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Market Risk: Understanding and Managing Tail Events

Scenario 3: Eurozone Meltdown

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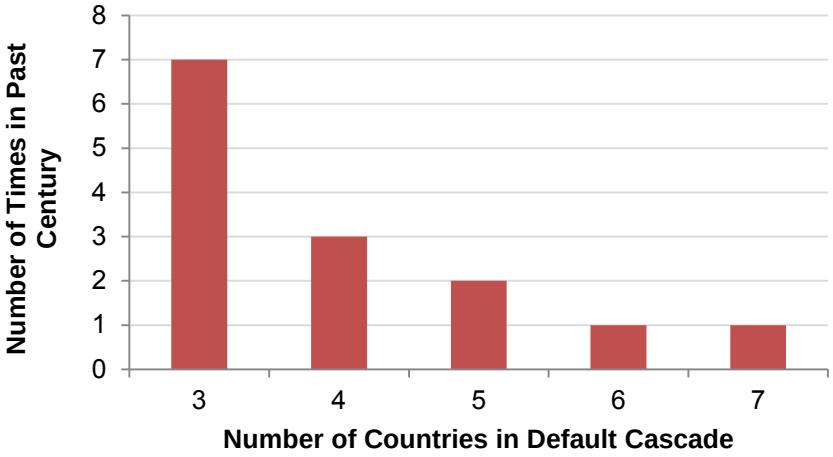
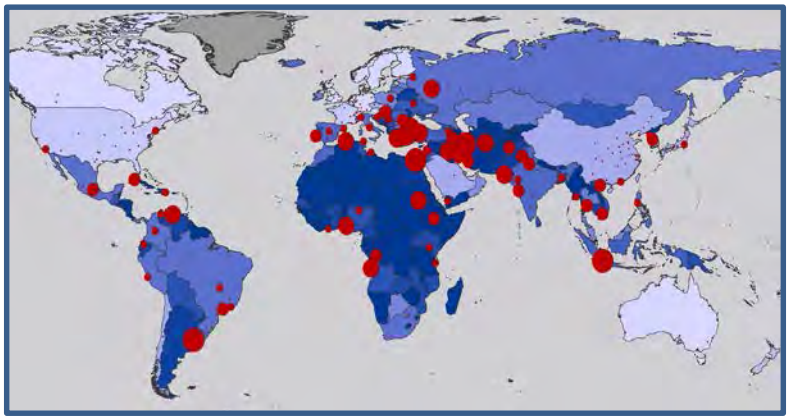
Eurozone Meltdown

Economic Shocks

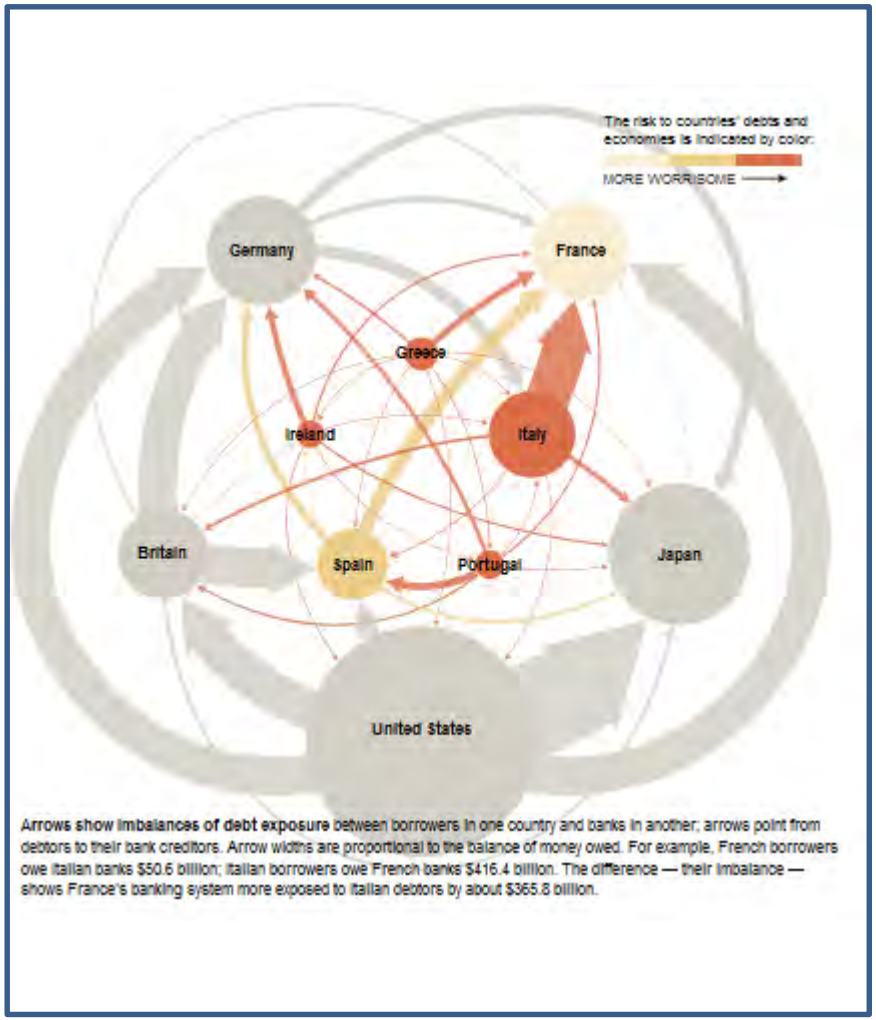
- **Government debt**
- **Investment**
- **Short term rates**
- **Long term rates**
- **FX rates**

