Debt Sustainability and the Terms of Official Support

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Key motivating facts

- Recent debt crises feature Eurozone governments receiving funding from both the IMF and ESM/EFSF
- The type and terms of official lending differ significantly in maturity (ESM is longer) and spreads (ESM is lower)
- ESM engagement is large

Official Lending Terms in the euro area

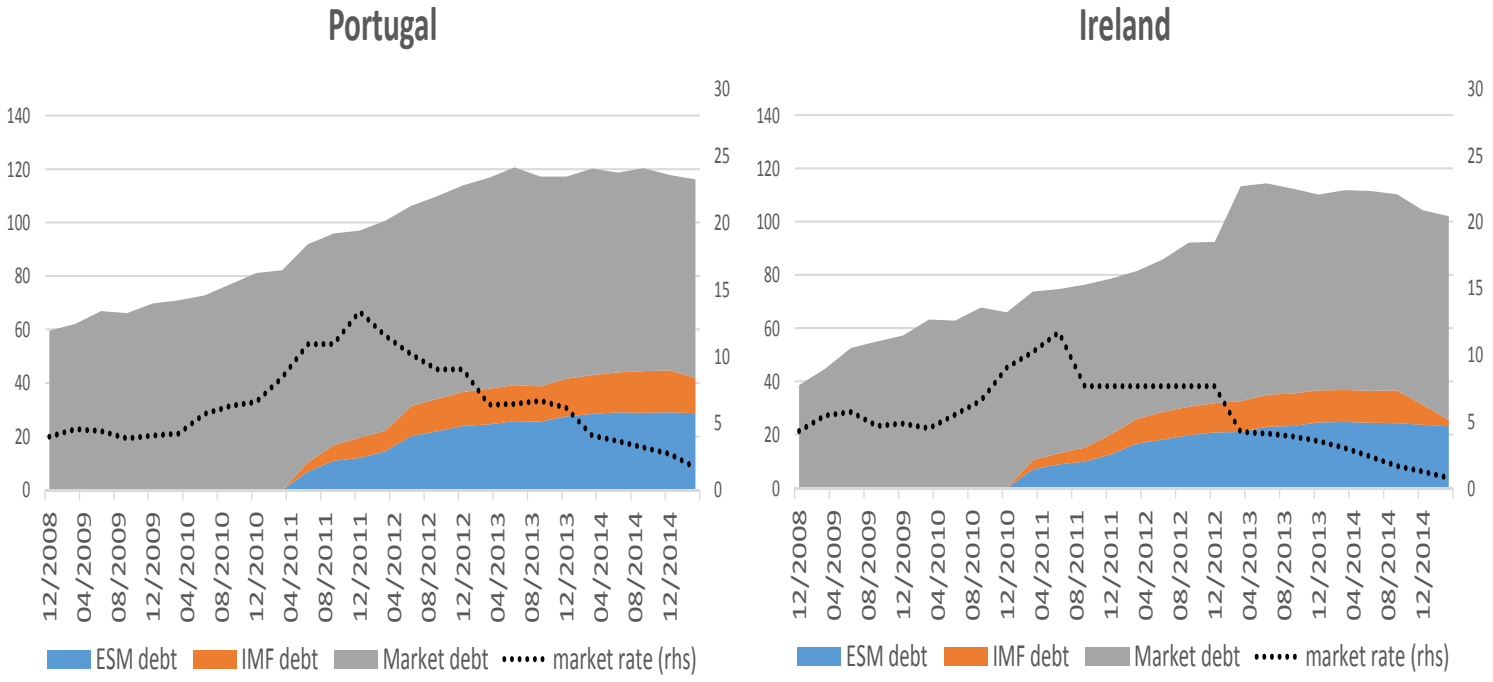
Maturities and marginal lending rate

			Dec-10	Dec-11	Dec-12	Dec-13	Dec-14
Ireland	EFSF/ESM	Maturity	7.5 years	15 years	15 years	22 years	22 years
		Interest rate	525 bps	272 bps	255 bps	226 bps	226 bps
	IMF	Maturity	7 years	7 years	7 years	7 years	7 years
		Interest rate	337 bps	321 bps	307 bps	309 bps	404 bps
Portugal	EFSF/ESM	Maturity	-	15 years	15 years	22 years	22 years
		Interest rate	-	277 bps	233 bps	210 bps	210 bps
	IMF	Maturity	-	7 years	7 years	7 years	7 years
		Interest rate	-	321 bps	307 bps	309 bps	404 bps

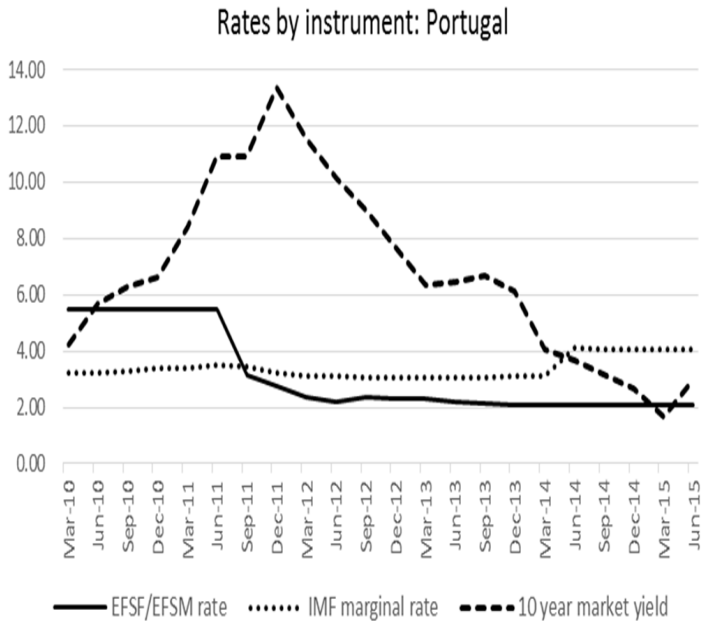
Sources: International Monetary Fund, European Commission, European Financial Stability Facility, European Stability Mechanism and Bloomberg.

