Week 5

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When is a Country Bankrupt?

- Debt Sustainability Analysis (DSA)
- Importance of Credit Rating Agencies (CRAs)
- Contingent Liabilities and the Sovereign
- Rules vs Discretion in the Eurozone
- The Case of Greece and Cyprus

Debt Sustainability (CH 17 GE)

Starting from the evolution of debt

$$D_{t+1} = (1+i)D_t + G_{t+1} - T_{t+1}$$

We want to express everything as a percent of GDP. Divide both sides by Y_{t+1} and define lower case letters as $d = D/Y$. Let primary surplus by $S_{t+1} = T_{t+1} - G_{t+1}$

$$\begin{aligned} d_{t+1} &= \frac{D_{t+1}}{Y_{t+1}} = \frac{(1+i)D_t + G_{t+1} - T_{t+1}}{Y_{t+1}} = \\ &= \frac{(1+i)D_t}{Y_{t+1}}\frac{Y_t}{Y_t} + \frac{G_{t+1} - T_{t+1}}{Y_{t+1}} \\ &= \frac{(1+i)D_t}{Y_t}\frac{Y_t}{Y_{t+1}} + \frac{G_{t+1} - T_{t+1}}{Y_{t+1}} \\ &= (1+i)d_t/(1+g_{t+1}+\pi_{t+1}) - s_{t+1} \end{aligned}$$

where g_{t+1} is the real growth in GDP at $(t+1)$, π is inflation and s is the primary surplus to GDP: $s_t = \frac{T_t - G_t}{Y_t}$.

Some Approximations

For small x

$$\frac{1}{1+x} \approx (1-x)$$

which means that

$$\frac{(1+i)}{(1+g+\pi)} \approx (1+i-g-\pi)$$

Debt Sustainability

In your EXCEL

$$\begin{aligned} d_{t+1} &= (1+i)d_t/(1+g_{t+1}+\pi_{t+1}) - s_{t+1} \\ &\approx [1+i-g_{t+1}-\pi_{t+1}]d_t - s_{t+1} \end{aligned}$$

There are three main components of the change in the debt to GDP ratio $\{d_{t+1} - d_t\}$

$$(i - \pi_{t+1})d_t$$

$$-g_{t+1}d_t$$

$$-s_{t+1}$$

Debt Sustainability

Debt will keep growing when (roll-over) interest rates are high, and/or when inflation, real growth and the primary surplus are low (ie primary deficits high)

$$(i - \pi_{t+1})d_t$$

$$-g_{t+1}d_t$$

$$-s_{t+1}$$

One definition of DS

One definition of debt sustainability is to keep debt stable. That is $\{d_{t+1} - d_t\}$=0. This happens when

$$s = (i - \pi_{t+1} - g_{t+1})d_t$$

So as long as there is growth and inflation, debt can be sustainable (not growing) even with primary budget deficits ($s < 0$).
Equivalently, if $(i - \pi_{t+1} - g_{t+1}) > 0$, then must have primary surplus.
But if $(i - \pi_{t+1} - g_{t+1}) < 0$, then can run primary deficit.

Application: UK

Moody's report on UK DSA (October 2021):
Factors that could lead to a downgrade:
The UK's rating would likely come under downward pressure if we were to conclude that the UK's fiscal strength was likely to deteriorate due to **growth pressures**, higher-than-expected **deficits**, or **higher funding costs**. A further **structural weakening** in economic fundamentals would also undermine the UK's credit profile. While it is unlikely at this stage, indications that sterling's status as a **reserve currency** was in question would also exert downward pressure on the outlook and eventually the **rating**.

Application: UK

Use DSA Slides_deficits to do calculation for most recent UK data

Starting debt December 2024	97.2
Components of change in B/Y	
Real interest	1.94
Growth	0.0
Primary deficit	1.8

Total change in debt equals 1.94+0.0+1.8=3.74
Therefore
Year end debt (% of GDP) 97.20+3.74=100.94
Debt Sustainability Analysis deals with different scenarios that can affect this calculation

Some complications in debt arithmetic

- Some issues have been hidden under the carpet in debt arithmetic and you need to take them into account if analyzing the numbers for a country
- Duration (debt maturity) matters; it matters whether the country needs to refinance a 3 month debt versus a ten year debt obligation. Liquidity key to bankruptcy (applies for corporates/banks too).
- Composition of debt between foreign and domestic creditors matters. It is harder to refinance external debt (eg in dollars).
- Law under which bond was issues matters (eg English law vs local law)

What happens when debt not sustainable?

- Address the following questions in what follows:
- Further issues buried within the arithmetic of debt accounting: how do sovereign debt interest rates change once markets lose confidence in a country's debt sustainability?
- What does it mean for other interest rates, asset prices and exchange rates?
- What are the signals from CRAs (Credit Rating Agencies)?
- Bank and sovereign diabolical loop

What happens to interest rates, stock prices and exchange rates?

- Sovereign debt interest rates increase
- RFS (2019) paper on costs of sovereign default, evidence from the stock market.
- Negative reputation spillover to firms associated with government.

