Explaining the Effects of Government Spending Shocks on Consumption and the Real Exchange Rate

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Effects of Government Spending Shocks: SVAR Evidence

A rise in government spending leads to

- **An increase in private consumption.**

  (Fatás and Mihov, 2001; Blanchard and Perotti, 2002; Galí et al., 2007; Perotti, 2007.)

- **A real exchange rate depreciation.**

  (Monacelli and Perotti, 2006.)

- An increase in output and wages

  (Rotemberg and Woodford, 1992; Blanchard and Perotti, 2002; Perotti, 2007.)

- A trade balance deterioration.

  (Corsetti and Müller, 2006; Monacelli and Perotti, 2006.)

This Paper

- produces SVAR evidence using a panel approach.
  - To gain efficiency
  - To obtain a single benchmark against which to evaluate theoretical explanations.

- presents a **theoretical explanation** of the observed effects of government spending shocks on consumption, the real exchange rate, output, and the trade balance based on the **deep-habit mechanism**.

Effects of Government Spending Shocks: Evidence from the Narrative Approach

- In response to a rise in government spending
  - Output increases.
  - Consumption fails to increase.
  - Wages fail to rise.

(Ramey and Shapiro, 1998; Burnside, Eichenbaum, and Fisher, 2004; Ramey, 2006)

Estimation of Impulse Responses to a Government Spending Shock

- The Structural VAR Model

$$AX_t = B(L)X_{t-1} + \epsilon_t$$

where $X_t = \begin{bmatrix} \log g_t & \log y_t & \log c_t & \frac{nx_t}{y_t} & \log e_t \end{bmatrix}'$

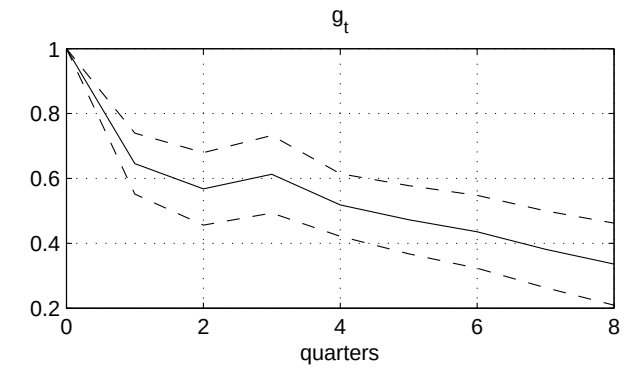
- **Identification:** Government spending is not affected contemporaneously by structural innovations to any variable other than government spending itself.

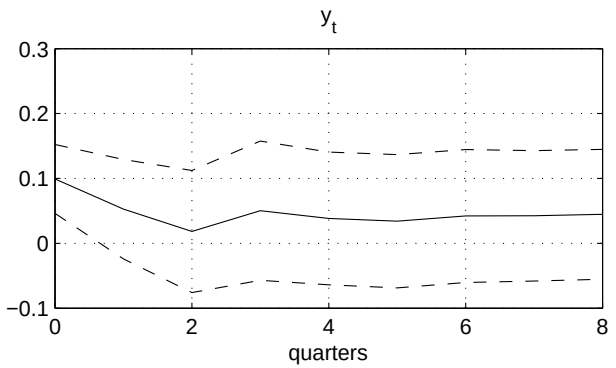
- Panel of Countries: Australia, Canada, U.K., and U.S.

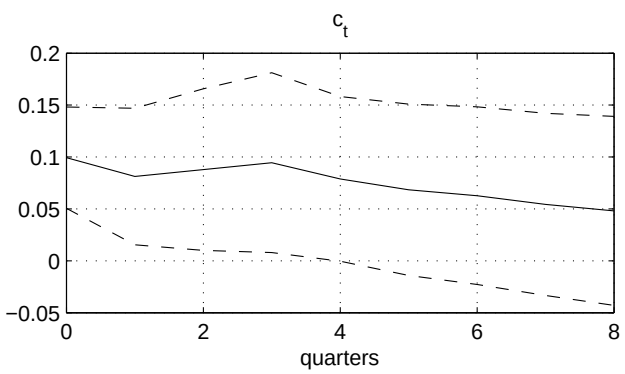
- Sample: Quarterly data from 1975Q1 to 2005Q4.

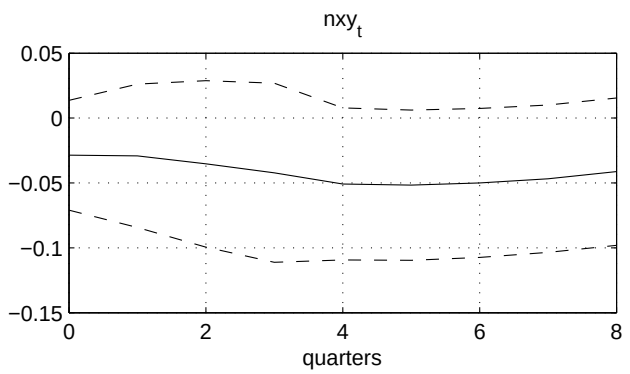
- 4 lags.