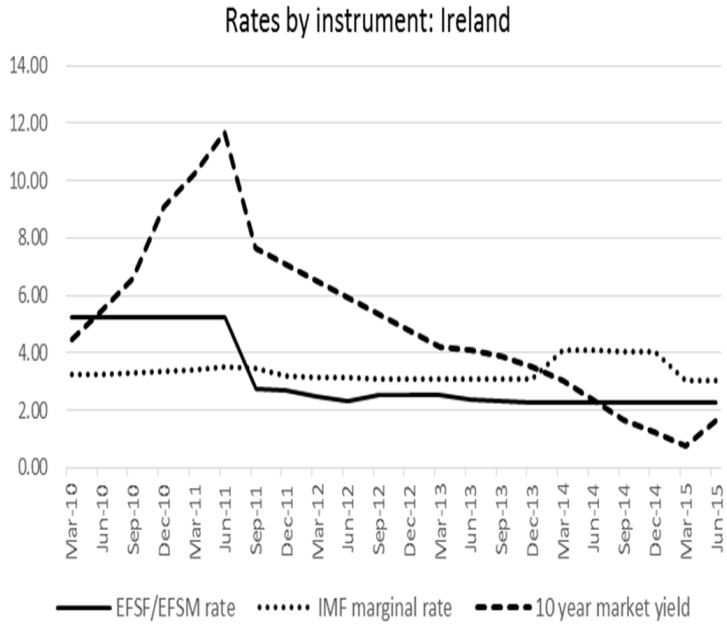
Debt Composition and Market Rates

ESM debt includes EFSM loans (for Ireland, also bilateral loans from DK and UK)

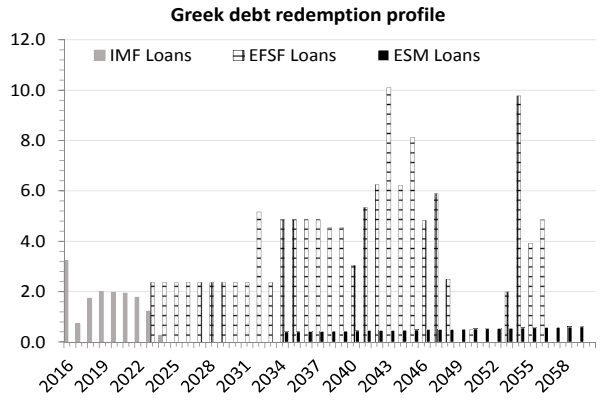


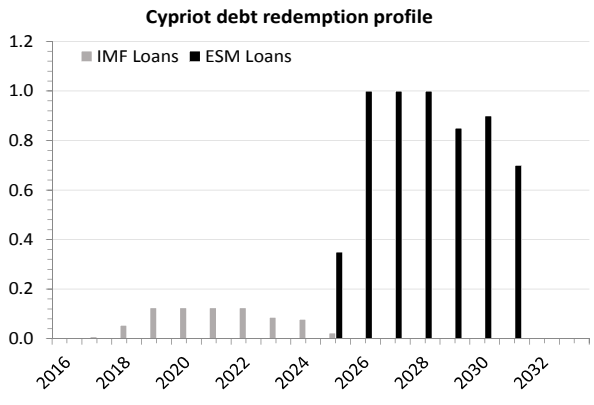
Market and official rates

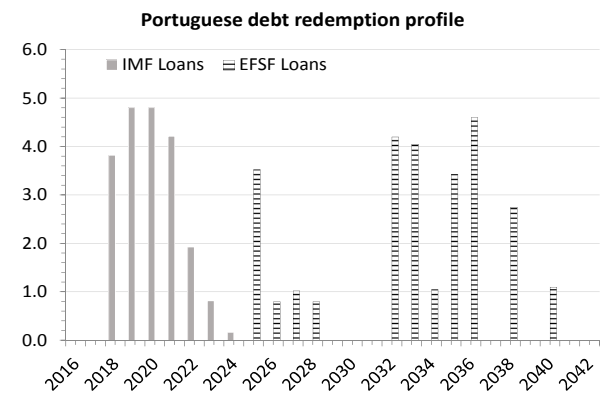


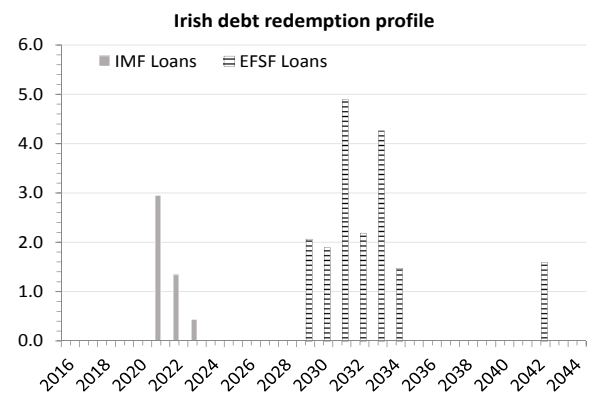


Managing the cash flow









Sources: European Commission, European Stability Mechanism and International Monetary Fund. Debt repyaments measured in billion euros.

Motivating facts

1. Euro area official loans are larger in size, feature longer maturities, and imply lower borrowing costs than loans from the International Monetary Fund.
2. Despite the sharp increase in sovereign rates at the onset of the crisis, public debt stocks kept increasing. Countries financed further debt accumulation by switching from market financing to official sources, to a large extent euro area official loans.
3. With improving market conditions, sovereigns return to bond financing.
4. Official loans, especially those from the euro area, smoothened the repayment structure of public debt in program countries and significantly reduced the interest payments for the sovereign under programs.

The question

- The terms of official loans affect governments' incentives to issue, repay, or default on debt:
  hence they matter for how much debt a country can sustain, just like tax capacity and default costs.

- Debt sustainability cannot be assessed independently of the official lending regime.

- How does setting different terms (maturity and price) of official loan affect debt sustainability? What are the policy relevant trade-offs?