Identification

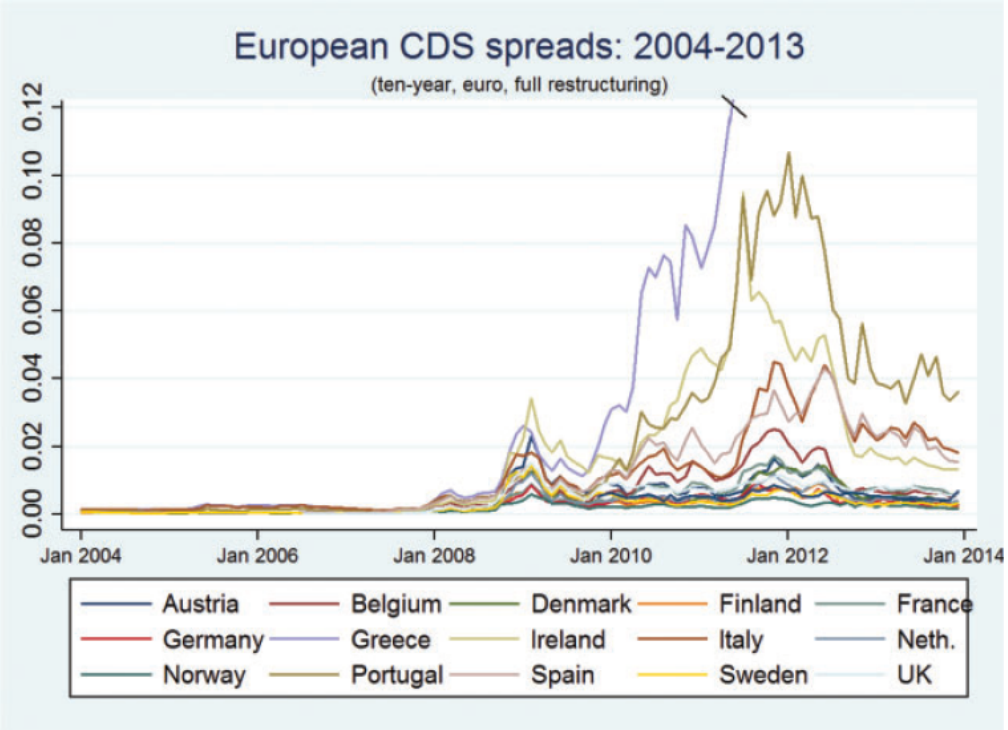


Figure 1
European CDS spreads
The figure shows ten-year eurozone sovereign CDS spreads on a monthly basis from 2004 to 2013. Data are euro-denominated and based on contracts with the Full Restructuring clause. Data are from Markit. Greek sovereign CDS data ends in February 2012 and is capped at 0.13.

What happens to individual firms?

- Create firm vulnerability variable to government and banking system based on exposure to government contracts and bank relationships
- Interaction coefficient (Vulnerability times change in CDS sovereign spread) on individual stock returns
- Negative coefficient indicating 1.2% reduction in returns

What are the signals from CRAs?

- CRAs: credit rating agencies
- Moody's, S&P and Fitch control 95% of market for ratings.
- Why should domestic corporates care about country's rating?
- Drop in ratings very fast and syncronized.
- Around ten grades/categories above investment and ten in non-investment grade
- Investment vs non-investment grade (junk) bonds: why the drop in category is important
- Rating changes vs Outlook changes

Information Leakage

- Why did European Securities and Markets Authority (ESMA) force sovereign debt rating announcements to be scheduled on Fridays after the close of business in local trading, unless new important information arrives?
- Possibility of information leakage
- Drops in market before official announcement, more pronounced in countries with lower institutional quality
- US equivalent; trading by members of Congress/Fed officials
- Leads to further volatility in asset markets that can translate into political uncertainty that further dampens economic activity

Sovereign Debt Bank Diabolical Loop

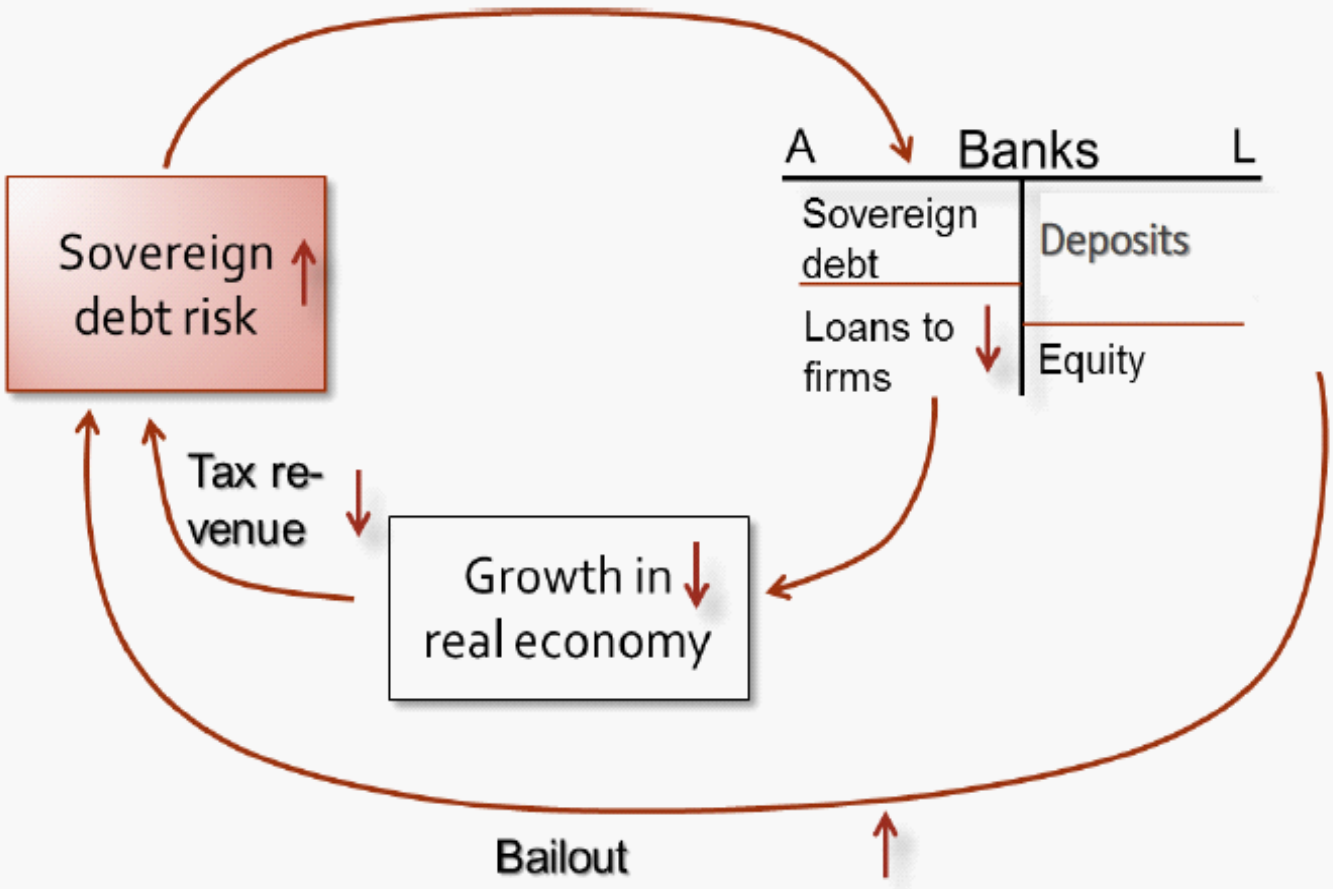


FIGURE 1. "BAILOUT AND REAL-ECONOMY DIABOLIC LOOP. SOURCE: BRUNNERMEIER ET AL. (2011).

