



BANCO DE PORTUGAL
EUROSYSTEM

GDP-LINKED BONDS

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Ministry of Finance

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Research on GDP-Linked Bonds dates back to the 1990s.
But issuances have been an exception and related to debt restructurings.

(Shiller 1993)

...

The interest on these products has
re-emerged.

(Borensztein and Mauro 2002, 2004)

(Sharma & Griffith-Jones 2009)

(Barr et al. 2014)

(Benford et al. 2016)

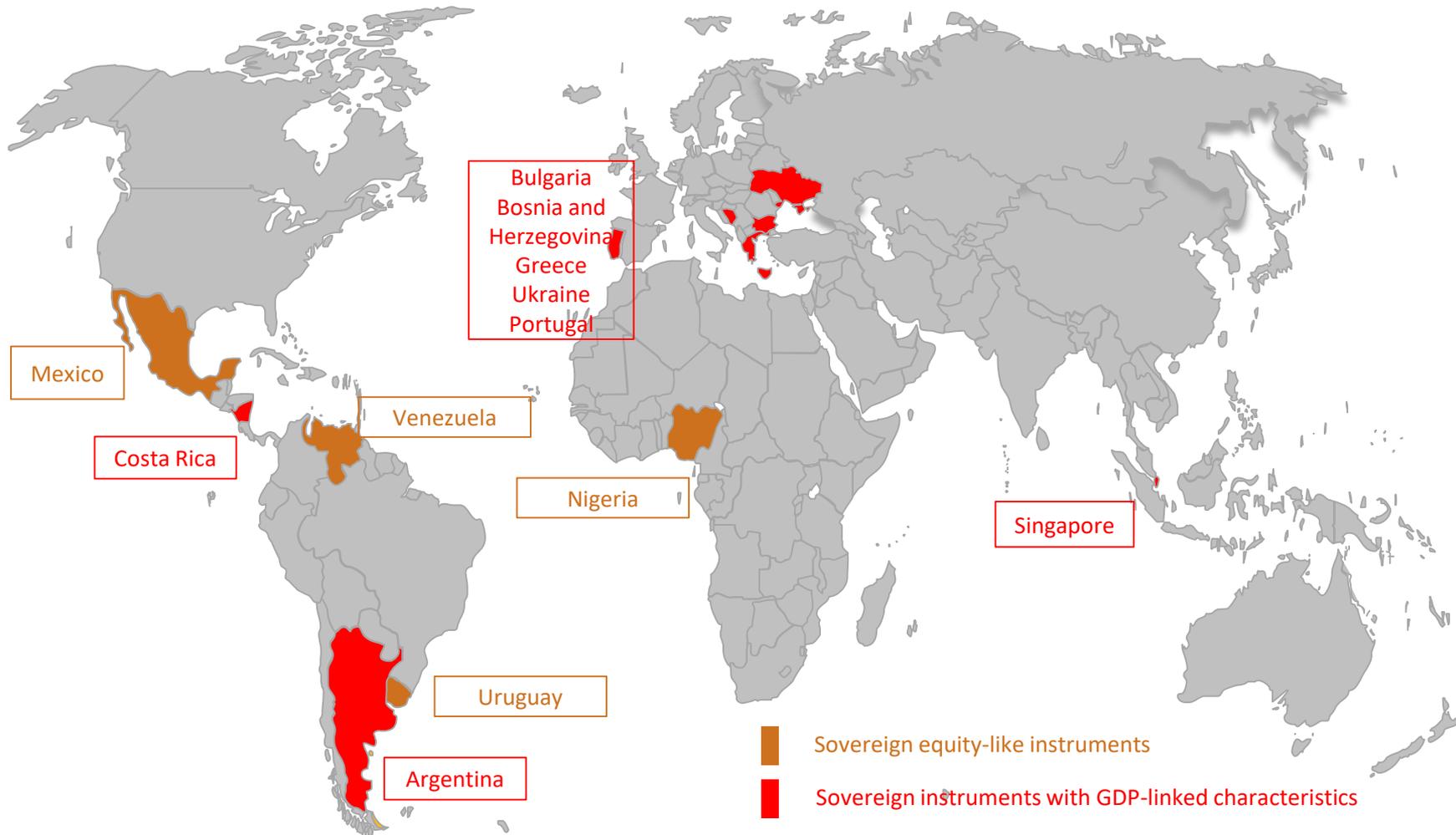
(Pienkowski 2017)

...

