Measuring Fiscal Discipline

—A Revealed Preference Approach—

Regis Barnichon and Geert Mesters

December 18, 2023

Introduction

- Fiscal rules intend to constrain fiscal policy discretion and limit debt-financing
- 90+ countries have fiscal rules on public deficit, public expenditures or debt level
- Fiscal rules are often violated, approximately 50% of the time is spend in violation (Eyraud, 2018)

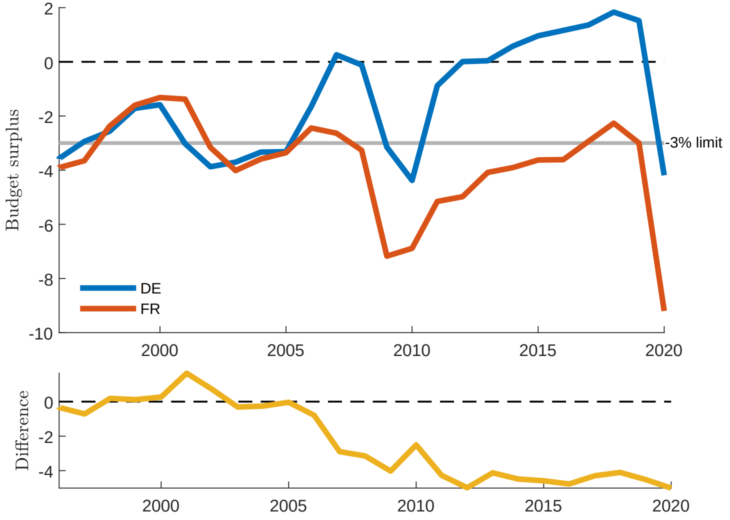
Important feature

> *The Balanced Budget and Emergency Deficit Control Act of 1985 set annual targets for an endogenous variable —the budget deficit— that Congress cannot control any more than King Canute could control the tides.*
>
> Blinder (2022)

- Fiscal rules depend on endogenous variables (e.g. budget deficit) affected by factors outside policy makers' immediate control

$\Rightarrow$ **How should we establish, quantify and compare responsibility for rule violations?**

Figure: Budget surplus: France vs. Germany



This paper

- Propose a revealed-preference approach to measure policy makers' preference for respecting fiscal rules: "fiscal discipline"

- Central idea: macro stabilization can conflict with fiscal rules:

  $\Rightarrow$ how policy maker (PM) trades off the macro stabilization objective with the fiscal rules allows to measure fiscal discipline

- Fiscal discipline (FD): weight placed on fiscal rules relative to macro stabilization when deciding on fiscal policy

- Show FD is computable from sufficient statistics: forecasts and IRFs

Illustrative example

- y_t output gap, x_t fiscal deficit and $x_t \leq \bar{x}$ fiscal rule

  set $\bar{x} = \mathbf{0}$ for simplicity

$$y_t = \alpha x_t + \xi_t$$

$$x_t = \underbrace{-\beta y_t}_{\text{“automatic stabilizer”}} + \underbrace{p_t}_{\text{“discretionary component”}}$$

- policy maker is liable for

$$p_t = \theta \xi_t + \epsilon_t \qquad \rightarrow \quad \text{policy choice } = (\theta, \epsilon_t)$$

Baseline approach

Define fiscal efforts based on "cyclically-adjusted" fiscal variables

(e.g. EU Commission 2009, 2019 , OECD 2005, 2015, IMF 2009, 2022)

(i) extract discretionary component $p_t = x_t + \beta y_t$

(ii) then compare p_t to threshold $\bar{x}$, across time or countries

Two key problems

$$x_t = -\beta y_t + p_t \qquad \text{and} \qquad p_t = \theta \xi_t + \epsilon_t$$

(i) Endogeneity: separating p_t from x_t is riddled with simultaneity, omitted variable and measurement error problems

(ii) Comparability: p_t is not comparable across time or countries as it depends on shocks ξ_t (in general on economic environment)