  This paper studies the effects of varying the terms of official lending on debt sustainability, market access, and a country's vulnerability to crises.

This Paper

- Introduce official lending in a model of sovereign debt and default after Conesa and Kehoe 2015.
- Analyze the effects of Long-Term (LT) vs Short-Term (ST) loans, at different (below-market) rates, on a government's optimal decision to default, in the presence of both fundamental (output) and rollover risk.
- Bring the model to bear on the dynamic of the sovereign risk crisis in Portugal in 2011 after the country received official lending.

Main findings

- With fundamental and rollover risk, the availability of official loans raises the debt levels at which default is never optimal—it widens the debt "safe region".
- When the debt is above the "safe region", official lending helps the government to keep consumption smooth in the face of fundamental shocks and facilitate debt reduction policies.
- Policy trade-off:
  - As a larger safe region translates into a higher average debt—hence a lower consumption—in the long run, official lending also lowers the incentive to choose repayment over default.
  - In the face of a sequence of adverse fundamental shocks, as the country optimally accumulates debt to smooth consumption, the threshold at which default becomes the preferred option may become smaller.

Quantitative results

- Model replicates the Portuguese experience in 2011-2015 in a key dimension:
  market rates fall endogenously upon the country accessing IMF-style and ESM-style programs, as countries use official debt and the composition of debt (official vs market) evolves as observed in the data .

- In our calibration, depending on the terms of official lending, the sustainable debt level can be either as low as 80% of GDP, or as high as 180% of GDP.

- Counterfactual exercises suggest that the results are more sensitive to official loan maturity than spread.

Roadmap for the Rest of the Talk

1. The model
2. Analytical insight
3. Quantitative analysis (Portugal in 2011-2015) and counterfactuals

Bailout with Rollover and Output Risk

- In Conesa-Kehoe (2015), debt is in one of three zones

- Safe zone: debt is low enough that the country never defaults, not even if it suffers a debt rollover crisis, losing market access
- Default zone: debt is high enough that the country defaults for fundamental reasons, regardless of the availability of market funding
- Crisis zone: for intermediate level of debt, the country repays if market funding is available, but defaults if no funding is available

- Utility is concave (crisis zone disappears with linear utility)

Model

- Relative to Conesa and Kehoe (2015), we model bailout agencies
- Agents: risk-averse domestic government (and consumers), risk-neutral international investors, and (two types of) official lenders
  - Minimum non-defaultable spending.
    Government taxes output at fixed rate and borrows from the other agents (consumers are passive)
  - International investors lend shorts at market rate,
    IMF-like lends short, ESM-like lends long.
    No seniority of official loans (pari passu)
- A welfare-maximizing government choose whether to repay or default and suffers exogenously given output losses in each period.

Model

- State vector $s = (b, b_i, b_e, a, z_{-1}, \zeta)$
- Government debt owed to international creditors b, the IMF b_i, the ESM b_e
- Economy is in a recession $a = 0$ or in normal times $a = 1$
  In a recession, the economy recovers with probability $p < 1$, and once recovered, never falls into recession ever again.
- Default has occurred in the past $z_{-1} = 0$ or not $z_{-1} = 1$
  If the government chooses to default, $z = 0$, it stays in default forever.
- Initially $a = 1$ and $z = 1$ but shock in period 0 pushes economy to recession $a = 0$
- Rollover risk: sunspot ζ is drawn from a uniform distribution on $[0, 1]$. If $\zeta > 1 - \pi$, international creditors expect a crisis to occur and refuse to lend to the government if such a crisis occurs.

Debt Thresholds

- In our model environment, there are **four debt thresholds** above which default occurs:
  - without market financing $b(0)$ and with market financing $B(0)$ in a recession
  - without market financing $b(1)$ and with market financing $B(1)$ in normal times
- We know $b(1) < B(1)$, $b(0) < B(0)$: the interval between these thresholds defines the crisis zone;
  below $b(1)$ or $b(0)$ debt is in the safe zone;
  above $B(1)$, $B(0)$ is the default zone.

Analytical insight

- Simplifying assumptions:
  - One official lending instrument, with maturity δ and price q_e
  - Countries lose τ and a units of output when, respectively, in default and recession (in the full model, these are fractions Z and A of output)
  - No minimum consumption spending
  - Initial state: positive outstanding market debt, zero official debt

The Safe Zone Threshold

A rollover crisis

- If market financing stops and there is no official lending, the maximum sustainable debt (b_{nl}) solves:

$$u(y - b_{nl}) + \beta \frac{u(y)}{1-\beta} = \frac{u(y-\tau)}{1-\beta}$$

  equating the value of repayment with that of default.
- If Short-term official funding is available, the threshold ($b_{l(1)}$) solves:

$$u(y - b_{l(1)} + qb'_e) + \beta u(y - b'_e) + \beta^2 \frac{u(y)}{1-\beta} = \frac{u(y-\tau)}{1-\beta}$$

  Given UF concavity, by Jensen's inequality $b_{l(1)} > b_{nl}$.
- To wit: Let $\tau = 5$, $Y = 100$, $\beta = 0.95$. For log preferences, $b(0) = 64.15$. With $q = 0.9$, $b(0)_{l(1)} = 77.77$, so any debt between 64.15 and 77.77% of GDP is now safe.
- Argument extends to longer loans: $b_{nl} < b_{l(1)} < b_{l(2)} < \ldots$.

The Government Problem in the Crisis Zone

Rollover risk

- With no output risk, while in crisis zone, the government decides how to make its way back to the safe zone.
- Optimal trades off between smoother consumption (longer period in crisis) and a higher price for debt (from being in safe zone earlier).

We have seen above that official lending raises the steady-state level of debt in the safe zone $b_l(1)$.
We now see its effect during the transition to it.

Consumption in the transition and in the long run

Rollover risk only for simplicity

Official lending in the crisis zone:

- raises government consumption in the transition and may affect the time of exit to the safe zone.