- ✓ High debt ratios
- ✓ Low and uncertain growth
- ✓ Low inflation
- ✓ Low interest rates

Which are
the main
fiscal
advantages?







- 1 Design – The coupon formula**
- 2 Fiscal Effects of GDP-linked bonds**
 - Interest bill savings or expenses
 - Fiscal policy – Avoiding Procyclical Fiscal Measures
- 3 Conclusions and Shortcomings**
- 5 Main Advantages/Limitations/Possible Solutions**

Based on Borensztein and Mauro 2004



THE COUPON FORMULA

$$(1) \text{ Coupon}_t = \max[r + (g_t - \bar{g}), 0]$$

- r : baseline coupon rate
- g_t : observed growth rate
- \bar{g} : baseline growth rate

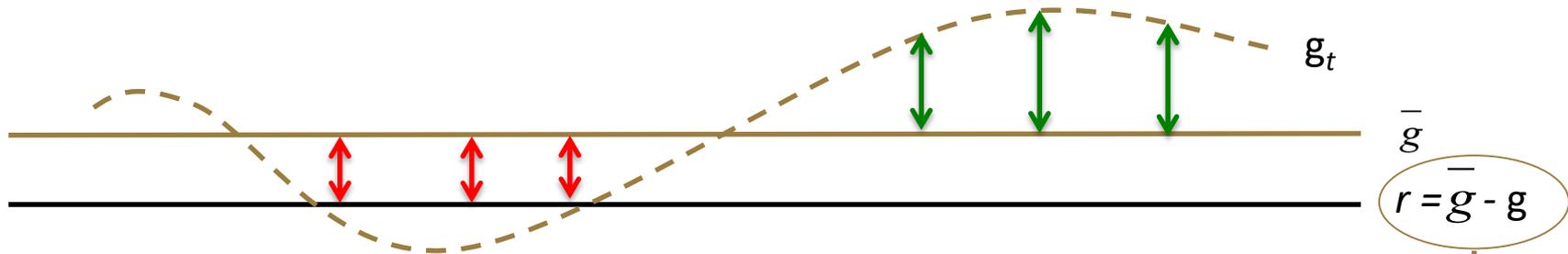
\bar{g}

- To be agreed at the moment of the contract
- Should reflect long-term growth
- Should adjust the economic performance of year t to a period of growth of sufficient length



$$(1) \text{Coupon}_t = \max[r + (g_t - \bar{g}), 0]$$

INDEXATION PREMIUM



Coupon rate reflects the evolution of real GDP growth

By adding an indexation factor to the
baseline coupon rate



Insurance against periods of low - below trend -
growth rates

If $r \leq \bar{g} - g$
 $\text{Coupon}_t = 0$



$$(1) \text{ Coupon}_t = \max[r + (g_t - \bar{g}), 0]$$

EXERCISES - ASSUMPTIONS

- ✓ Since the beginning of 1999 all the government debt consisted of GDP-linked bonds.
- ✓ The new coupon rate is determined by equation (1).
- ✓ The new coupon rate and interest bill would have no impact on other variables (v.g. GDP).
- ✓ The baseline growth rate corresponds to the average (geometric mean) growth rate in the period 1980-2015 (1992-2015 for euro area aggregated data).



