The Analytics of the Greek Crisis

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July 2016, Bank of Greece

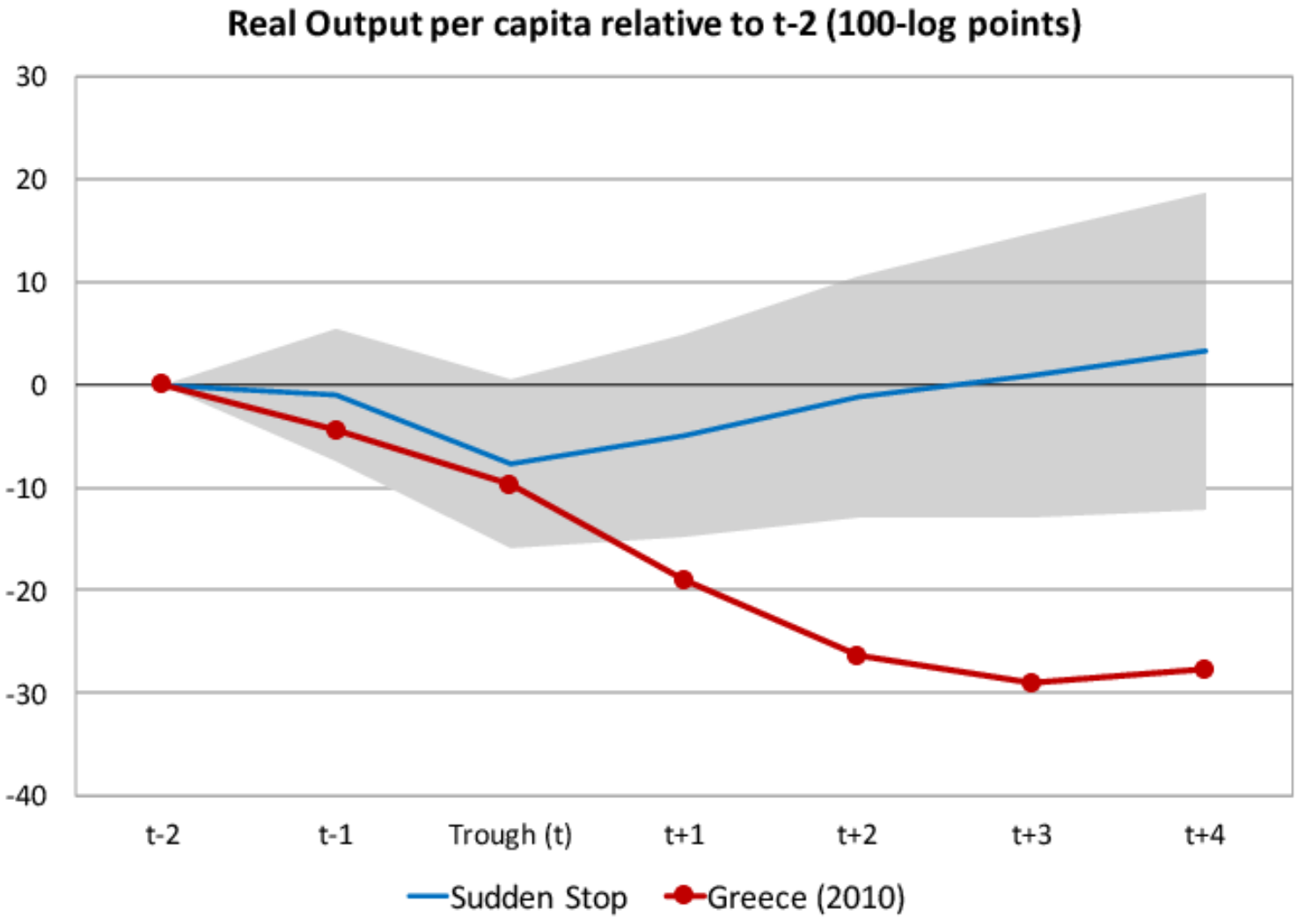
The Greek Depression

- In 2007, Greek GDP per capita was around \$35,000 and the unemployment rate was 8.4%.
- In 2014, Greek GDP per capita was around \$25,000 and the unemployment rate was 26.6%
- What happened?