For given exit time T:

$$\frac{dg^T}{d\delta} = \underbrace{\underbrace{-\frac{d\frac{1}{1+x+x^2+\ldots+x^{T-1}}}{dx}}_{<0}\underbrace{\frac{dx}{d\delta}}_{<0} B - \beta \underbrace{\frac{d\frac{x^{T-1}}{1+x+x^2+\ldots+x^{T-1}}}{dx}}_{<0}\underbrace{\frac{dx}{d\delta}}_{<0} b_l(1) + }_{\uparrow \text{ consumption for } \downarrow \delta}$$

$$\underbrace{+\beta \frac{x^{T-1}}{1+x+x^2+\ldots+x^{T-1}} \underbrace{\frac{db_l(1)}{d\delta}}_{<0}}_{\uparrow \text{ consumption for } \downarrow \delta}$$

Utility gains from official loans

Rollover risk only for simplicity

- Lengthening the maturity of official lending (offering low rates) raises utility in the transition to the safe zone, but reduces it in the long run
(since a higher long-run debt $\Rightarrow$ lower long-run consumption).

$$\frac{dV^T}{d\delta} = \underbrace{\frac{1-[\beta(1-\pi)]^T}{1-\beta(1-\pi)} u'(g^T) \underbrace{\frac{dg^T}{d\delta}}_{<0}}_{\uparrow V^T \text{ as } \downarrow \delta} +$$

$$+ \underbrace{[\beta(1-\pi)]^{T-2} \frac{\beta u'(y-[1-\beta]b_l(1))}{1-\beta} \cdot -(1-\beta) \underbrace{\frac{db_l(1)}{d\delta}}_{<0}}_{\downarrow V^T \text{ as } \downarrow \delta}$$

Trade-offs of official lending

Rollover and output risk

- Key: once debt is in the safe zone, there is no welfare incentive for the government to deleverage further.
- Value of repayment may/may not be dominated by long-run effect of official lending.

With output risk:

- Value of official lending is higher: government can consume more in the transition and have larger fiscal space to smooth recession at risk free rates.
- As debt accumulates, default may become the preferred option at *lower level* of debt than in the absence of official lending.

The Crisis Zone Threshold

- Formally, in the absence of official lending, the key condition governing the upper threshold $B_{nl}(1)$ is

$$\max\{V^1(B_{nl}(1)), V^2(B_{nl}(1)), \ldots, V^\infty(B_{nl}(1))\} = \frac{u(y-\tau)}{1-\beta}$$

$$\begin{aligned} V^T(B) =& \frac{1-[\beta(1-\pi)]^T}{1-\beta(1-\pi)} u(g_{nl}^T) + \\ & \frac{1-[\beta(1-\pi)]^{T-1}}{1-\beta(1-\pi)} \frac{\beta\pi}{1-\beta} u(y-\tau) + \\ & [\beta(1-\pi)]^{T-2} \frac{\beta u(y-[1-\beta]b_{nl}(1))}{1-\beta} \end{aligned}$$

$$g_{nl}^T = y - \frac{1-\beta(1-\pi)}{1-[\beta(1-\pi)]^T} \left(B - [\beta(1-\pi)]^{T-1} b_{nl}(1)\right)$$

- Similar expression, but more involved, when including official lending.

The Crisis Zone Threshold

- When the long run negative effect of official lending is stronger (which would be the case if $\pi \to 0$), the value of repayment *at the threshold* falls while the value of default remains unchanged

$$\max\{V^1(B_l(1)), V^2(B_l(1)), \ldots, V^\infty(B_l(1))\} = \frac{u(y-\tau)}{1-\beta}$$

  This means that the maximum level that is sustainable $B(1)$ falls with the introduction of official debt.
- Hence while official debt enlarges the safe zone, by encouraging higher levels of steady state debt it can raise the incentive to default in adverse states of the world, i.e. it may shrink the crisis zone from above.

Quantitative Analysis

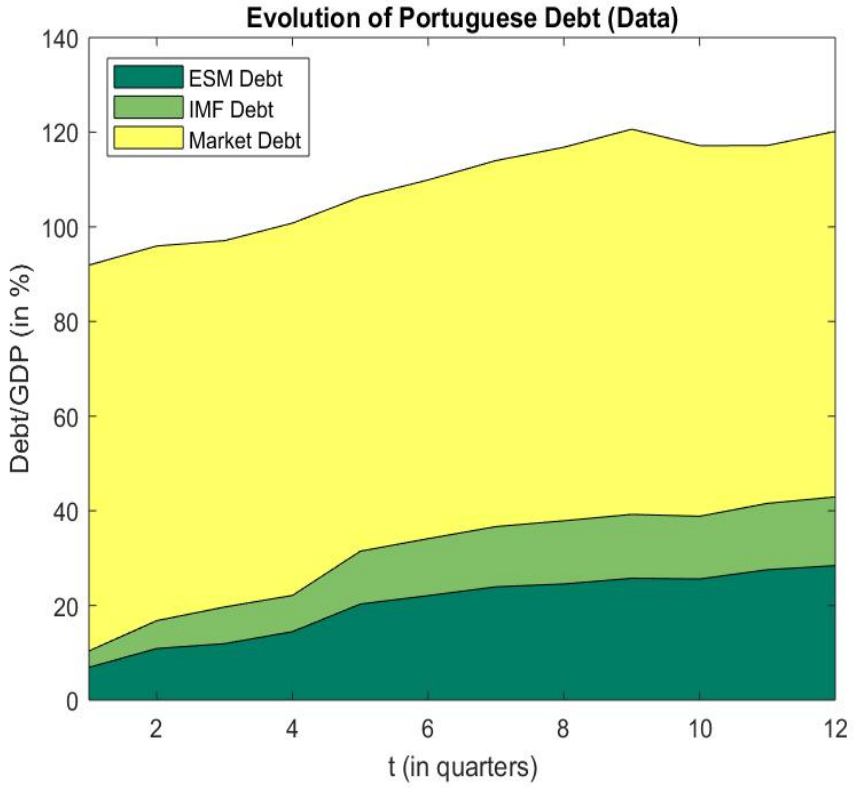
Benchmark

- Using the actual loans terms of IMF and ESM, the model does a good job in matching the evolution of debt, debt composition and market rates in the data.

