

Variable rate debt to insure the government budget  
against macroeconomic shocks

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# Motivation

- ▣ Over the last decades sovereign debt management shifted from **operational bodies** within finance ministries or central banks to partly or **fully independent entities**
- ➔ Change of debt management objectives from macroeconomic stabilization to **expected cost minimization**
- ▣ We try to raise awareness for the **potential of debt management as a vital tool of fiscal policy**
- ➔ Debt management should consider the potential to **insure government finances against macroeconomic shocks**

# Motivation and related literature

- ▣ **“Fiscal insurance theory of public debt management”**  
 (Faraglia et al. 2008): two potential arguments

  - **Tax smoothing:** “Optimal Taxation Literature”: Lucas and Stokey (1983) complete set of state-contingent instruments; Angeletos (2002) and Buera and Nicolini (2004) incomplete set of state-contingent instruments
  - **Debt stabilization:** e.g. special importance for existing fiscal rules: Giavazzi and Missale (2004), Goldfajn (1998), Lloyd Ellis and Zhu (2001), Borenztein and Mauro(2004)
- ➡ **Idea: use positive covariance between fiscal shock (change of budget balance) and price of public debt to secure the intertemporal budget constraint**

# Our approach

- ▣ Debt stabilization through **smoothing of budget balance**

  - “first best”: **GDP-indexed debt** is only available under special circumstances (e.g. debt restructuring)
  - **Which debt instruments can replicate/approach the “first best”,** e.g. variable rate debt: inflation indexed debt, floaters,...
- ▣ In reality the price of issued debt securities (net present value) has minor influence on the budget balance

  - Small amount of buy backs
  - Replicating derivative instruments are hardly used
  - We assume that bond prices of not maturing debt (net present value of debt) do not influence government finances
- ➡ **Idea: use positive covariance between fiscal shock (change of primary budget balance) and financing costs**

# Analytical framework I

- Debt management tries to **minimize the conditional variance of the budget balance ratio**.

- Contemporaneous version:

- Budget balance:

$$BB_t = PB_t - \tilde{l}_t D_{t-1}$$

- Impact of macroeconomic shock to budget balance

$$\frac{\partial BB_t}{\partial \varepsilon_t} = \frac{\partial PB_t}{\partial \varepsilon_t} - \frac{\partial \tilde{l}_t}{\partial \varepsilon_t} D_{t-1}$$

- **Perfect smoothing (minimum variance) of the budget balance ratio:**

$$\frac{\partial PB_t}{\partial \varepsilon_t} = \frac{\partial \tilde{l}_t}{\partial \varepsilon_t} D_{t-1}$$

# Analytical framework II

- $\left(\frac{\partial PB_t}{\partial \varepsilon_t}\right)$ : shock induced **reaction of Austrian PB** captured by

  - Reaction of Austrian GDP evaluated with
  - Budget semi-elasticity
  
- $\left(\frac{\partial \tilde{i}_t}{\partial \varepsilon_t} D_{t-1}\right)$ : shock induced **reaction of interest payments** depends on

  - **Debt level and debt structure** (fixed/variable: “**variable-rate-ratio**” and maturity profile)
  - **Interest reaction** depends on type of shock and interest benchmark.  
We consider two **benchmarks**:
    - **Inflation (inflation-indexed debt, IID)**
    - **3M-Euribor (floater)**

# Considered macroeconomic shocks

## □ Demand shock:

$$\frac{\partial GDP}{\partial \varepsilon_t^d} > 0, \frac{\partial \pi_t}{\partial \varepsilon_t^d} > 0, \frac{\partial i_t}{\partial \varepsilon_t^d} > 0$$

## □ Supply shock:

$$\frac{\partial GDP_t}{\partial \varepsilon_t^s} > 0, \frac{\partial \pi_t}{\partial \varepsilon_t^s} < 0, \frac{\partial i_t}{\partial \varepsilon_t^s} \geq / < 0$$

## □ Monetary policy shock :

$$\frac{\partial GDP_t}{\partial \varepsilon_t^{mp}} > 0, \frac{\partial \pi_t}{\partial \varepsilon_t^{mp}} > 0, \frac{\partial i_t}{\partial \varepsilon_t^{mp}} < 0$$

