Sovereign default risk and debt limits

Case of Slovakia

Moderné nástroje pre finančnú analýzu a modelovanie

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Motivation I

Quiz: **How much would you pay for €100 government bond with 10-year maturity?**

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- Time inconsistency issue: when a government issues new debt, it does not take into account the loss it inflicts on existing creditors.
- Result: **High Risk Premium** (over-borrowing, lower price of current bonds)

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$\Longrightarrow$ **Restrictions on future borrowing might generate a welfare gain for current economy**

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Motivation II

Reason:

- need to study **sovereign spreads**: high and increasing debt (ageing creates upward pressures), inflating away the debt is unlikely, currently no political support for debt mutualization, QE termination
- sovereign debt reduction: matter of fiscal and structural issues
  - firmly anchored fiscal expectations and credible fiscal frameworks might make the process less costly
  - importance of fiscal rules (country-specific)

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Key Results: **The optimal (net) debt limit: 48 %** of the mean annual output

- **Sovereign spread reduction: 51 basis points**
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Literature: **strategic default model** à la Eaton and Gersovitz (1981), our study is based on works of Hatchondo et al. (2016) and Aguiar and Gopinath (2006)

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Model Features

- **Environment**:
  - small open economy
  - non-complete asset markets, single constant international real interest rate
  - non-state contingent defaultable bonds traded with risk-neutral competitive foreign investors

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  - two decisions: default, new debt issuance
  - two default consequences:
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- **Foreign lenders**: possibility of future default + indebtedness $\Rightarrow$ risk premium
- **Timing**:
  - Realisation of the technology shock
  - Government with access to markets: decisions about default/debt reimbursement and amount of debt to issue.
  - Government excluded from markets: whether to end the default if there is an opportunity to do so.

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Calibration & Solution

Solution:

- **Recursive formulation** of the model: Markov perfect equilibrium
- **Value function iteration** approach: determine two value functions and the bond price
  - numerical integration: Gauss-Legendre quadratures
  - interpolation schemes: cubic splines
- **Procedure**: Determine the equilibrium of the finite-horizon version of the economy, and approximates the infinite horizon economy by increasing the number of periods until value functions and bond prices are sufficiently close.
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Calibration

- Quarterly model
- **Data**: Slovak data between 2009-2016 (real GDP, net real debt, government and household consumption, long-term bond yields) + Germany long-term bond yields
- **Approach**: standard literature, direct calibration, parameters set to match target moments of the data