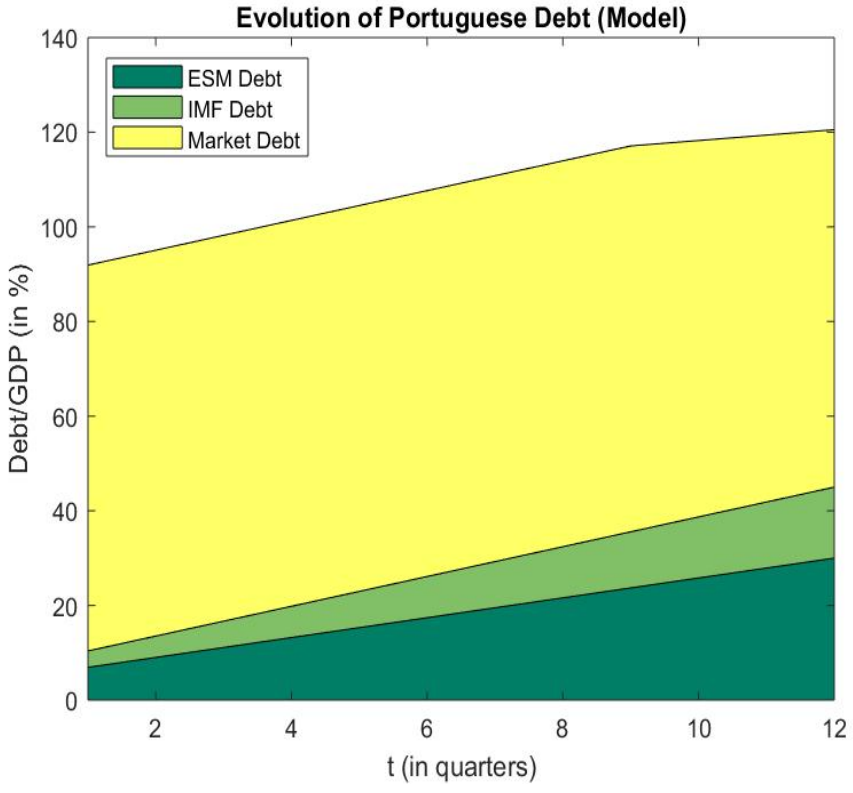
Quantitative Analysis: Calibration

Y	Output	100
Z_d	Default cost	0.95
A	Fraction of output during recession	0.93
β	Discount factor	0.98
π	Interest rate in crisis	.07
θ	Goverment revenue as a share of output	0.4
$\overline{g}$	Level of essential government expenditure	25
γ	Relative weight of c and g in the utility function	0.5
p	Probability of leaving the recession	0.33
δ	Amortization of market borrowing (6 years)	0.1667
δ_i	Amortization of IMF loan (7 years)	0.1429
q_i	Interest on the IMF loan	0.9483
δ_e	Amortization of ESM loan (15 years)	0.067
q_e	Interest on the ESM loan	0.9662