Two key problems

$$x_t = -\beta y_t + p_t \qquad \text{and} \qquad p_t = \theta \xi_t + \epsilon_t$$

(i) Endogeneity: separating p_t from x_t is riddled with simultaneity, omitted variable and measurement error problems

(ii) Comparability: p_t is not comparable across time or countries as it depends on shocks ξ_t (in general on economic environment)

⇒ Propose revealed-preference approach that side-steps (i) and (ii)

Optimal policy

Macro stabilization objective $\mathcal{L}_t^y = \frac{1}{2} {y_t}^2$, solve

$$\min_{p_t} \mathcal{L}_t^y \qquad \text{s.t.} \qquad \text{model}$$

$\Rightarrow$ optimal rule

$$p_t^u = \theta^u \xi_t \qquad \text{with} \qquad \theta^u = -\frac{1}{\alpha}$$

Optimal policy with fiscal constraint

Consider legislator who wants $x_t \leq \bar{x}$, then

$$\min_{p_t} \mathcal{L}_t^y \qquad \text{s.t.} \qquad \text{model and } x_t \leq \bar{x}$$

$\Rightarrow$ optimal rule (if binding)

$$p_t^c = \theta^c \xi_t \qquad \text{with} \qquad \theta^c = \beta$$

Note fiscal loss

$$\mathcal{L}_t^x = (x_t - \bar{x})_+^2 = 0$$

Revealing fiscal preferences

- Two polar cases:
  - unconstrained $\theta^u = -\frac{1}{\alpha}$ $\rightarrow$ no attention to fiscal rule, $\mathcal{L}_t^y \downarrow \mathcal{L}_t^x \uparrow$
  - constrained $\theta^c = \beta$ $\rightarrow$ perfectly follows fiscal rule, $\mathcal{L}_t^y \uparrow \mathcal{L}_t^x \downarrow$

- Exists range $[\theta^u, \theta^c]$ where
  - each θ implies different preference: $\mathcal{L}_t^y$ vs $\mathcal{L}_t^x$
  - i.e. a different preference for abiding by rule

- The policy makers' choice θ^0 reveals preference

Towards defining fiscal discipline

Define *auxiliary* loss

$$\mathsf{L}_t = \mathcal{L}_t^y + \lambda \mathcal{L}_t^x$$

Policy problem becomes

$$\min_{p_t} \mathsf{L}_t \qquad \text{s.t.} \qquad \text{model}$$

Solving gives

$$p_t^*(\lambda) = \theta(\lambda)\xi_t \qquad \text{with} \qquad \theta(\lambda) = \frac{\beta\lambda - \alpha}{\alpha^2 - \lambda}.$$

Fiscal discipline

Definition

Fiscal discipline is defined as the weight

$$\lambda^0 = \arg\min_{\lambda \in \mathbb{R}^+} \mathbb{E}\|p_t^0 - p_t^*(\lambda)\|^2$$

where

- p_t^0: policy choice
- $p_t^*(\lambda)$: λ-optimal policy

- Intuitively, λ^0 is weight that PM places on average on the fiscal constraints when choosing the policy p_t^0
- Crucially, λ^0 is comparable across countries or time periods

Measuring fiscal discipline from sufficient statistics

In this simple example

$$\lambda^0 = \frac{\theta^0 \alpha^2 - \alpha}{\theta^0 + \beta} .$$

- requires estimating θ^0, α and β, i.e. structural model must be known

Instead note that see BM (2023, AER)

- λ-optimal policy $p_t(\lambda)$ is solution to lin-quad problem
- distance to any p_t^0 can be computed from
  - (y_t^0, x_t^0) allocation under p_t^0
  - $\mathcal{R}_y$ and $\mathcal{R}_x$ irfs of (y_t, x_t) to policy shock ϵ_t