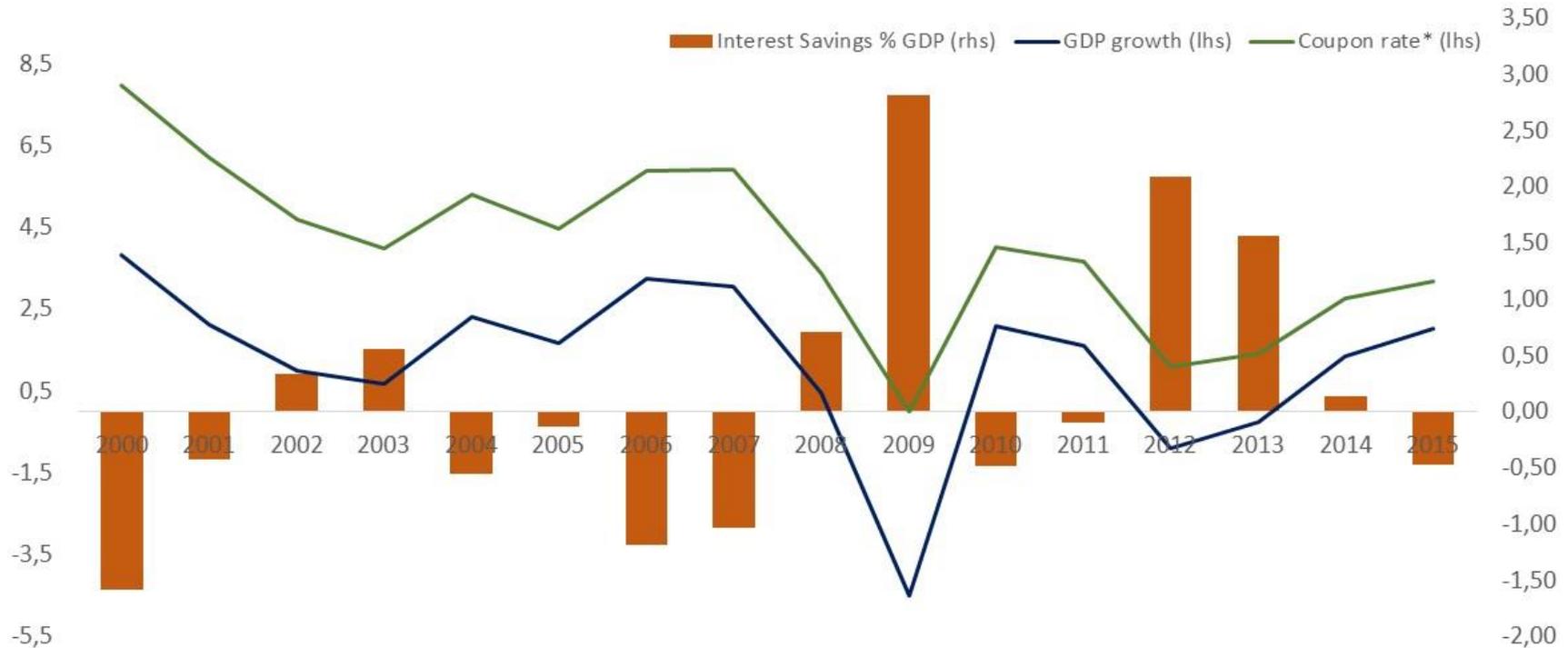
$$(1) \text{ Coupon}_t = \max[r + (g_t - \bar{g}), 0]$$

INTEREST SAVINGS OR EXPENSES | CALCULATIONS

- ✓ The actual implicit coupon rate is determined as a result of the ratio of gross interest payments of year t to the average of that same year's debt and the one of year t-1.
- ✓ The difference between that year's GDP growth rate and the baseline growth rate is then added to the coupon rate and the maximum of the adjusted coupon rate and 0 is computed.
- ✓ The new interests are calculated by applying that new coupon rate to the same average of year t and year t-1 debt.