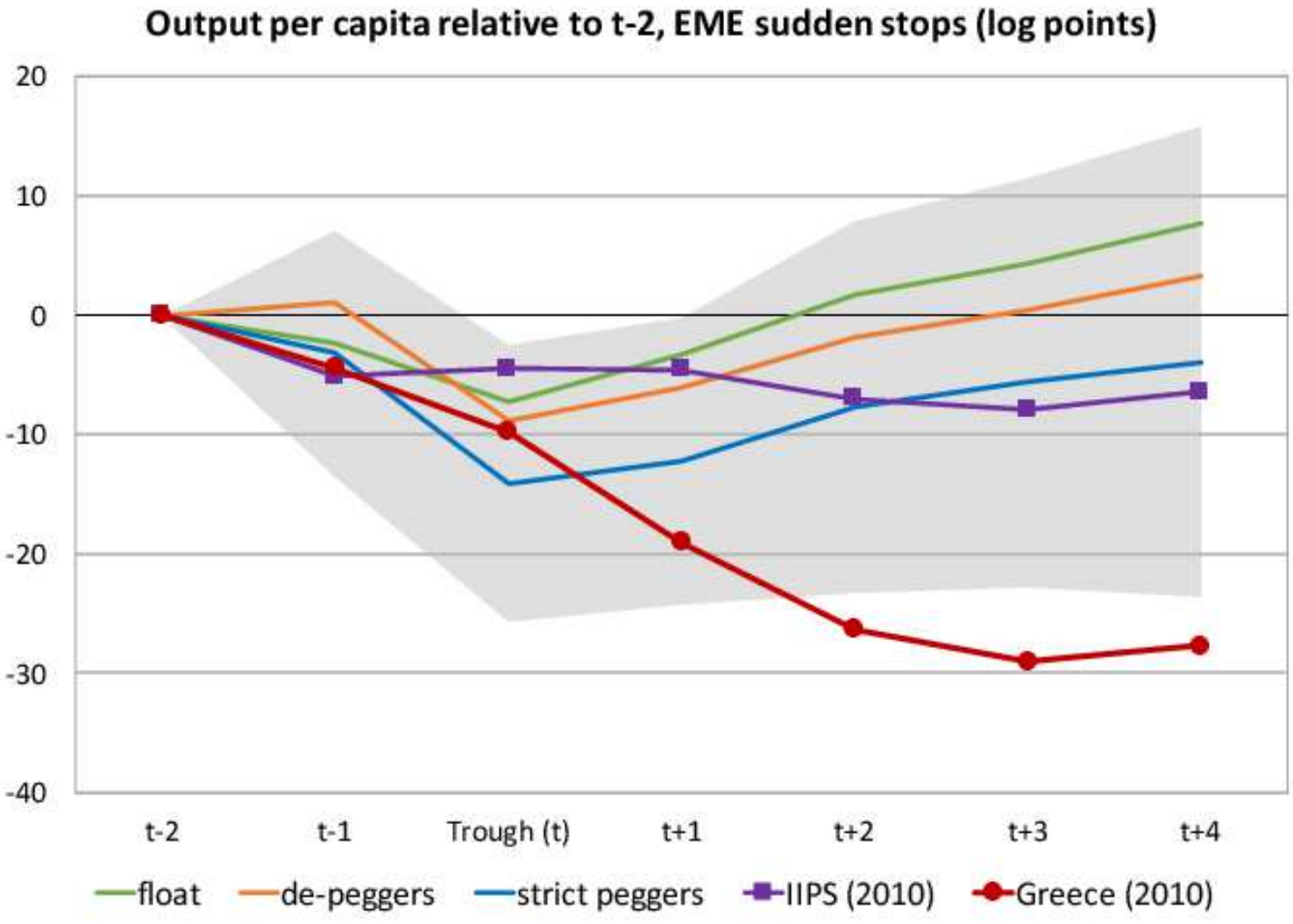
Outline

- Empirical investigation: Was Greece really that bad?
  - Yes
  - Much worse than emerging market sudden stops
  - Even for 'strict peggers'
- Model-Based investigation: Why?
  - Because Greece caught an EM disease with AE leverage ratios
  - What would have helped?
    - Less leverage
    - Banking union
    - Fiscal discipline
    - More flexible prices