Models Comparison

Main observations

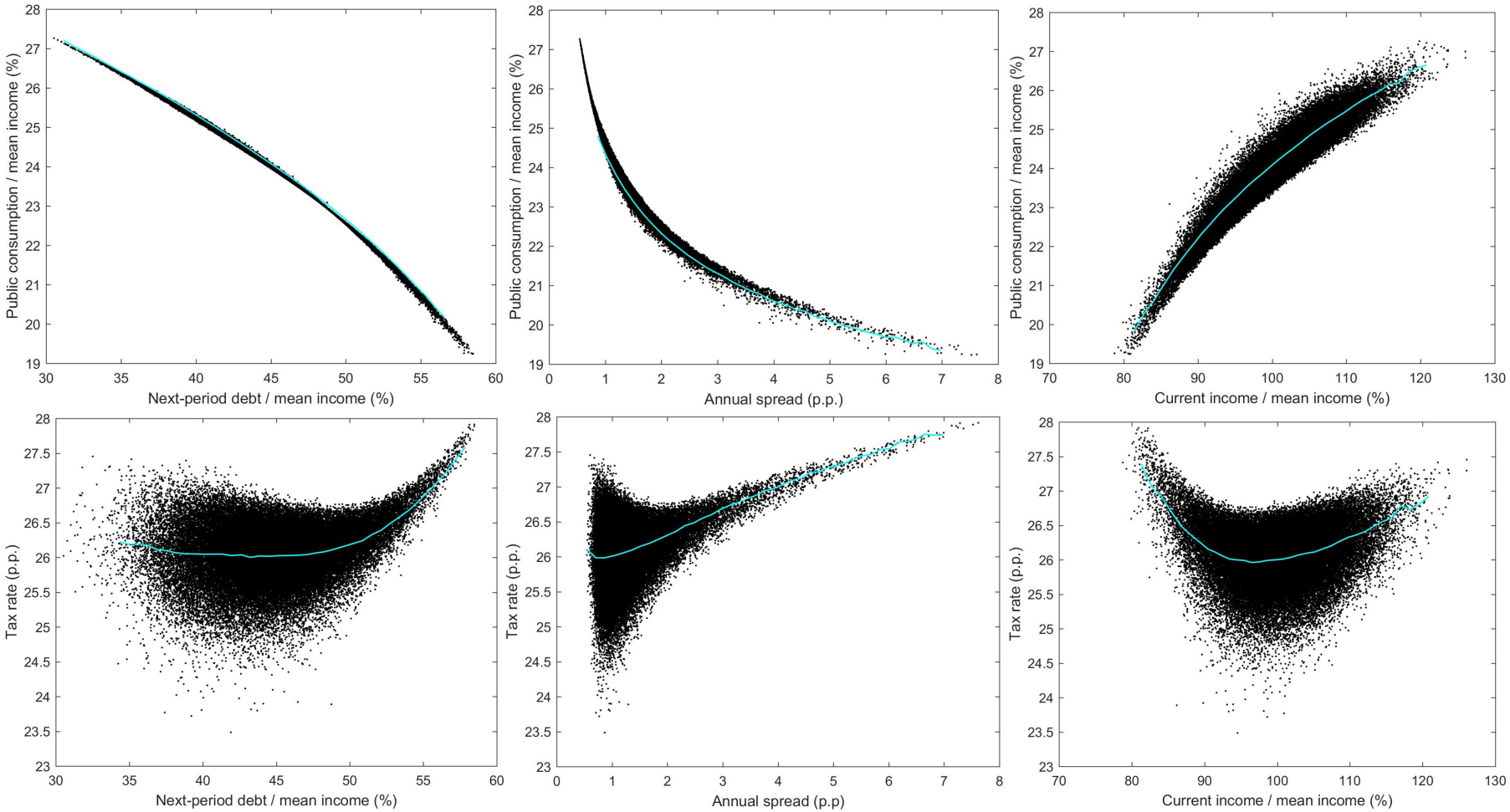
- Benchmark model (without fiscal rule) well approximates data moments.
- It is optimal for the government to choose a pro-cyclical fiscal policy.
- Government can benefit from committing to an optimal debt limit (48% of mean benchmark economy income):
  - debt dilution mitigation,
  - default becomes less attractive especially in bad times,
  - significant decline of risk premium, borrowing opportunities arise,
  - higher aggregate product, faster economy recovery after a crisis.
- Gains from imposing fiscal rules may be even larger for indebted economies.

Target	Slovak Data	Benchmark Model	Debt Rule (48%)
Average Duration of gov. bonds	6.15 years	6.15 years	6.61 years
Average Spread	1.35% p.a.	1.34% p.a.	0.83% p.a.
Average Debt	44.0%	44.8%	47.2%
g/c	34.0%	33.4%	33.5%
$\sigma(c)/\sigma(y)$	0.95	0.96	0.99
Average annual default rate	-	0.68	0.57

Table 1: Benchmark vs. optimal debt-rule model comparison. Statistics calculated from 1,000 simulation samples