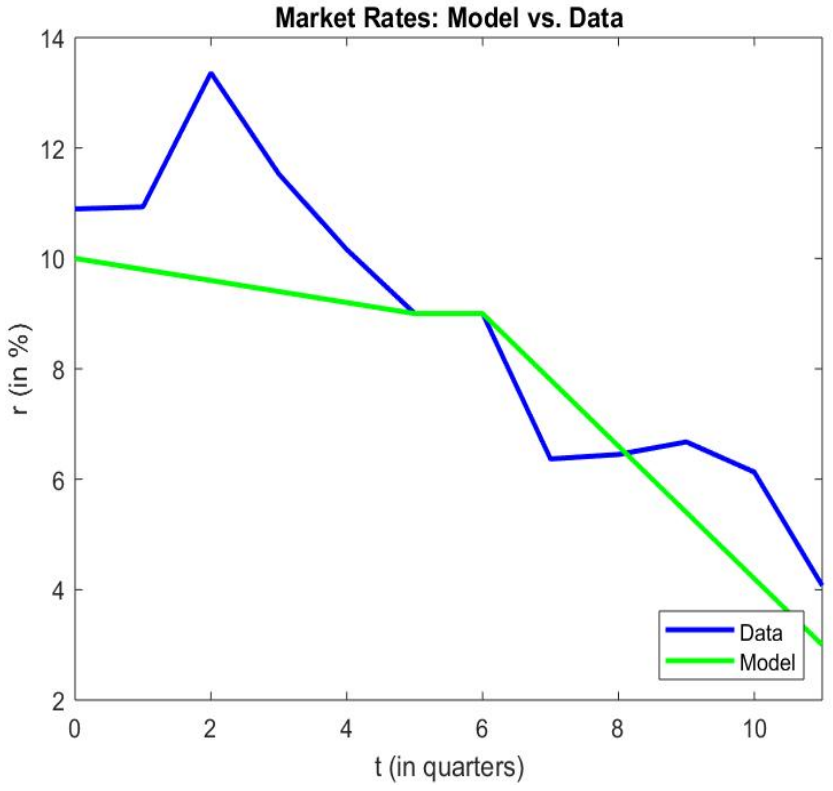
Evolution of Portuguese Debt: Data



Evolution of Portuguese Debt: Model



Market rates: data and model

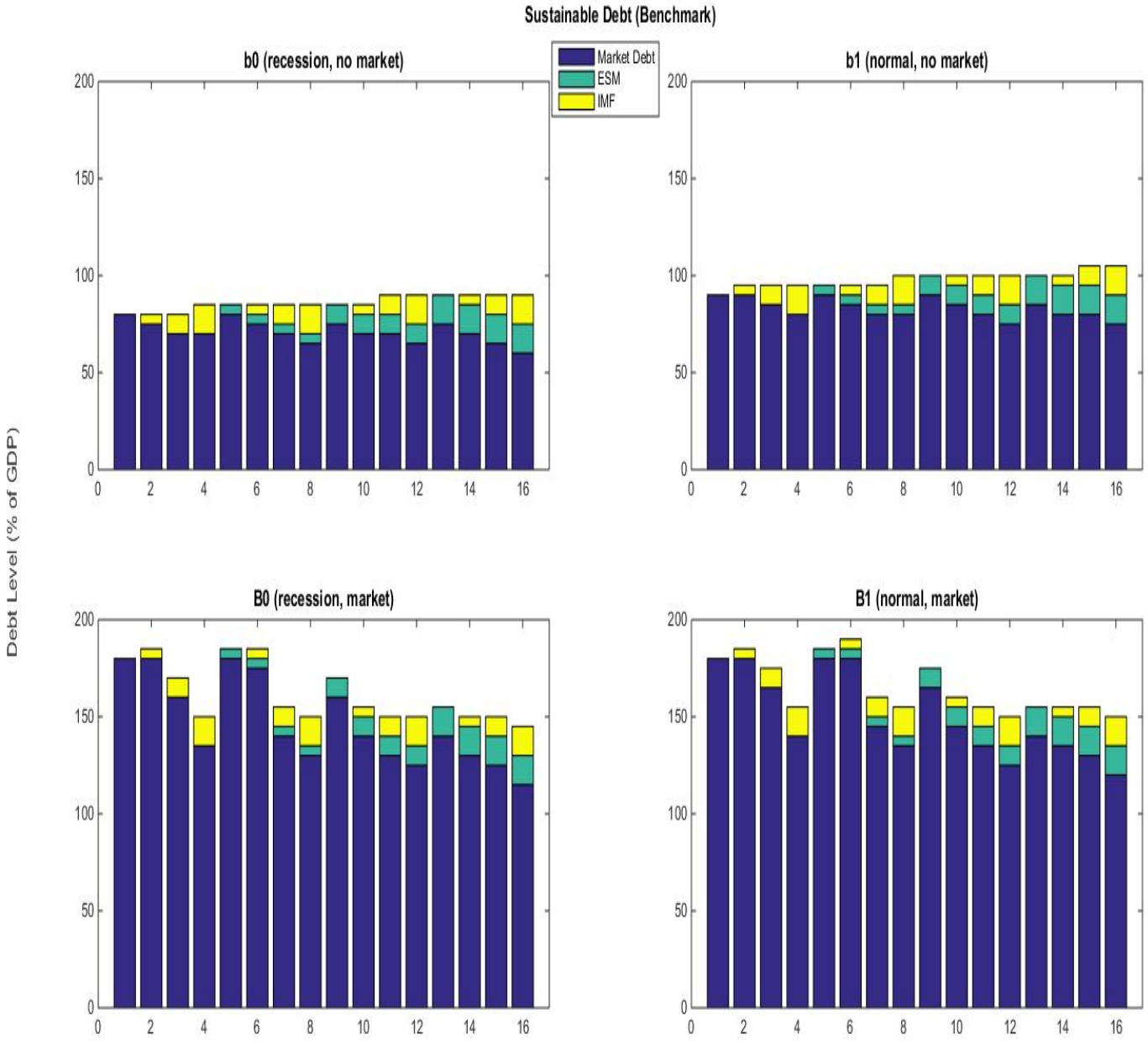


Mapping Analytic to Quantitative Results

Debt Thresholds Varying Official Support Size and Composition

- We calculate the debt thresholds for 16 different combinations of market and official loans: we let model IMF and ESM loans to increase in step of 5% of GDP.
  - We plot 16 bars (as static representations of dynamic model): **ESM lending is Green**, **IMF lending yellow**, **market blue.**
  - Official lending increases from left to right (from 0% to 20%).
- Top panels (1 and 2): **safe zone limits** $b(0)$ **and** $b(1)$ **increase unambiguously** as theory predicts.
- Bottom panels (3 and 4): **the crisis zone limits** $B(0)$ **and** $B(1)$ **increase for mixed loans up to 10% of GDP, but decrease if support is larger**: the tradeoff inherent in official lending kicked in!

Debt Thresholds Varying Official Support Size and Composition



Mapping Analytic to Quantitative Results

Debt Thresholds Varying Terms of Official Support

We consider 4 alternatives swapping EMS and IMF maturity and spread across loans.

- On every threshold, sustainable debt drops when the ESM maturity is changed (shortened) to IMF maturity.
- Sustainability is highest when both spreads are set to the ESM spread.
- Lengthening debt maturity has a stronger effect on sustainability than reducing the spread.
- See figures at the end of the slides.

Sustainable debt

- In our exercises, sustainable debt ranges from low (80% GDP) to very high (180% GDP) levels, depending on (i) the state of the economy (output and market access) and (ii) availability and the size of official loans, spreads and maturities (debt composition)

- Effects of official lending can be moderated by allowing for (political) uncertainty in the access to official loans

Conclusions

- The terms of official loans affect governments' incentives to issue, repay, or default on debt:
  hence they matter for how much debt a country can sustain, just like tax capacity and default costs.