Sovereign Debt Bank Diabolical Loop

- Bank loop arises because domestic banks hold domestic sovereign debt: home bias
- Why does that arise empirically?
- Moral suasion vs carry trade+regulatory arbitrage vs political economy considerations vs bailout expectations
- Hard to tell apart empirically

Capital and Liquidity Requirements

- Start with a bank T account (balance sheet) where the total size is 100, funded by 90 deposits and 10 equity and allocated to 10 sovereign debt and 90 long term loans
- Plain leverage capital requirement: equity greater than 9 percent of balance sheet size
- $10/100 > 9$ percent so all fine
- But if 10 goes down in value? How can banking sector recapitalize?
- Same applies for liquidity coverage ratios, risk-weighted assets.
- Basel notebook

Bailin vs Bailout

- Banking crises correlated with currency crises
- When banking system has little equity and needs to recapitalize, three broad options arise
- Option 1: Go to the private sector. Private sector unwilling to provide equity due to debt overhang problem
- Option 2: Go to the state. Government provides equity and might keep management or not depending on moral hazard and situation-specific considerations. This is a bailout because equity is provided from outside the banking system.
- Option 3: Go to creditors within the bank (bailin). Transform uninsured depositors to equity holders.

International Monetary Fund (IMF)

- Options 1-3 might not be available for a sovereign. The private sector refuses to participate, the state cannot issue new debt at reasonable interest rates (rule of thumb is seven percent) so that sovereign debt/GDP does not exponentially increase, and there might be no uninsured depositors left to bailin (and that is politically unpopular)
- So only option if capital markets will not provide answer is to call IMF (note that IMF is not causing the recession, IMF is called in to fix the recession but the medicine might involve making the recession worse)
- IMF will typically do DSA and recommend policies so that debt from IMF at below market rates can be repaid (ie sovereign debt becomes sustainable)

IMF New Policy on Debt Sustainability

- Why are IMF policies very important from the point of view of the private sector?
- What does IMF conditionality mean?
- Debt Sustainability Important
- How is this determined? Example from UK
- Might need to write off public debt (creditors accept lower payment for outstanding debt, debt restructuring, face value reductions)

Debt Restructuring

- Imagine 180% debt to GDP. Cannot pay.
- Convince holders of 50% of that 180% to accept 20% payment.
- Then, holders of that debt are worse off but state is better off and moves to 150% debt to GDP which might be sustainable
- Complications: holders of debt might be your local banks and that wipes them out and no lending in economy and big recession arises. Or need much higher risk premium to issue any new debt even after many years pass.

Example

- Imagine sovereign debt has zero risk weight in bank balance sheets (true in reality)
- IMF 2023 working paper works out what happens for different debt restructuring amounts
- Regulatory capital to risk weighted asset (CAR) ratio is 12 percent
- Higher haircut makes loans less valuable reflecting more risky conditions; this affects CAR calculation

Example

Table 1 examples (page 8):

Haircut		0	percent
Loan impairement		0	percent
Risk-weighted Assets		Liab. and Equity	
Gov. bonds	2,000	9,000	Liabilities
Loans	8,000	1,000	Equity
Memo:	CAR	12.5%	
	Shortfall	0	

Haircut		10	percent
Loan impairement		1	percent
Risk-weighted Assets		Liab. and Equity	
Gov. bonds	1800	9000	Liabilities
Loans	7920	720	Equity
Memo:	CAR	9.1%	
	Shortfall	230	

Example

Table 1 examples (page 8):
With 10% haircut, save 200 but if loan value falls to 7920, even with no depositor flight, 720=1800+7920-9000=720, then CAR=720/7920=9.1%. To go back to 12%, need to have equity equal to 0.12*7920=950, thus need extra 950-720=230 equity for the banking system! In the paper they assume that everything below 400 is "small" and can be found by the private sector and only large amounts above 400 require extra state funds.