# Standard results from economic theory

## ■ Demand shock

- IID: AT and EA shock:  $\frac{\partial \pi_t^{AT}}{\partial \varepsilon_t^d} > 0 \rightarrow$  possible to insure
- Floaters: EA shock :  $\frac{\partial i_t^{3M}}{\partial \varepsilon_t^d} > 0 \rightarrow$  possible to insure

## ■ Supply shock

- IID: AT and EA shock:  $\frac{\partial \pi_t^{AT}}{\partial \varepsilon_t^s} < 0 \rightarrow$  amplifies fiscal shock
- Floaters: EA shock:  $\frac{\partial i_t^{3M}}{\partial \varepsilon_t^s} \geq / < 0 \rightarrow$  uncertain

## ■ Monetary policy shock

- IID: AT and EA shock:  $\frac{\partial \pi_t^{AT}}{\partial \varepsilon_t^{mp}} > 0 \rightarrow$  possible to insure
- Floaters: EA shock:  $\frac{\partial i_t^{3M}}{\partial \varepsilon_t^{mp}} < 0 \rightarrow$  amplifies fiscal shock



# ■ Identification and transmission of structural shocks: two-country VAR-model

- Estimated **model**: 
$$\begin{pmatrix} x_t^{EA} \\ x_t^{AT} \end{pmatrix} = \begin{pmatrix} A_{11}(L) & 0 \\ A_{21}(L) & A_{22}(L) \end{pmatrix} \begin{pmatrix} x_{t-1}^{EA} \\ x_{t-1}^{AT} \end{pmatrix} + \begin{pmatrix} \varepsilon_t^{EA} \\ \varepsilon_t^{AT} \end{pmatrix}$$
- $x_t^{EA}$  vector of **euro area variables**: GDP-growth, HCPI, 3M-Euribor
- $x_t^{AT}$  vector of **Austrian variables**: GDP-growth, HCPI
- $\varepsilon_t^{EA}, \varepsilon_t^{AT}$  **residuals** (shocks)
- 1999Q1-2019Q1
- **Assumptions**:
  - Minor (ignored) influence of Austrian variables on EA variables
  - EA development serves as a proxy for global developments.

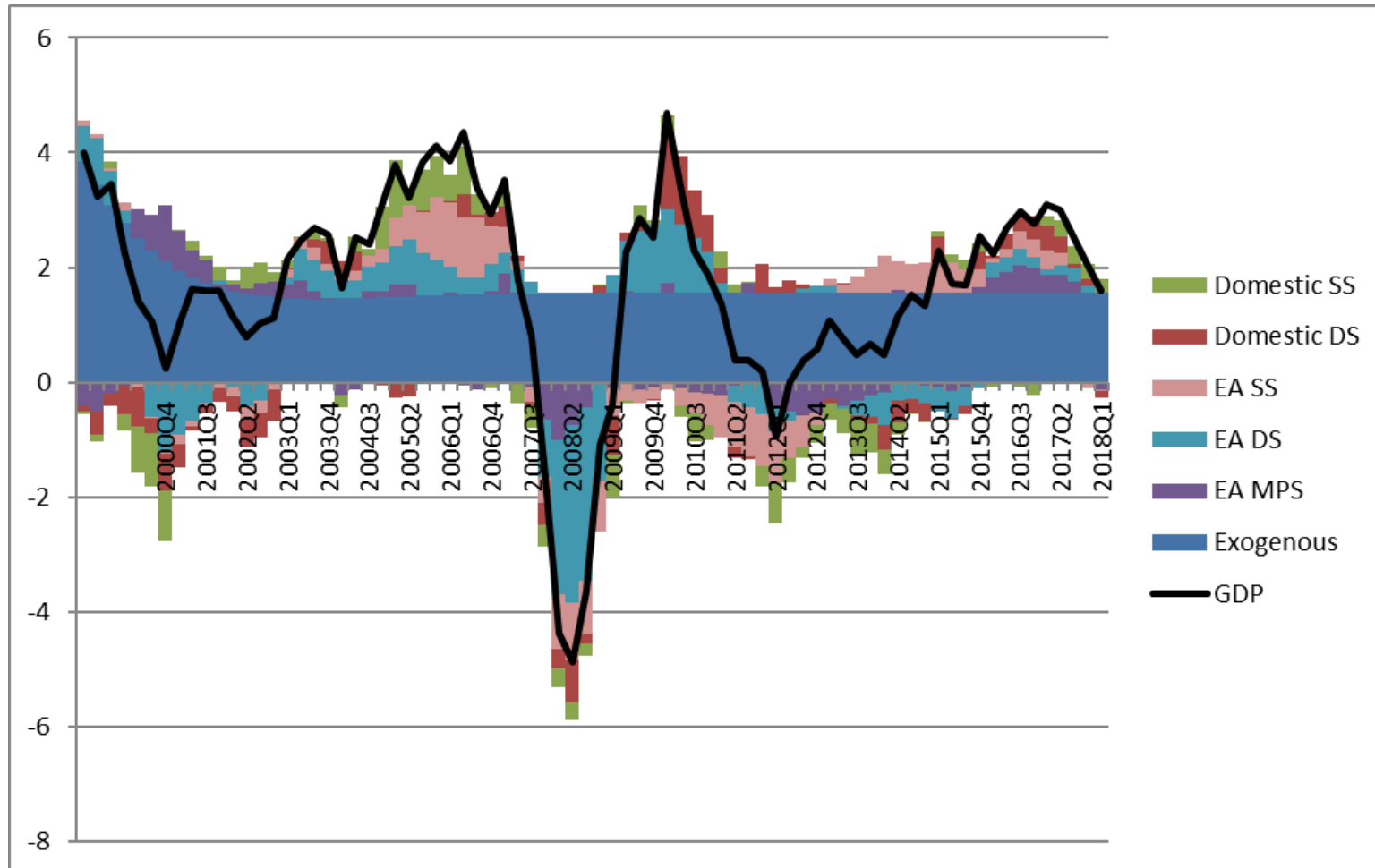
# ■ Identification of structural shocks via sign restriction approach