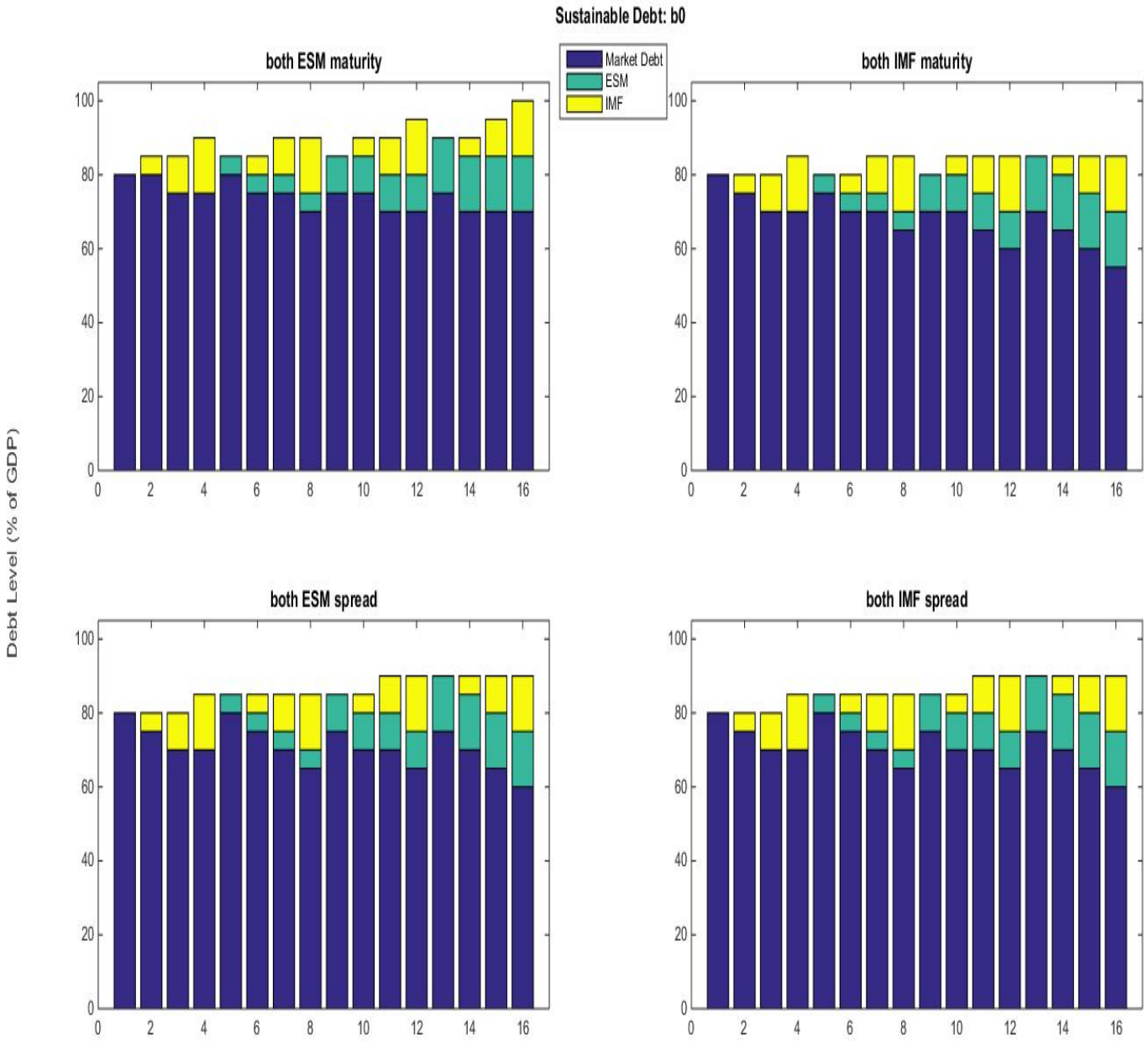
- We augment a model of optimal default to gain insight on the mechanism. Long maturities and low spreads:
  - reduce the exposure to rollover risk, facilitating consumption smoothing and deleveraging of debt;
  - enhance sustainability against any given credible repayment flows—contribution to the creation of "safe asset" in the EA;
  - raise the average stock of debt in the economy, which may/may not reduce resilience to negative fundamental developments.
- Our quantitative results show that official lending can explain cases like Portugal in 2011-2015, whereas the interest rates on domestic debt fell even as debt as a fraction of GDP rose.

Policy issues

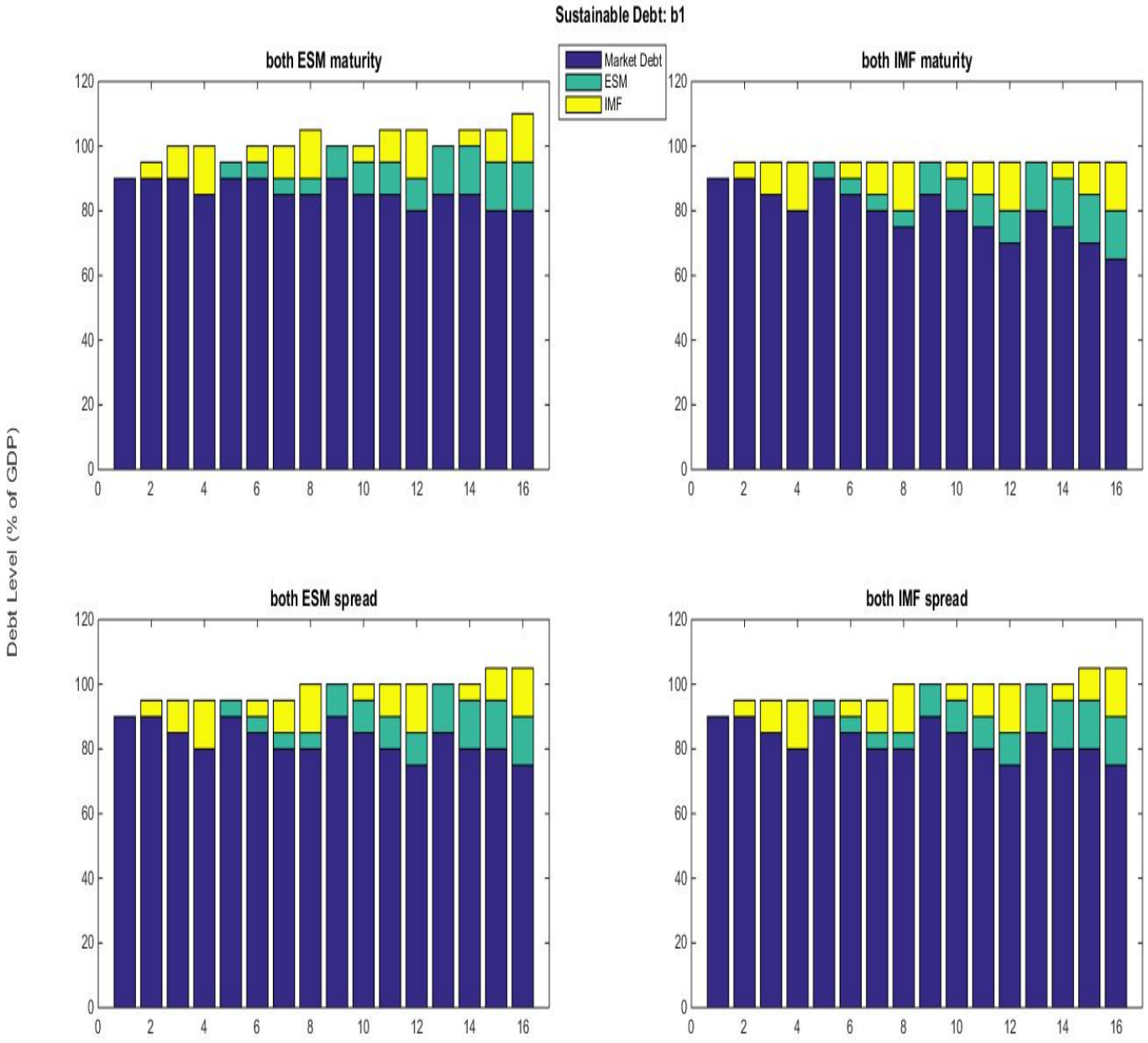
- Debt sustainability cannot be assessed independently of the official lending regime.
  - Uncertainty about the EA institutional setting can be destabilizing.
  - Completing the EMU requires a careful considerations of objective function, instruments, budget constraint of official lending institutions.