Example

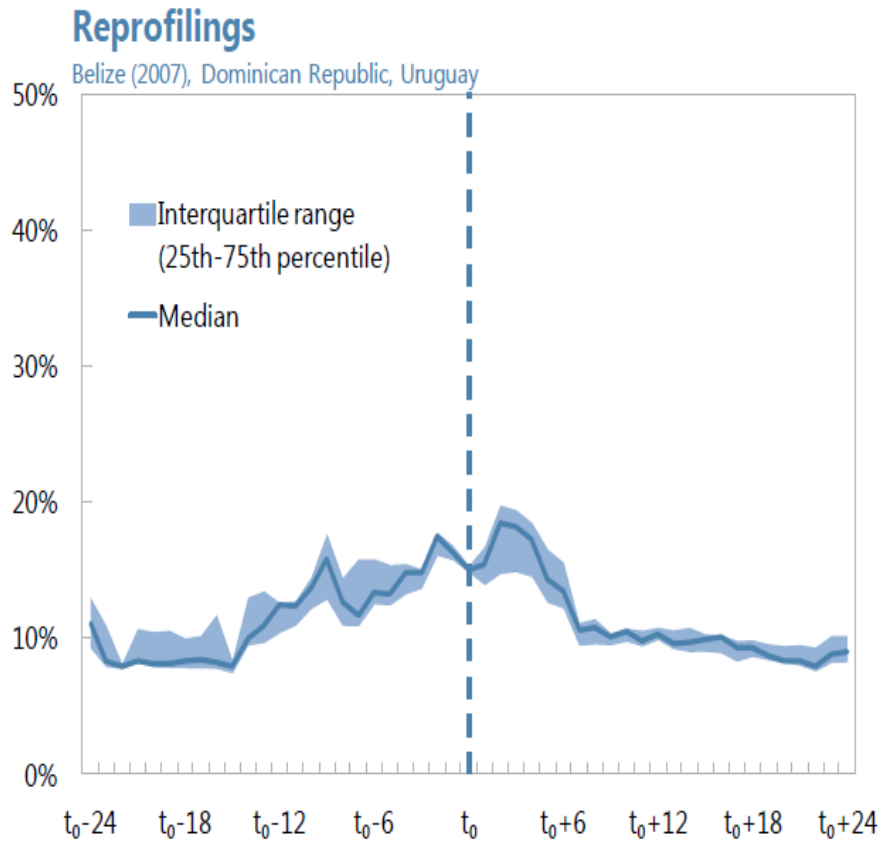
Summary Calculations

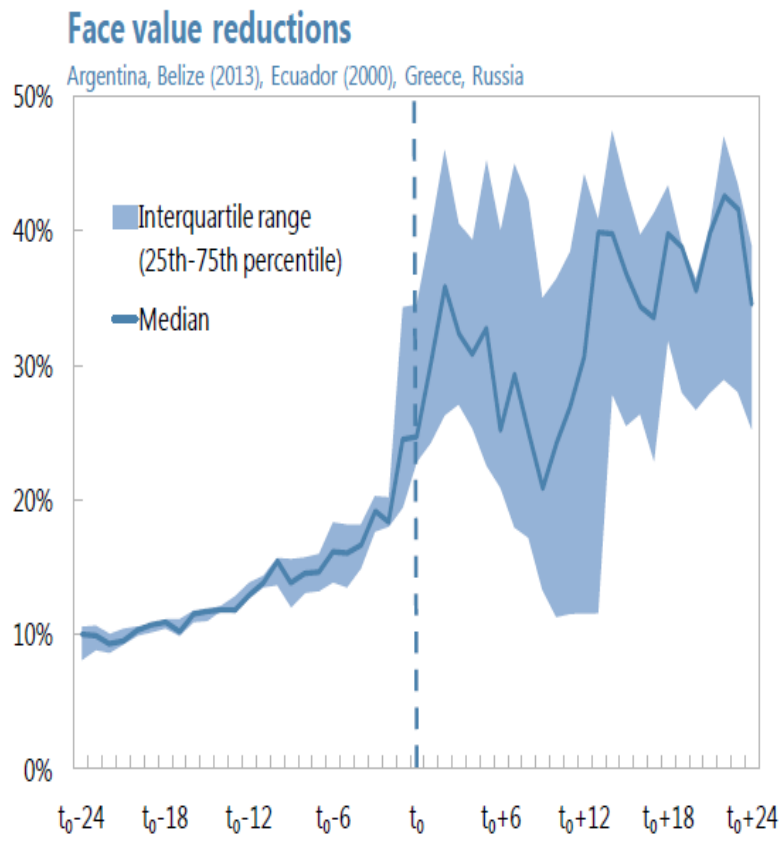
Haircut (%)	Capital shortfall (below 12% CAR)	Public recap. cost (Shortfall above $400)	Gross debt relief (Haircut * Gov bonds)	Net debt relief (GDR - Public recap. cost)
0	0.0	0.0	0	0.0
10	230.4	0.0	200	200.0
20	500.8	100.8	400	299.2
30	841.6	441.6	600	158.4
40	1252.8	852.8	800	-52.8
50	1734.4	1334.4	1000	-334.4
60	2216.0	1816.0	1200	-616.0

Reprofiling vs face value reductions: who pays?

To avoid debt restructuring complications, new policy introduced by IMF: reprofiling.

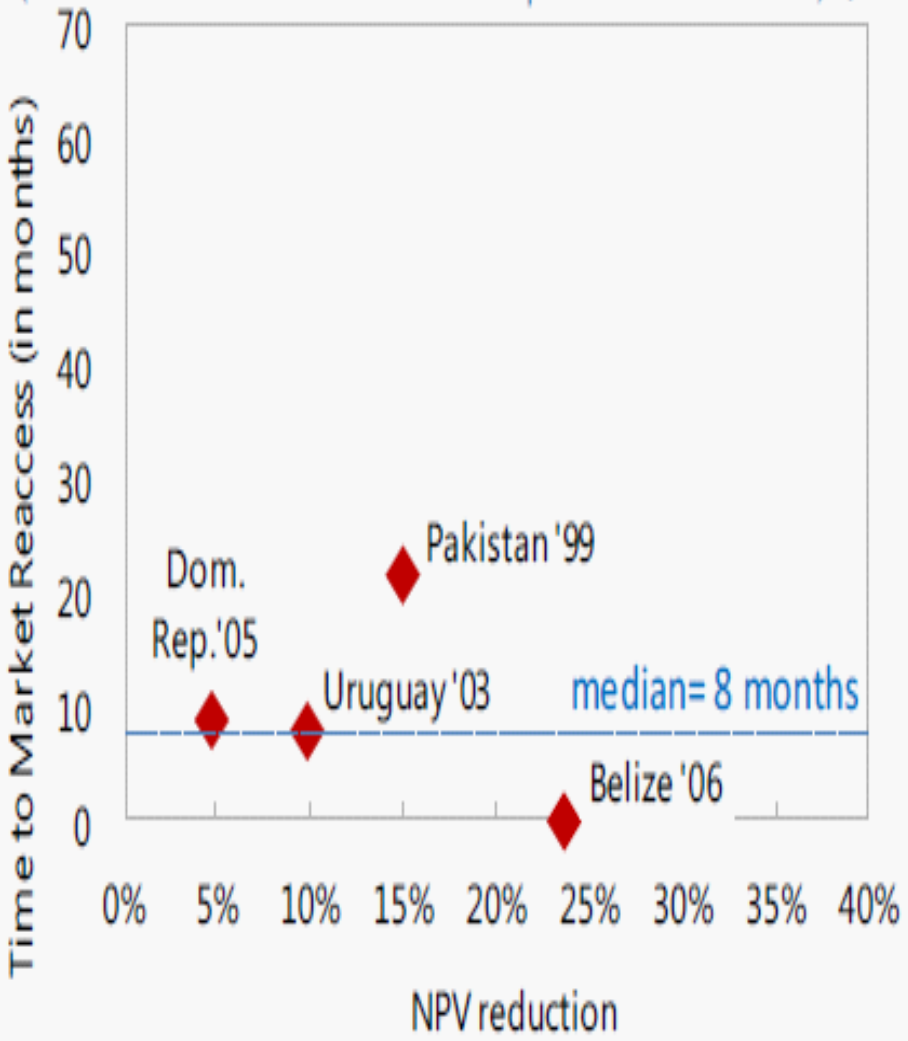
Figure 1. Median Bond Yields Before and After Restructuring Announcement