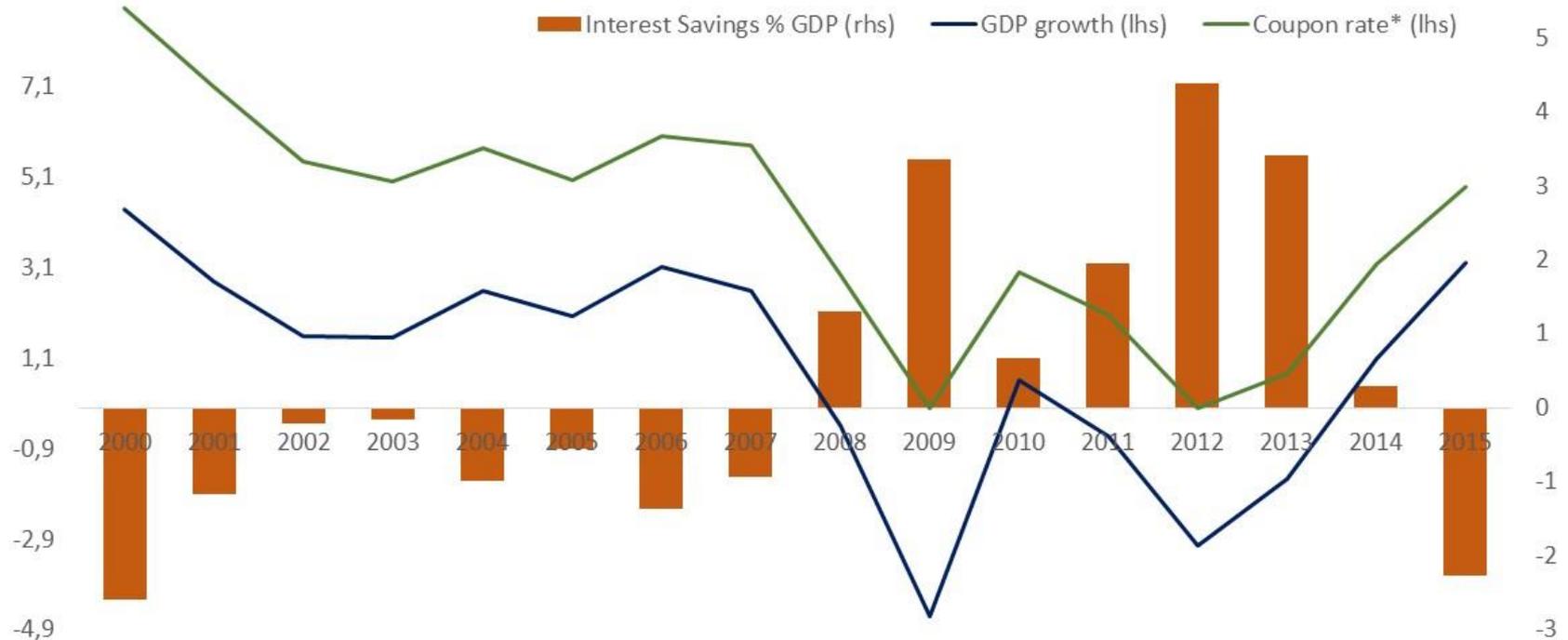
INTEREST SAVINGS OR EXPENSES – RESULTS (PERIOD 2000-2015)



- ✓ Baseline growth rate: 1.49% (*versus an average growth rate of 1.41%*)
- ✓ Average coupon rate: 4.34 % (*versus the average observed rate of 4.37%*)
- ✓ **Yielded savings: 0.13% of GDP / 0.08% of GDP considering GDP risk premia of 150 bp**