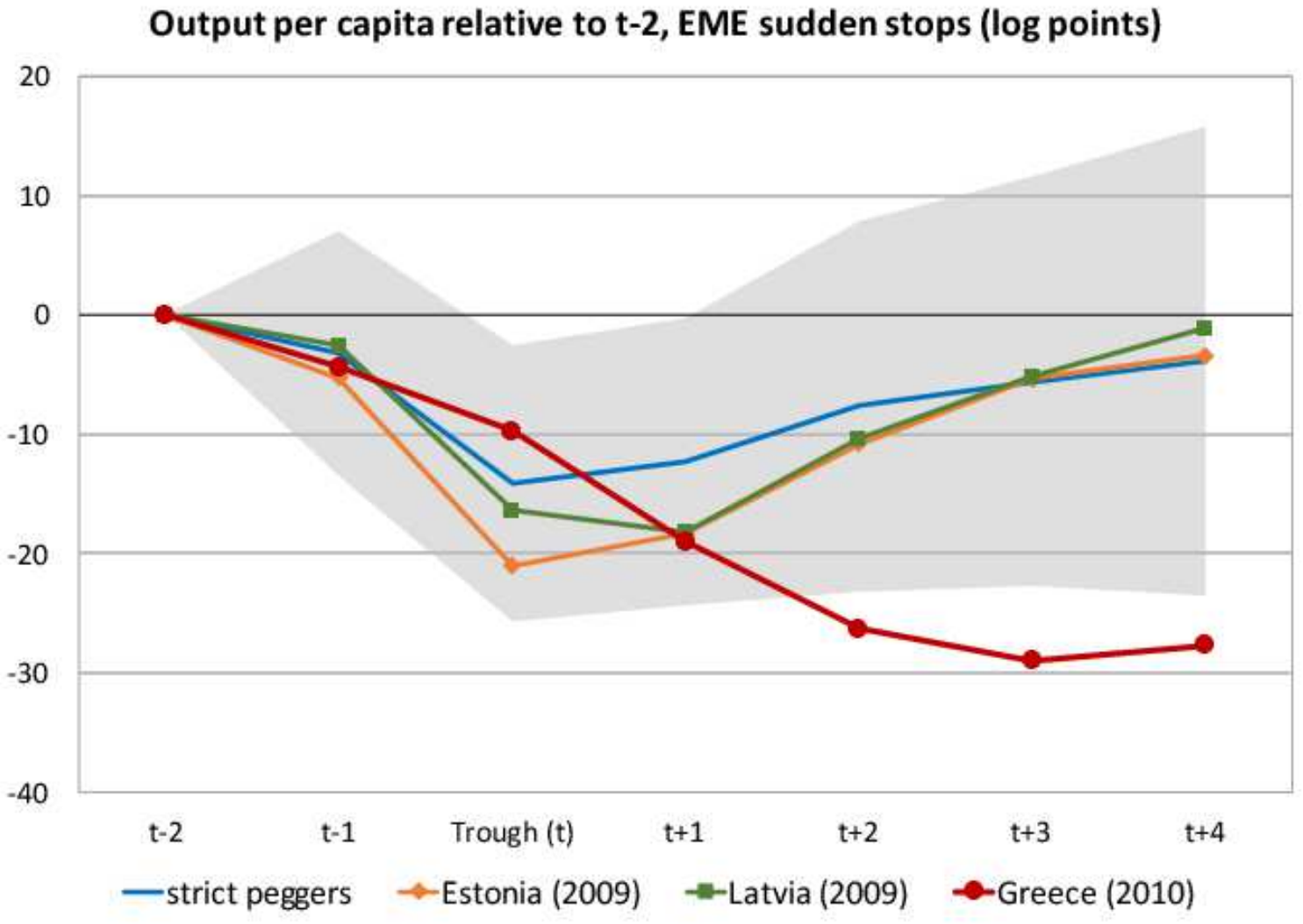
GDP Relative to All Sudden Stops



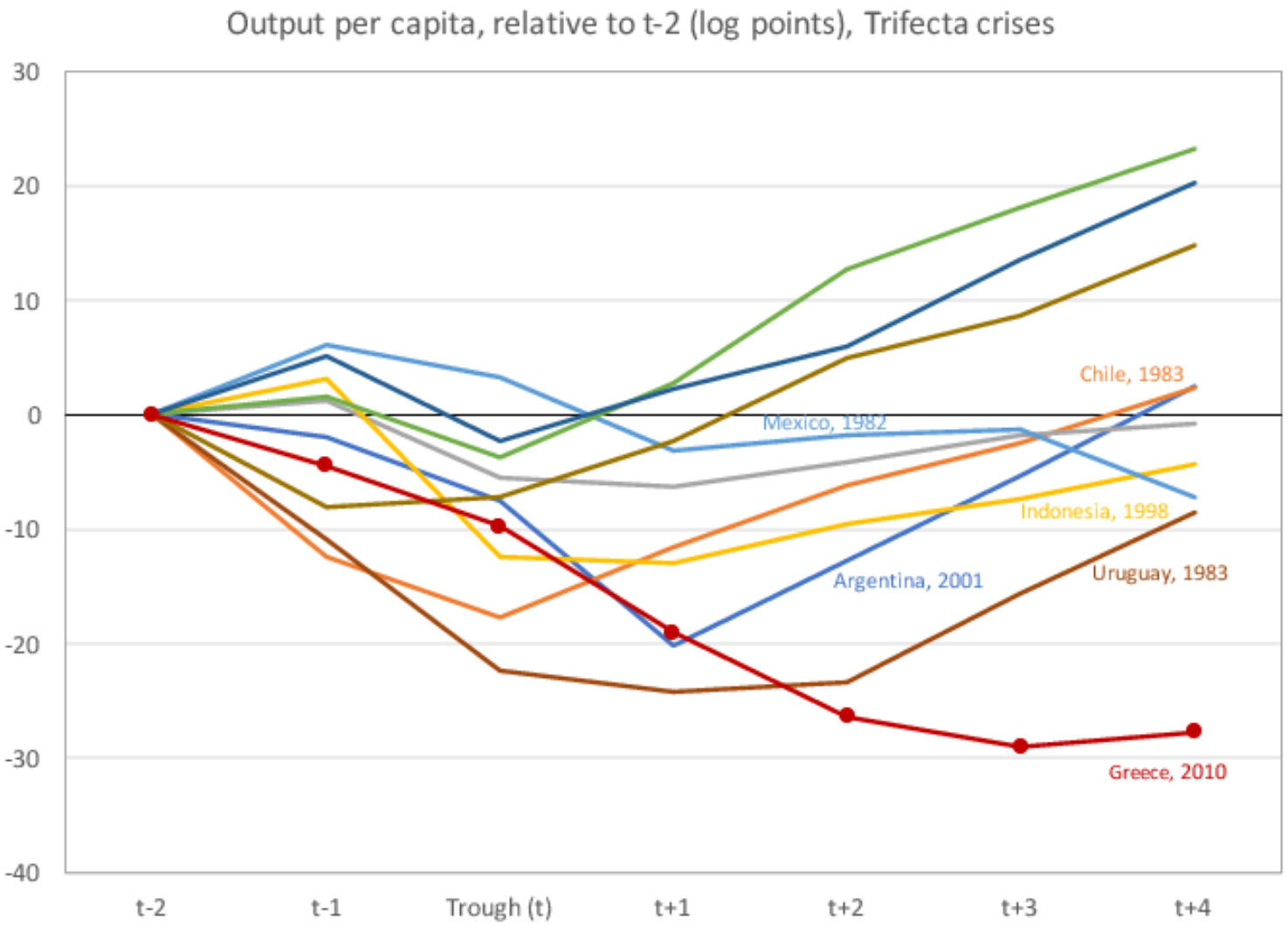
Compared to EM Floaters & Peggers



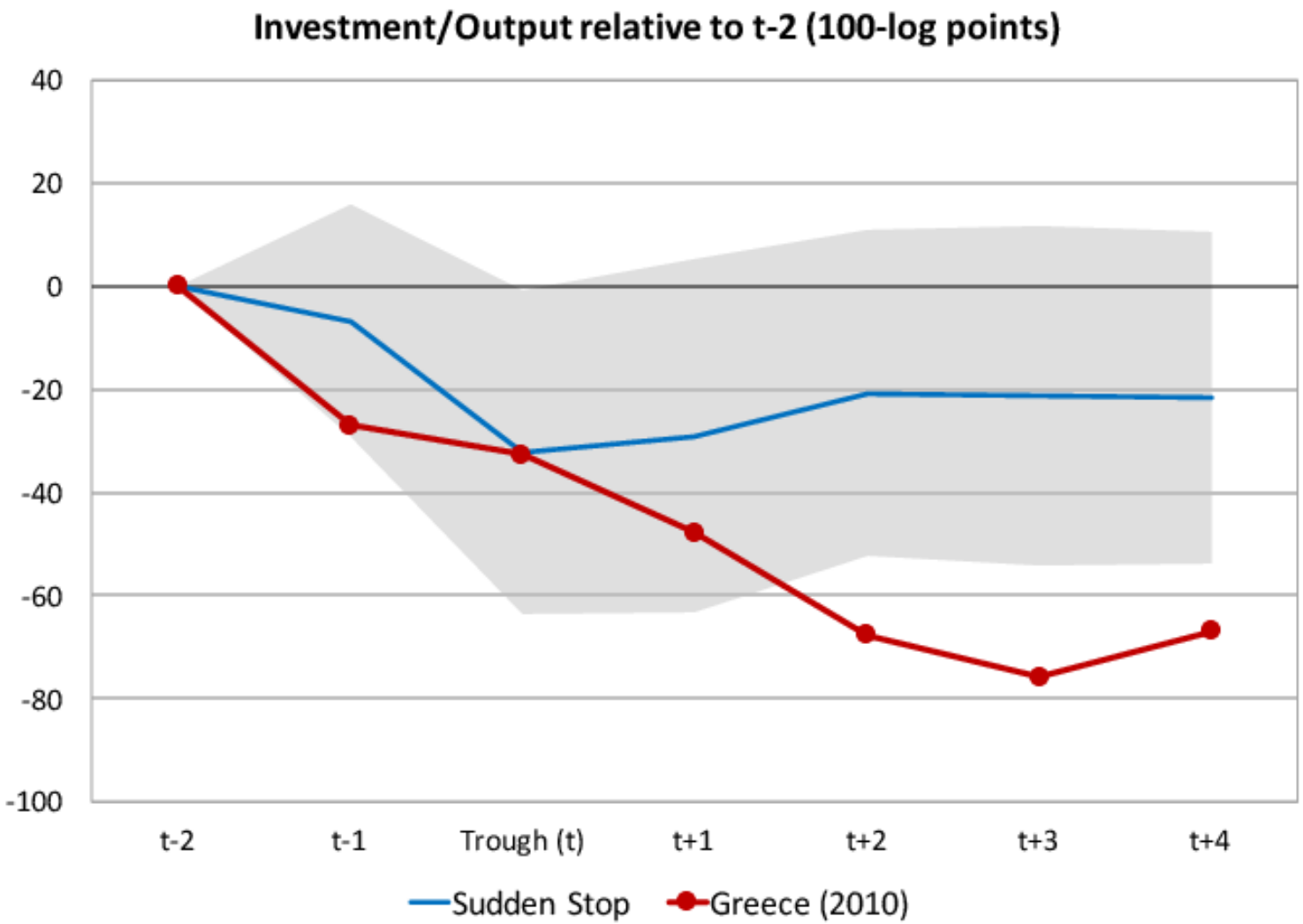
Endogenous Peg?



Sovereign Default? Credit Bust?... Trifecta



I/Y


Investment/Output relative to t-2 (100-log points)
40
20
0
-20
-40
-60
-80
-100
t-2
t-1
Trough (t)
t+1
t+2
t+3
t+4
Sudden Stop
Greece (2010)

Model

- SOE in a currency union (r, π^F)
- Standard NK DSGE
  - Government
  - Banks
    - Households (B, C)
    - Firms (I, K)
- Various shocks

$$\zeta_t^{\#} = \rho^{\#} \zeta_{t-1}^{\#} + \sigma^{\#} \varepsilon_t^{\#}$$

Government

- Budget constraint

$$\frac{B_t^g}{R_t^g} + \tau_t Y_t = G_t + T_t + \frac{B_{t-1}^g}{\Pi_t^H}$$

- Fiscal rule (spending and social transfers)

$$g_t = F_l g_{t-1} - F_n n_t - F_r r_t^g - F_b b_t^g + \zeta_t^{spend}$$

- Tax rate

$$\tau_t = \bar{\tau} + \zeta_t^{tax}$$

Households

- Same prefences over consumption and hours worked. Different discount factor ($\beta_s > \beta_b$).