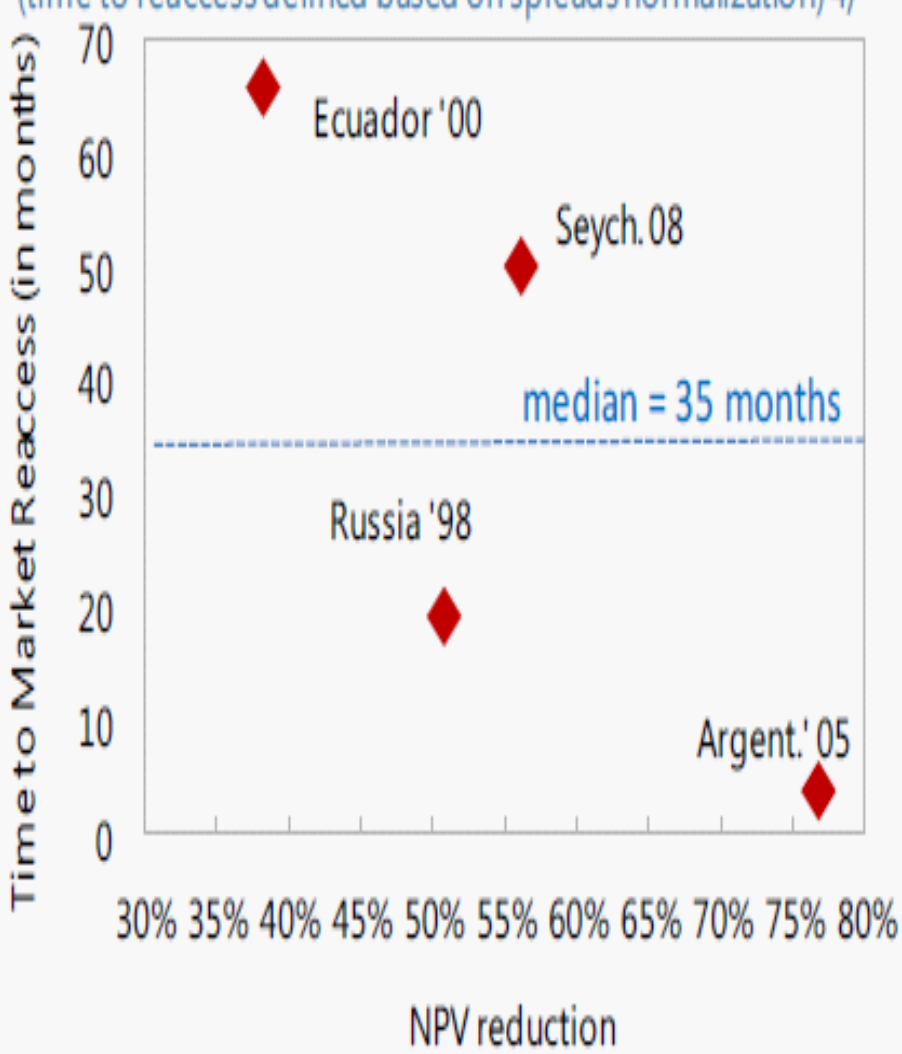




Sources: Datastream; Fund staff calculations.

Time to Reassess Markets





Recent Debt Haircuts: Greece

Greek Debt Restructuring by Zettelmeyer, Trebesch and Gulati (EP, 2013)
Near elimination of Sovereign bonds held by private investors, more than 100% of GDP!
Defiant statements by politicians that sovereign debt restructuring within Eurozone was "unthinkable"
Higher losses on holders of bonds maturing in one year (75%) and lower losses (50%) on bonds maturing after 2025.
Free rider problem due to "voluntary" participation of private sector: regulatory and peer pressure

Political summit

Importance of political events

October 26, 2011, Euro Summit statement invited: "Greece, private investors and all parties concerned to develop a voluntary bond exchange with a nominal discount of 50% on notional Greek debt held by private investors' and pledged to contribute to PSI package up to 30 billion euros ... to help with the recapitalization of Greek banks"

Table 2. Composition and estimated Greek bond holdings of creditor committee

Allianz (Germany)	1.3	Ageas (Belgium)	1.2	MACSF (France)	na
Alpha Eurobank (Greece)	3.7	Bank of Cyprus	1.8	Marathon (USA)	na
Axa (France)	1.9	Bayern LB (Germany)	na	Marfin (Greece)	2.3
BNP Paribas (France)	5.0	BBVA (Spain)	na	Metlife (USA)	na
CNP Assurances (France)	2.0	BPCE (France)	1.2	Piraeus Bank (Greece)	9.4
Commerzbank (Germany)	2.9	Credit Agricole (France)	0.6	RBS (UK)	1.1
Deutsche Bank (Germany)	1.6	DekaBank (Germany)	na	Société Générale (France)	2.9
Greylock Capital (USA)	na	Dexia (Belg/Lux/Fra)	3.5	Unicredit (Italy)	0.9
Intesa San Paolo (Italy)	0.8	Emporiki (Greece)	na		
Landesbank BW (Germany)	1.4	Generali (Italy)	3.0		

