

What is the risk of sovereign debt default?

Fiscal space, CDS, and market pricing of risk

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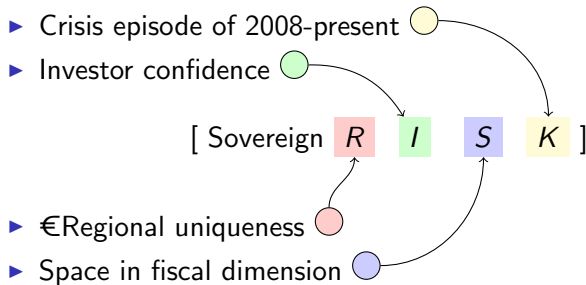
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THE GREEK JOB

In a nutshell

We offer empirical linkages:



Latest Stats: Reuters

News Events: New York Times

Greece in 2011

- ▶ .347 €Trillions = sovereign bond outstanding
- ▶ .055 €Trillions = sovereign CDS outstanding, **gross**
- ▶ .004 €Trillions = sovereign CDS outstanding, net

Credit Default Swap (CDS) is an insurance policy.
(a fee/spread for default protection; naked trading is possible)

Outstanding CDS globally is currently around 20 trillion USD.
(negligible in the early 2000; peaked in 2007 at 60 trillion USD)

2008 Crisis, Fiscal Insolvency, and More

- ▶ subprime fallout and global recession
 - ▶ financial sector bailouts
 - ▶ prospective fiscal expenditures up, revenues down
 - ▶ harder it in Euro area
 - ▶ Greece, Ireland, Italy, Portugal, Spain (**SWEAP**)
 - ▶ heterogeneity in market responses to fiscal fragility
 - ▶ uncertainty on rescue packages
-
- ▶ gross asset holdings with the US
 - ▶ capital flow with emerging markets
 - ▶ world trade financed by European banks

Questions

- ▶ Is market pricing of sovereign default risk **systematically linked** to fiscal solvency?
- ▶ Is Eurozone being treated **tougher**?
ESP, GRC, IRL, ITA, PRT?

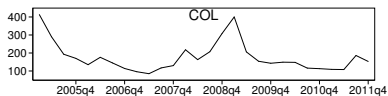
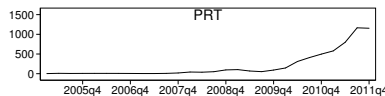
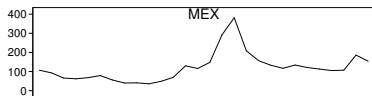
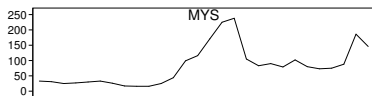
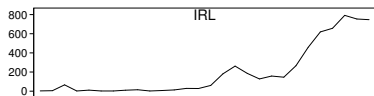
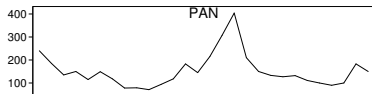
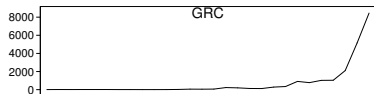
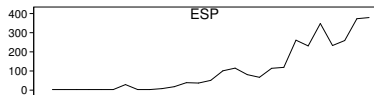
Credit Default Swap

