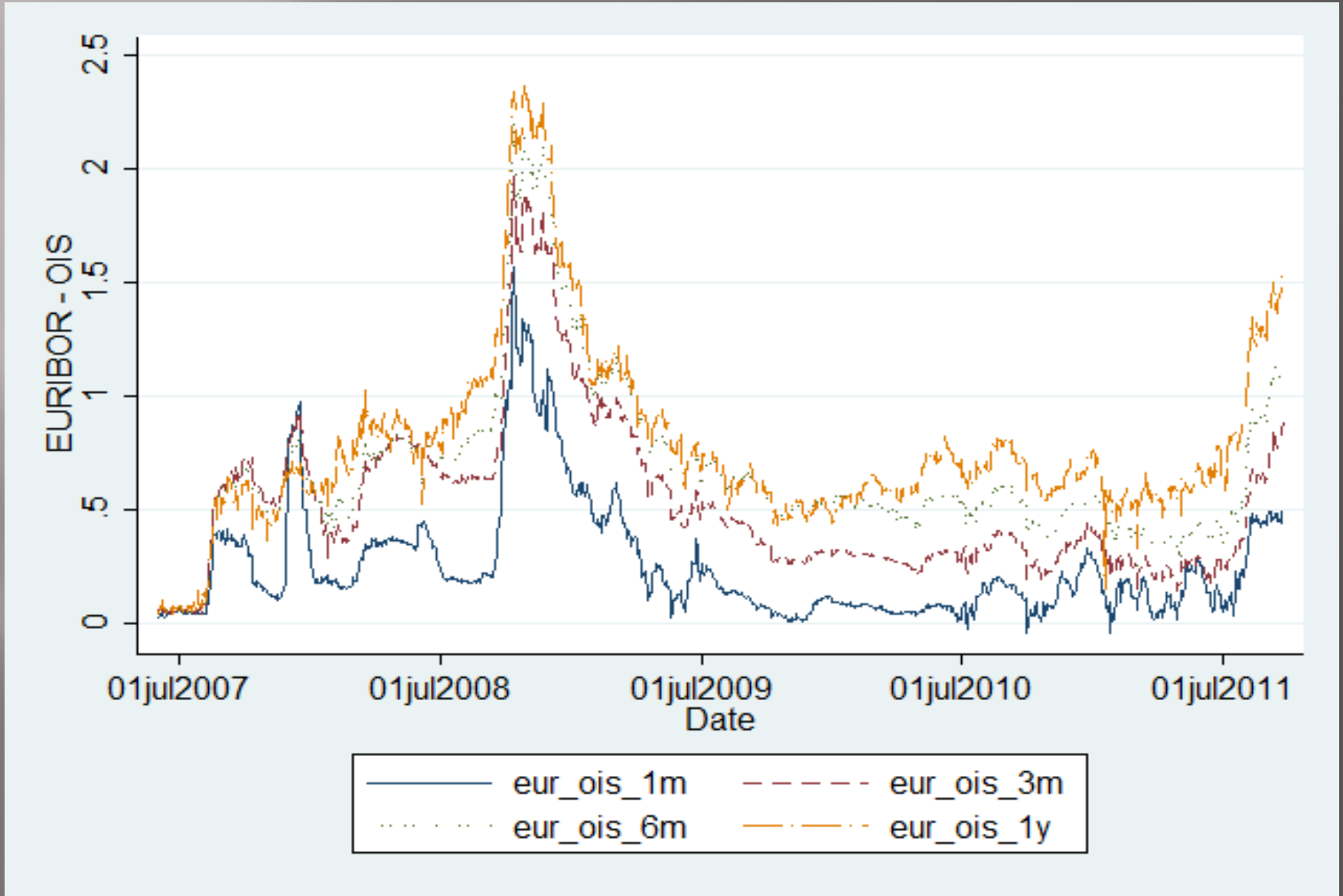
WHAT LIMITS LEVERAGE? RISK!

- With a certain amount of cash or equity, the firm chooses leverage to leave an adequate cushion.
- In a low volatility environment, financial institutions are likely to increase leverage.
- When asset prices decrease, leverage increases more, amplifying volatility, leading to further losses in a firms' debt liabilities.
- This applies to US subprime mortgages and to European sovereign debt. It may also apply to Chinese municipal debt.

REGULATION

- If bankruptcy due to common shocks such as volatility rise, especially of large complex financial institutions, imposes costs on society as a whole (e.g., breakdown in maturity transformation) in addition to the costs imposed on equity and bond holders, it is natural to regulate this risk.

Stress in term lending markets



REGULATION

- If bankruptcy due to common shocks such as volatility rise, especially of large complex financial institutions, imposes costs on society as a whole (e.g., breakdown in maturity transformation) in addition to the costs imposed on equity and bond holders, it is natural to regulate this risk.
- If we do not, ex post financial institutions will receive a massive transfer from taxpayers

Quasi-fiscal operations?

Soft landing?

REGULATION

- If bankruptcy due to common shocks such as volatility rise, especially of large complex financial institutions, imposes costs on society as a whole (e.g., breakdown in maturity transformation) in addition to the costs imposed on equity and bond holders, it is natural to regulate this risk.
- If we do not, ex post financial institutions will receive a massive transfer from taxpayers
- In contrast, with reduced ex-ante risk, investors may also accept reduced risk premia thus reducing the cost of added capital.

MEASURING SYSTEMIC RISK

- Acharya, Pedersen, Philippon, and Richardson(2010) propose the use of market data to estimate systemic risk contributions of firms.
- Brownlees and Engle (2010) use new time series methods to estimate and forecast systemic risk.

- The question – How much capital would a firm need if we have another financial crisis? This could be supplied by taxpayers or spill into the economy with all the externalities that the failure causes.

CAUSALITY

- Does the crisis cause the firm distress or does the distress cause the crisis?
- Both: crisis is driven by "common" shocks that induce co-dependence in firm distress
- These are jointly endogenous variables
- If there are many weak firms, the common shock is more likely to lead to a crisis and those with the greatest capital shortfall are the biggest contributors to the crisis.

THE APPROACH

- Estimate for each firm, the expected capital shortfall in a future crisis:

$$E\left(Capital\ \ Shortfall_i \middle| Crisis\right)$$

- As we have little data on crises, it is necessary to carefully structure the problem.
- Estimate MES the expected equity losses for a firm from a modest decline (-2%) in market returns.
- Extrapolate to LRMES - a full financial crisis (-40%).
- Calculate capital shortages based on liabilities which we call SRISK.

HOW TO ESTIMATE MES DYNAMICALLY

- Use flexible time series approaches to modeling volatilities, correlations and tails.
- The Model:

$$R_{m,t} = \sigma_{m,t}\varepsilon_{m,t}$$

$$R_{i,t} = \sigma_{i,t}\left(\rho_t\varepsilon_{m,t} + \gamma_t\varepsilon_{m,t-1} + \sqrt{1-\rho_t^2-\gamma_t^2}\,\xi_{i,t}\right)$$

$$\left(\varepsilon_{m,t}, \xi_{i,t}\right) \sim F$$

- Disturbances are serially independent, mean zero, variance one, uncorrelated and independent random variables.
- Volatilities are Asymmetric GARCH models
- Correlations are DCC and are estimated separately assuming no serial correlation in $\varepsilon_{m,t}$

MULTI-STEP FORECASTING

- Simulate the bivariate outcome of (r_i, r_m) for six months starting on date t using the estimated model for volatilities, correlations and copula.
- Examine all the scenarios where market return falls by at least 40%. Find trimmed mean loss for firm i.

$$LRMES = E_t\left(1-\exp\sum_{j=1}^{126} r_{i,t+j} \,\middle|\, \exp\sum_{j=1}^{126} r_{m,t+j} < .60\right)$$

$$\approx 1-\exp\left(-18 * MES\right)$$

SRISK

- As equity values fall in a crisis, leverage increases until the firm is in distress.
- Nominal debt is taken from Bloomberg and changes little over time. It is from 10-K and 10-Q filings.
- SRISK= k [D + (1-LRMES) E] - (1-LRMES)E
- *k* is a prudential standard ratio of equity to assets = 8% (e.g., ratios of safest banks like JPM and HSBC during crises).

NYU STERN SYSTEMIC RISK RANKINGS

- So far, we have had a page in VLAB providing estimates of systemic risk for the largest US Financial firms.

- This is updated weekly to allow regulators, practitioners and academics to see early warnings of system risks.

vlab.stern.nyu.edu or
systemicriskranking.stern.nyu.edu

TODAY WE WILL SEE FOR THE FIRST TIME…

NYU STERN GLOBAL SYSTEMIC RISK RANKINGS

FOR ALMOST 1200 FINANCIAL INSTITUTIONS

IN COLLABORATION WITH INSTITUTE FOR GLOBAL FINANCE AT UNSW IN SYDNEY AND UNIVERSITE DE LAUSANNE IN LAUSANNE

Some Implementation Details

- Stress scenario: Collapse of GLOBAL equity market
- Step 1:
  - Estimate volatility and correlation between daily firm returns and current and lagged daily (US-traded) MSCI Global Equity ETF returns
  - Full impact of US-traded MSCI return is felt in European and Asian markets the following day
  - Results for MES for the same day and lagged market return are added together to obtain firm's MES.
- Step 2: $LRMES = 1 - \exp(-18 * MES)$
- Step 3:

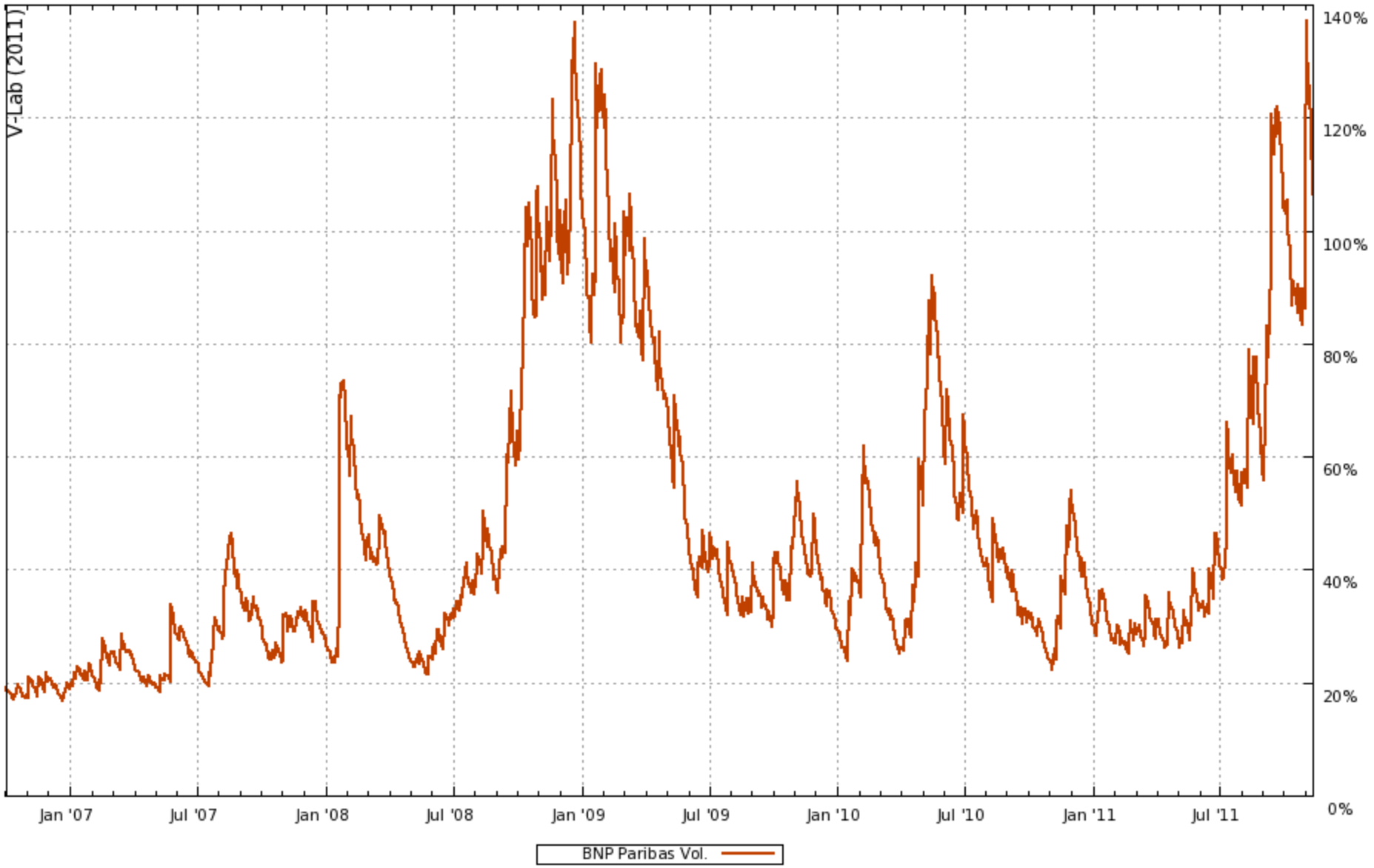
$$SRISK = 0.08\ BDebt - 0.92\ (1-LRMES) * MEquity$$

November 12: NYU STERN GLOBAL SYSTEMIC RISK RANKING

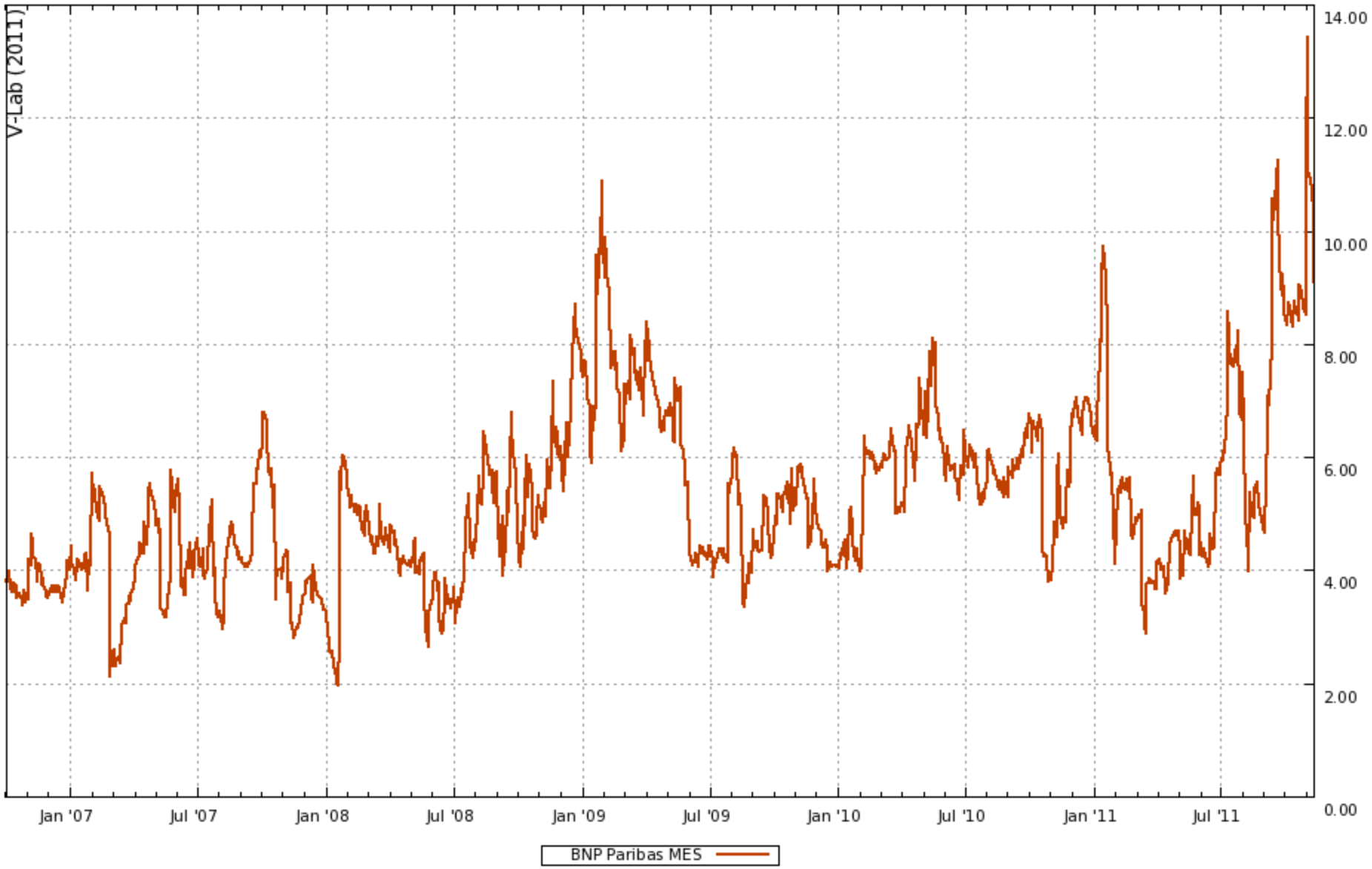
Systemic Risk Top Ten

TOP 10	SRISK%	MES	LVG
Deutsche Bank AG	4.5	7.33	82.30
BNP Paribas	4.0	9.09	50.87
Credit Agricole SA	3.4	7.95	133.88
Barclays PLC	3.4	7.08	66.61
Royal Bank of Scotland Group PLC	3.2	6.20	56.35
Mitsubishi UFJ Financial Group	3.0	2.40	40.23
HSBC Holdings PLC	2.7	4.08	18.47
Bank Of America	2.7	5.19	32.61
Mizuho Financial Group Inc	2.5	2.50	60.25
ING Groep NV	2.5	12.15	54.21