Greek Haircut

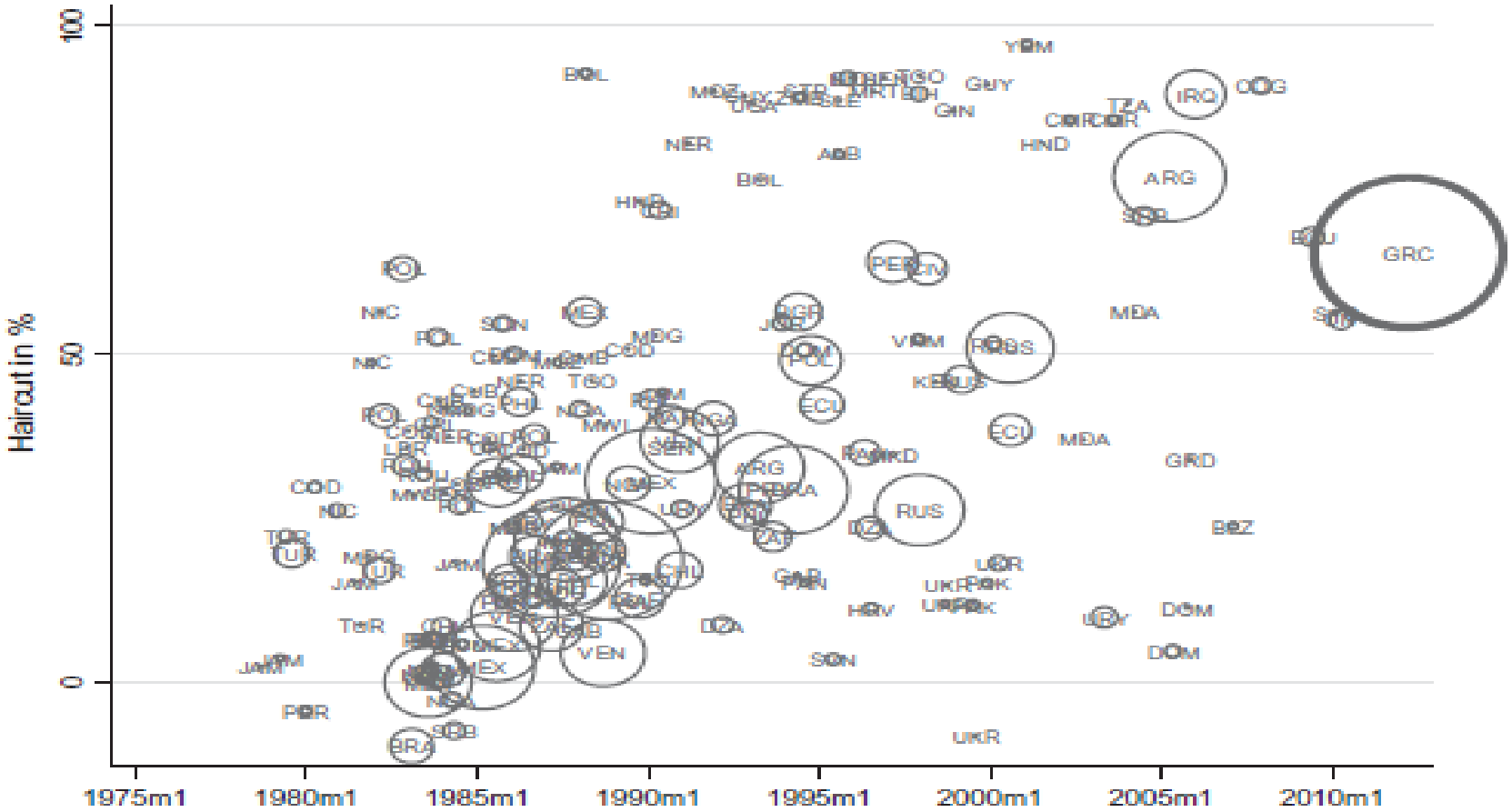


Figure 4. Haircut and size of the Greek debt exchange in historical perspective

Note: The figure plots the size of the present value haircut, using the methodology described in the text, for Greece (2012) and 180 restructuring cases from 1975 until 2010. The circle sizes represent the volume of debt restructured in real US$, deflated to 1980 (excluding holdouts). For Greece, we use the haircut estimate of 64.6% (column 1 in Table 3) and the exchange volume of US$ 199.2 billion (excluding holdouts).

Sources: Cruces and Trebesch (2013) and authors' calculations.

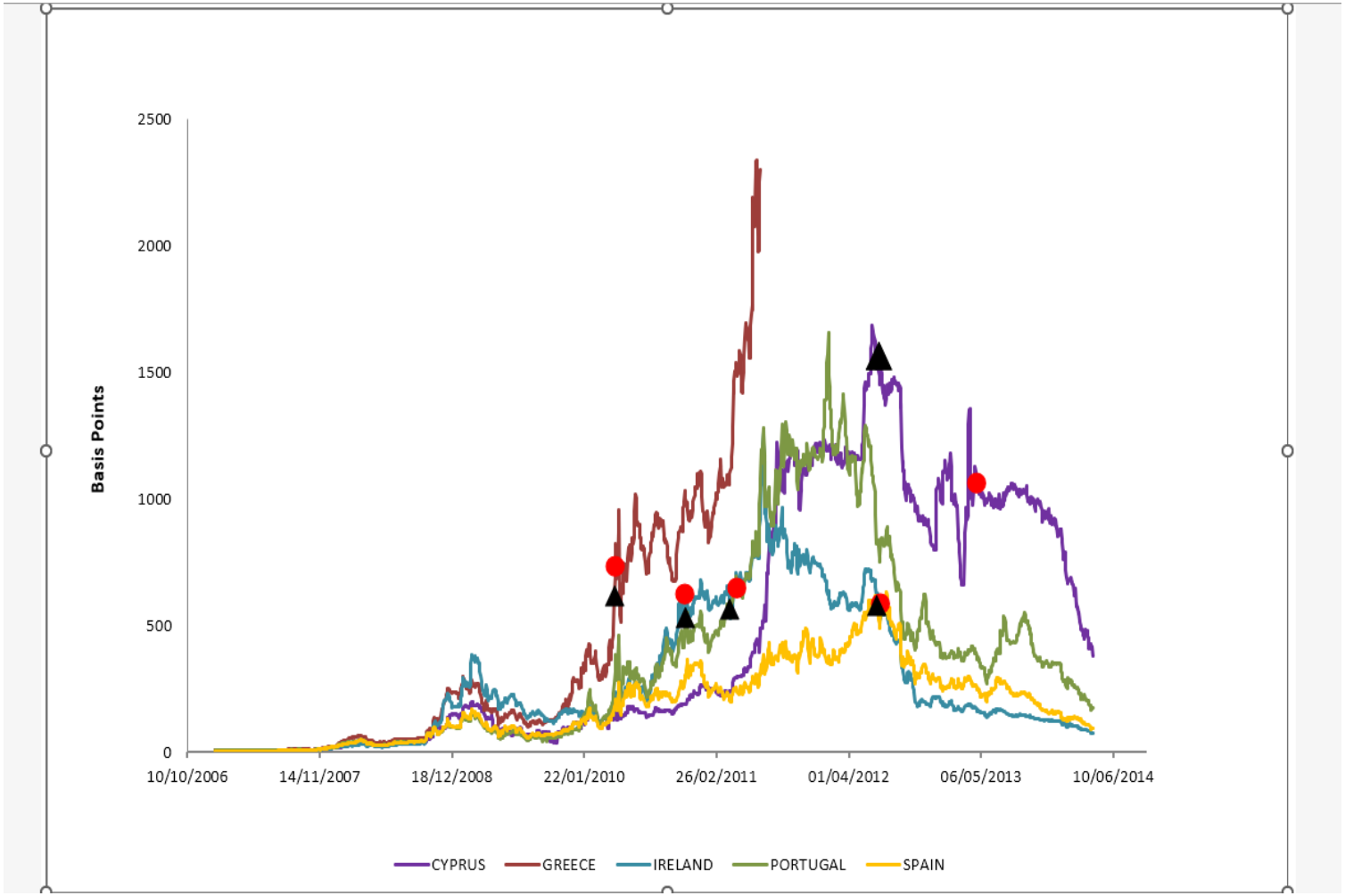
Cyprus; Who Pays?

- Note holdings of Greek Government debt by Laiki and Bank of Cyprus above
- Cyprus, March 2013
- Unsustainable debt (90 percent of GDP) with expected bailout of 60% of GDP
- IMF wants sustainable debt, reprofiling not allowed
- Similar situation in Lebanon 2021; plus other countries that have increased debt to deal with COVID
- Bailin instead of bailout
- Bank creditors (unsecured depositors) pay