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta_i^t \left(\frac{\left(\mathbf{C}_t^i\right)^{1-\gamma}}{1-\gamma} - \frac{\left(N_t^i\right)^{1+\phi}}{1+\varphi} \right)$$

- Borrowers (mass χ)

$$\mathbf{P}_t \mathbf{C}_t^b = (1-\tau_t) W_t N_{b,t} + \frac{P_{H,t} B_t^h}{R_t^h} - \left(1-d_t^h\right) P_{H,t-1} B_{t-1}^h + P_{H,t} T_t^b$$

$$B_t^h \leq \bar{B}_t^h$$

- Savers (mass $1-\chi$)

$$\mathbf{P}_t \mathbf{C}_t^s = (1-\tau_t) W_t N_{s,t} + \tilde{R}_t P_{H,t-1} S_{t-1} - P_{H,t} S_t + P_{H,t} T_t^s$$

Non-Financial Firms

- For simplicity, break down into capital- and goods-producing firms.
- Capital-producing firms:
  - Convert consumption goods into capital, and rent to goods-producing firms.
  - Q rule for investment.
- Goods-producing firms:
  - Convert capital and labor into goods.
  - Cobb-Douglas with constant TFP.
  - Financing friction: pay part of wage bill in advance.

Price and Wage Rigidity

- Phillips curve for wages

$$\pi_t^w = \beta \mathbb{E}_t \pi_{t+1}^w - \lambda^w \left(w_t - \gamma c_t - \varphi n_t \right) + \zeta_t^w$$

- Phillips curve for prices

$$\pi_{h,t} = \lambda_p \mathtt{mc}_t + \beta \mathbb{E}_t \pi_{h,t+1} + \zeta_t^{\pi h},$$

where $\mathtt{mc}_t$ is log marginal cost.

Banks

- Lend to households and firms.
- Subject to capital requirement

$$V_t \geq \kappa \left(\frac{B_t^k}{R_t^k} + \frac{B_t^h}{R_t^h} \right)$$

where V_t is franchise value.

Funding Costs

- Key equations
  - Banks fund households and firms

$$r_t^k = r_t^d$$

  - Banks: sudden stop and capital loss

$$\begin{aligned} r_t^d &= r_t + \zeta_t^r + \xi^d L\mathbb{E}_t\left[d_{t+1}^p\right] \\ d_t^p &= -\bar{d}_y y_t + \bar{d}_b b_{t-1} + \zeta_t^{def} \end{aligned}$$

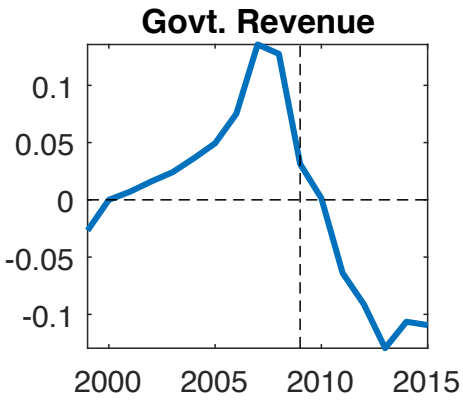
  - Government

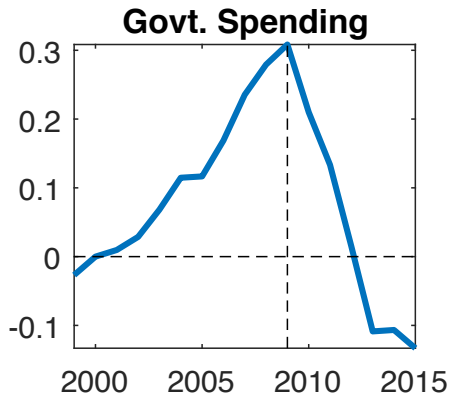
$$\begin{aligned} r_t^g &= r_t + d_t^g \\ d_t^g &= \bar{d}_g \frac{B^g}{Y}\left(b_t^g - \mathbb{E}_t\left[y_{t+1}\right] - \mathbb{E}_t\left[\pi_{t+1}^h\right] + \zeta_t^{dg}\right) \end{aligned}$$

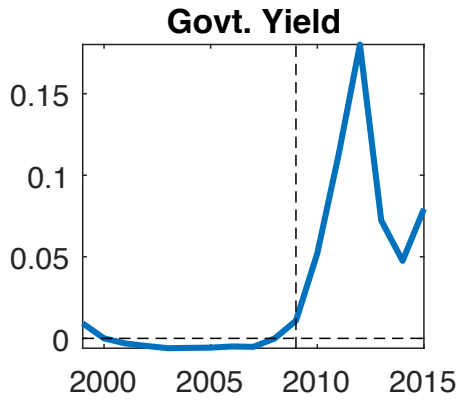
Doom Loops

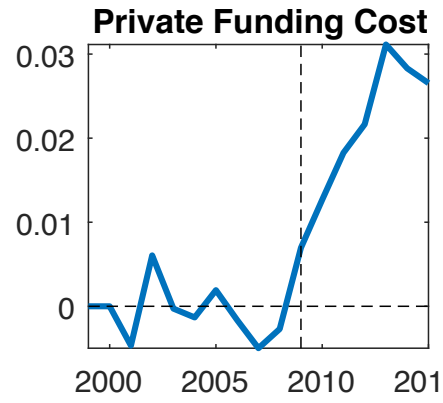
- Sovereign risk shock ζ_t^{dg}:
  - Government funding costs increase $\rightarrow$ Government raises taxes and reduces expenditure $\rightarrow$ Output declines $\rightarrow$ Expected costs of default on private-sector loans increase $\rightarrow$ Funding costs for private sector increase and investment drops.
- Sudden stop ζ_t^{r}:
  - Funding costs for private sector increase $\rightarrow$ Output and investment drop $\rightarrow$ Fiscal revenues drop $\rightarrow$ Expected costs of default on sovereign loans increase $\rightarrow$ Government funding costs increase.