BNP Paribas Volatility

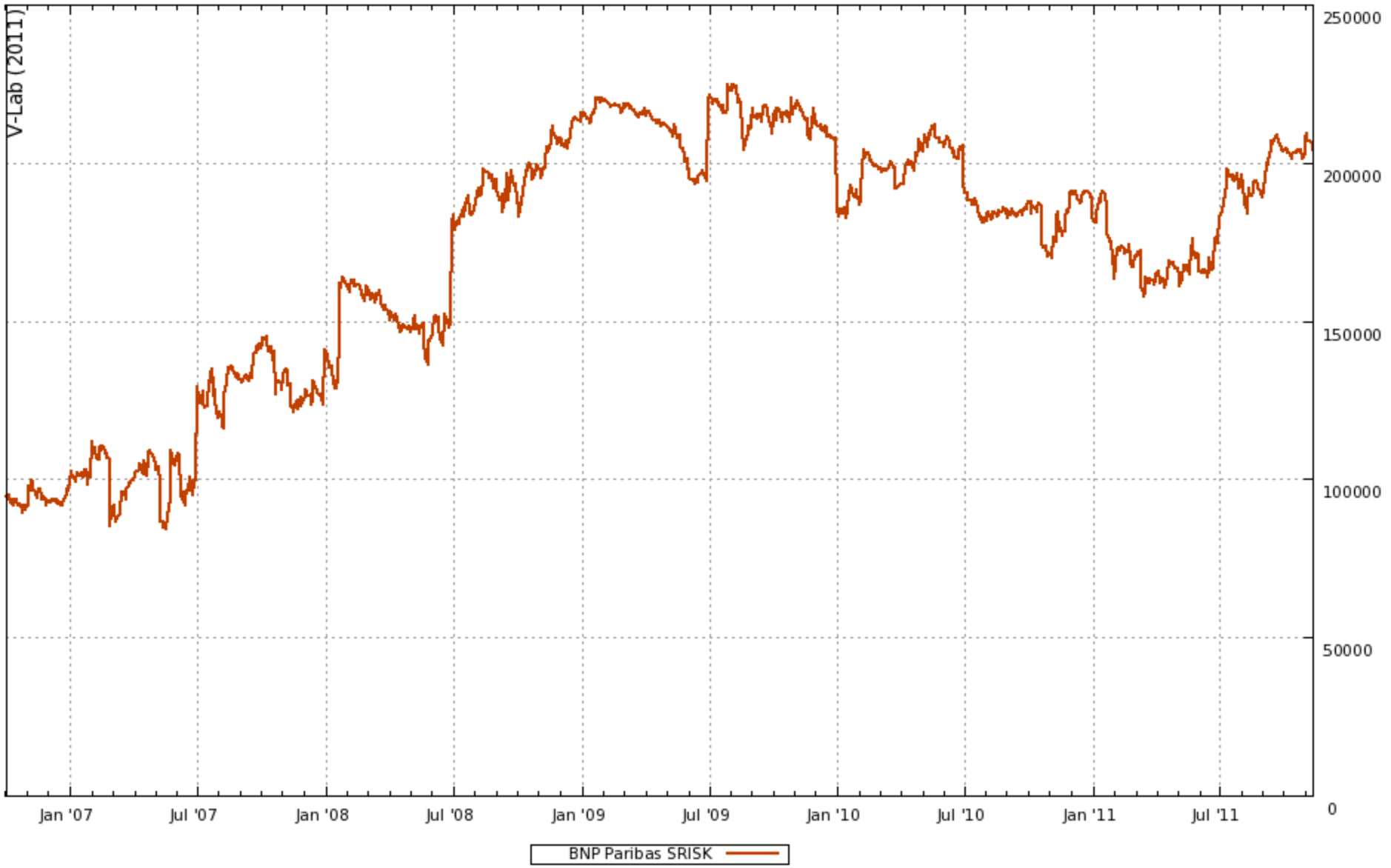


BNP Paribas MES

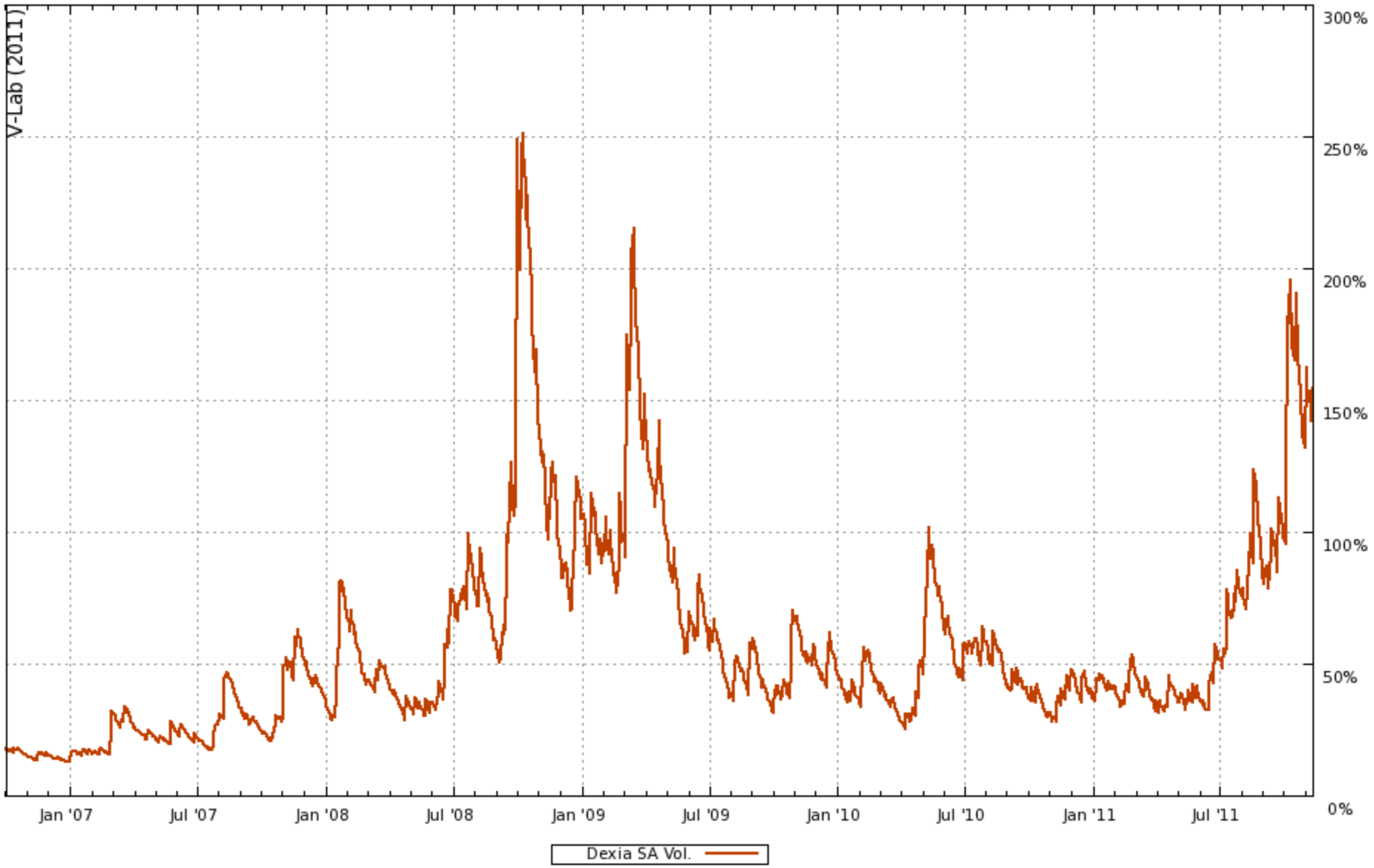


BNP Paribas Leverage

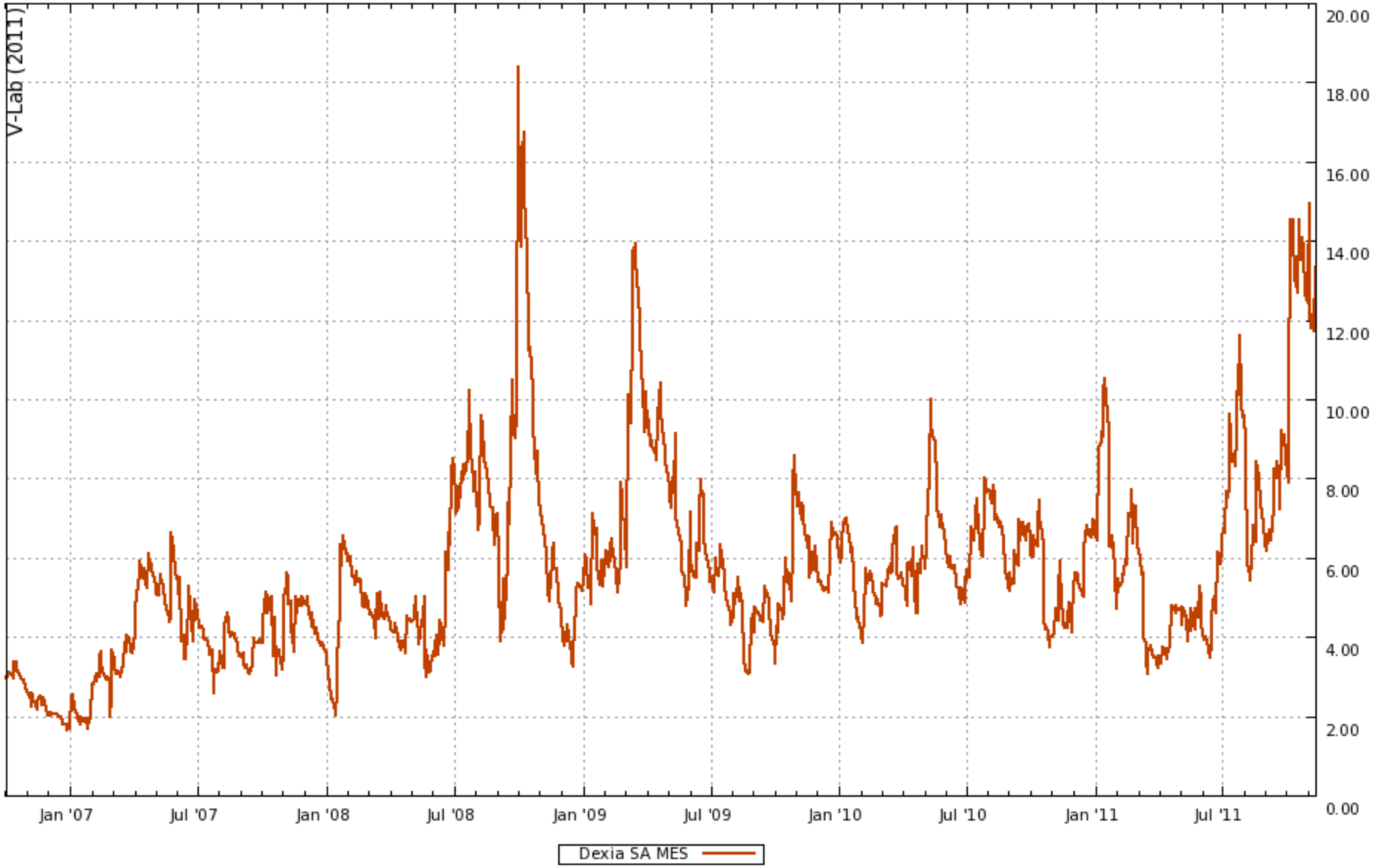
BNP Paribas SRISK (mln$)