Fiscal discipline with sufficient statistics

Proposition

We can measure fiscal discipline based on

$$\lambda^0 = \underset{\lambda \in \mathbb{R}^+}{\arg\min} \left\| \mathcal{R}_x (\mathcal{R}' \mathcal{W}(\lambda) \mathcal{R})^{-1} \mathcal{R}' \mathcal{W}(\lambda) W_t^{0+} \right\|^2$$

where

- Impulse responses: $\mathcal{R} = (\mathcal{R}_y, \mathcal{R}_x)'$
- Forecasts: $W_t^{0+} = (y_t^0, (x_t^0 - \bar{x})_+)'$
- $\mathcal{W}(\lambda) = \text{diag}(1, \lambda)$

▸ Intuition ▸ Proof sketch

Generalizing

All holds for *any* generic macro model of form

$$\mathbb{E}_t Y_t - \mathcal{A}_{yx}\mathbb{E}_t X_t = \Upsilon_t$$
$$\mathbb{E}_t X_t - \mathcal{A}_{xy}\mathbb{E}_t Y_t = \mathcal{B}_{x\upsilon}\Upsilon_t + \mathbb{E}_t P_t$$

$$\Theta_{pp}\mathbb{E}_t P_t = \Theta_{py}\mathbb{E}_t Y_t + \Theta_{p\upsilon}\Upsilon_t + \boldsymbol{\epsilon}_t \ ,$$

where

- $\mathbb{E}_t W_t = \mathbb{E}_t(w_t', w_{t+1}', w_{t+2}', \ldots)'$ for $W = Y, X, P$

are paths of endogenous variables

Defining fiscal discipline

Pick any

- Macro loss: $\mathcal{L}_t^y = \frac{1}{2}\mathbb{E}_t Y_t' \mathcal{W}_y Y_t$
- Fiscal loss: $\mathcal{L}_t^x = \frac{1}{2}\mathbb{E}_t (X_t - \bar{X}_t)_+' \mathcal{W}_x (X_t - \bar{X}_t)_+$

Auxiliary loss becomes

$$\mathsf{L}_t = \mathcal{L}_t^y + \lambda \mathcal{L}_t^x$$

- Fiscal discipline: elicit λ^0 from

$$\lambda^0 = \arg\min_{\lambda \in \mathbb{R}^+} \mathbb{E} \| \mathbb{E}_t P_t^0 - \mathbb{E}_t P_t(\lambda) \|^2$$

Measuring fiscal discipline

Proposition

We can measure fiscal discipline based on

$$\lambda^0 = \arg\min_{\lambda \in \mathbb{R}^+} \left\| \mathcal{R}_x (\mathcal{R}' \mathcal{W}(\lambda) \mathcal{R})^{-1} \mathcal{R}' \mathcal{W}(\lambda) W_t^{0+} \right\|^2$$

where

- Impulse responses: $\mathcal{R} = (\mathcal{R}_y, \mathcal{R}_x)'$
- Forecasts: $W_t^{0+} = (\mathbb{E}_t Y_t^0, \mathbb{E}_t (X_t^0 - \bar{X}_t)_+)'$
- $\mathcal{W}(\lambda) = \text{diag}(\mathcal{W}_y, \lambda \mathcal{W}_x)$

Fiscal policy in EU

To illustrate we consider

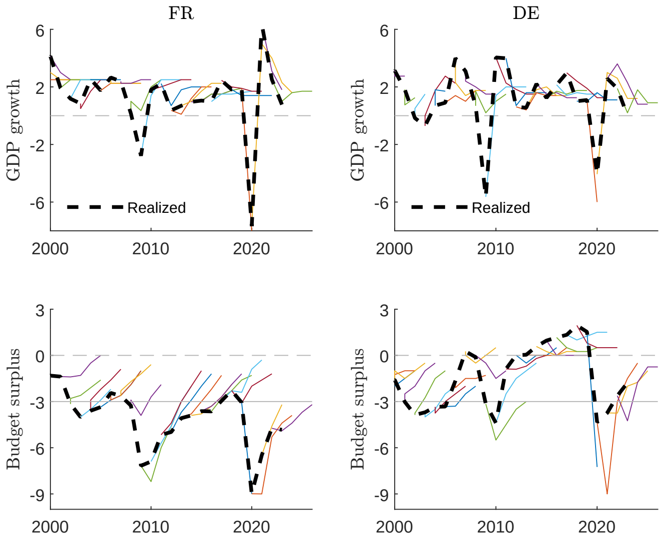
$$\mathsf{L}_t = \sum_{h=0}^{H} \mathbb{E}_t y_{t+h}^2 + \lambda \sum_{h=0}^{H} \mathbb{E}_t (s_{t+h} - \bar{s})_+^2$$