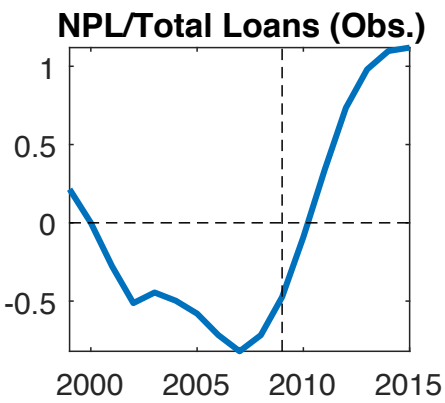
Data Inputs

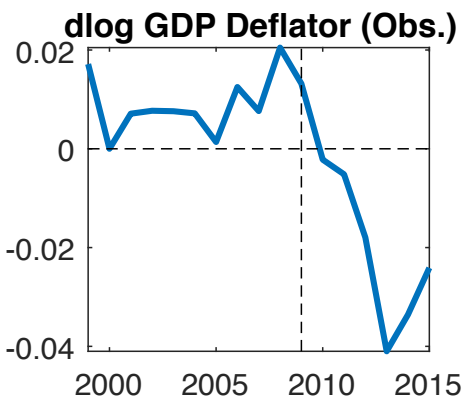

Govt. Revenue
0.1
0.05
0
-0.05
-0.1
2000
2005
2010
2015

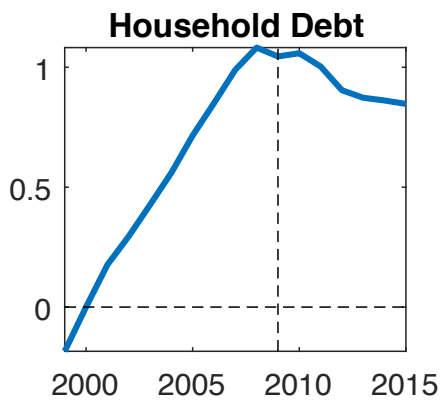

Govt. Spending
0.3
0.2
0.1
0
-0.1
2000
2005
2010
2015

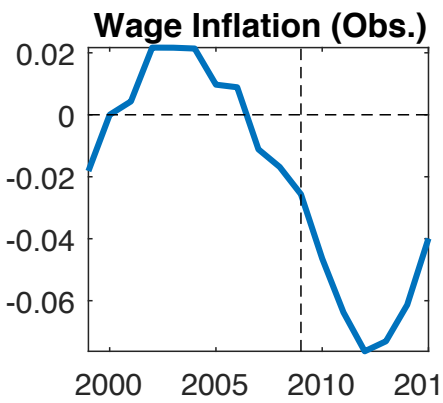

Govt. Yield
0.15
0.1
0.05
0
2000
2005
2010
2015


Private Funding Cost
0.03
0.02
0.01
0
2000
2005
2010
201