- Theoretical restrictions for the impulse responses of the VAR-models

	$GDP^{EA}$	$\pi^{EA}$	$i^{EA}$	$GDP^{AT}$	$\pi^{AT}$
EA-demand shock	1	1	1	?	?
EA-supply shock	1	-1	?	?	?
EA-monetary policy shock	1	1	-1	?	?
AT-demand shock	0	0	0	1	1
AT-supply shock	0	0	0	1	-1

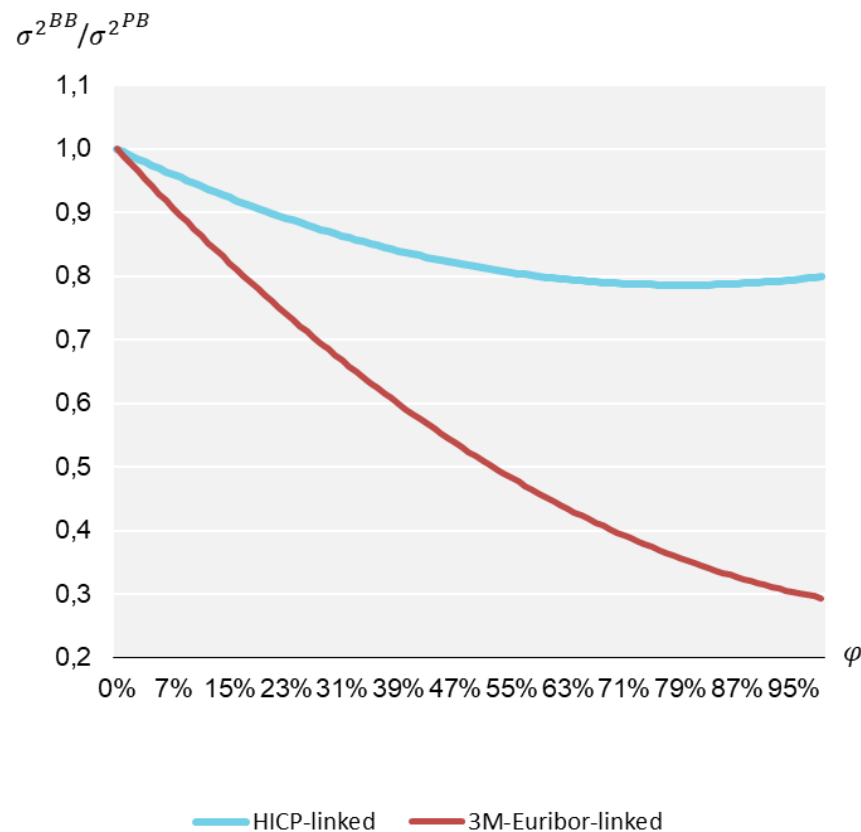
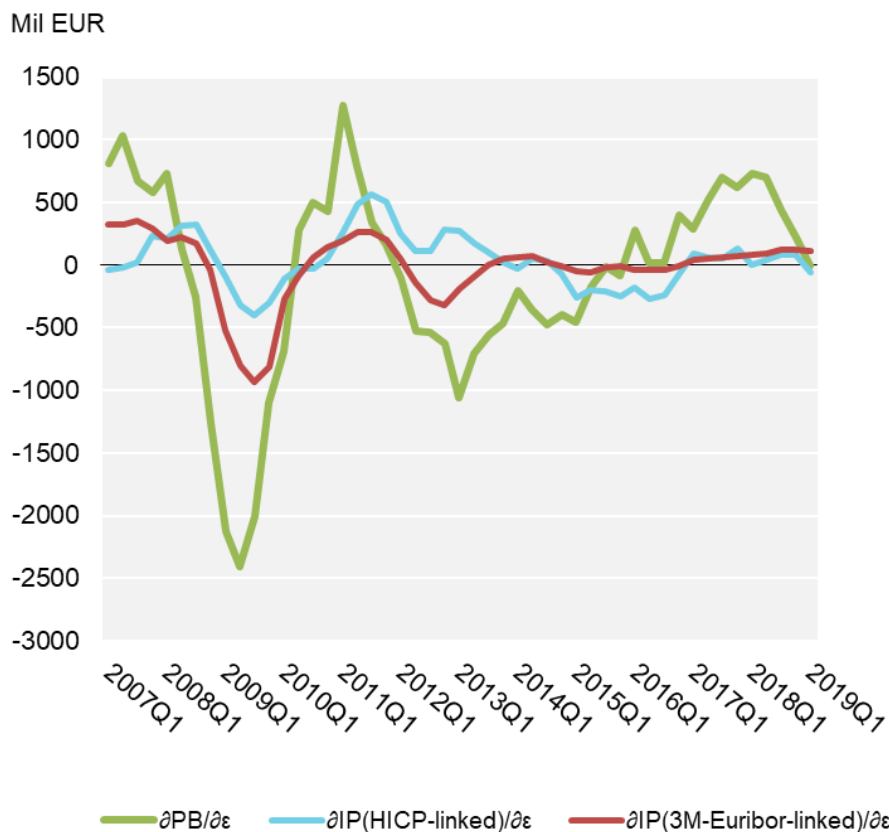
- 1: increase; -1: decrease; 0: no change; ?: uncertain reaction