Benchmark Model

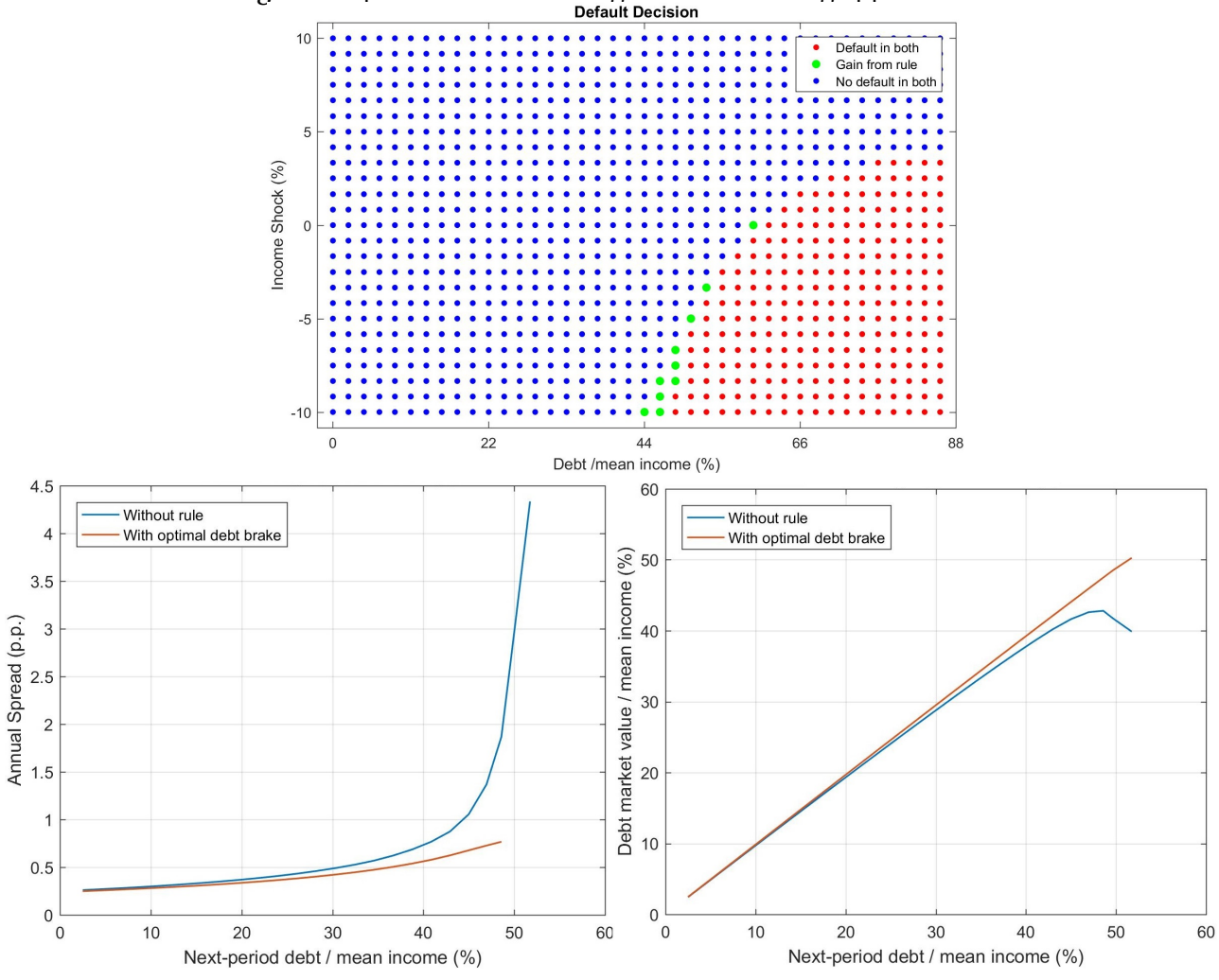
Figure 1: Benchmark economy: pro-cyclical fiscal policy



Responsiveness of fiscal policy: government consumption (bottom panel) and taxes (top panel) to the debt/GDP ratio (left), annual spread (middle) and business cycle. Cyan curves represent the mean of the simulated response of the fiscal policy tool (tax rate, consumption) to debt/GDP, spread or business cycle.

Optimal Debt Limit Model I.