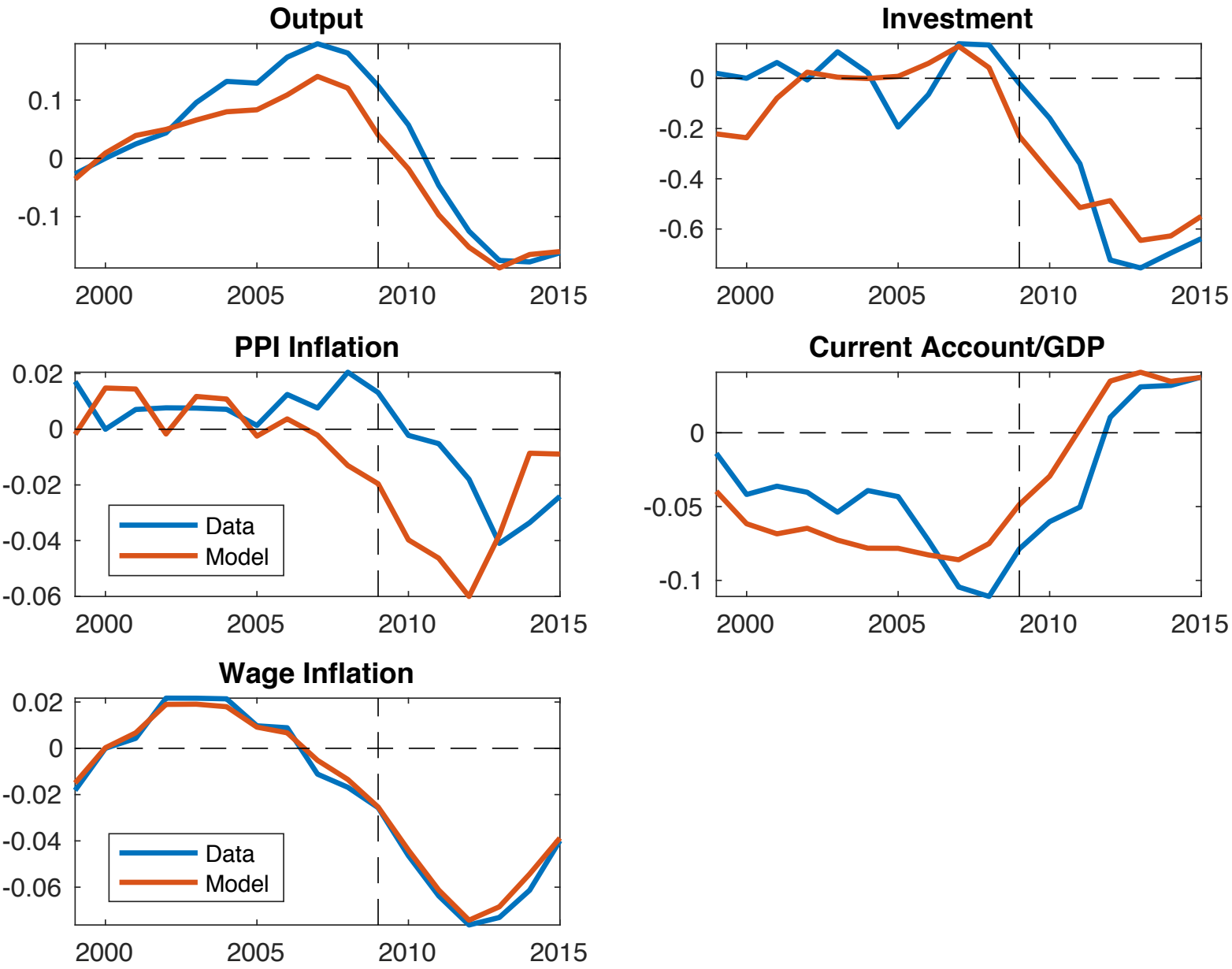

NPL/Total Loans (Obs.)
1
0.5
0
-0.5
2000
2005
2010
2015


dlog GDP Deflator (Obs.)
0.02
0
-0.02
-0.04
2000
2005
2010
2015

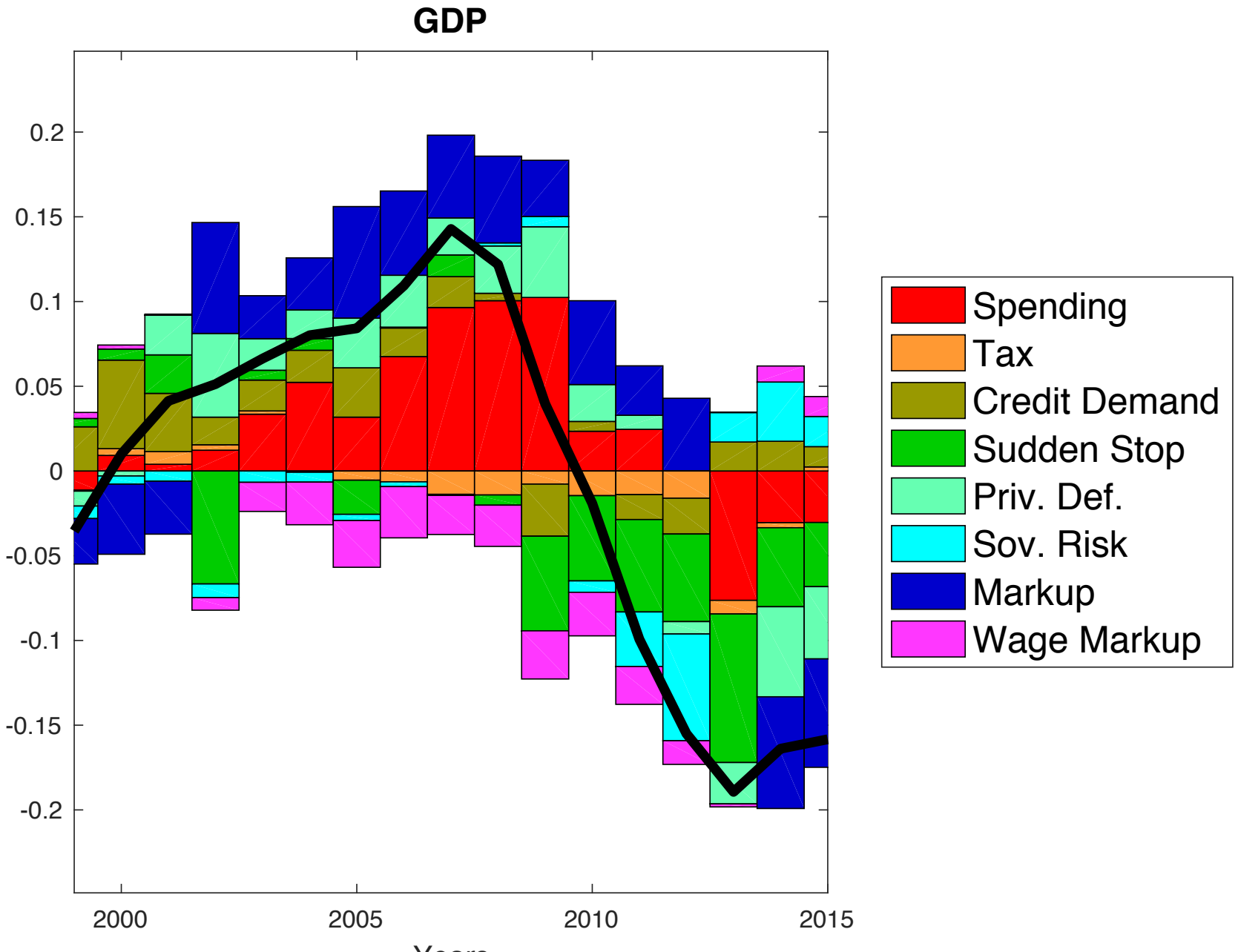

Household Debt
1
0.5
0
2000
2005
2010
2015


Wage Inflation (Obs.)
0.02
0
-0.02
-0.04
-0.06
2000
2005
2010
201

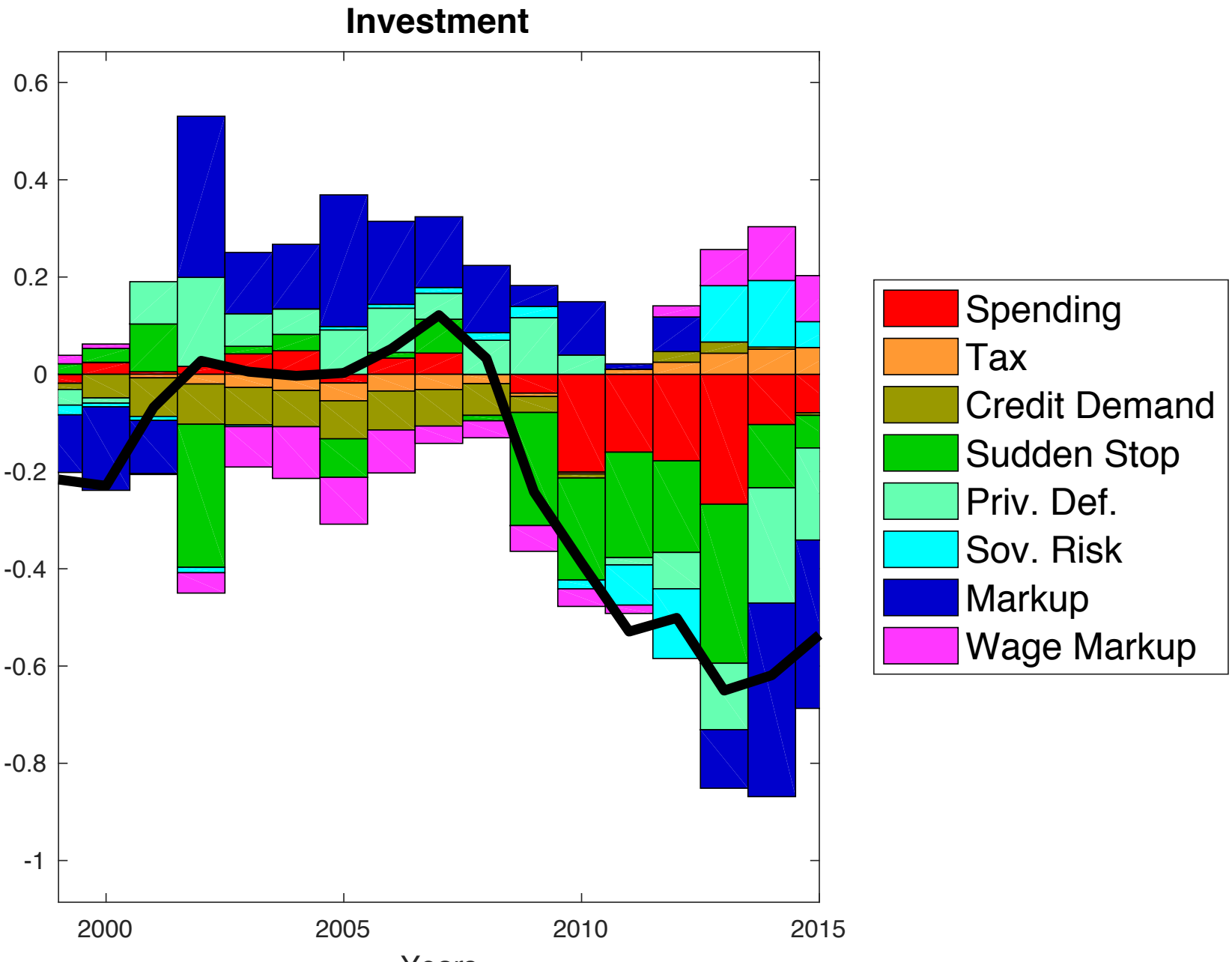
Fit of the Model



Decomposition of Output