trading off

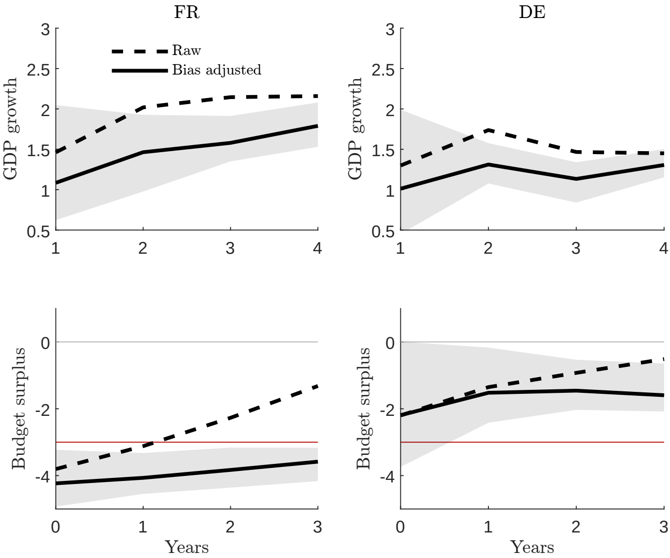
- output gaps: $y_t, y_{t+1}, \ldots$
- budget surpluses: $s_t, s_{t+1}, \ldots$, with $\bar{s} = -3$