Dexia Volatility



Dexia MES


V-Lab (2011)
20.00
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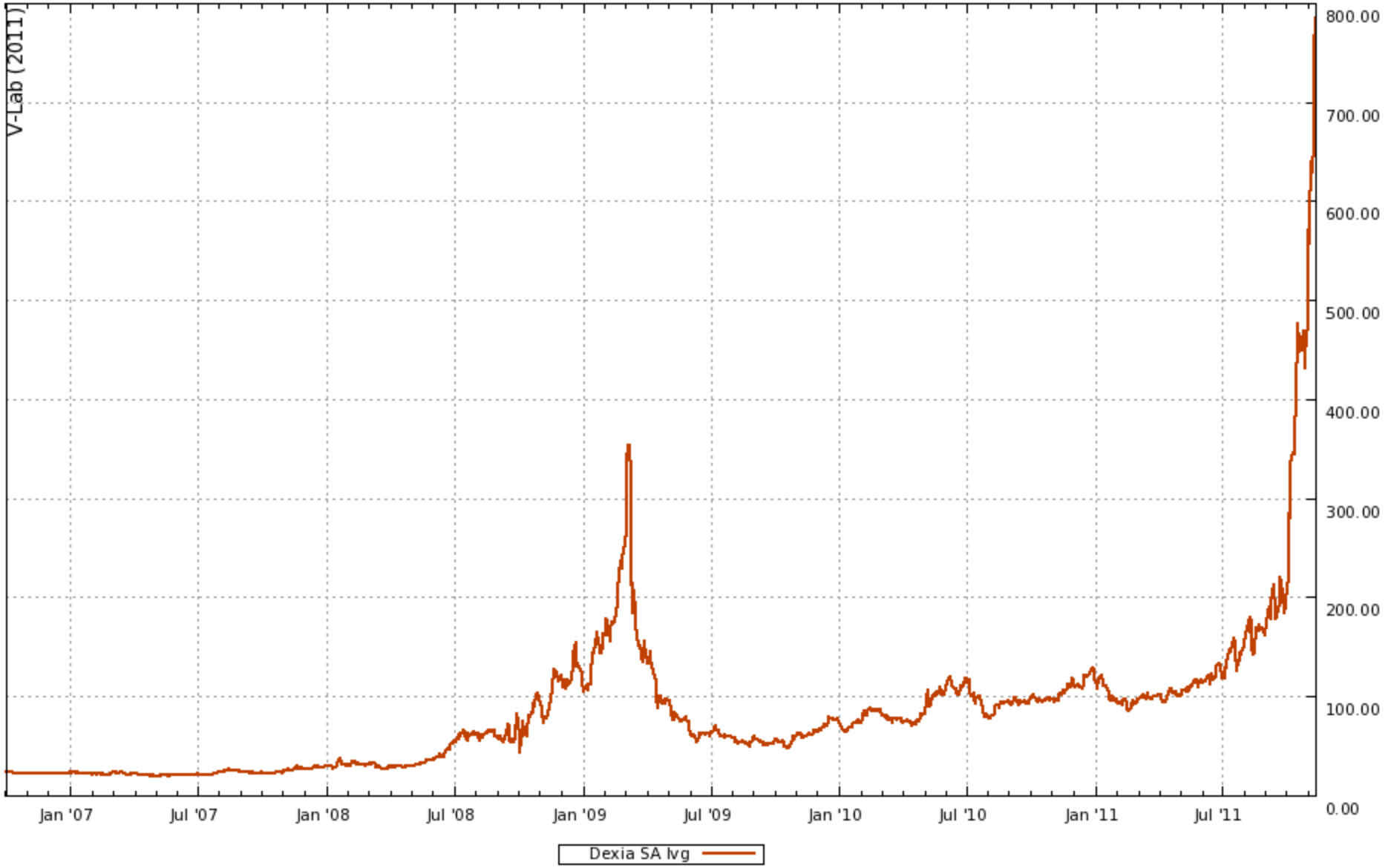
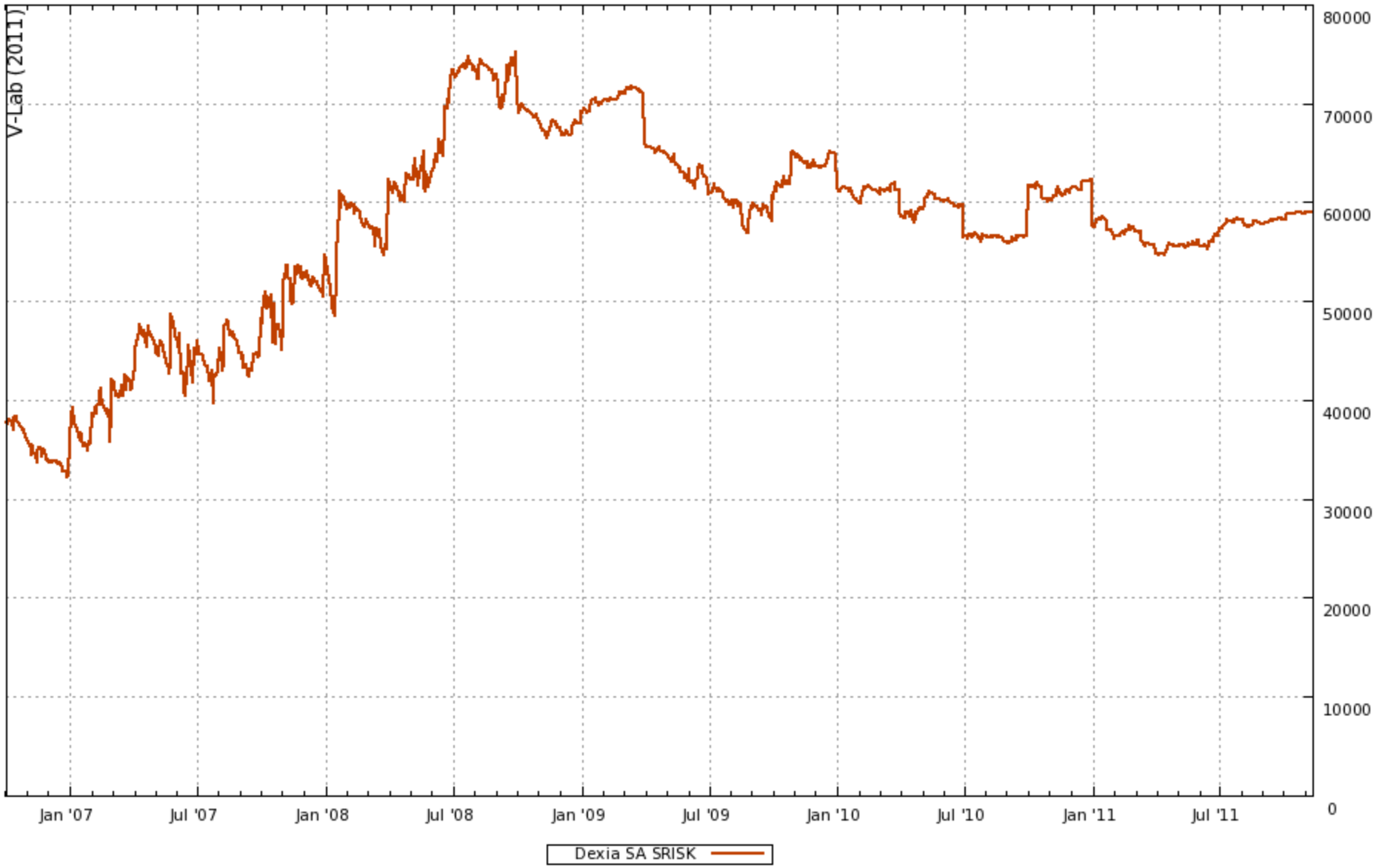
Jan '11
Jul '11
Dexia SA MES

Dexia Leverage



Dexia SRISK (mln$)



Relation to stress test results and FSB list of G-SIFIs

- Dexia rated one of the safest firms in European stress tests of 2011!
  - Are Basel risk-weights the real culprit?
  - Is current regulatory capital requirement divorced from systemic risk? …
- Relationship to FSB list of G-SIFIs better, but important differences remain
  - Size, Leverage, MES individually do not reflect the same ranking as SRISK
  - Of course, SRISK does not capture everything…

FSB list of European G-SIFIs
Released Nov 4,2011, Data through 2009

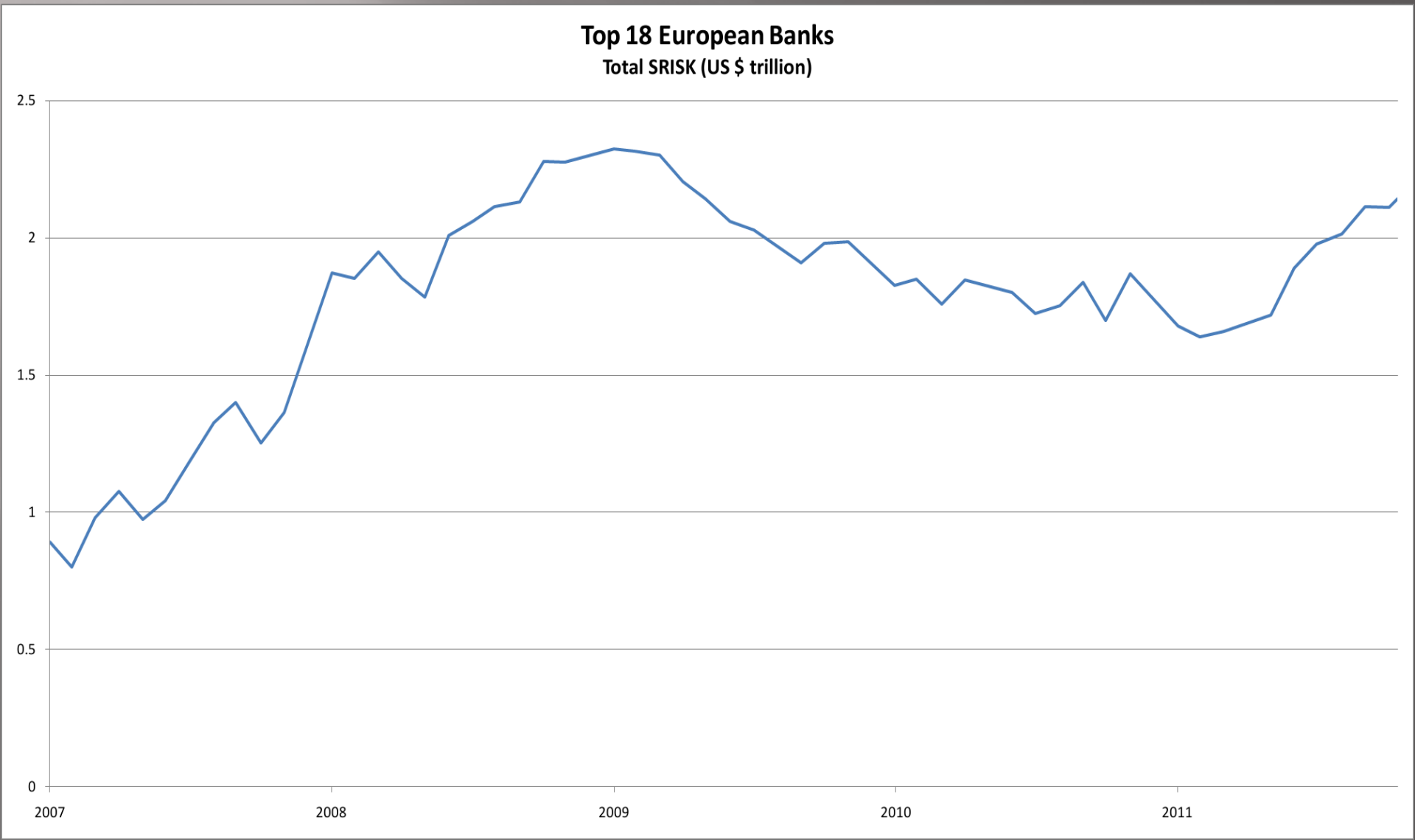
1. Banque Populaire CdE
2. Barclays
3. BNP Paribas
4. Commerzbank
5. Credit Suisse
6. Deutsche Bank
7. Dexia
8. Group Credit Agricole
9. HSBC
10. ING Bank
11. Lloyds Banking Group
12. Nordea
13. Royal Bank of Scotland
14. Santander
15. Societe General
16. UBS
17. Unicredit Group