A good proxy for market assessment of default risk

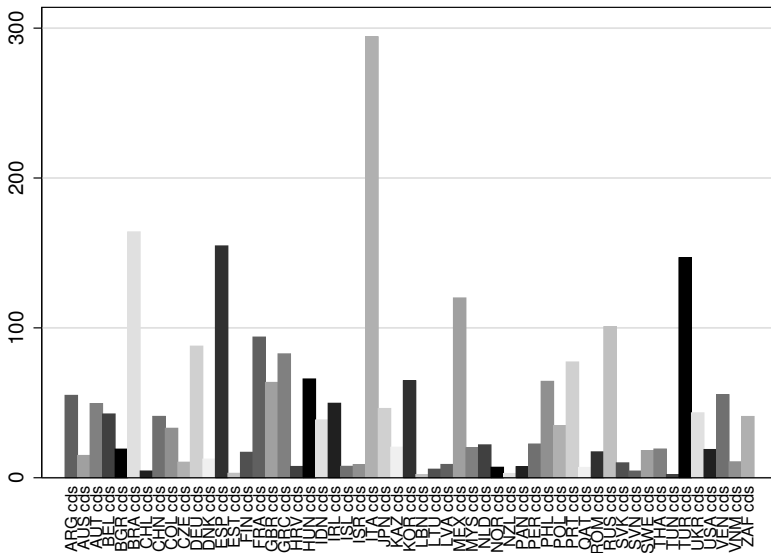
- ▶ CDS price
≡ quarterly payment for a contingent claim in credit event
- ▶ 1 basis point = \$1000 to insure against \$10 million debt
- ▶ Credit events: default, restructuring, haircut
- ▶ Commercial banks are the main users (CVA desks)
- ▶ Mainly **OTC** derivative markets
- ▶ 5-year tenor is the most liquid

▶ more on CDS markets

Sovereign CDS Spreads (basis point)



Notional Gross Sovereign CDS Positions (billion USD)



Related Studies

- ▶ Acharya et al. (NBER, 2011)
Bank bailouts and sovereign credit risk in CDS
- ▶ Palladini and Portes (NBER, 2011)
Sovereign CDS and Bond Pricing Dynamics in the Euro-area
- ▶ Pan and Singleton (JF, 2008; AEJ-Macro, 2011)
How sovereign is sovereign credit risk in CDS

▶ more on related studies

In 1991

[on derivatives and CDS] ‘‘Off-balance sheet activities have a role, but they must be managed and controlled carefully, and they must be understood by top management, as well as by traders and rocket scientists. I hope this sounds like a warning because it is!’’

E.G. Corrigan, Federal Reserve NY President (85-93)

Methodology

- ? Can the sovereign spread be pinned down by some dynamics, cyclical, amenable to macroeconomic and market fluctuation ...
- ? Or is there a far-reaching structural implication due to expected fundamental and investor sentiment ...
 - ▶ Market assessment of fiscal solvency⇒ default risk in CDS
 - ▶ Macro model of sovereign CDS pricing
 - ▶ Out of sample prediction error (market mispricing)
 - ▶ Descriptive comparison between countries

Data

- ▶ 50 countries, 2005-10, balanced panels
- ▶ CDS prices from CMA Datavision
- ▶ Macro controls for local and global factors
- ▶ Fiscal Space

Fiscal Space

- ▶ Fiscal capacity ($\frac{1}{[\cdot]}$ = Fiscal burden)
- ▶ Stock measure: $PublicDebt \div TaxBase \Rightarrow [-]$
- ▶ Flow measure: $+FiscalBal \div TaxBase \Rightarrow [+]$
- ▶ $TaxBase \equiv avg5yr.(Tax) \div (GDP)$

Tax Base and Income Inequality in 50 Countries

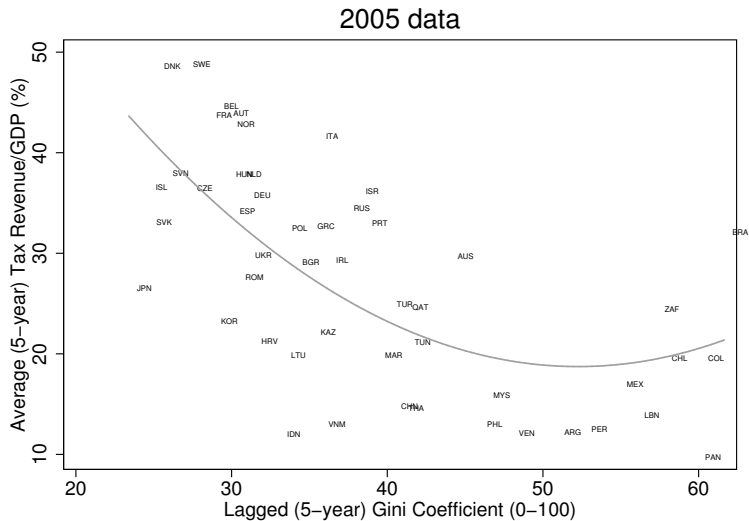


Figure: correlation = -0.6265

In 1782

‘‘We [the American colonists fighting in the War of Independence] have shed our blood in the glorious cause in which we are engaged; we are ready to shed the last drop in its defense. Nothing is above our courage, except only (with shame I speak it) the courage to TAX ourselves.’’