# Historical growth decomposition of Austrian real GDP growth



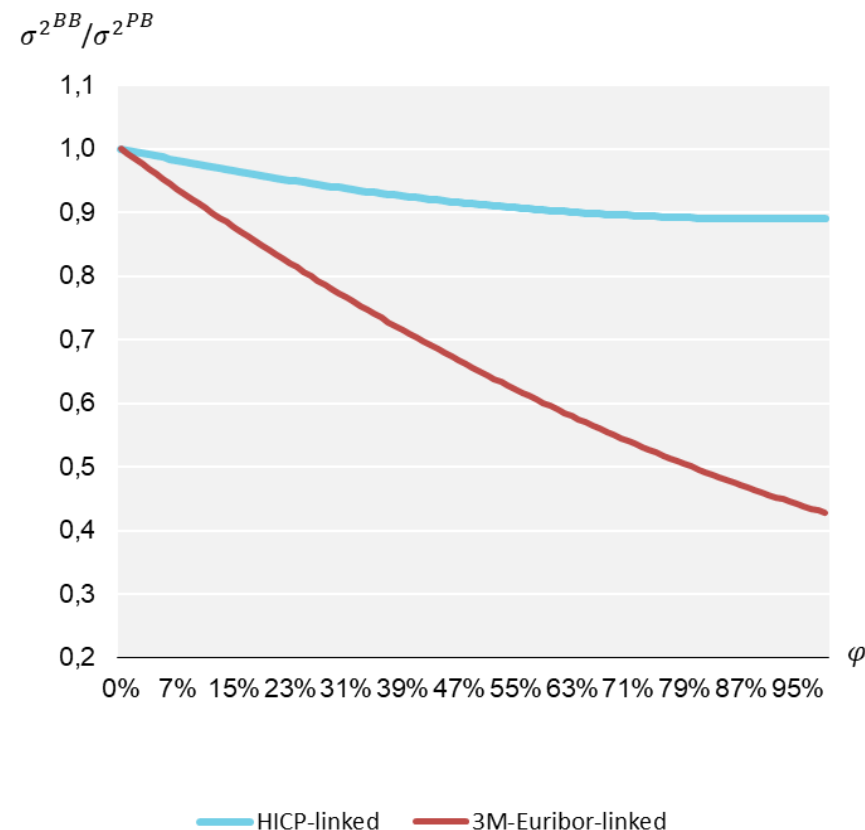
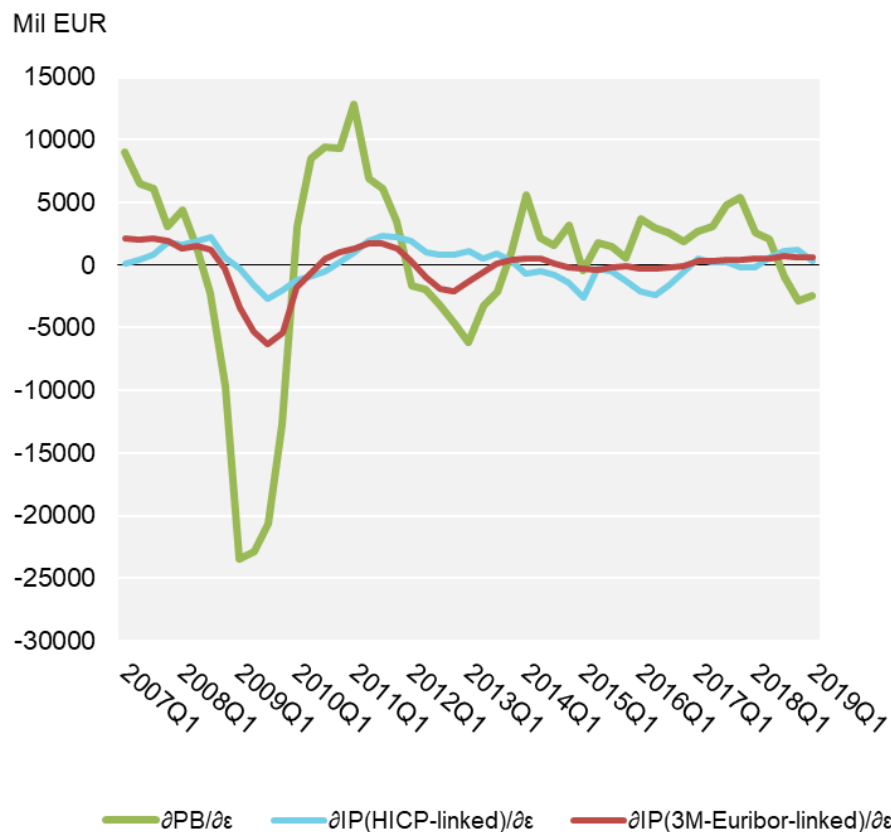
# Variance of budget balance – aggregate shocks