Decomposition of Investment



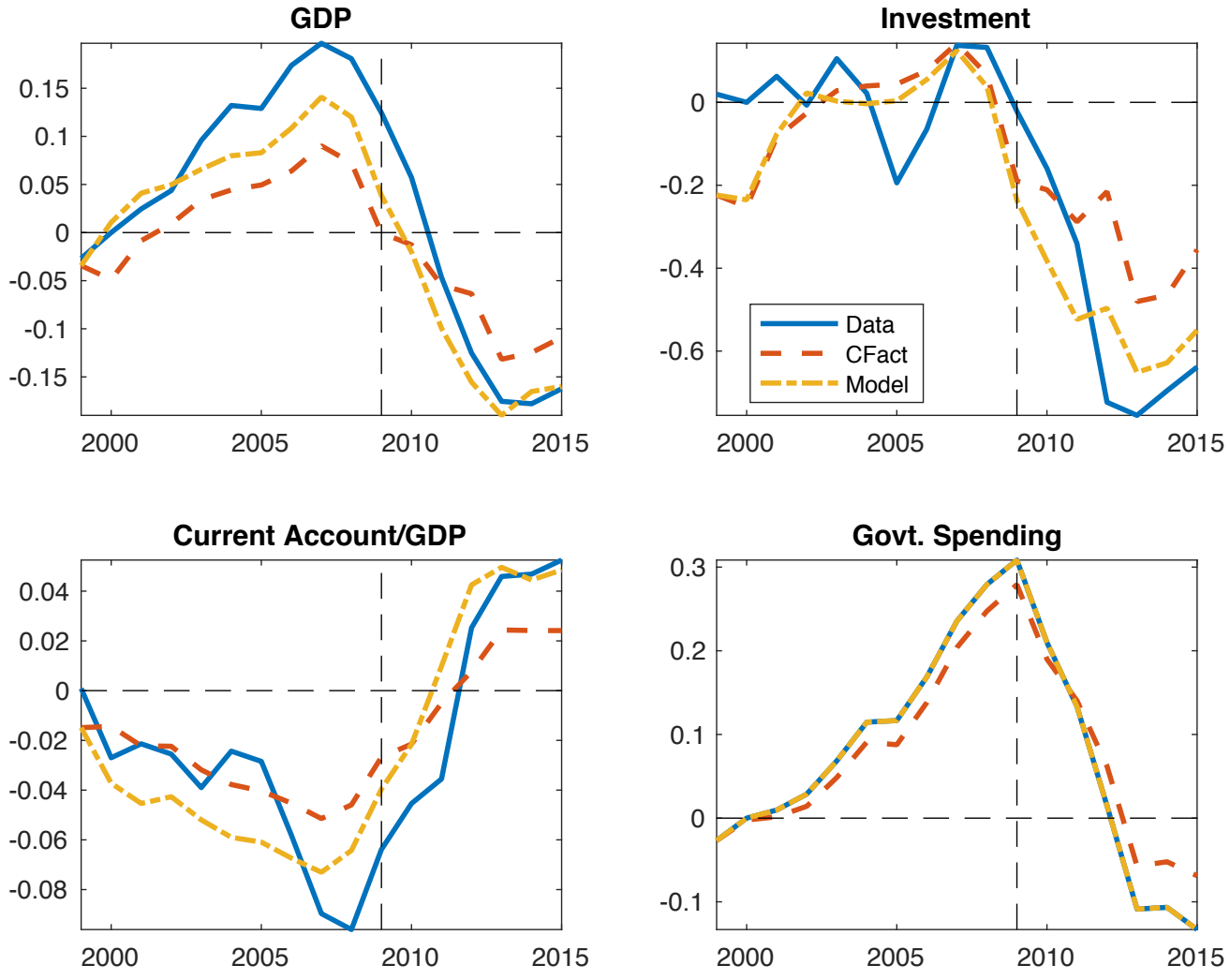
Counterfactual I: EME Leverage

	Greece	Typical EME	Min	Max
Credit / GDP	0.81	0.46	0.025	1.46
Sovereign Debt / GDP	1.08	0.35	0.063	0.68
Current Account	-0.12	-0.04	-0.10	+0.17

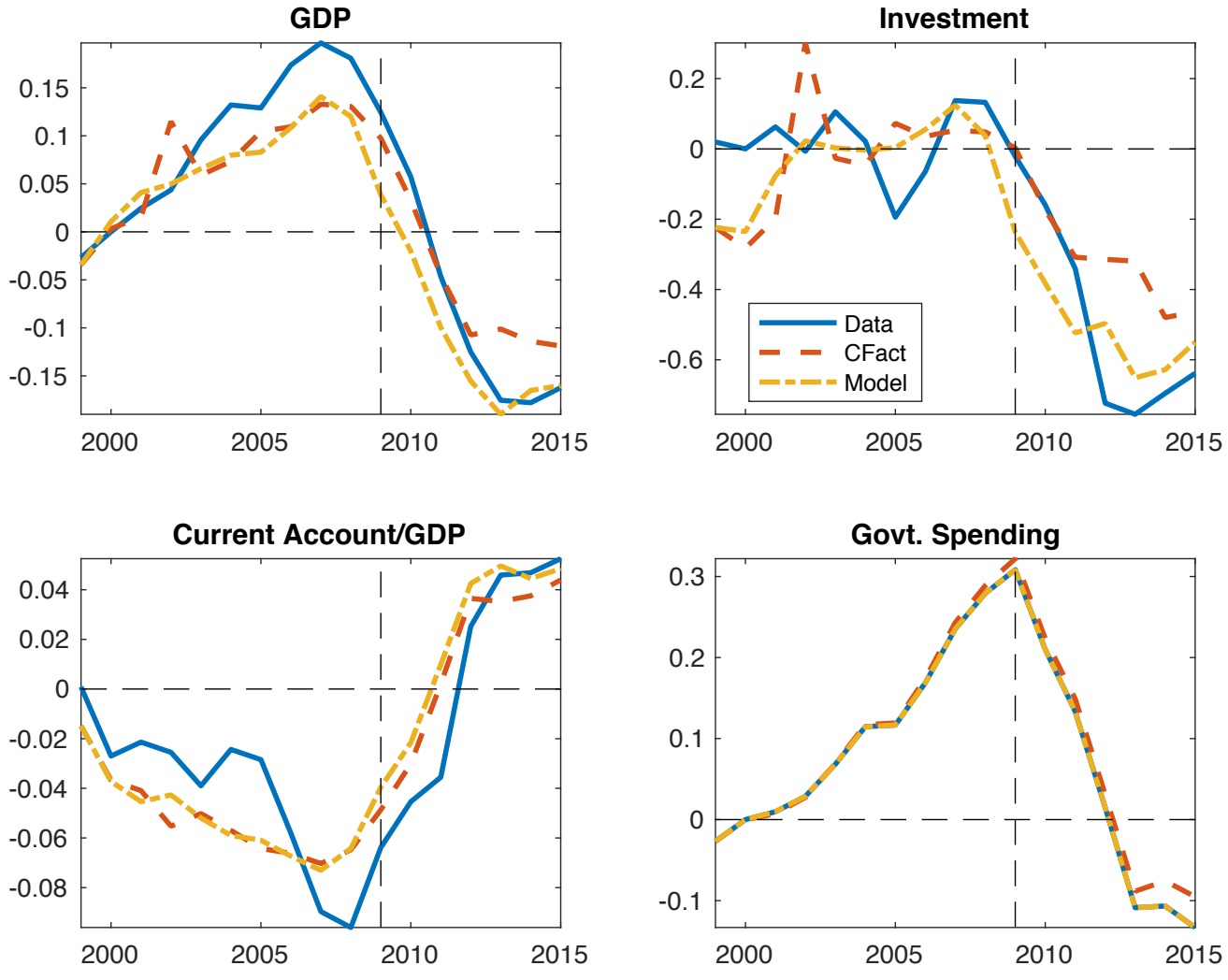
Table: **Leverage and Imbalances Before Sudden Stop**

Notes: Average from t-6 to t-2 where t is sudden stop.