FSB and NYU list of European G-SIFIs

1. Banque Populaire CdE
2. Barclays
3. BNP Paribas
4. Commerzbank
5. Credit Suisse
6. Deutsche Bank
7. Dexia
8. Group Credit Agricole
9. HSBC
10. ING Bank
11. Lloyds Banking Group
12. Nordea
13. Royal Bank of Scotland
14. Santander
15. Societe General
16. UBS
17. Unicredit Group

1. Deutsche Bank
2. BNP Paribas
3. Credit Agricole
4. Barclays
5. Royal Bank of Scotland
6. HSBC
7. ING Groep
8. Societe Generale
9. Lloyds
10. UBS
11. Santander
12. UniCredit
13. Credit Suisse
14. Commerzbank
15. Intesa Sanpaolo
16. Dexia
17. Nordea
18. Natixis

FSB and NYU list of European G-SIFIs



SORT BY SIZE

Systemic Risk Rankings for 2011-11-11 (MES is equity loss for a 2% daily market decline)

Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
Ind & Comm Bank Of China-A	0.0%	831	-6,389	0.92	0.14	0.20	20.3	10.39	231195.0
China Construction Bank-H	1.1%	25	58,534	3.98	0.63	0.37	50.3	10.77	176305.3
HSBC Holdings PLC	2.7%	7	138,153	4.08	1.18	0.70	50.1	18.47	144432.9
Agricultural Bank Of China-A	0.1%	108	7,421	0.67	0.11	0.21	15.8	11.87	136756.0
Wells Fargo	0.5%	45	27,061	3.51	1.32	0.66	58.9	9.62	135265.8
JP Morgan Chase	2.3%	12	117,996	4.63	1.59	0.73	64.2	17.66	126456.1
Bank Of China Ltd-H	1.6%	19	82,474	4.35	0.65	0.35	54.2	14.75	121257.9
Citigroup	2.2%	13	115,176	6.31	2.01	0.75	79.3	21.49	85752.4
Berkshire Hathaway Shares	0.0%	862	-34,894	2.01	0.74	0.60	36.7	3.70	82143.8
Commonwealth Bank Of Australia	0.2%	84	11,807	3.11	0.65	0.58	33.2	9.40	80401.2
Banco Itau Holding Financeira S.A.	0.0%	832	-6,496	3.62	0.97	0.69	41.7	5.96	77845.2
China Life Insurance Co-H	0.0%	858	-16,181	4.30	0.67	0.32	61.4	3.69	77439.8
Banco Santander SA	1.9%	17	99,468	4.80	1.29	0.68	55.9	23.93	68767.8
Visa	0.0%	863	-43,492	1.75	0.56	0.55	29.9	1.13	65796.0
Westpac Banking Corp	0.4%	55	20,732	4.27	0.83	0.54	45.4	10.29	65589.0
Bank Of America	2.7%	8	136,418	5.19	1.75	0.67	78.0	32.61	62943.7
Banco Bradesco SA	0.0%	766	-2,768	3.19	0.85	0.66	38.1	6.91	60772.8
Mitsubishi UFJ Financial Group	3.0%	6	152,800	2.40	0.31	0.25	37.5	40.23	60138.3
American Express	0.0%	860	-21,839	2.84	0.93	0.71	38.6	3.23	58503.9
Allied Irish Banks PLC	0.0%	759	-2,668	6.48	1.42	0.37	114.9	4.01	57887.9

SORT BY MES

Systemic Risk Rankings for 2011-11-11 (MES is equity loss for a 2% daily market decline)

Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
ING Groep NV	2.5%	10	129,551	12.15	3.06	0.72	126.2	54.21	31189.6
Deutsche Wohnen AG	0.1%	146	4,121	12.13	2.90	0.63	136.5	48.80	1107.6
Dexia SA	1.1%	24	58,968	11.75	2.95	0.58	149.8	713.22	1037.0
Societe Generale	2.4%	11	126,034	11.48	2.86	0.67	126.2	80.77	20117.4
Emporiki Bank SA	0.0%	222	1,620	9.36	2.35	0.38	183.4	89.43	234.7
UniCredit SpA	1.9%	18	95,867	9.26	2.62	0.67	116.5	57.87	21907.0
KBC Ancora	0.0%	343	-28	9.11	2.08	0.60	103.3	2.58	543.6
BNP Paribas	4.0%	2	203,932	9.09	2.37	0.66	106.4	50.87	53523.0
Banco Comercial Portugues SA	0.2%	92	9,507	9.09	2.34	0.57	121.5	119.68	1020.6
Admiral Group PLC	0.0%	449	-421	9.02	2.80	0.46	179.1	1.82	3653.3
Intesa Sanpaolo SpA	1.2%	23	62,654	9.00	2.55	0.68	111.4	30.58	28678.1
AXA SA	1.4%	22	69,951	8.88	2.28	0.70	96.9	29.17	33831.5
Chongqing Rural Commercial Ban	0.0%	193	2,364	8.85	1.24	0.35	106.0	10.00	4435.8
Eurocommercial Properties NV	0.3%	77	12,995	8.83	2.09	0.73	84.2	220.70	747.3
Storebrand ASA	0.1%	133	4,691	8.74	2.26	0.71	94.6	26.08	2583.5
Aegon NV	0.6%	41	31,997	8.52	2.19	0.72	89.4	48.88	8810.8
Marfin Popular Bank PCL	0.1%	148	4,009	8.35	1.99	0.49	119.4	111.92	462.5
KBC Groep NV	0.6%	44	29,558	8.32	1.96	0.58	100.6	57.82	6810.6
Ageas	0.2%	93	9,473	8.13	1.93	0.71	80.6	27.87	4890.6
Alpha Bank AE	0.1%	118	6,582	8.09	1.86	0.36	151.5	107.40	793.3

SORT BY LEVERAGE

Systemic Risk Rankings for 2011-11-11 (MES is equity loss for a 2% daily market decline)

Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
Dexia SA	1.1%	24	58,968	11.75	2.95	0.58	149.8	713.22	1037.0
Prelios SpA	0.1%	131	4,697	3.42	0.88	0.39	66.3	547.61	108.7
Eurobank Properties Real Estate Investment Co	0.3%	71	14,507	2.72	0.62	0.36	51.3	451.59	408.8
Eurocommercial Properties NV	0.3%	77	12,995	8.83	2.09	0.73	84.2	220.70	747.3
Agricultural Bank of Greece	0.1%	121	6,150	7.66	1.69	0.34	148.8	199.53	393.0
EFG Eurobank Ergasias SA	0.2%	97	8,737	7.55	1.77	0.34	154.9	195.50	570.1
Espirito Santo Financial Group SA	0.2%	99	8,702	6.56	1.66	0.57	86.9	136.51	824.2
Credit Agricole SA	3.4%	3	175,119	7.95	2.03	0.59	101.3	133.88	16821.1
GAG Immobilien AG	0.1%	138	4,333	3.76	0.82	0.38	64.0	126.03	454.5
Banco Comercial Portugues SA	0.2%	92	9,507	9.09	2.34	0.57	121.5	119.68	1020.6
Marfin Popular Bank PCL	0.1%	148	4,009	8.35	1.99	0.49	119.4	111.92	462.5
Alpha Bank AE	0.1%	118	6,582	8.09	1.86	0.36	151.5	107.40	793.3
Emporiki Bank SA	0.0%	222	1,620	9.36	2.35	0.38	183.4	89.43	234.7
Commerzbank AG	1.4%	21	74,166	7.73	2.14	0.63	99.9	85.93	11297.1
Deutsche Bank AG	4.5%	1	230,798	7.33	2.06	0.73	83.5	82.30	36879.5
Societe Generale	2.4%	11	126,034	11.48	2.86	0.67	126.2	80.77	20117.4
Banque Nationale de Belgique	0.1%	117	6,632	1.67	0.40	0.40	30.1	75.77	1251.1
Banco Popolare SC	0.3%	72	13,877	6.49	1.73	0.62	82.3	73.57	2514.2
Azimut Holding SpA	0.1%	135	4,475	6.64	1.66	0.59	84.2	72.20	826.1

Global Systemic Risk Rankings

"A Look Back"

AUGUST 29,2008

Systemic Risk Rankings for 2008-08-29 (MES is equity loss for a 2% daily market decline)

Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
Royal Bank of Scotland Group PLC	5.9%	1	264,745	6.90	2.35	0.60	53.7	52.36	68881.0
Deutsche Bank AG	5.1%	2	228,842	4.81	1.67	0.70	33.8	69.05	45256.1
Barclays PLC	4.5%	3	201,075	8.10	2.34	0.55	59.6	51.79	52246.7
BNP Paribas	4.4%	4	194,605	5.70	1.85	0.66	39.2	34.77	82071.1
Credit Agricole SA	3.7%	5	165,122	6.28	2.19	0.61	50.8	48.33	47329.2
ING Groep NV	3.3%	6	146,167	5.43	1.55	0.57	39.1	33.43	65027.3
UBS AG-REG	3.2%	7	141,295	6.78	1.96	0.60	45.6	31.93	64140.9
Citigroup	3.0%	8	131,502	7.29	2.99	0.68	63.1	19.99	103408.0
Societe Generale	2.5%	9	112,728	6.06	1.74	0.56	44.4	29.51	57168.8
Mitsubishi UFJ Financial Group	2.4%	10	108,873	3.96	0.64	0.20	43.8	22.77	84372.9
HSBC Holdings PLC	2.4%	11	107,486	3.96	1.36	0.62	30.6	13.73	189562.3
Mizuho Financial Group Inc	2.2%	12	96,961	3.98	0.66	0.19	45.9	31.18	49345.6
Bank Of America	2.1%	13	92,880	7.91	3.44	0.66	75.2	11.94	142001.9
UniCredit SpA	2.1%	14	92,737	3.85	1.27	0.57	32.0	22.82	72106.5
JP Morgan Chase	2.0%	15	88,348	5.77	2.74	0.62	62.9	13.42	132291.5
Allianz SE	2.0%	16	87,166	3.78	1.32	0.66	28.2	21.24	75626.4
Dexia SA	1.6%	17	72,884	7.04	2.51	0.59	60.6	59.77	16406.2
Banco Santander SA	1.6%	18	72,838	4.40	1.40	0.62	31.8	14.76	106586.5
Credit Suisse Group AG	1.6%	19	71,691	4.95	1.40	0.57	34.3	22.19	54417.3
Sumitomo Mitsui Financial Group	1.5%	20	67,325	5.00	0.87	0.23	49.0	22.99	48601.2

JAN 31, 2007

Systemic Risk Rankings for 2007-01-31 (MES is equity loss for a 2% daily market decline)

Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
Barclays PLC	6.2%	1	106,568	3.66	1.19	0.51	20.2	20.99	94916.9
BNP Paribas	5.9%	2	101,253	4.19	1.86	0.69	22.5	18.60	103821.9
Credit Agricole SA	5.4%	3	92,758	3.25	1.50	0.55	22.4	23.88	70407.6
UBS AG-REG	5.4%	4	92,459	3.80	0.97	0.43	19.1	15.60	131438.9
ING Groep NV	5.3%	5	90,067	5.16	1.62	0.68	20.2	17.24	96238.6
Deutsche Bank AG	4.5%	6	76,504	3.07	1.27	0.67	15.9	20.63	73469.6
Allianz SE	3.9%	7	66,168	3.94	1.88	0.67	23.1	16.28	86019.8
Societe Generale	3.6%	8	61,810	4.12	1.40	0.68	17.8	15.99	81266.4
Royal Bank of Scotland Group PLC	3.4%	9	58,960	2.80	1.22	0.55	18.5	13.77	126520.6
Mizuho Financial Group Inc	2.9%	10	49,196	2.75	0.76	0.30	20.8	15.21	85425.6
Mitsubishi UFJ Financial Group	2.8%	11	48,672	2.97	0.68	0.21	26.1	12.42	129949.4
Commerzbank AG	2.8%	12	47,940	3.08	1.26	0.46	22.9	29.26	27679.1
Morgan Stanley	2.7%	13	46,547	3.80	1.51	0.57	23.5	13.50	86838.4
Banco Santander SA	2.5%	14	42,455	4.93	1.60	0.69	19.6	10.21	118707.4
Credit Suisse Group AG	2.3%	15	38,660	3.79	1.34	0.55	20.2	12.46	85597.7
Dexia SA	2.1%	16	35,726	2.00	0.89	0.44	16.7	21.99	34455.3
AXA SA	2.0%	17	34,784	4.40	1.84	0.68	22.2	11.15	88050.1
Fannie Mae - Receivership	1.9%	18	32,053	2.54	0.91	0.41	19.0	15.56	55119.7
Natixis	1.7%	19	29,719	3.50	1.12	0.32	28.9	17.98	34200.4
UniCredit SpA	1.7%	20	29,006	2.82	1.18	0.58	17.1	11.68	96417.1

JAN 31, 2005

Systemic Risk Rankings for 2005-01-31 (MES is equity loss for a 2% daily market decline)

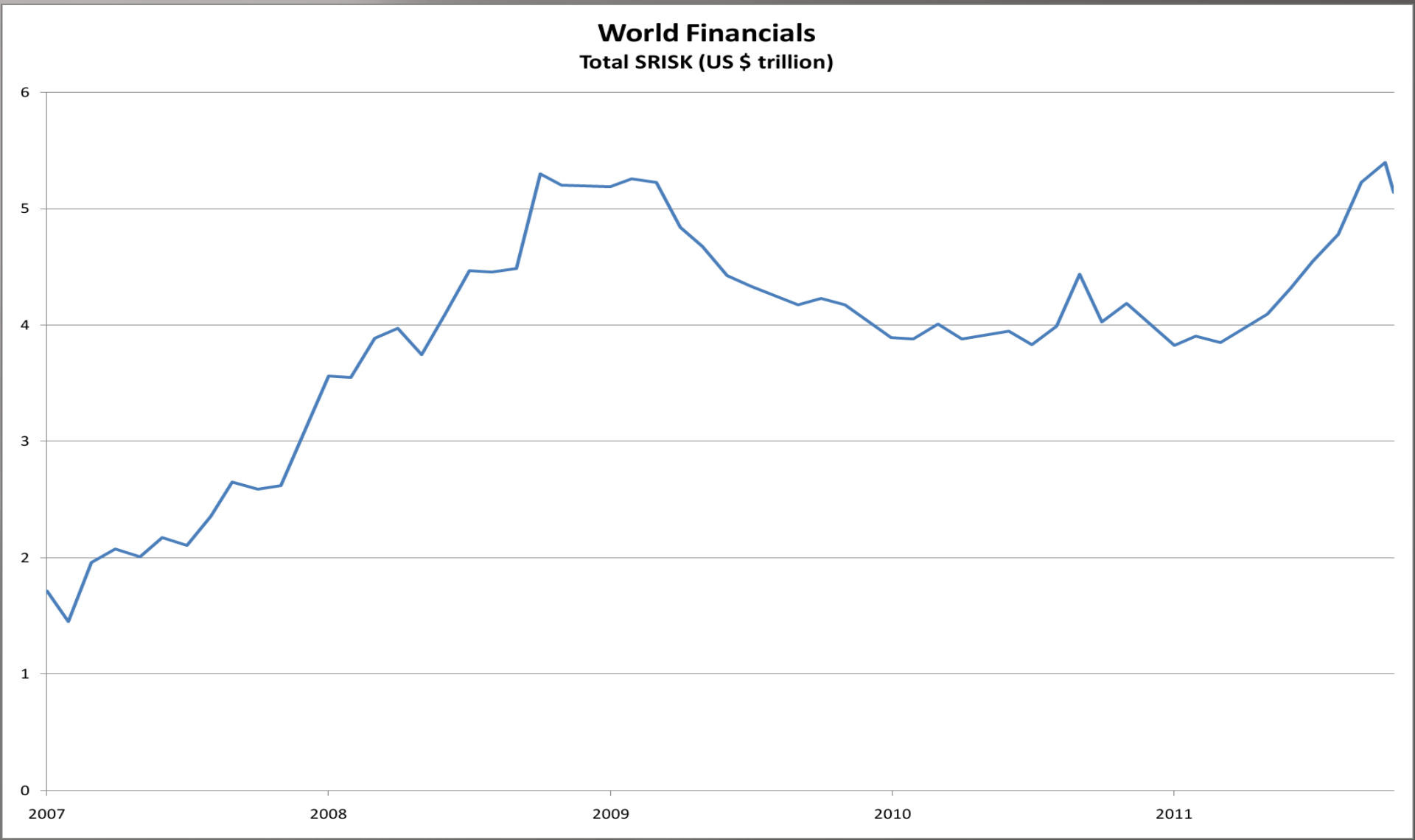
Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
Allianz SE	5.9%	1	82,081	3.80	1.59	0.61	23.6	29.23	45748.6
UBS AG-REG	5.8%	2	79,772	4.22	1.10	0.59	17.3	17.29	91401.7
Mizuho Financial Group Inc	4.8%	3	67,268	3.02	0.99	0.30	28.1	22.29	57545.1
Deutsche Bank AG	4.7%	4	64,977	3.34	1.36	0.65	19.2	24.88	46224.7
ING Groep NV	4.5%	5	62,853	3.85	1.05	0.55	17.6	19.12	63508.2
Credit Agricole SA	4.3%	6	59,090	2.39	1.14	0.51	19.7	25.30	43925.9
BNP Paribas	4.1%	7	56,983	2.50	0.98	0.54	16.3	19.48	63883.9
Credit Suisse Group AG	3.4%	8	47,063	2.96	1.08	0.50	19.5	19.80	48821.6
Sumitomo Mitsui Financial Group	3.4%	9	46,735	2.90	1.00	0.37	22.9	21.17	43747.6
Mitsubishi UFJ Financial Group	3.1%	10	43,364	2.57	0.76	0.30	22.3	17.02	61743.8
Fannie Mae - Receivership	3.1%	11	43,061	2.68	1.07	0.37	25.8	16.72	62478.2
Societe Generale	2.9%	12	40,192	3.29	1.05	0.60	16.2	18.70	44303.3
Commerzbank AG	2.7%	13	37,052	2.24	0.97	0.48	18.4	45.07	12729.9
Barclays PLC	2.7%	14	36,843	2.31	0.75	0.39	17.8	15.09	70906.0
Banco Santander SA	2.5%	15	34,233	3.90	1.07	0.58	17.0	12.45	74331.7
AXA SA	2.1%	16	29,778	3.79	1.33	0.62	18.9	14.85	46359.3
Morgan Stanley	1.9%	17	25,890	3.17	1.12	0.56	18.9	12.82	60834.1
Dexia SA	1.6%	18	22,359	1.38	0.64	0.35	16.4	20.88	25609.0
Aviva PLC	1.4%	19	19,975	2.74	0.87	0.42	19.0	17.17	27282.8
Nordea Bank AB	1.1%	20	15,901	3.59	0.97	0.40	22.3	14.35	27155.6