## AT



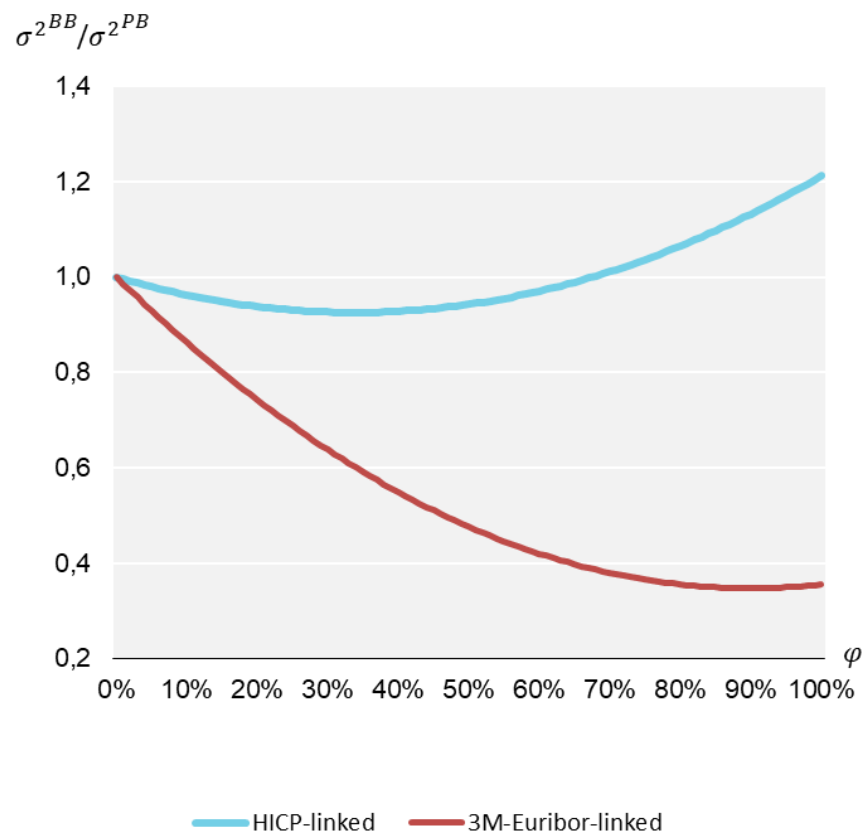
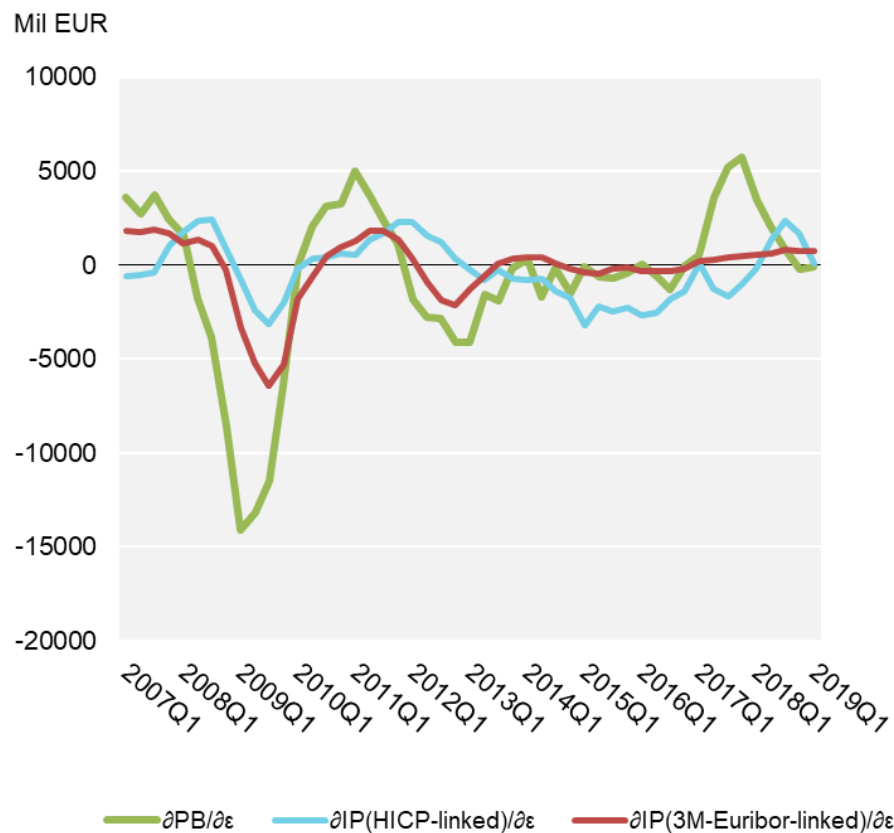
# Variance of budget balance – aggregate shocks