James Madison, US President (1809-17)



Debt, Deficit, Tax Base

Panel A

2005	$\frac{\text{PublicDebt}}{\text{GDP}}$	$\frac{\text{Tax}}{\text{GDP}}$	$\frac{\text{PublicDebt}}{\text{Tax}}$	$\frac{\text{FiscalBal}}{\text{GDP}}$	$\frac{\text{FiscalBal}}{\text{Tax}}$
Panama	.63	.10	6.3		
Austria	.64	.44	1.5		

Panel B

2005	$\frac{\text{PublicDebt}}{\text{GDP}}$	$\frac{\text{Tax}}{\text{GDP}}$	$\frac{\text{PublicDebt}}{\text{Tax}}$	$\frac{\text{FiscalBal}}{\text{GDP}}$	$\frac{\text{FiscalBal}}{\text{Tax}}$
Poland		.33		-2.9	-.09
Philippines		.13		-2.7	-.21

► more on fiscal space studies

In 2012

‘‘I am concerned about fiscal stability in future because our fiscal deficit has worsened in the past three years.’’

*‘‘We have run out of **fiscal space** and must once again begin the process of fiscal consolidation.’’*

In his New Year address, Prime Minister Manmohan Singh told the nation it could not take India's high economic growth rate for granted and warned of the need to pare back subsidies and implement tax reform. (FT, Jan.02)

FiscalSpace as Measured by [Public Debt] ÷ [Tax Base]

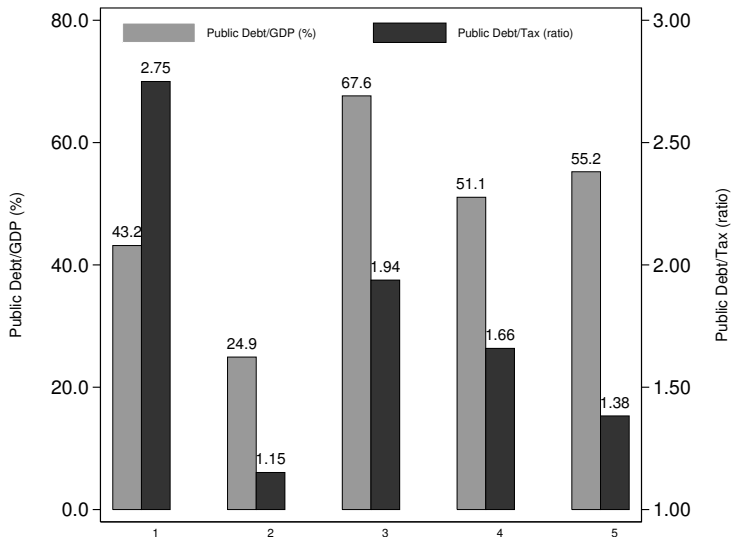


Figure: 1/Emerging..... 2/High-Inc..... 3/SWEAP..... 4/OECD..... 5/Euro.....

Sovereign CDS Price in a Macro Fundamental Model

Y-variable ↪ CDS spread	2005 – 10 coefficient	(s.e.)	2005 – 10 coefficient	(s.e.)
<i>TEDSpread</i>	3.2	(27.3)	7.3	(27.8)
<i>CDS_{t-1}</i>	.1	(00.1)***	.3	(00.1)***
$\frac{Trade}{GDP}$	-86.1	(151)	-118.0	(129)
<i>Inflation</i>	24.5	(11.9)**	19.8	(10.3)*
$\frac{ExternalDebt}{GDP}$	-36.6	(30.1)	-1.9	(17.9)
$\frac{FiscalBal}{TaxBase}$	-829.4	(302)***		
$\frac{PublicDebt}{TaxBase}$			81.0	(29.9)***
R^2	.52		.46	
Observations	300	, balanced	300	, balanced
Countries	50	w/ f.e.	50	w/ f.e.