- Counterfactuals suggest that the sustainability is more sensitive to maturity than spread in official lending.
  - The analysis lends support to revising DSA and programme design focusing on cash flow management
- On these issues, see our companion policy paper, "Official Lending Strategies During the Euro Area Crisis," CEPR DP 12228, and my paper "DSA: state of the art", written for the European Parliament in 2018.

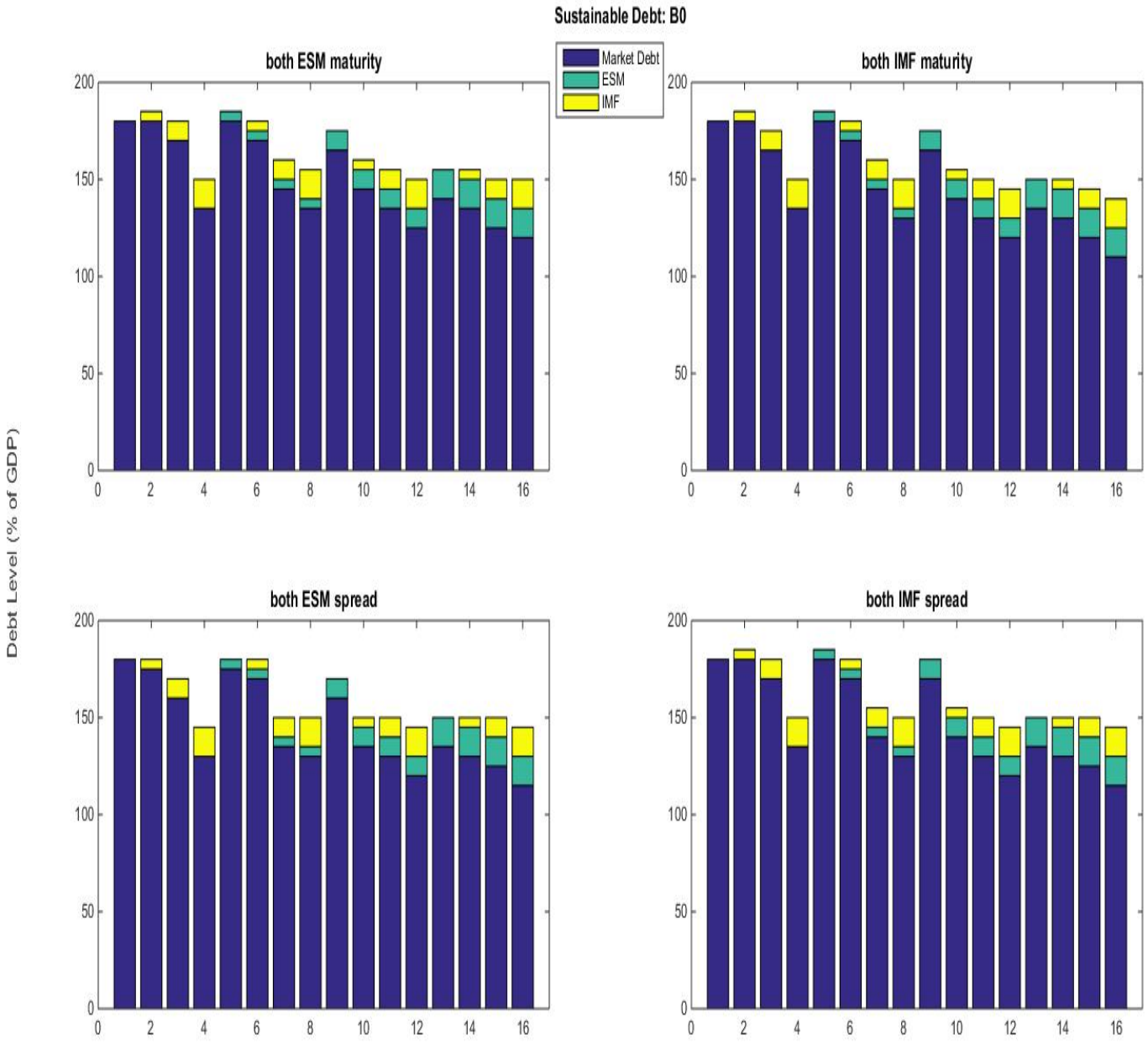
Counterfactuals on b(0): Different Spreads and Maturity



Counterfactuals on b(1): Different Spreads and Maturity



Counterfactuals on B(0): Different Spreads and Maturity



Counterfactuals on B(1): Different Spreads and Maturity