## DE



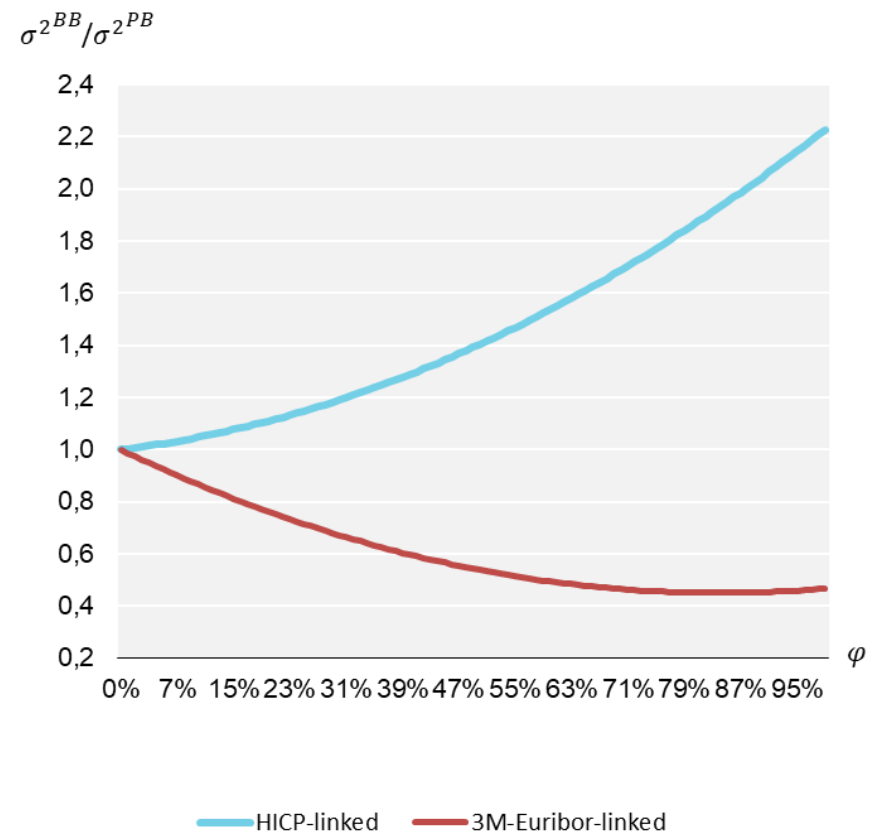
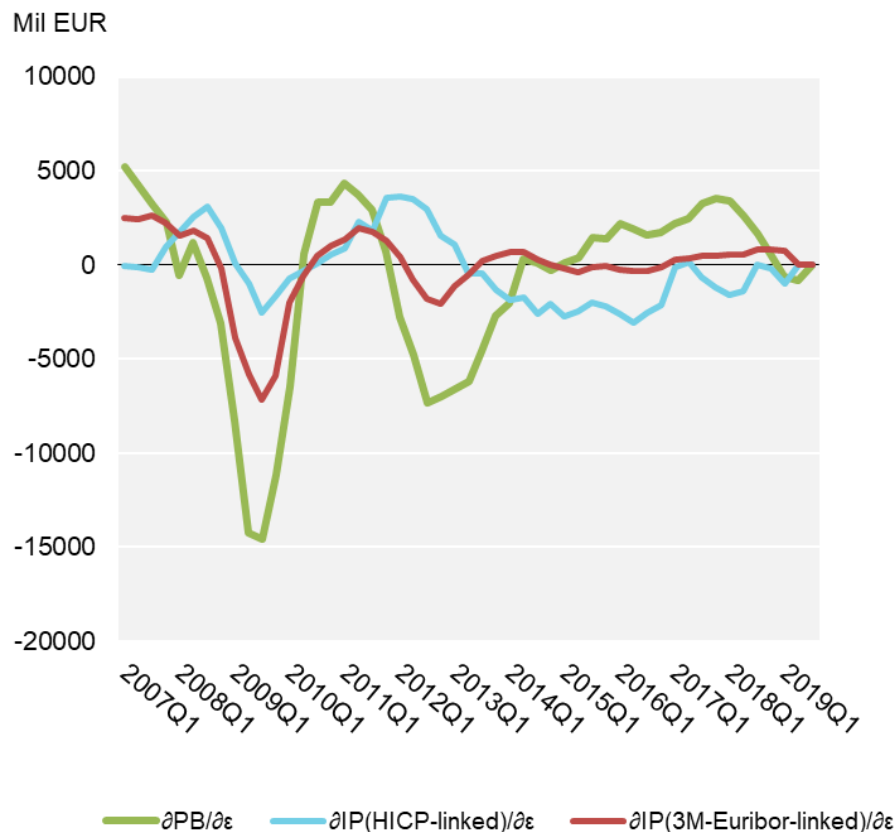
# Variance of budget balance – aggregate shocks

## FR



# Variance of budget balance – aggregate shocks

## IT



## Conclusion

- **Variable rate debt** can be used to **partly insure** the budget balance **against aggregate macroeconomic shocks**.
- **Inflation-indexed debt** can partly insure the budget balance against demand and monetary policy shocks, but increases the reaction of the budget balance for supply shocks.
- **3M-Euribor-indexed debt** has the ability to insure the budget balance against demand and supply shocks, but increases the reaction of the budget balance to monetary policy shocks.
- First results for other OECD countries imply qualitatively similar results.