Macro-Fundamental Error : $\frac{\text{Actual}}{\text{Forecasted}}$: Market Misprice

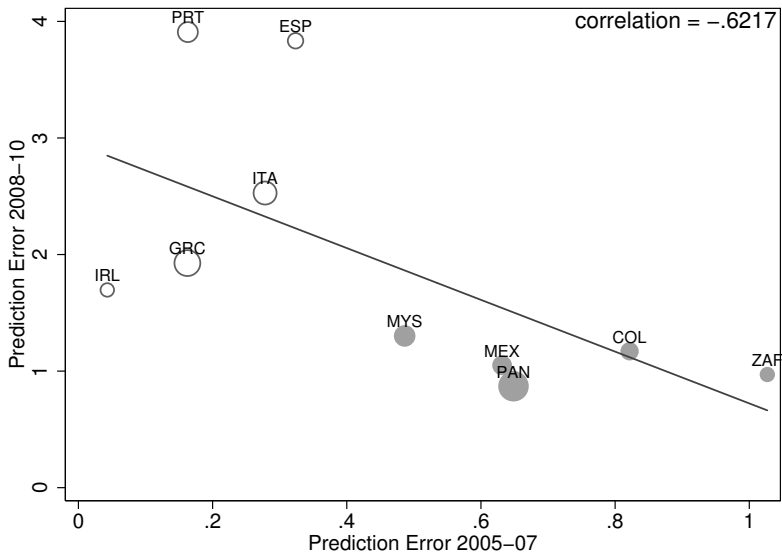
$\frac{\text{ActualCDS}}{\text{ForecastedCDS}}$	2008	2009	2010
Greece	2.7	2.2	3.3
Portugal	2.8	2.9	6.9
Emerging Markets	3.9	1.0	1.8
EURO excl. SWEAP	5.0	5.8	13.7

► detailed regression analysis

Matching Countries in Fiscal Space

- ▶ Match SWEAP with similar emerging markets
in terms of fiscal space to study their sovereign CDS price
- ▶ See if the pricing of risk in SWEAP was different from
corresponding matches
- ▶ ESP — GRC — IRL — ITA — PRTSWEAP
- ▶ ZAF — PAN — MYS — MEX — COL ...Emerging Markets
- ▶ EM have the option to inflate/devalue away the imbalance

FiscalSpace and Market Mispricing of Sovereign CDS Price



Taking Stock

- ▶ A large component of market risk assessment in CDS cannot be accounted for by fundamentals ($R^2=.5$)
- ▶ Market valuing CDS spread in Eurozone and SWEAP more than twice of what fundamentals have forecasted
- ▶ Pre-crisis excessive optimism?
...fundamental under-forecasting
- ▶ Crisis excessive pessimism?
...market over-pricing

What Have We Learned

- ▶ Fiscal space ($\frac{debt}{tax}; \frac{deficit}{tax}$) $\rightsquigarrow$ a potent predictor of fiscal solvency reflected in CDS spreads
- ▶ Systematically large market over-pricing on sovereign CDS especially in and after crisis
- ▶ Euro area being priced much higher given its fundamentals
locally and globally

In 2010/11

‘‘Credit default swaps are traded without any transparency and are threatening to bring down entire countries and entire societies ... They are betting on our bankruptcy and the breakup of the Euro. But their effort is in vain.’’

George Papandreou, Greece Prime Minister (2009 - 11)

‘‘The markets don’t believe that Italy is capable or has the intention of approving these reforms,’’ ... ‘‘Things like who leads or who doesn’t lead the government are less important than doing what is best for the country.’’