- 120 sovereign defaults in past 100 years
- Cascading defaults are most significant threat
- A cascade involving 4 or more countries has occurred on average every 14 years





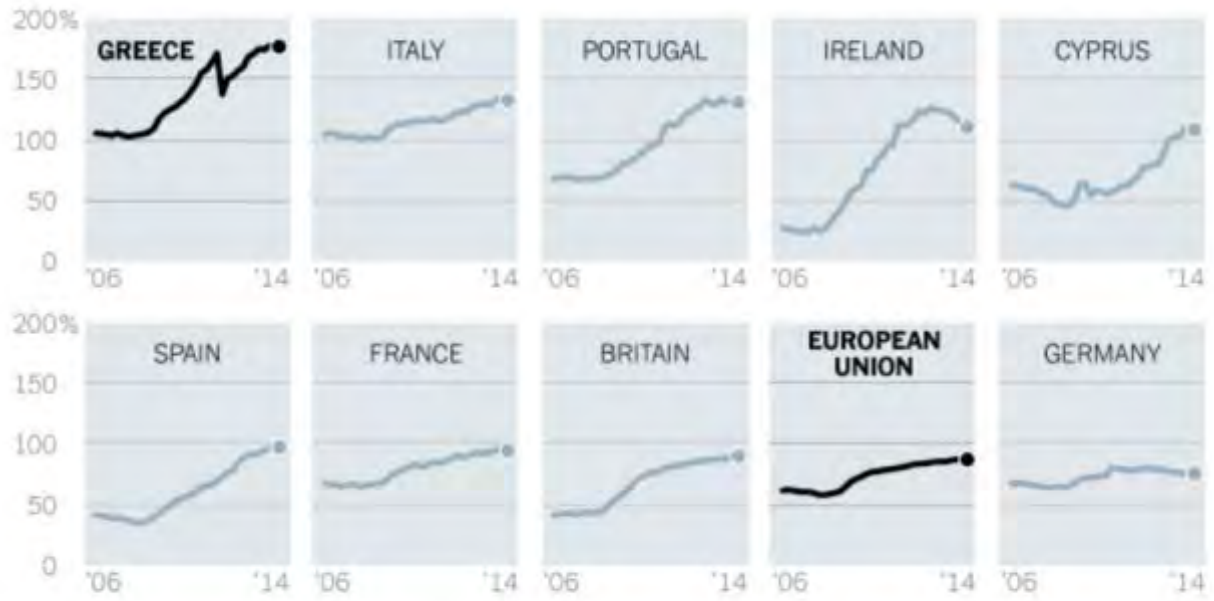
Eurozone Meltdown



S1	S2	X1	Global Rank
Italy	Italy	Italy	5 127%
Greece	Greece	Greece	2 159%
Spain	Spain	Spain	22 84%
Portugal	Portugal	Portugal	7 123%
Ireland	Ireland	Ireland	8 117%
	Germany	Germany	25 82%
	France	France	19 90%
		All Eurozone	
$4.2 Tn	$10.8 Tn	$12.9 Tn	GDP ($US)
5.60%	14.30%	17.00%	% Global GDP:

Most Indebted Nations: Government Debt as % GDP

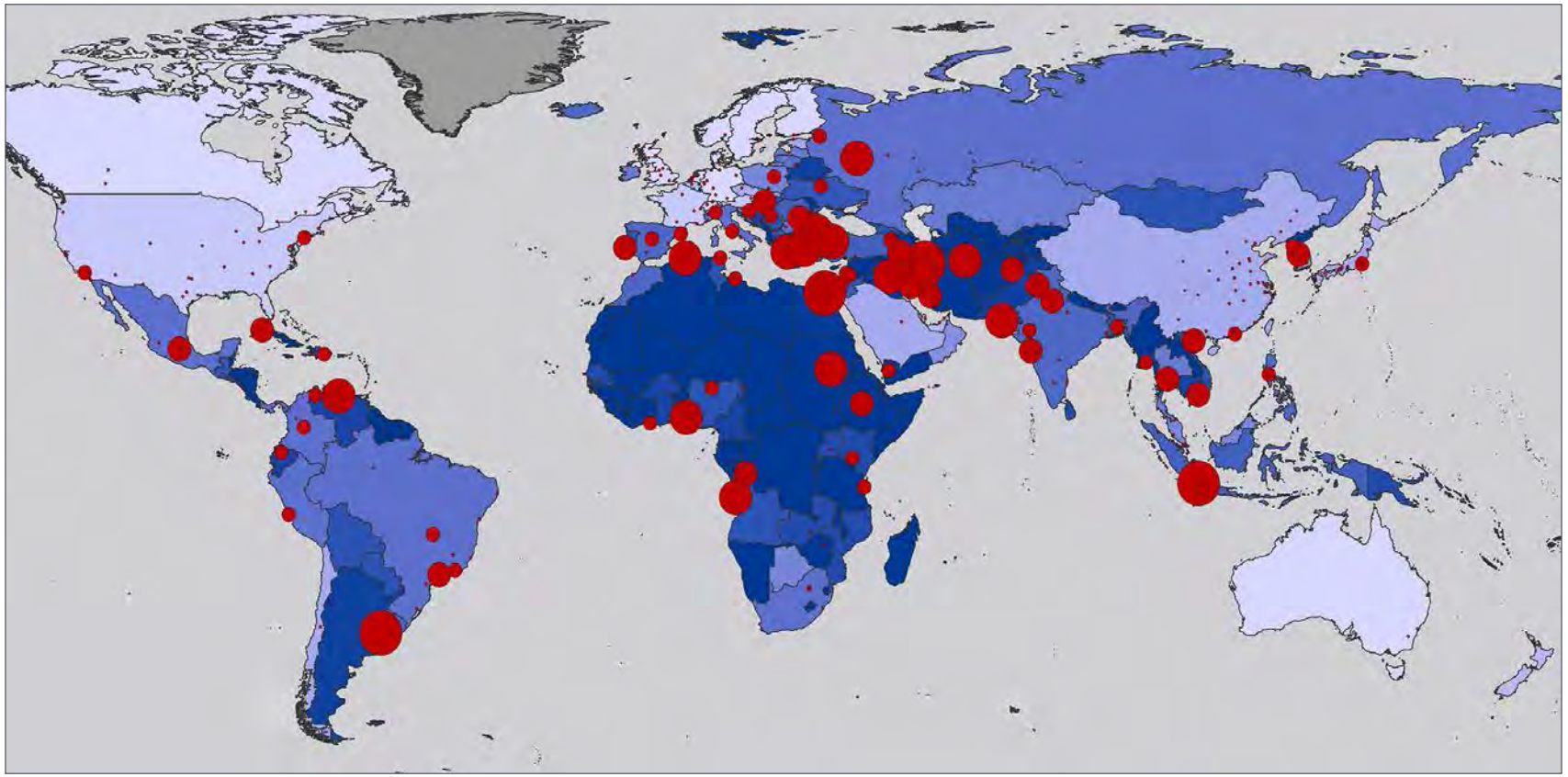
Debt In European Union



Source: Eurostat

1	Japan	238%
2	Greece	159%
3	Jamaica	147%
4	Lebanon	140%
5	Italy	127%
6	Eritrea	126%
7	Portugal	123%
8	Ireland	117%
9	Grenada	113%
10	Singapore	111%
11	United States	107%
12	Cape Verde	103%
13	Belgium	100%
14	Iceland	99%
15	Sudan	98%
16	United Kingdom	90%
17	France	90%
18	Antigua and Barbuda	89%
19	Cyprus	86%
20	Canada	86%
21	Saint Lucia	85%
22	Spain	84%
23	Saint Kitts and Nevis	83%
24	Seychelles	83%
25	Germany	82%
26	Egypt	80%
27	Mauritania	80%
28	Jordan	80%
29	Hungary	79%
30	Belize	78%

World Mapping of Sovereign Default Risk



Credit Rating: Threat Assessment Grading

AAA AA+ AA AA- A+ A A- BBB+ BBB BBB- BB+ BB BB- B+ B B- CCC+ Ungraded

City - GDP@Risk ($US Bln)

0.0 - 0.4 0.4 - 1.2 1.2 - 2.3 2.3 - 4.0 4.0 - 12.4

Sovereign default, where a national government is unable to meet its financial obligations or honour its treasury bonds, results in devaluation of the national currency and the loss of foreign direct investment, which can have significant impact on the economic outputs of cities in that country. The published national credit rating of Standard and Poor's for June 2014 (pre-dating the Argentina default of July 2014) is used to assess the probability of national default, combined with an historical perspective of past defaults by countries from the post-1810 catalogue of Reinhart & Rogoff. The national assessment is applied to all cities in that country, to assess GDP loss and probability of the characteristic scenario of default:

SD1 Country defaults and reschedules its debt, devalues its currency substantially; Investors flee. National economy loses substantial foreign direct investment

Top 10 Cities by GDP@Risk ($US Bn)

1	ARG	**Buenos Aires**	12
2	TUR	**Istanbul**	10
3	IRN	**Tehran**	9
4	EGY	**Cairo**	8
5	IDN	**Jakarta**	7
6	VEN	**Caracas**	4
7	TUR	**Ankara**	3
8	ALG	**Algiers**	3
9	SDN	**Khartoum**	3
10	IRN	**Meshed**	3