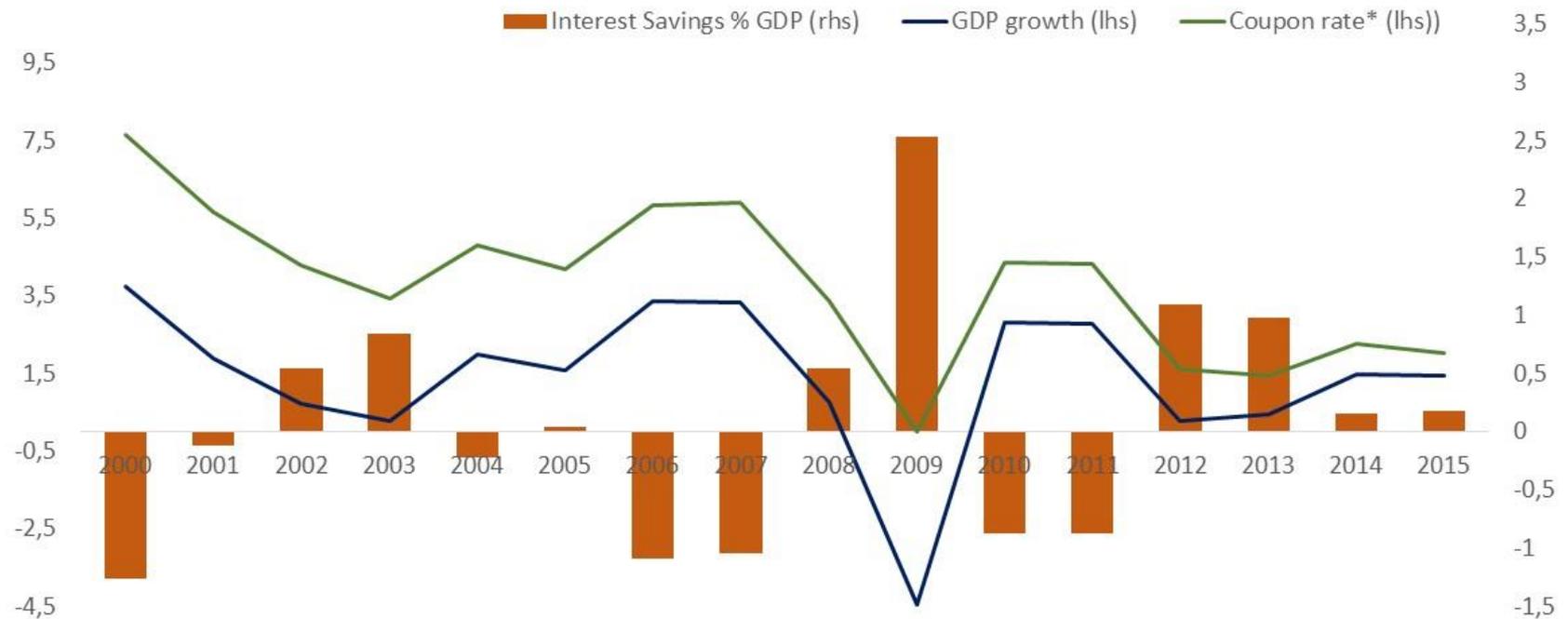
INTEREST SAVINGS OR EXPENSES – RESULTS (PERIOD 2000-2015)



- ✓ Baseline growth rate: 1.34% (versus an average growth rate of 0.93%)
- ✓ Average coupon rate: 4.09 % (versus the average observed rate of 4.35%)
- ✓ Yielded savings: 0.30% of GDP | 0.22% of GDP considering GDP risk premia of 150 bp



INTEREST SAVINGS OR EXPENSES – RESULTS (PERIOD 2000-2015)



- ✓ Baseline growth rate: 1.65% (*versus an average growth rate of 1.39%*)
- ✓ Average coupon rate: 3.81 % (*versus the average observed rate of 3.92%*)
- ✓ **Yielded savings: 0.09% of GDP / 0.05% of GDP considering GDP risk premia of 150 bp**



CORRELATION BETWEEN PRIMARY BALANCE AND GDP GROWTH | ASSUMPTIONS

- ✓ Since the beginning of 1999 all the debt stock had been indexed to GDP for 23 advanced countries and 15 emerging market countries.
- ✓ The new coupon rate and interest bill would have no impact on other variables (GDP, total deficit, debt path, risk *premia*). Ceteris paribus, the interest savings (expenses) would have a direct and proportional impact on fiscal policy and thus on primary balance.
- ✓ The same assumptions as in the previous exercise.