Silvio Berlusconi, Italy Prime Minister (1994-96; 2001-06; 2008-11)

Interesting Patterns, Many Interpretations

- ▶ **Eurozone uniqueness**
which currency to issue debt? to devalue? €
- ▶ **Panic premium**
(un)warranted pessimism to future deterioration
- ▶ **Multiple equilibria**
high debt, a high required rate of return, low prospective tax
- ▶ **Potential contagion**
haircuts; bank recapitalization; no €; how bad are twins?
- ▶ **Fiscal consolidation?**
disciplinary? debt, tax, spending, growth? [+ golden rule, automatic sanction, bailout facility, financial regulation]
- ▶ **Public finance in the presence of financial innovation?**
CDS? Euro bond? [sharing tax resource (i.e. VAT); but relative power of member governments to the center?]



The Functioning of CDS Markets

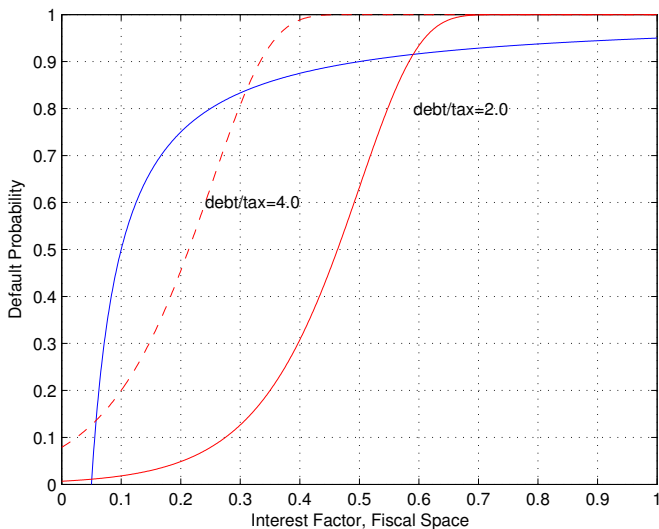
- ▶ Risk pooling, asynchronicities, counter-party risk
- ▶ Decentralised trading, multilateral netting
- ▶ Naked trading of CDS: not owning the underlying bond
- ▶ No credit event: worth buying sovereign CDS?
i.e. a rollover of Greek debt
- ▶ 10 commercial banks and 5 investment funds
= ISDA committee deciding on **credit event**

Market Overpricing and Outstanding CDS Positions

CDS Positions	Gross b(s.e.)	Gross b(s.e.)	Turnover b(s.e.)	Net b(s.e.)
Public Debt	.51(.08)***	.55(.07)***	.75(.09)***	.57(.06)***
$\widehat{CDSprice}$		.32(.15)**	.38(.18)**	.06(.11)
$Market > \widehat{[*]}$		.20(.07)***	.21(.09)**	.12(.06)**
$Market < \widehat{[*]}$		.13(.09)	.09(.11)	.08(.07)
R^2	.48	.63	.67	.76

CDS, FiscalSpace and Default Risk in Multiple Equilibria

After all, probabilities have to add up to 1.0



Related Studies (cont'd.)

Ang and Longstaff (NBER, 2011)

- ▶ Euro countries and US states
- ▶ weekly data: May 08 - Jan 11
- ▶ multi-factor affine framework
- ▶ systemic risk vs sovereign-specific shock
- ▶ systemic risk represents a smaller fraction of total risk among the U.S. states than among the Euro countries
- ▶ $\rightsquigarrow$ systemic risk has roots in global financial markets, not sovereign-specific macro fundamentals?

Using Fiscal Space to Summarize Fiscal Capacity?

- ▶ This time is different
(Reinhart and Rogoff, Princeton Press, 2010)
Public debt/GDP > .9, then median GDP growth falls by 1pct
- ▶ Fiscal fatigue and debt sustainability
(Ghosh, Kim, Mendoza, Ostry, Qureshi, NBER WP, 2011)
Debt limit: primary balances to keep pace with rising debt
- ▶ Debt and the effects of fiscal policy
(Favero, Giavazzi, Perego, IMF, 2011)
$$PublicDebt_t = Sum_{t \rightarrow \tau} \frac{1+r}{1+g} [Tax - Spending]$$

Debt feedback can affect the dynamic effects of fiscal shocks
- ▶ Fiscal stimulus of 2009-10
(Aizenman and Jinjarak, NBER ISoM, 2011)
Greater Tax/Debt, lower trade openness $\rightsquigarrow$ higher stimulus