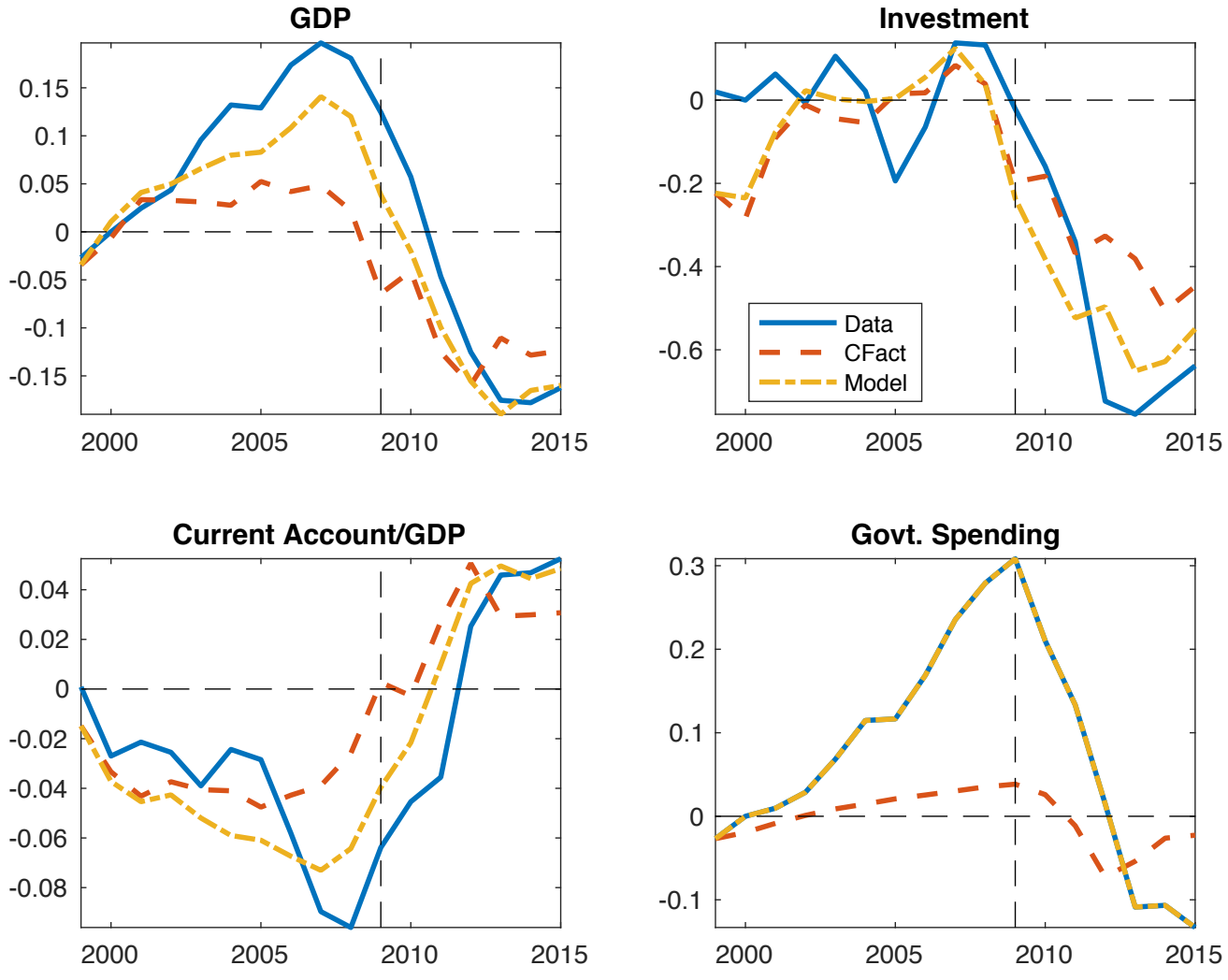
Counterfactual I: EME Leverage



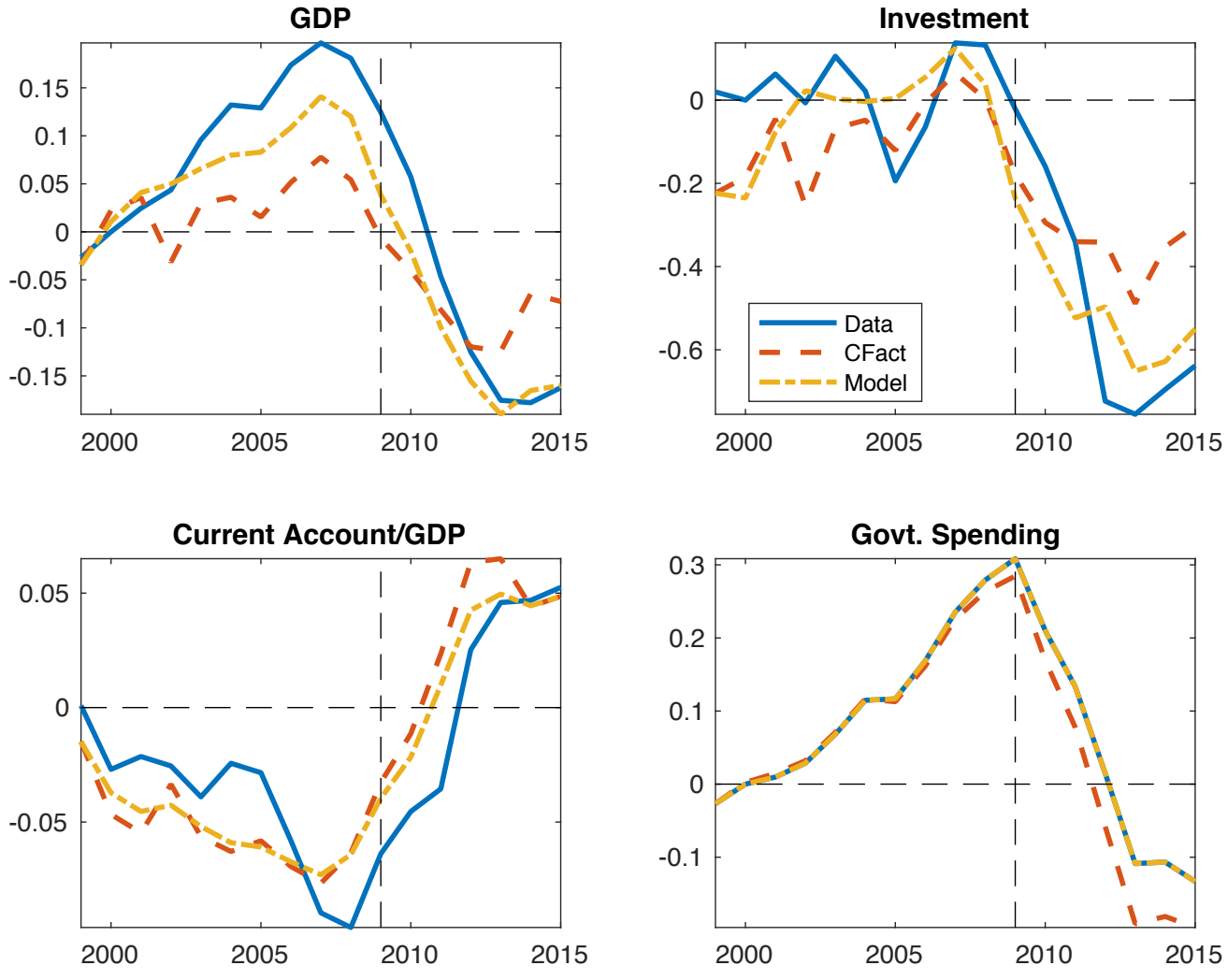
Counterfactual II: Banking Union



Counterfactual III: No Discretionary Spending



Counterfactual V: Low Price Stickiness



Conclusion: What Would Have Helped?

- What we can say
  - Exposure Y+10%, I+15%
  - Banking union Y+10%, I+30%
  - Sound fiscal Y+15%, I+20%
  - More flexible prices Y+15%, I+20%
- Open issues
  - Early sovereign default?
  - Devaluation?