Cyprus CDS

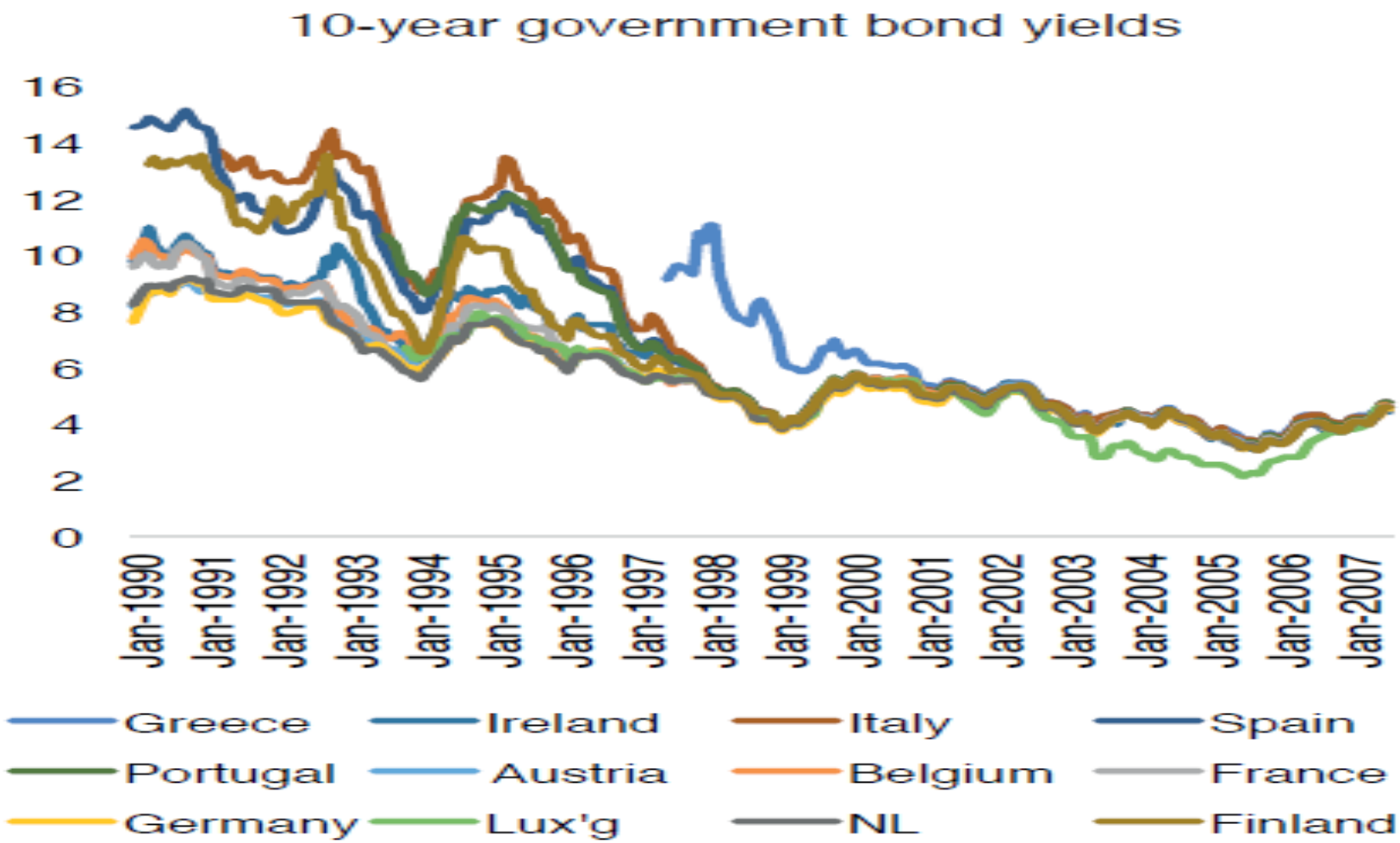
- Credit default swap spreads (5 years), Data from Markit; Michaelides (2014).
- Date assistance sought (triangles), date assistance agreed (circles)

Cyprus CDS


Basis Points
2500
2000
1500
1000
500
0
10/10/2006
14/11/2007
18/12/2008
22/01/2010
26/02/2011
01/04/2012
06/05/2013
10/06/2014
CYPRUS
GREECE
IRELAND
PORTUGAL
SPAIN

Case 2: Bond Yields in Eurozone (CEPR 2015 Narrative)

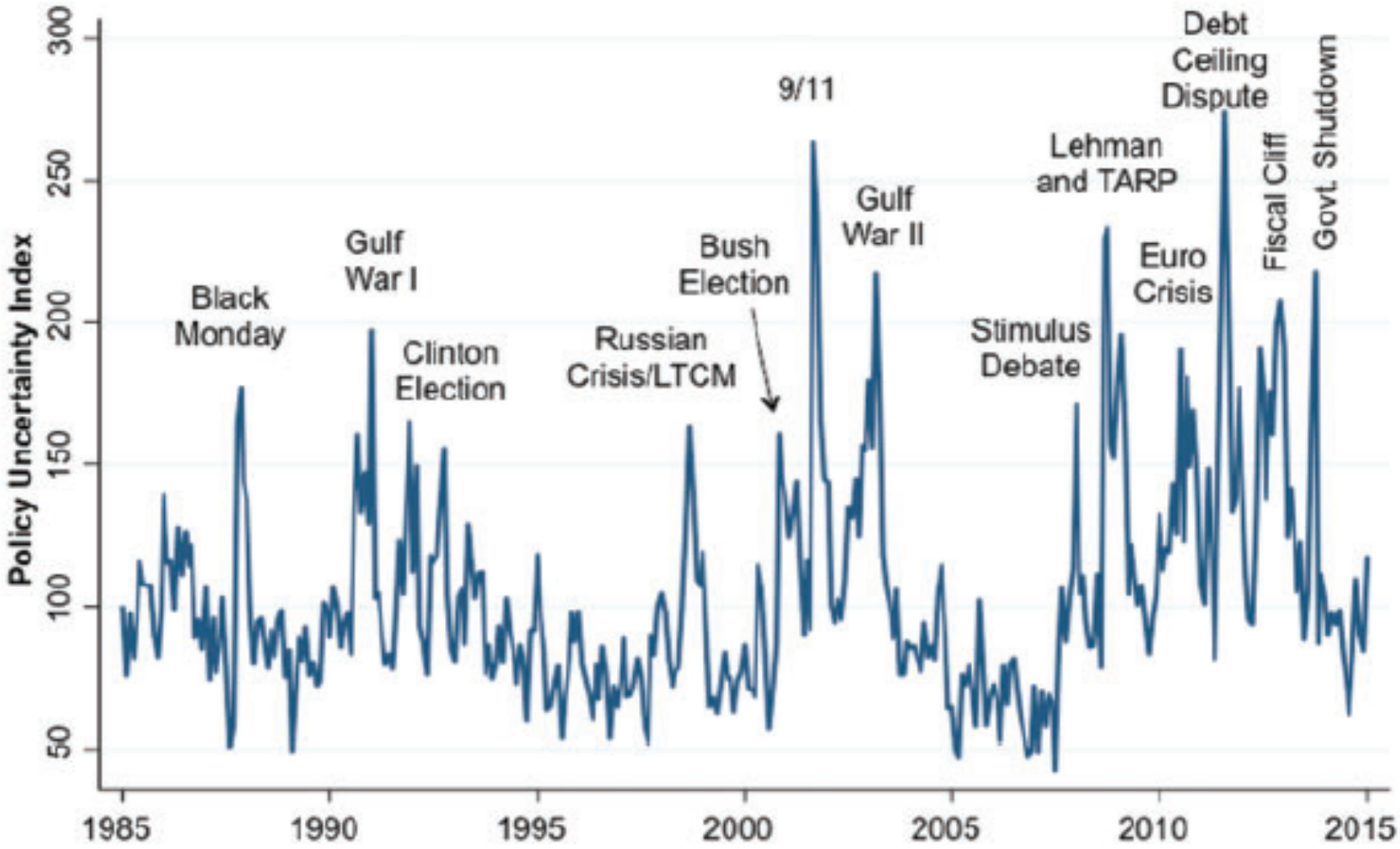
Figure I Interest rates fell and risk premiums disappeared pre-Crisis