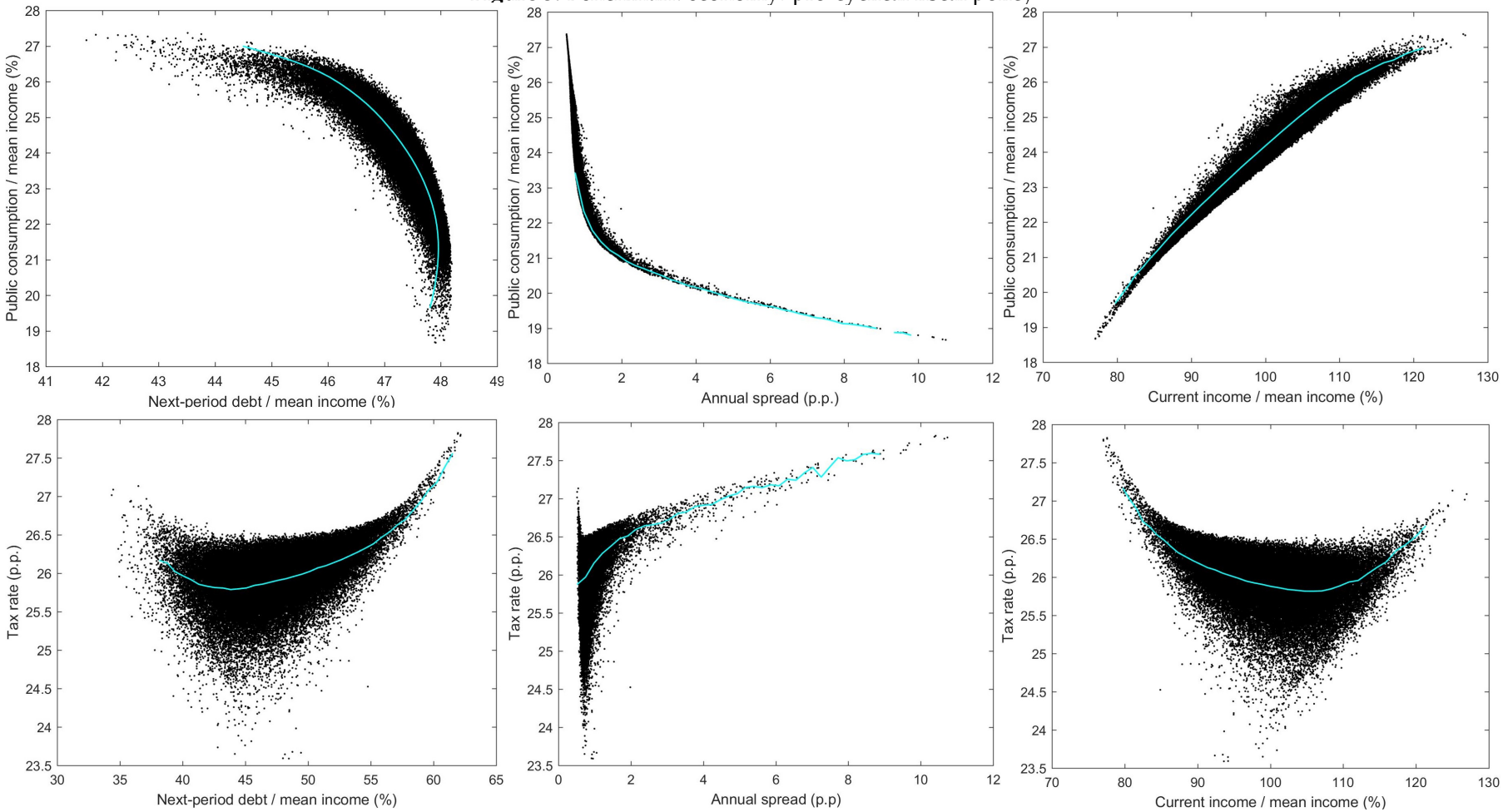
Figure 2: Optimal decision strategies and borrowing opportunities



Gains from the optimal debt rule implementation: No default benefit (green dots), debt dilution mitigation and new borrowing opportunities creation. The rule limits future borrowing, enabling the government to pay a lower interest rate for any chosen debt level.

Optimal Debt Limit Model II.