$\Rightarrow$ compare λ^0's for different EU countries and time periods

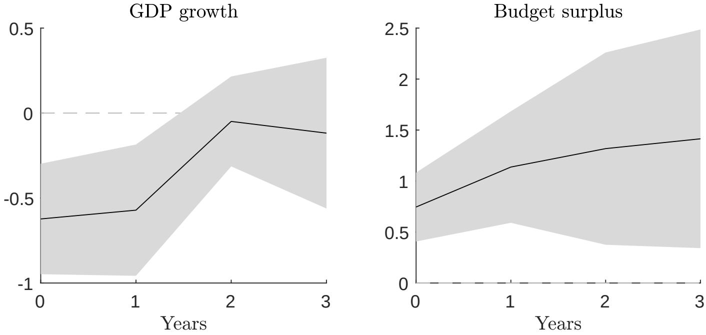
SGP forecasts



SGP forecasts – adjusted

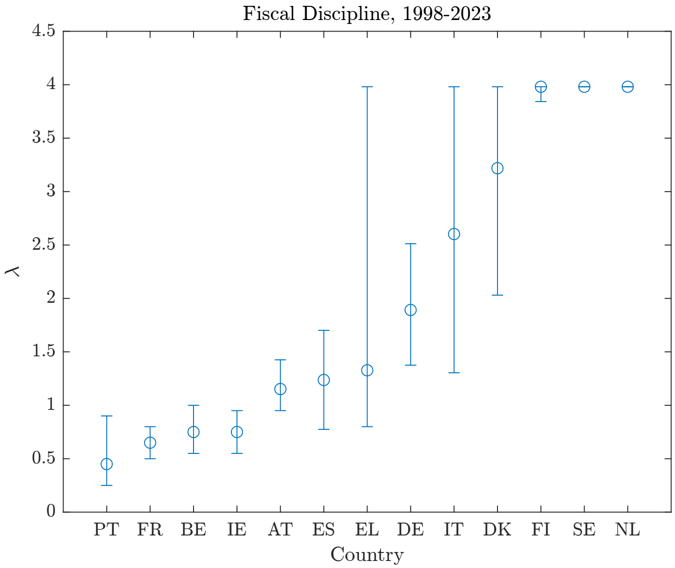


Impulse responses to a fiscal austerity shock

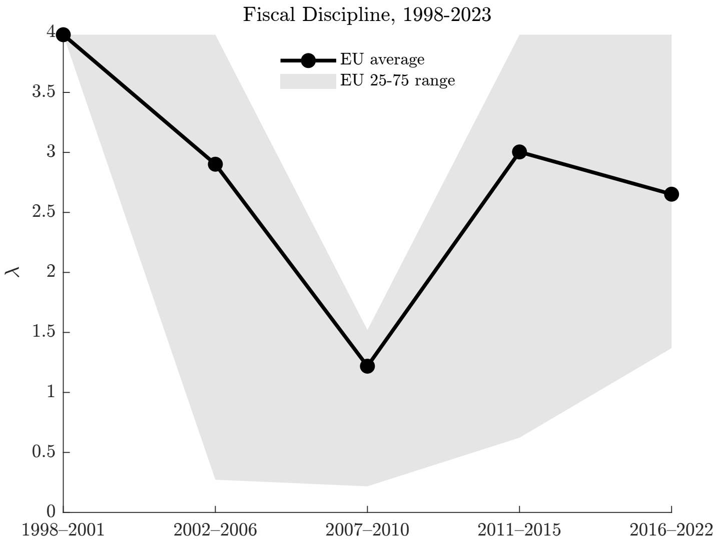


- ϵ_t from Guarjardo, Leigh & Pescatori (2014)

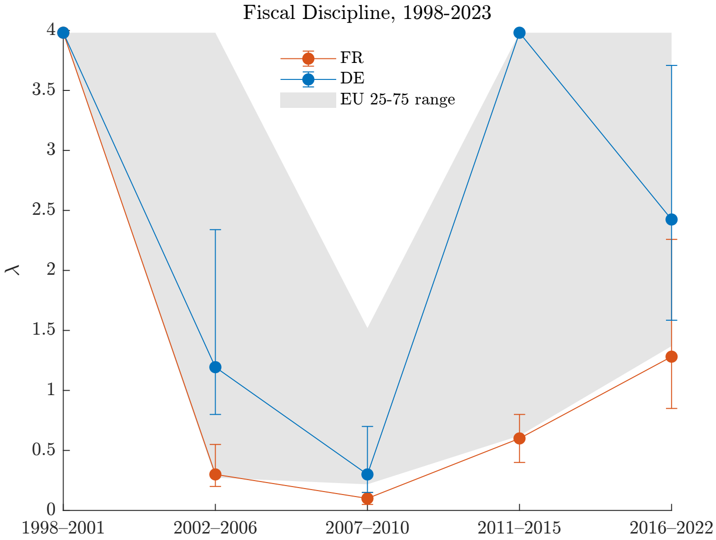
Fiscal discipline in the EU: 1998-2023



Fiscal discipline over time



Fiscal discipline: France vs Germany



Summary

- Defining and measuring fiscal discipline is hard
- New approach based on **Revealed Preferences**
- Avoids: Comparability and Endogeneity concerns
- Easy to implement based on sufficient statistics: forecasts + irfs