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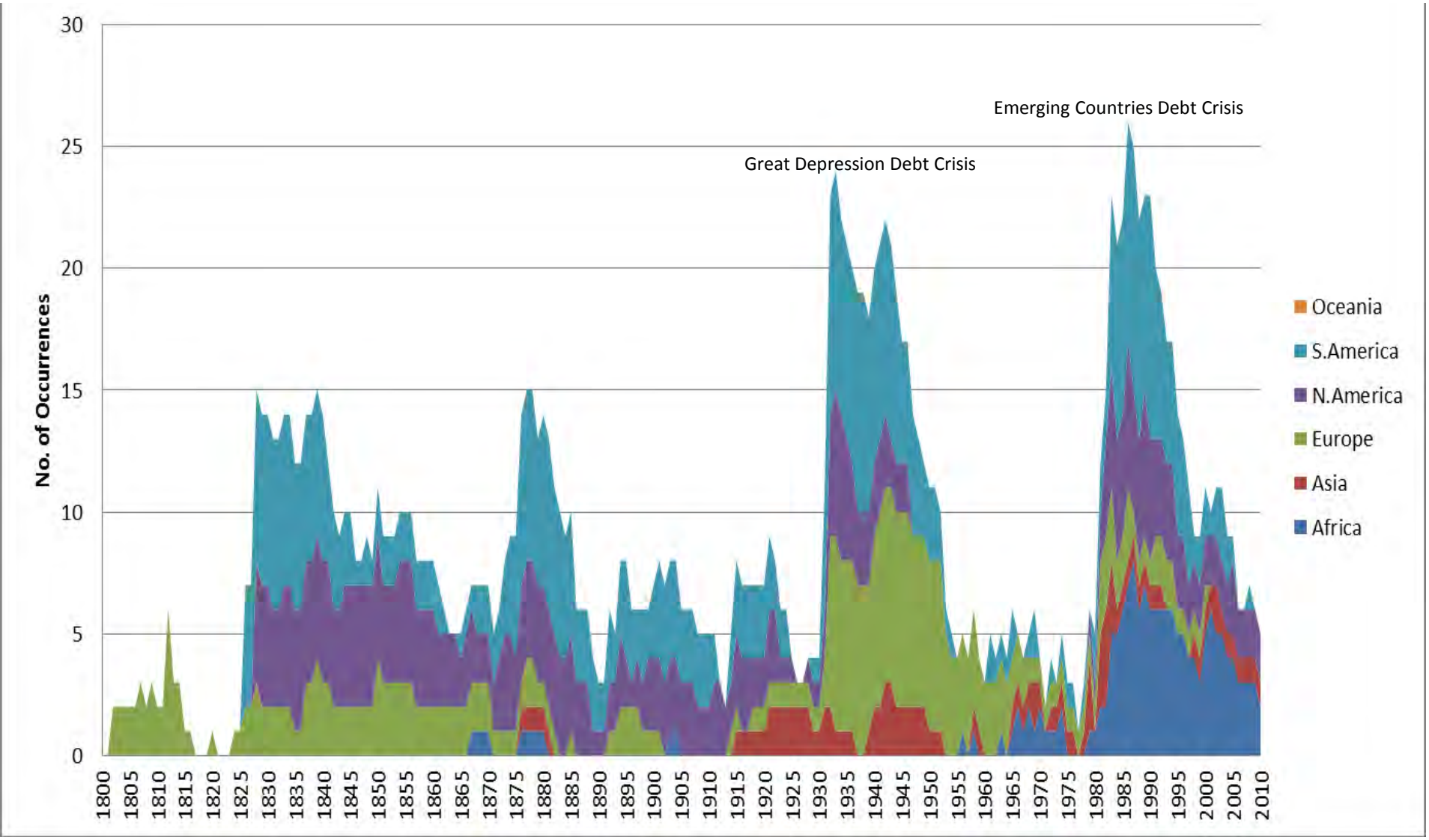
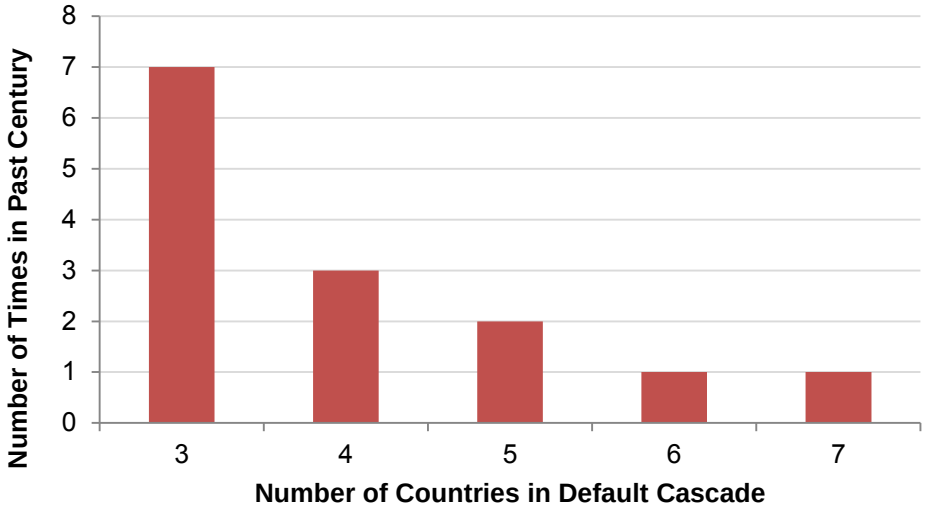
Sovereign Defaults Through History