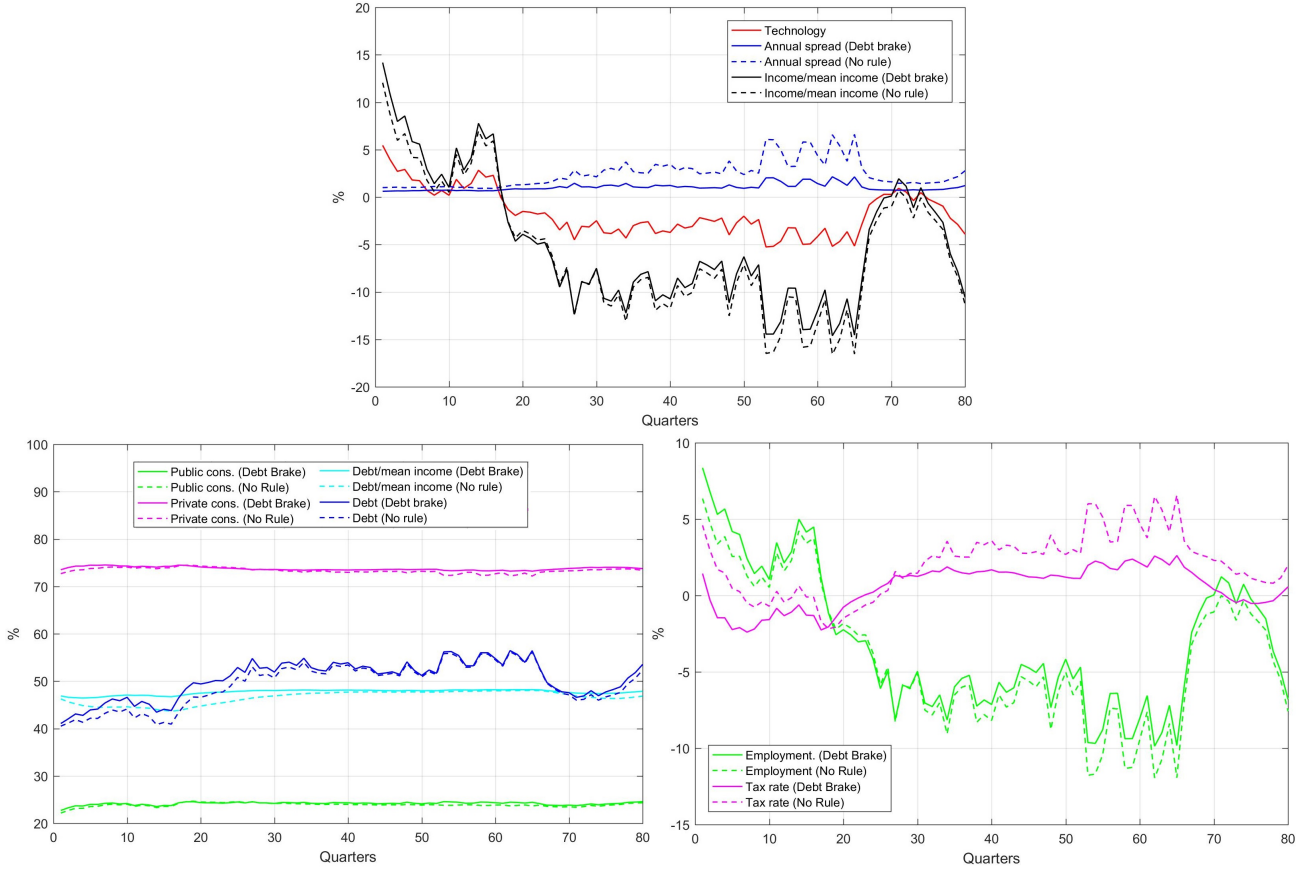
Figure 3: Benchmark economy: pro-cyclical fiscal policy



Responsiveness of fiscal policy under optimal debt rule: government consumption (bottom panel) and taxes (top panel) to the debt/GDP ratio (left), annual spread (middle) and business cycle. It is optimal for the government to choose a pro-cyclical fiscal policy (when aggregate output is lower, the tax rate tends to be higher, and the level of public good lower). As debt approaches its ceiling, government has to dramatically cut its consumption and increase taxes to finance the debt.

Optimal Debt Limit Model III.