JAN 31, 2000

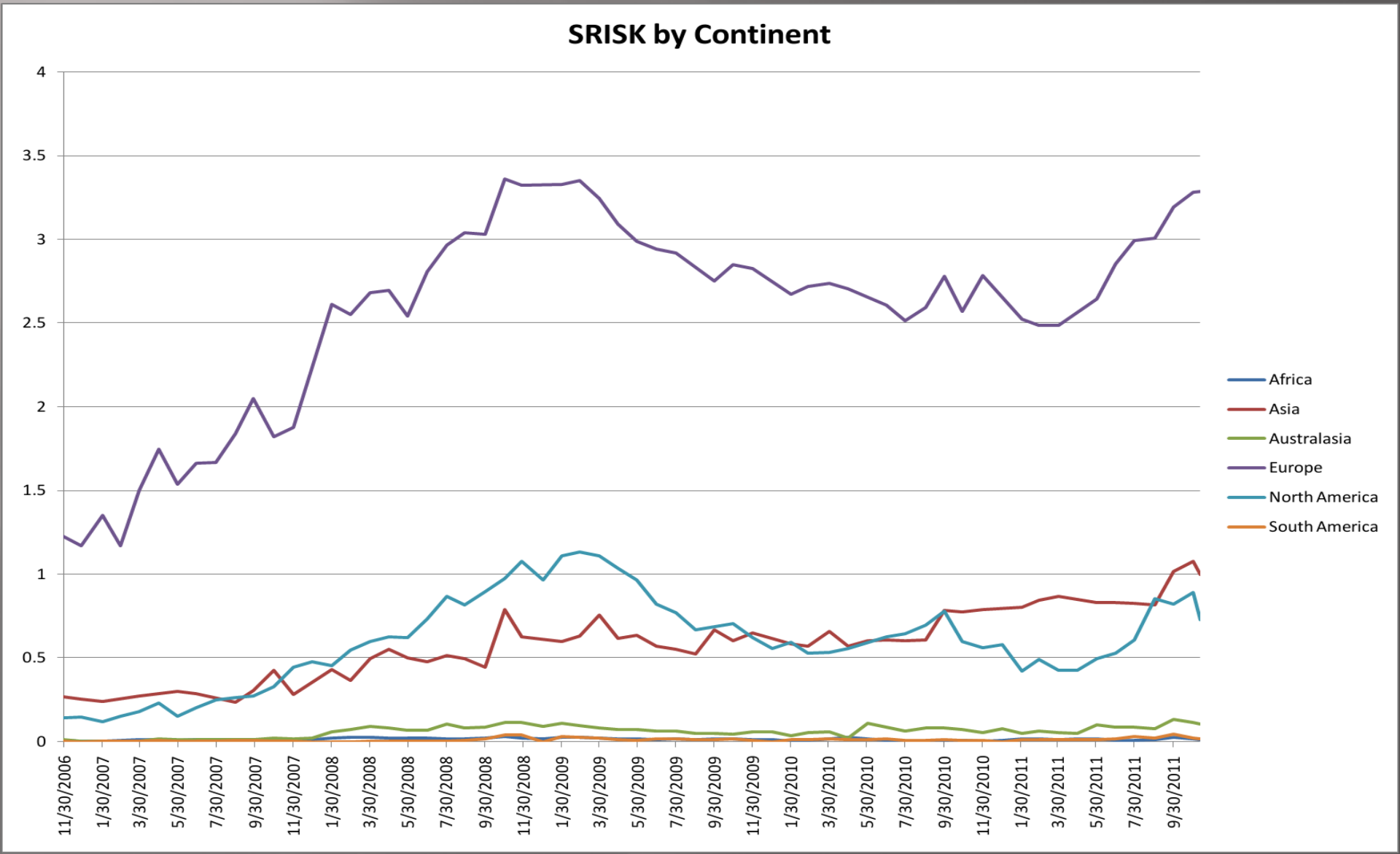
Systemic Risk Rankings for 2000-01-31 (MES is equity loss for a 2% daily market decline)

Institution	SRISK%	RNK	SRISK ($ m)	MES	Beta	Cor	Vol	Lvg	MV
Deutsche Bank AG	14.6%	1	41,050	2.57	0.93	0.52	33.4	20.82	40799.6
UBS AG-REG	8.4%	2	23,664	3.40	1.04	0.50	36.5	13.39	48040.8
Societe Generale	7.3%	3	20,584	1.37	0.25	0.14	31.2	22.61	20393.5
Morgan Stanley	5.5%	4	15,449	5.52	1.88	0.61	54.6	10.54	36590.9
Barclays PLC	5.3%	5	14,872	3.88	1.14	0.38	52.9	11.74	36992.5
Aviva PLC	4.5%	6	12,686	3.24	0.97	0.43	39.5	16.57	17320.2
Landesbank Berlin Holding AG	4.4%	7	12,422	0.62	0.19	0.17	19.3	57.52	3358.0
ING Groep NV	4.1%	8	11,497	3.16	0.95	0.53	30.9	10.48	48473.9
JP Morgan Chase	3.7%	9	10,478	2.36	1.11	0.43	45.4	10.49	66549.1
Hartford Financial Services	3.0%	10	8,410	3.23	1.07	0.40	47.6	19.76	8523.8
Royal Bank of Canada	2.9%	11	8,197	3.57	1.25	0.40	52.8	15.32	12393.5
Canadian Imperial Bank of Commerce/Canada	2.8%	12	7,747	2.84	1.01	0.38	46.0	17.14	10484.8
Bank of Montreal	2.5%	13	6,971	2.71	0.95	0.40	40.9	17.89	8870.7
Fannie Mae - Receivership	2.3%	14	6,492	2.17	0.81	0.32	44.1	10.11	61175.1
Legal & General Group PLC	2.1%	15	5,982	2.72	0.72	0.28	45.4	14.23	12108.4
Bank of Nova Scotia	1.9%	16	5,391	1.73	0.58	0.28	35.4	16.12	10070.7
Toronto-Dominion Bank/The	1.9%	17	5,217	3.95	1.13	0.42	46.2	10.86	15507.6
Bank of Yokohama Ltd/The	1.6%	18	4,559	1.79	0.61	0.22	48.8	21.46	4695.3
Lincoln National Corp	1.2%	19	3,470	2.25	0.82	0.36	40.3	14.67	7231.8

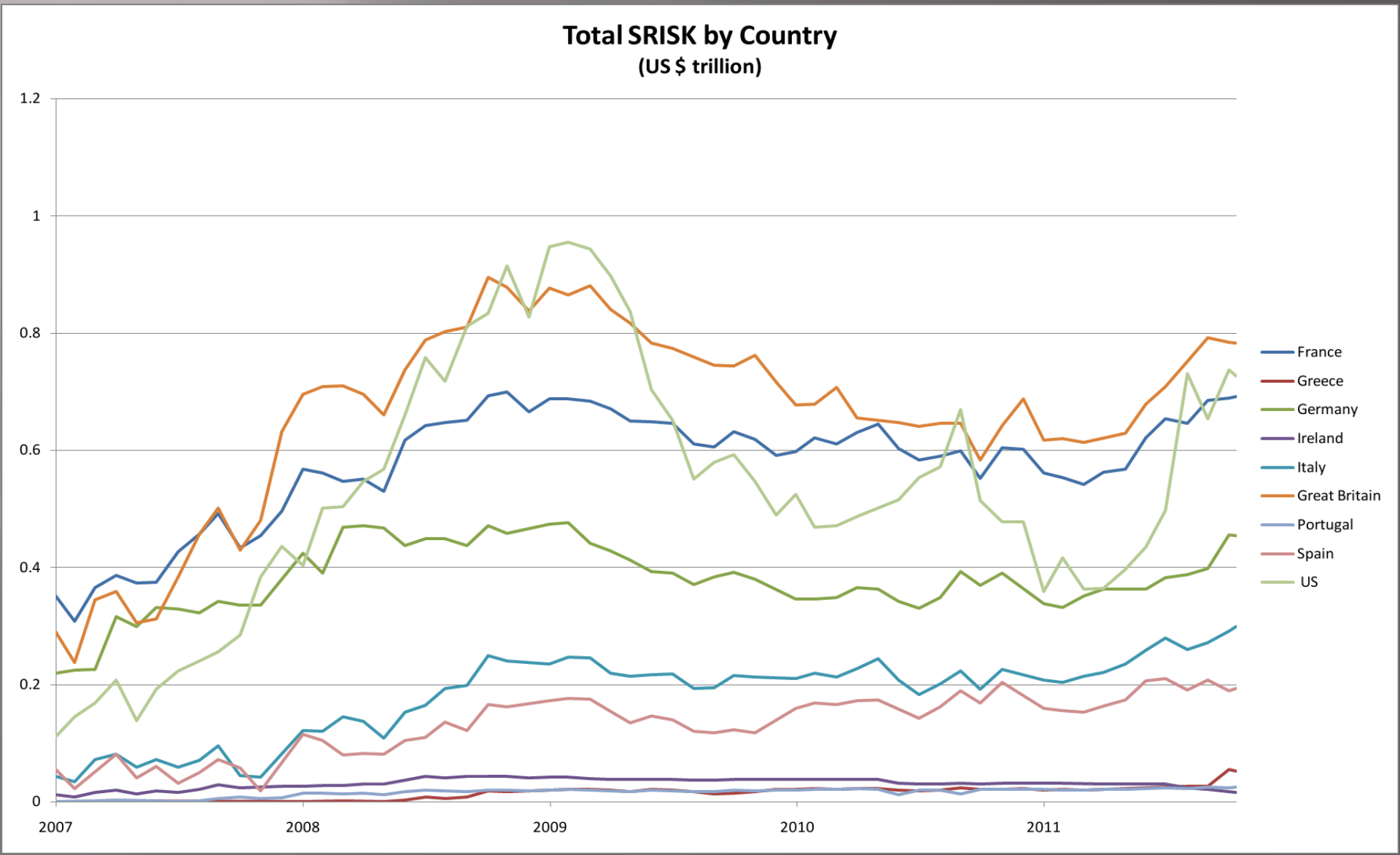
SYSTEM CAPITAL SHORTFALL (FOR 1178 FINANCIAL FIRMS)