Income Inequality and Tax Base in 2005

variable (t=5yr)	$\frac{Tax}{GDP}$ 2005	$\frac{Tax}{GDP}$ 2010	$\frac{PublicDebt}{GDP}$ 2005	$\frac{PublicDebt}{GDP}$ 2010
<i>laggedGini</i>	-2.9(1.03)***	-3.4(0.95)***	-4.9(5.36)	-6.2(5.00)
<i>laggedGini</i> ²	0.03(0.01)**	0.03(0.01)***	0.06(0.06)	0.07(0.06)
<i>R</i> ²	0.47	0.48	0.03	0.06
Countries	50	50	50	50

Sovereign CDS price in time and space, 2005-10

Y-variable ↪ CDS spread	<i>FiscalBal</i> coefficient	= x^* (s.e.)	<i>PublicDebt</i> coefficient	= x^* (s.e.)
$t = 2008$	328.0	(78.0)***	295.6	(78.3)***
$t = 2009$	-36.8	(33.7)	35.4	(27.7)
$t = 2010$	2.5	(32.6)	92.9	(27.1)***
$t = 2008 \times i_{Euro}$	-225.3	(82.3)***	-209.5	(80.7)***
$t = 2009 \times i_{Euro}$	14.6	(30.1)	-15.0	(30.8)
$t = 2010 \times i_{Euro}$	5.2	(26.6)	-29.1	(28.0)
$t = 2008 \times i_{sweap}$	-249.5	(98.2)**	-159.3	(82.7)*
$t = 2009 \times i_{sweap}$	18.7	(58.6)	73.4	(36.1)**
$t = 2010 \times i_{sweap}$	174.4	(108)	261.9	(63.7)***

(continuing next)

Robustness

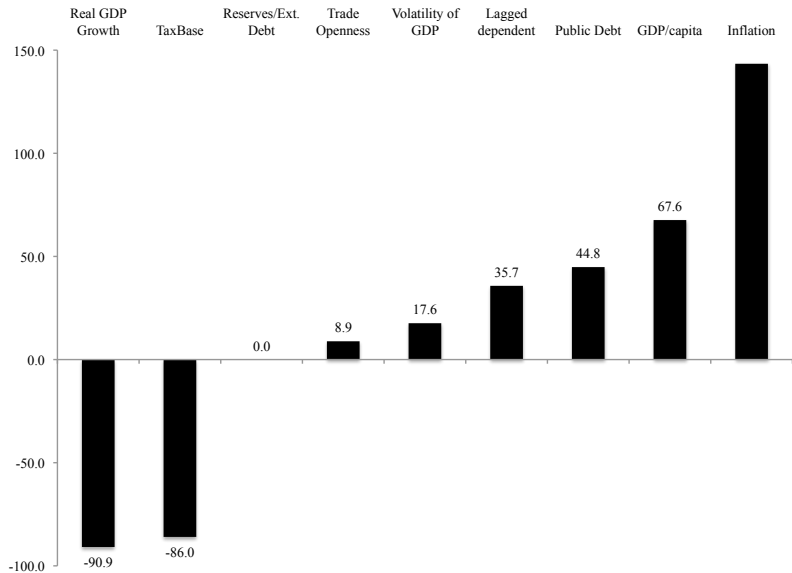
- ▶ 3-year, 5-year, 10-year tenors
- ▶ Debt/Tax v. Debt/GDP horserace
- ▶ Arellano-Bond type estimation
- ▶ Structural change

Selected Robustness Checks

(w/ full set of fixed effects and macro controls)

Test	variable	coefficient	(s.d.)	R^2
$\div GDP?$	$\frac{PublicDebt}{GDP}$	1.5	(00.4)***	.48
Arellano-Bond	$\frac{PublicDebt}{Tax}$	240.3	(14.8)***	.44
2005 – 07	$\frac{FiscalBal}{Tax}$	-291.7	(86.5)***	.89
2008 – 10	$\frac{FiscalBal}{Tax}$	-567.4	(606)	.61

Economic Significance of 1s.d. on CDS (basis points)



FiscalSpace and Under-Forecasting