Figure 4: Simulations with and without a fiscal rule

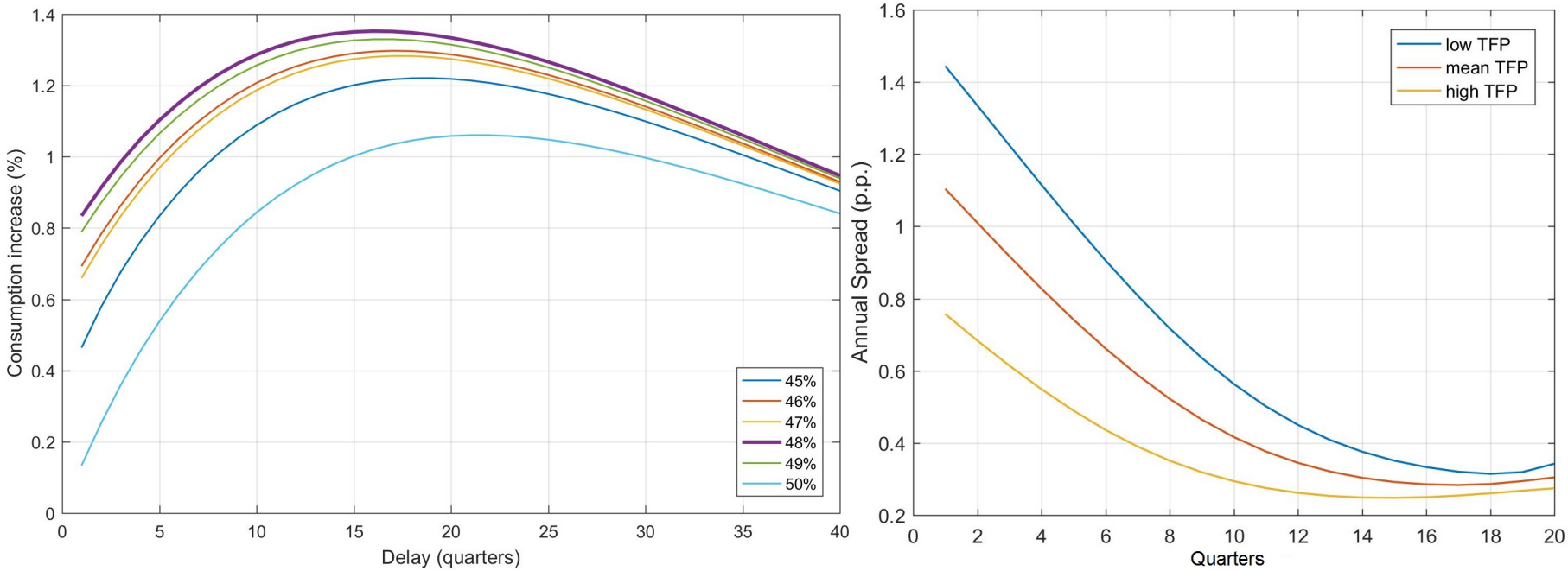


Benefits of anchoring expectations with the optimal fiscal rule: Thick lines correspond to the paths of variables simulated using the optimal debt rule model while the dashed lines correspond to the paths of variables simulated using the no-rule model. Faster recovery of the economy after the crisis, lower spreads and taxes are evident in the debt rule economy are not implied by any additional sacrifice of consumption required by the debt brake but from anchored expectations about future fiscal policy.

Debt Rule for Indebted Economy

Problem: indebted economy + immediate implementation of the debt rule → welfare loss
Solution: introduce the debt ceiling + transition period between its announcement and implementation
Aim: search for the combination of the debt limit and delay that maximizes welfare
Welfare evaluation: constant proportional change in consumption that would leave a consumer indifferent between continuing living in the benchmark economy and moving to an economy with a debt rule

Figure 5: Welfare gain and annual spreads



Gains from debt rule implementation: Welfare is maximised with a debt brake at 48% of the mean output of the benchmark economy approx. 4 years after its announcement (gain is 1.25 - 1.45%) assuming the initial 44.8% indebtedness. Commitment to the optimal rule implies a substantial and immediate decline of spreads regardless of the initial level of technology

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Conclusion

The optimal (net) debt brake threshold: 48 % of the mean annual output

- **Sovereign spread reduction**:
  - **fully credible rule: 51 basis points**
  - **empirics: 20-40 basis points** (possible impact of the Fiscal Responsibility Act (2011))
- Optimal implementation strategy: 4 years after rule announcement

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Bibliography

Download our paper:
http://www.rozpoctovarada.sk/svk/rozpocet/346/sovereign-default-risk-and-debt-limits-case-of-slovakia

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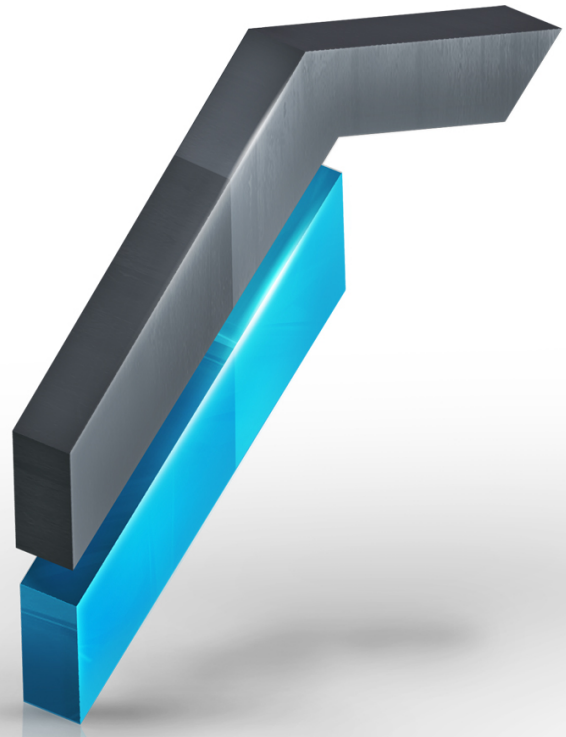

Thank you for your attention

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