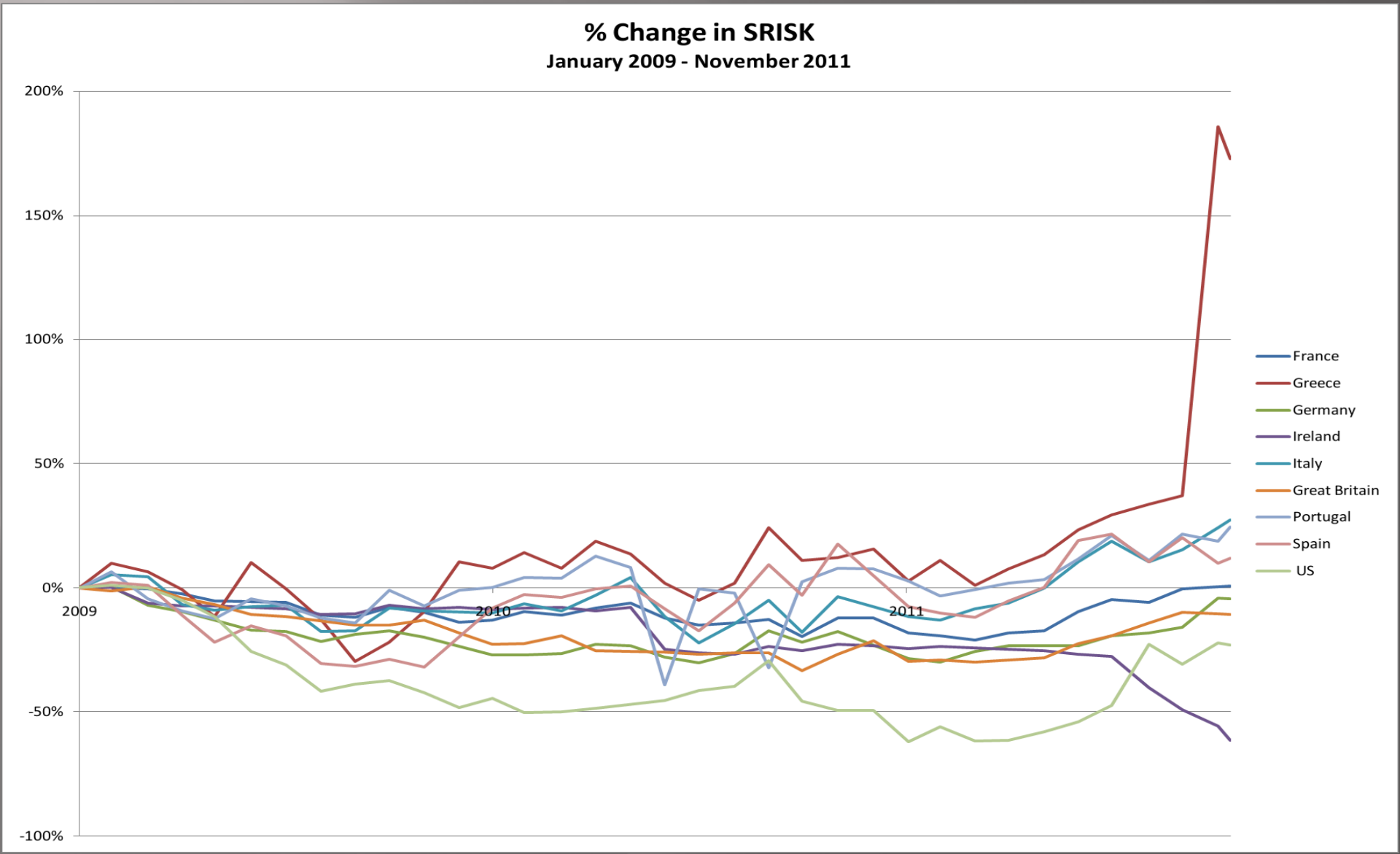
SYSTEM CAPITAL SHORTFALL BY CONTINENT (US $ trillion)



SYSTEM CAPITAL SHORTFALL BY COUNTRY



SYSTEM CAPITAL SHORTFALL BY COUNTRY (% CHANGE FROM JAN 2009)



IMPLICATIONS FOR BASEL III

- IDENTIFICATION OF SIFI AND G-SIFI
- CAPITAL SURCHARGE IDEAS
  - Set capital requirements so that capital in a crisis will not fall below k.
  - Thus capital requirements today should be

$$E \geq k \frac{A}{1-(1-k)\,LRMES}, \quad A = D + E$$

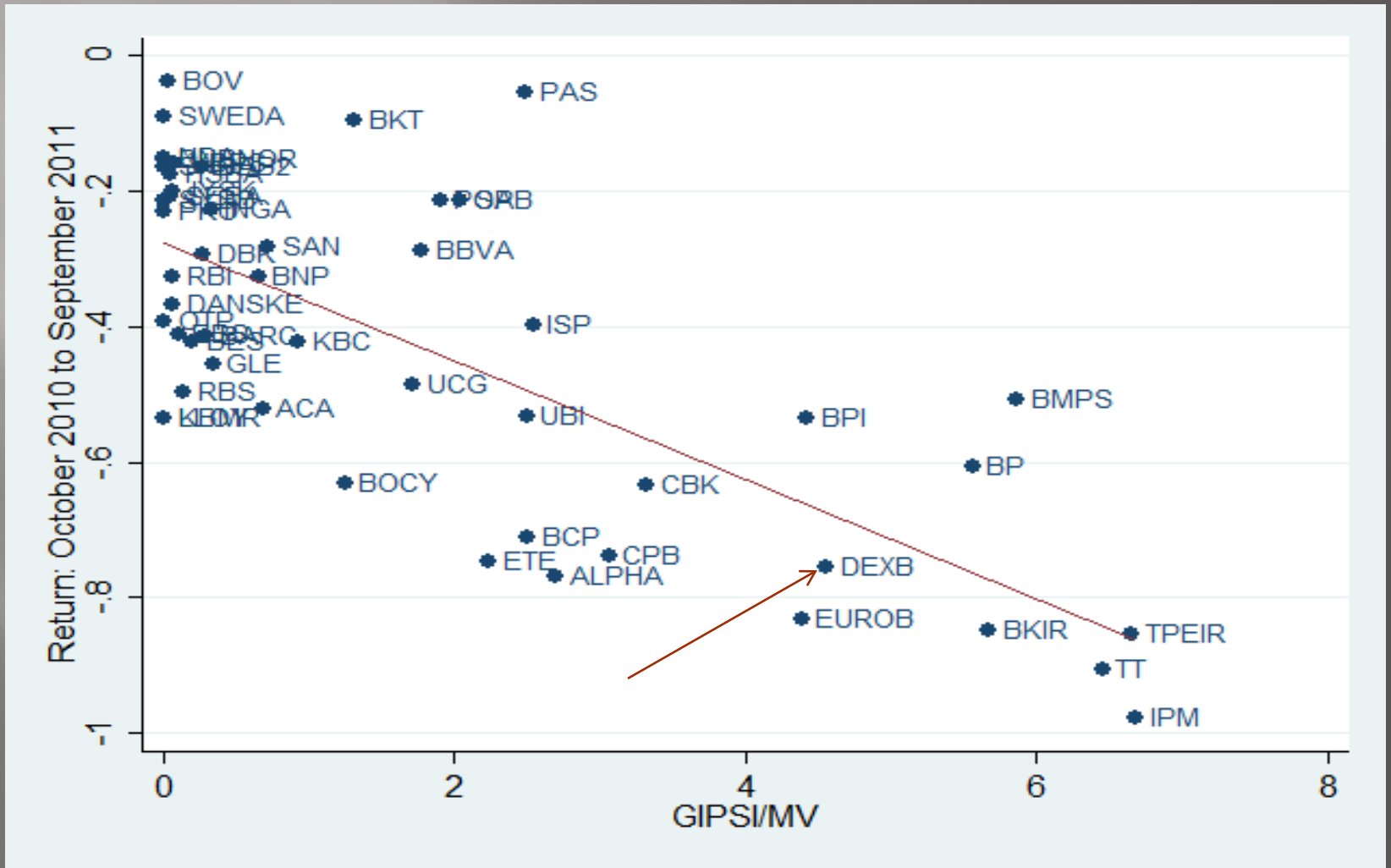
  - OR EQUIVALENTLY RISK WEIGHTS SHOULD BE

$$\frac{1}{1-(1-k)\,LRMES}$$

FIRM IMPLICATIONS

- TO REDUCE REQUIRED CAPITAL, A FIRM COULD REDUCE
  - LEVERAGE
  - RISK
  - CORRELATION
  - SIZE

What did Basel II give us? Bank return (Oct'10-Sep'11) vs GIPSI/MV exposure of Dec'10



OPEN QUESTIONS

- Counter-cyclical SRISK?
  - Stress = 40% downfall from the peak?
  - Ensure firms can raise required capital in a future crisis too, without restructuring (or bailout)?
- Dealing with externalities of the financial sector's equity and debt valuations
- Effect of capital raising on the macroeconomic state of the world, and thus on "stress" scenario
  - Deep nexus of financial and sovereign credit risks

Home Bias in Banks' Sovereign Bond Holdings (2011)