Appendix

Generalization

- two objectives $\mathcal{L}^y$ and $\mathcal{L}^x$
- policy plan P^0

λ-weighted optimal policy plan

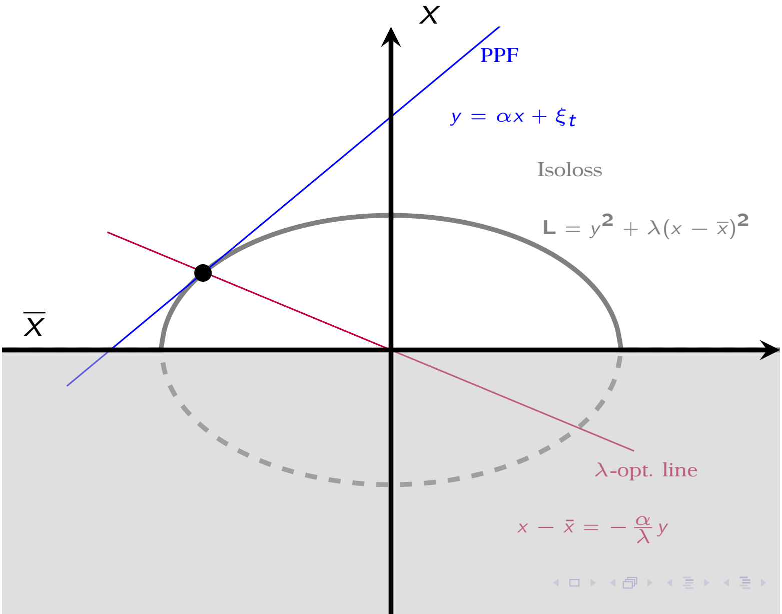
$$\widehat{P}(\lambda) = \arg\min_{P} \; \mathcal{L}^y + \lambda \mathcal{L}^x$$

Effort towards satisfying $\mathcal{L}^x$ is

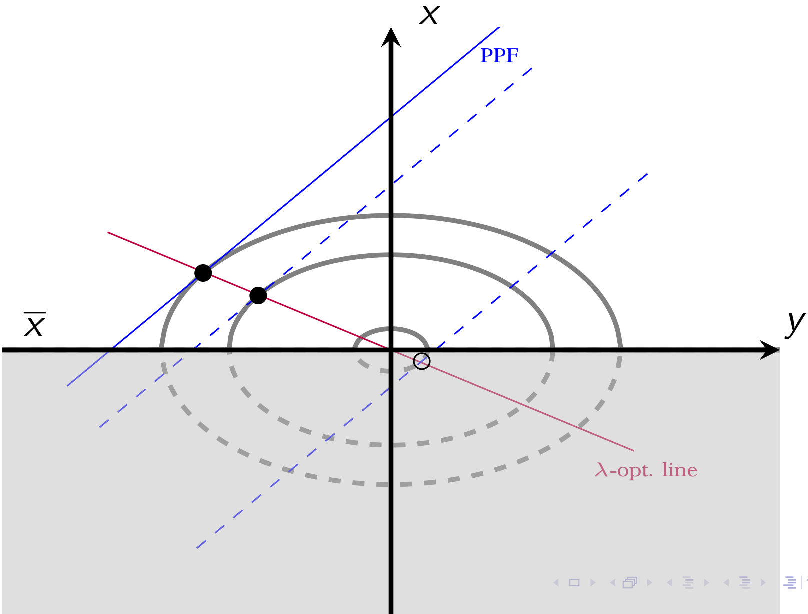
$$\lambda^0 = \arg\min_{\lambda \in \mathbb{R}^+} \mathbb{E} \| P^0 - \widehat{P}(\lambda) \|^2$$