Case 3: Economic Policy Uncertainty

How can we measure economic policy uncertainty?
Recent QJE (2016) paper uses textual analysis based on analyzing newspaper articles
"We search the digital archives of each paper from January 1985 to obtain a monthly count of articles that contain the following trio of terms: “uncertainty” or “uncertain”; “economic” or “economy”; and one of the following policy terms: “Congress,” “deficit,” “Federal Reserve,” “legislation,”, “regulation,” or “White House” (including variants like “uncertainties,” “regulatory,” or “the Fed”). In other words, to meet our criteria, an article must contain terms in all three categories pertaining to uncertainty, the economy, and policy.” (p. 1599).

Economic Policy Uncertainty



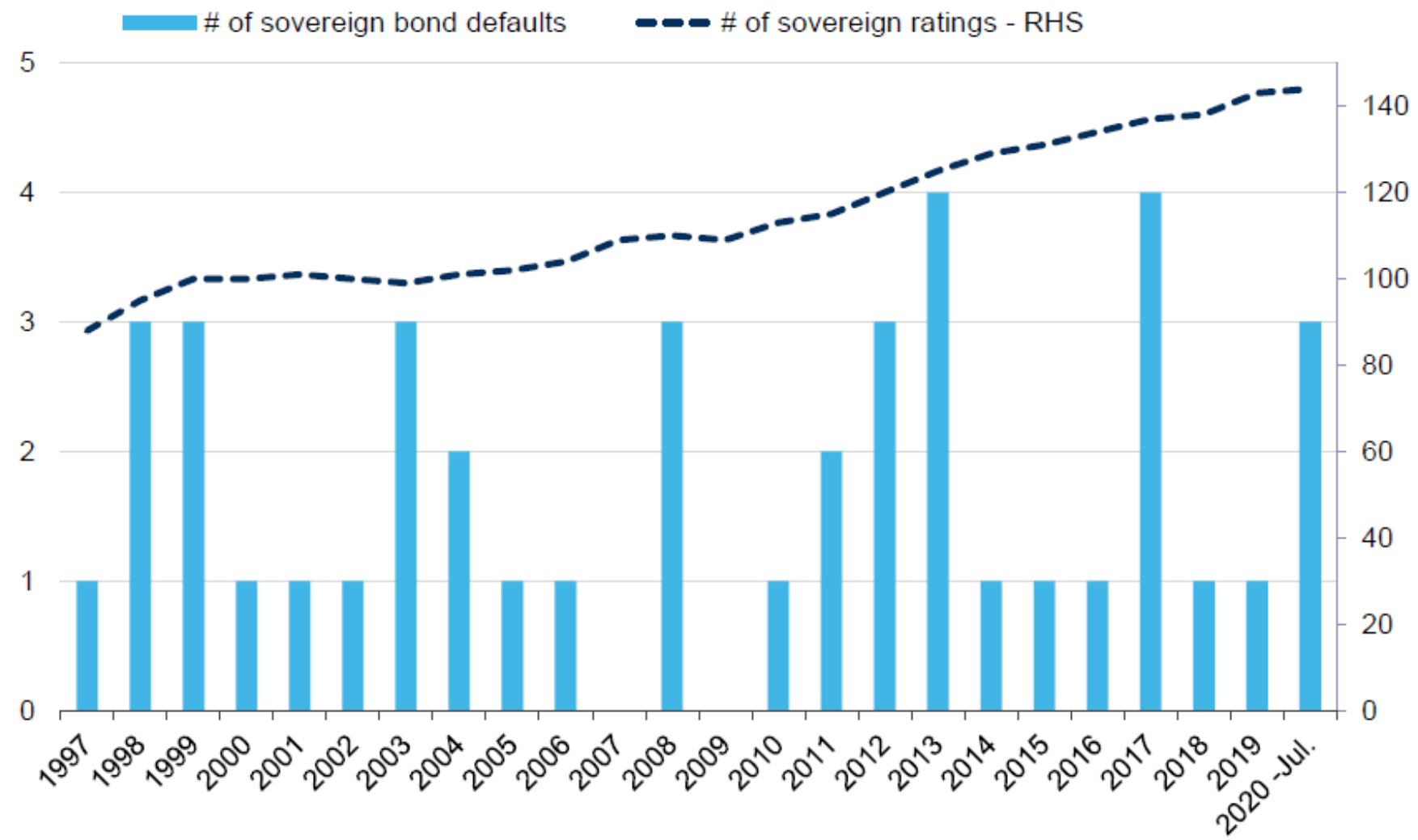
Index reflects scaled monthly counts of articles containing 'uncertain' or 'uncertainty', 'economic' or 'economy', and one or more policy relevant terms: 'regulation', 'federal reserve', 'deficit', 'congress', 'legislation', or 'white house'. The series is normalized to mean 100 from 1985-2009 and based on queries run on 2 February, 2015 for the USA Today, Miami Herald, Chicago Tribune,

Moody's Research: Causes of Sovereign Defaults

- What are the types of defaults?
- Environmental; if you are an island in the Carribean and get hit by a natural disaster
- Banking through contingent liabilities
- Typical Latin American crisis: spend beyond your means
- Low growth

Moody's Research: Causes of Sovereign Defaults

Rated and unrated sovereign bond defaults, 1997 – July 2020



Moody's Research: Causes of Sovereign Defaults

- Chronic economic stagnation (g): Russia (1998), Argentina (2001), Venezuela (2017)
- Institutional: civil conflict, weak management of contingent liabilities: Argentina (2019), Lebanon (2020)
- High debt burden: Lebanon (2020)
- Typical Latin American crisis: spend beyond your means, Greece (2012), Cyprus (2013)
- Banking crises, Cyprus (2013)

Common Signals for trouble

- "Our debt is very low at 30 percent of GDP that we will not default"
- "We will never default on our sovereign debt"
- "Credit rating agencies are politically motivated"
- "Credit rating agencies are behind the curve"
- "Credit rating agencies are run by foreigners"

Conclusion

Signals to look for to predict sovereign debt crises
Options when bankrupt: who pays?
Implications for asset prices (interest rates, stock market, exchange rates)