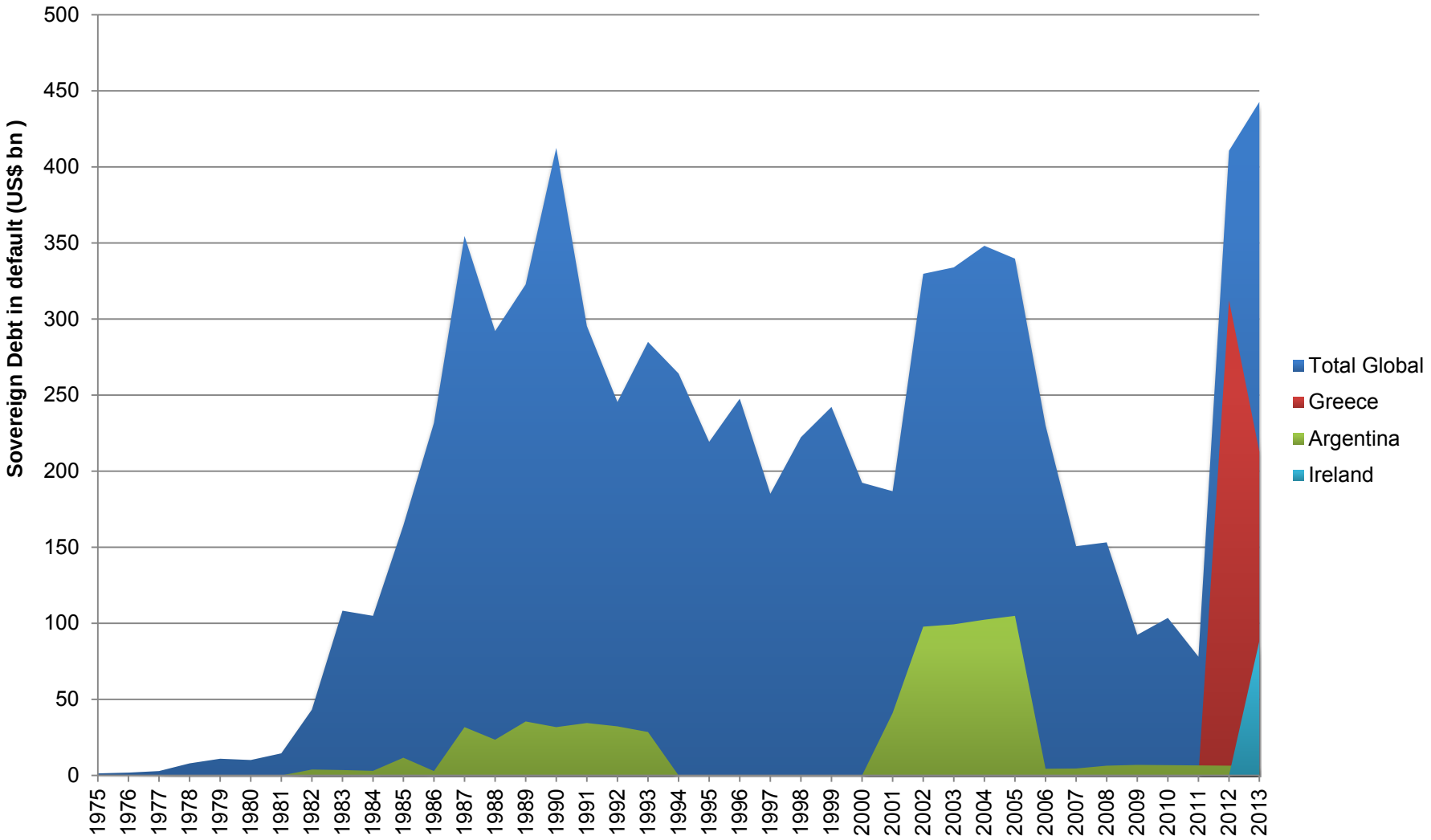
Source: Reinhart and Rogoff (2009), CRS Research

Historical Summary

- 120 sovereign defaults in past 100 years
  - More than one default a year on average
- Main threat is cascades of sovereign defaults
  - Where multiple countries default under similar conditions or from follow-on consequences
  - Size of the economy defaulting is a key component
- A cascades involving 4 or more countries has occurred on average every 14 years