$\Rightarrow$ General recipe for recovering preferences from policy plans

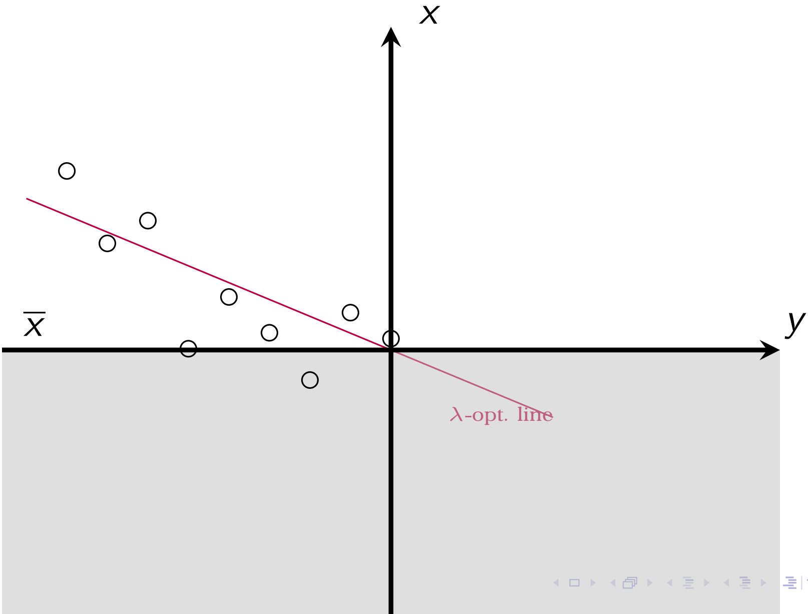
Defining fiscal discipline



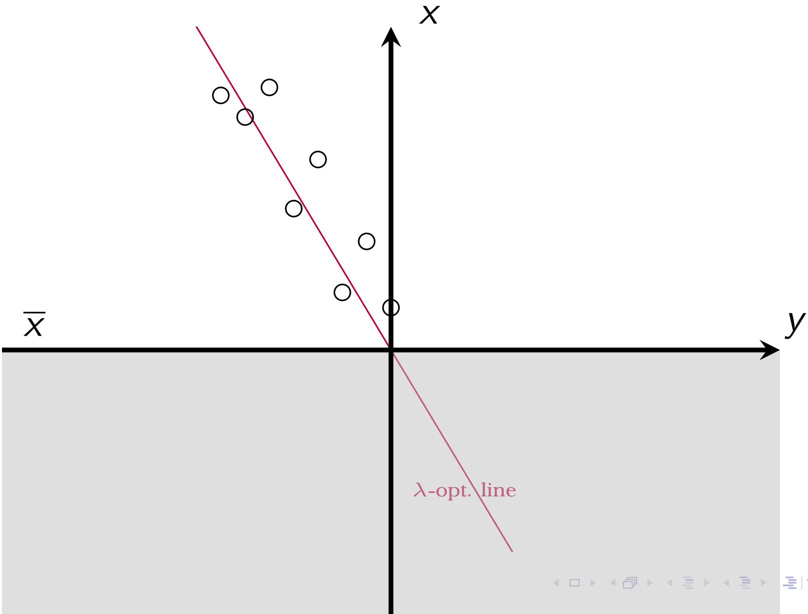
Measuring fiscal discipline



High fiscal discipline



Low fiscal discipline



Proof sketch for sufficient statistics (i)

- We want to show

$$p_t^0 - p_t(\lambda) = -\mathcal{R}_x(\mathcal{R}'\mathcal{W}(\lambda)\mathcal{R})^{-1}\mathcal{R}'\mathcal{W}(\lambda)W_t^{0+}$$

Note, under $p_t^0 = \theta^0\xi_t + \epsilon_t^0$ the equilibrium for $W_t = (y_t, x_t)'$ is

$$W_t^0 = \mathcal{R}\epsilon_t^0 + \Gamma\xi_t$$

- Now consider modifying policy choice

$$p_t = p_t^0 + \delta_t$$

Equilibrium becomes

$$W_t = \mathcal{R}(\epsilon_t^0 + \delta_t) + \Gamma\xi_t = W_t^0 + \mathcal{R}\delta_t$$

Proof sketch for sufficient statistics (ii)

We want to find δ_t such that

$$p_t^0 - p_t(\lambda) = x_t^0 - x_t(\lambda) = \mathcal{R}_x \delta_t^*$$

- Recall that $p_t(\lambda)$ is the λ-optimal policy, i.e. minimizes L_t, and thus

$$\delta_t^* = \arg\min_{\delta_t} \mathsf{L}_t \qquad \text{s.t.} \qquad W_t = W_t^0 + \mathcal{R}\delta_t$$

Solving gives

$$\delta_t^* = -(\mathcal{R}'\mathcal{W}(\lambda)\mathcal{R})^{-1}\mathcal{R}'\mathcal{W}(\lambda)W_t^{0+}$$

Conclude

$$p_t^0 - p_t(\lambda) = -\mathcal{R}_x(\mathcal{R}'\mathcal{W}(\lambda)\mathcal{R})^{-1}\mathcal{R}'\mathcal{W}(\lambda)W_t^{0+}$$

back