CORRELATION BETWEEN PRIMARY BALANCE AND GDP GROWTH | CALCULATIONS

- ✓ The computation of the adjusted coupon and new interests is the same as in the previous exercise.
- ✓ A new primary balance is calculated by adding those interests to the observed overall balance.
- ✓ Correlation between primary balance and growth - between 2000 and 2015 - as an indicator of a government's room for less procyclical fiscal measures.
- ✓ Comparison of the previous correlations with those between the same variables, but based on actual data.



FISCAL POLICY – AVOIDING PROCYCLICAL FISCAL MEASURES

CORRELATION BETWEEN PRIMARY BALANCES AND GDP GROWTH

“how much additional room would countries have had for countercyclical fiscal policy if their debt had been indexed to GDP (...)” ?

Results	Emerging Markets				Advanced Economies		
	Without Indexation	With Indexation		Without Indexation	With Indexation		
		100%	30%		100%	30%	
Mean	0.43	0.67	0.56	0.50	0.74	0.61	
Median	0.51	0.75	0.67	0.50	0.77	0.59	



CURRENCY UNION - CORRELATION BETWEEN PRIMARY BALANCE AND GDP GROWTH | ASSUMPTIONS AND CALCULATIONS

Assumptions

- ✓ In a currency union context - countries have lost, individually, the possibility of using monetary policy.
- ✓ Application of the fiscal constraint of 3% deficit limit. France, Spain and Portugal had complied with it. The assumption of no impact on the debt path is relaxed.
- ✓ The same assumptions as in the previous exercise.

Calculations

- ✓ Computation of a new debt path following the sovereign debt dynamics equation. Thus, an adjusted primary balance – considering the 3% deficit limit is considered.
- ✓ Following those paths for debt and deficits, a new primary balance is computed supposing all debt stock was indexed to GDP growth.
- ✓ The same correlation as in the previous exercises are then computed.



FISCAL POLICY – AVOIDING PROCYCLICAL FISCAL MEASURES

CORRELATION BETWEEN PRIMARY BALANCES AND GDP GROWTH
CURRENCY UNION CONTEXT

Fiscal constraint 3%
deficit

New debt path
(sovereign debt dynamics equation)

Results	France		Spain		Portugal	
	Without Indexation	With Indexation	Without Indexation	With Indexation	Without Indexation	With Indexation
Without SGP	0.63	0.82	0.92	0.96	0.17	0.66
With SGP	0.51	0.87	0.78	0.90	-0.28	0.97



MAIN CONCLUSIONS AND SHORTCOMINGS

Conclusions

- ✓ GDP-Linked bonds would be beneficial for countries increasing their fiscal space and giving room for countercyclical fiscal policies acting like an automatic stabilizer.
- ✓ This would particularly be helpful for countries in currency unions.

Shortcomings

- ✓ The new coupon rate has no impact on other variables, such as GDP growth and *risk premia*.
- ✓ Liquidity and novelty *premia* are not considered.
- ✓ The debt ratio includes other instruments, other than the indexable debt (medium to long term debt), as such the coupon rates calculated are less meaningful.
- ✓ Countries that were under financial assistance were excluded from the bond market.



MAIN ADVANTAGES/LIMITATIONS/POSSIBLE SOLUTIONS

ADVANTAGES	LIMITATIONS	POSSIBLE SOLUTIONS
<ul style="list-style-type: none">• Increases fiscal space allowing for less procyclical fiscal policies• Reduces the probability of sovereign debt crises• Allows for a more resilient domestic and international financial system• Increases diversification opportunities	<ul style="list-style-type: none">• Inaccuracies in GDP measurement and revisions• Possibility of misreporting• Absence of such a market: liquidity and novelty <i>premia</i>• Difficulty in pricing• Moral hazard• Adverse Selection	<ul style="list-style-type: none">• Independence of statistical agencies• Standardization (e.g. London Term Sheet)• Coordinated issuance• Technical (and issuance) support from international financial institutions