Sovereign Debt in Default

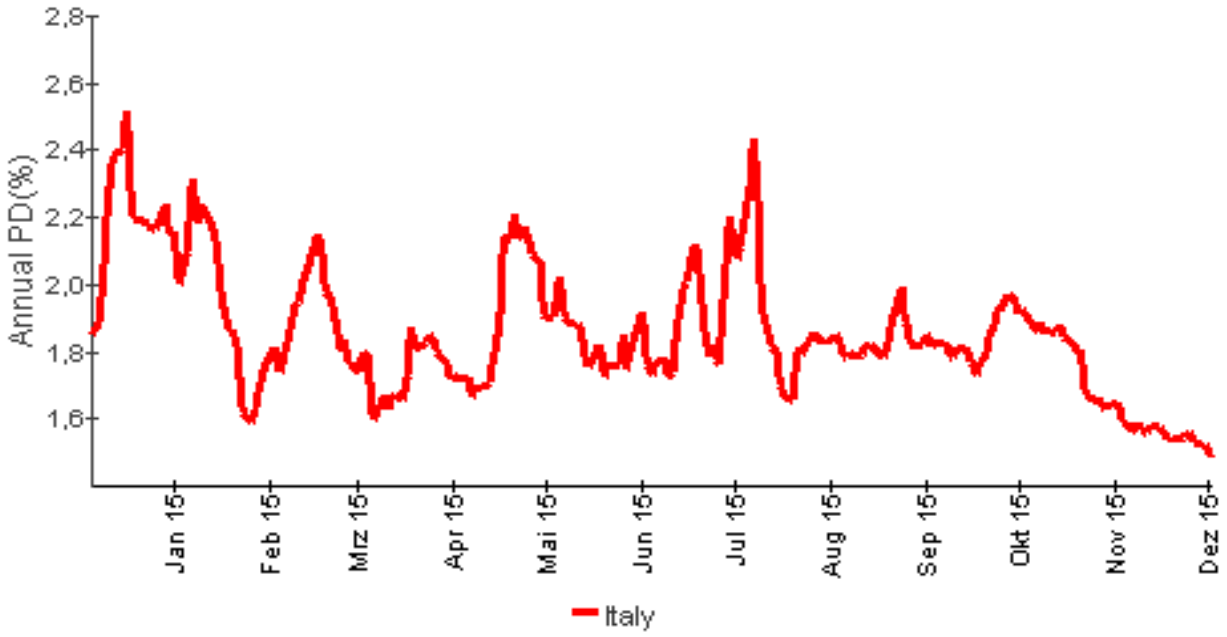


Source: Bank of Canada – CRAG, Database of Sovereign Defaults

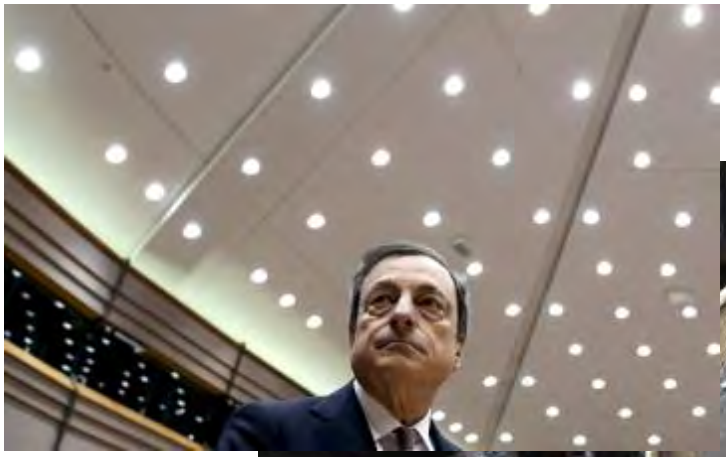
A ‘1-in-50’ Scenario?

Annual Probability of Italian Default from 5Yr CDS Spreads

Annual Probability of Default (%)



Has Eurozone Missed it's Chance for Recovery



Mario Draghi, president of the European Central Bank (ECB), he would do "whatever it takes" to save the euro

At one point the odds on a Greek euro exit rose by 2016 stood at more than one in three

Years of incoherent policy responses, combined with the acceptance of less advanced countries to the currency bloc, have meant that the group of countries the ECB has to set policy for is less unified than ever.

Phase 1: Change of Government in Italy

- Italians anti-austerity rallies turn into mass demonstrations
- Parliament revoke support of Prime Minister Renzi, Consequently, Renzi resigns and calls a general election.
- Anti-European populist party wins election
  - forms coalition with Lega Nord, Italy's most Eurosceptic party
- This government announces to no longer fulfil the Maastricht criteria but instead starts an extensive public welfare program.

Phase 2: Italy Exits Euro

- The Eurogroup undertakes negotiations with Italy about a Euro exit
- The countries agree on an Italian exit with an extensive support package for Italy
  - namely a substantial haircut, a guaranteed extensive financial aid program to prevent MSE to default in the transition phase, and 1000t of gold together with 10bn EUR and USD cash reserves
- The market value of Italian debt falls by 50% as a consequence of these measures.

Phase 3: Peripheral Countries Follow Euro Exit

- Spain finds itself in further difficulties
  - With escalating national debts it has little option but to default, exit the Eurozone, and devalue its own currency
- Portugal swiftly follows
- Ireland follows within a week
- Greece holds on for several weeks before it declares that it too, is exiting and devaluing its currency

Key input variables and their maximum shocks applied to the respective scenario variants

S/N	Input Variable	Scenario Variants			Max. Shock duration applied
		S1	S2	X1	
1	**Gross government debt**	-50%	-50%	-50%	1 Qtr
2	**Market confidence**	-50%	-50%	-50%	5 Yrs
3	**Exchange rate per Euro**	-25%	-25%	-35%	5 Yrs
4	**Long-term Government Bond Yields**	+50%	+50%	+50%	5 Yrs
5	Defaulting Countries				
	Portugal	√	√	√	
	Ireland	√	√	√	
	Italy	√	√	√	
	Greece	√	√	√	
	Spain	√	√	√	
	France		√	√	
	Germany		√	√	
	Rest of Eurozone			√	

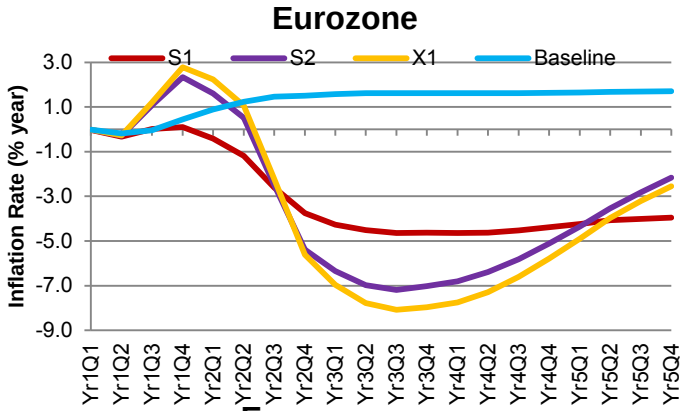
What Happens in the Scenario?

- Countries default and their new debt is re-denominated in new currencies.
  - **National exchange rates** drop by up to 40% against the euro
- Surge in inflation - new central banks respond by **raising interest rates** to 8-10%.
- **Equity prices** in affected countries fall by 30% initially
  - Stock markets fall 10%-20% in other major economies
- Banking sectors in both the exiting countries and the Eurozone suffer massive losses and tighten **credit standards** dramatically.
- **Government bond spreads** initially rise by 1200bp in Greece, 1100bp in Portugal, Italy and Spain, and by 700bp in Ireland.
- The residual **euro exchange rate** initially depreciates by around 15% against the US dollar.
- **Business** and **consumer confidence** drop sharply in the short term in reaction to heightened uncertainty and sharp declines in equity prices.

What are the Consequences?

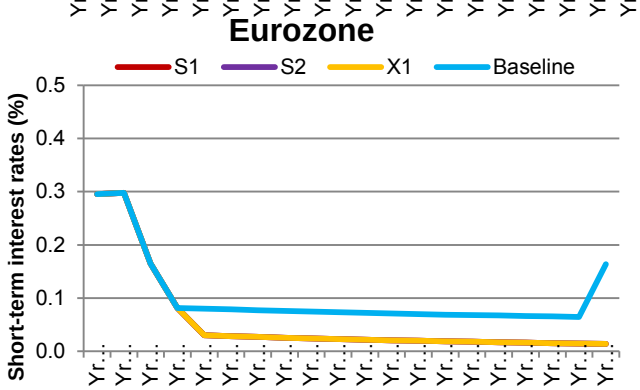
Impact on inflation rates

- The market sentiment shifts into pessimism



Effect on interest rates

- Eurozone enters a deflationary spiral following the several sovereign defaults, the short-term interest rates plummet to near zero.
- Long-term interest rates increase drastically in the Eurozone compared to the baseline projection



Effect on credit ratings

- Credit ratings of the defaulting countries suffer the largest downgrades
- However, credit ratings of non-defaulting countries are similarly affected. This is due to the transfer of the full or partial defaulted debts to other governments

Location	Minimum Credit Rating			
	Baseline	S1	S2	X1
Greece	C	N/A	N/A	N/A
Germany	AAA	BB	N/A	N/A
Eurozone	AA	BB	N/A	N/A
China	AA	AA	BBB	BBB
Japan	AA	BBB	BBB	BBB
United Kingdom	AAA	AA	BB	B
United States	AAA	AAA	AA	BB

Global Macroeconomic Impacts (Eurozone Meltdown)

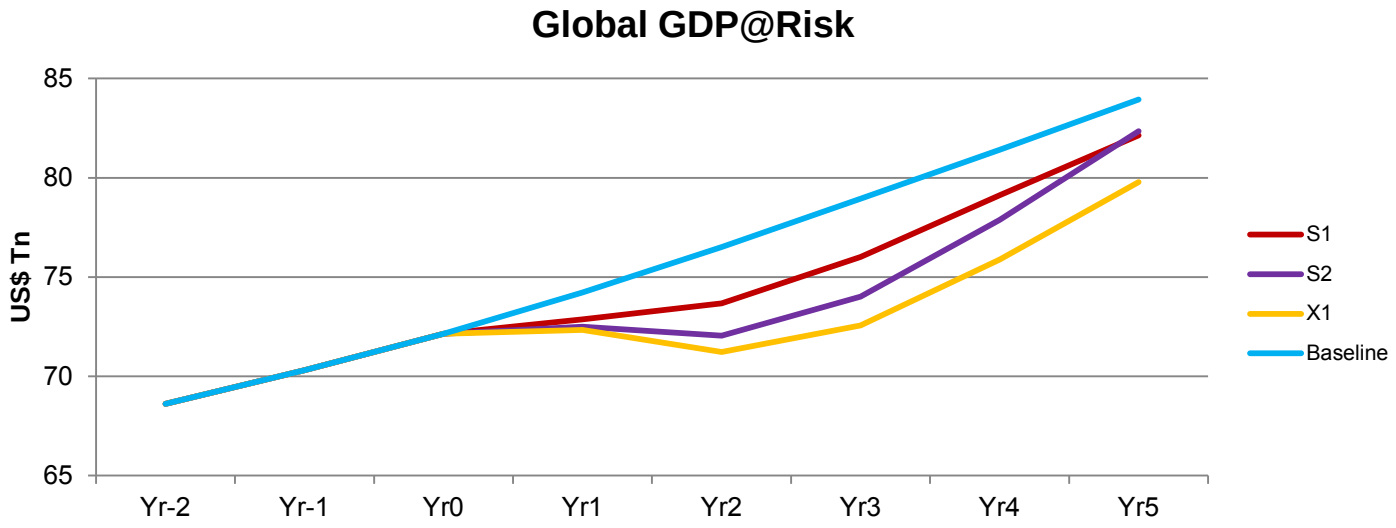
Macroeconomic losses	S1	S2	X1
Global recession severity (Qtr GDP min. growth rate)	-0.7%	-0.9%	-1.9%
Global recession duration	4 Qtrs	4 Qtrs	5 Qtrs
GDP@Risk (5 year loss of global output)	$16.8Tn (4.2%)	$18.2 Tn (4.6%)	$22.6 Tn (5.6%)

Global and Country-Specific Recession Severity

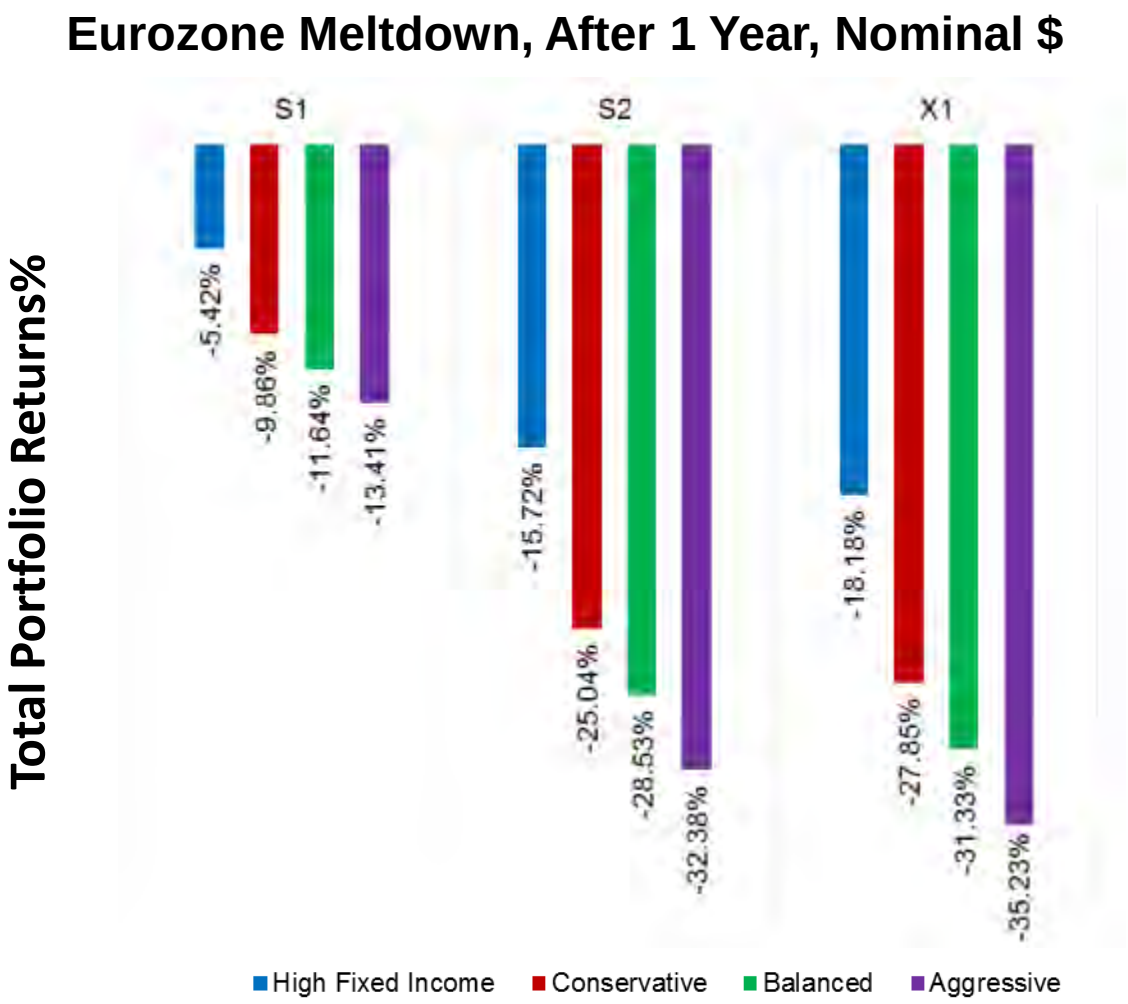
Country/ Region	Minimum GDP growth rate (% year)			
	Baseline	S1	S2	X1
Portugal	1.1	-6.1	-6.7	-6.7
Greece	1.5	-8.9	-9.3	-9.3
Spain	1.1	-6.0	-6.3	-6.3
Ireland	3.0	-3.2	-6.6	-6.6
United Kingdom	2.4	-1.3	-2.4	-2.4
Germany	1.5	-2.3	-2.8	-2.8
Eurozone	1.4	-2.8	-3.3	-3.3
Japan	0.8	-3.1	-3.2	-3.2
United States	2.9	-0.7	-0.9	-0.9
China	7.2	3.9	3.7	3.7
World	3.3	-0.2	-0.5	-0.5

Global Macroeconomic Impacts: GDP@Risk (Eurozone Meltdown)

Location	Baseline	S1		S2		X1	
	5-Year GDP (US$ Tn)	GDP @Risk (US$ Tn)	GDP @Risk (%)	GDP @Risk (US$ Tn)	GDP @Risk (%)	GDP @Risk (US$ Tn)	GDP @Risk (%)
Greece	1.3	0.16	11.6%	0.22	16.3%	0.24	17.9%
Germany	19.1	0.95	5.0%	0.78	4.1%	0.95	5.0%
Eurozone	67.1	4.17	6.2%	4.72	7.0%	4.91	7.3%
China	48.4	-0.08	-0.2%	0.03	0.1%	0.61	1.3%
Japan	29.3	0.33	1.1%	0.47	1.6%	0.65	2.2%
United Kingdom	14.0	1.39	9.9%	1.88	13.5%	2.34	16.8%
United States	88.9	2.72	3.1%	4.62	5.2%	8.62	9.7%
World	395.0	11.24	2.8%	16.26	4.1%	23.24	5.9%



Portfolio Performance Comparison



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