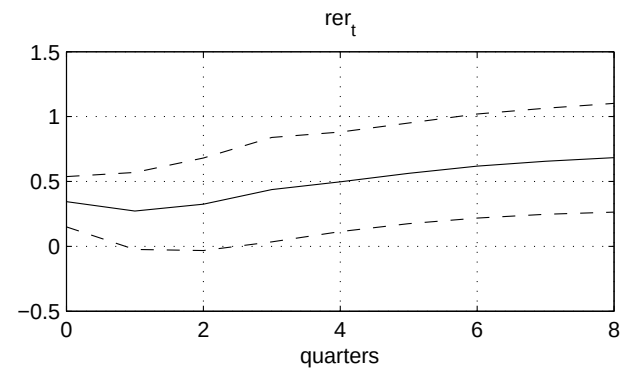
Estimated Impulse Response Functions To A Unit Innovation in Domestic Government Purchases











—— Point estimate

- - - Point estimate $\pm$ 2std

Habit Formation

Period Utility Function: $U(x_t, h_t)$

Superficial Habit Formation:

$$x_t = c_t - \theta \tilde{c}_{t-1} \quad \text{with} \quad c_t = \left[\int_0^1 c_{it}^{1-\frac{1}{\eta}} di \right]^{\frac{1}{1-\frac{1}{\eta}}}$$

Implied Demand Functions: $c_{it} = \left(\frac{P_{it}}{P_t}\right)^{-\eta} x_t$

Deep Habit Formation:

$$x_t = \left[\int_0^1 \left(c_{it} - \theta \tilde{c}_{it-1}\right)^{1-\frac{1}{\eta}} di \right]^{\frac{1}{1-\frac{1}{\eta}}}$$

Implied Demand Functions: $c_{it} = \left(\frac{P_{it}}{P_t}\right)^{-\eta} x_t + \theta \tilde{c}_{it-1}$

A Two-Country Model of Pricing to Habits

- Production economy without capital.

- Preferences

$$E_0 \sum_{t=0}^{\infty} \beta^t [\phi \ln(x_t) + (1-\phi) \ln(1-h_t)]$$

- Two goods: a and b

$$x_t = \left[\omega {x_{a,t}^c}^{1-\frac{1}{\xi}} + (1-\omega) {x_{b,t}^c}^{1-\frac{1}{\xi}} \right]^{\frac{1}{1-\frac{1}{\xi}}}$$

Habit-adjusted consumption of good a

$$x^c_{a,t} = \left[\int_0^1 (c_{i,a,t} - \theta^c s^c_{i,a,t-1})^{1-\frac{1}{\eta}} di\right]^{\frac{1}{1-\frac{1}{\eta}}}$$

$$s^c_{i,a,t} = \rho s^c_{i,a,t-1} + (1-\rho)\tilde{c}_{i,a,t}$$

Habit-adjusted consumption of good b

$$x^c_{b,t} = \left[\int_0^1 (c_{i,b,t} - \theta^c s^c_{i,b,t-1})^{1-\frac{1}{\eta}} di\right]^{\frac{1}{1-\frac{1}{\eta}}}$$

$$s^c_{i,b,t} = \rho s^c_{i,b,t-1} + (1-\rho)\tilde{c}_{i,b,t}$$

The Public sector

$$\max \chi(x^g_{a,t}, x^g_{b,t})$$

$$x^g_{a,t} = \left[\int_0^1 (g_{i,a,t} - \theta^g s^g_{i,a,t-1})^{1-\frac{1}{\eta}} di\right]^{\frac{1}{1-\frac{1}{\eta}}}$$

$$s^g_{i,a,t} = \rho s^g_{i,a,t-1} + (1-\rho) g_{i,a,t}$$

$$x^g_{b,t} = \left[\int_0^1 (g_{i,b,t} - \theta^g s^g_{i,b,t-1})^{1-\frac{1}{\eta}} di\right]^{\frac{1}{1-\frac{1}{\eta}}}$$

$$s^g_{i,b,t} = \rho s^g_{i,b,t-1} + (1-\rho) g_{i,b,t}$$

$$\int_0^1 (P_{i,a,t} g_{i,a,t} + P_{i,b,t} g_{i,b,t}) di = P^y_t g_t$$

- **Domestic Demand for good** a

$$d_{i,a,t} = \left(\frac{P_{i,a,t}}{P_{a,t}}\right)^{-\eta} x_{a,t} + \theta s_{i,a,t-1}$$

$$\text{Price elasticity } = -\eta\left(1 - \theta\frac{s_{i,a,t-1}}{d_{i,a,t}}\right)$$

- **Foreign Demand for good** a

$$d^*_{i,a,t} = \left(\frac{P^*_{i,a,t}}{P^*_{a,t}}\right)^{-\eta} x^*_{a,t} + \theta s^*_{i,a,t-1}$$

$$\text{Price elasticity } = -\eta\left(1 - \theta\frac{s^*_{i,a,t-1}}{d^*_{i,a,t}}\right)$$

Firms

- Firms can price discriminate internationally.
- Production Function: $y_{i,a,t} = h_{i,a,t}$
- Optimal pricing

$$P_{a,t} = \left[1 - \frac{1}{\eta\left(1 - \theta\frac{d_{a,t-1}}{d_{a,t}}\right)} + \theta\Omega_{a,t}\right]^{-1} MC_t$$

$$P^*_{a,t} = \left[1 - \frac{1}{\eta\left(1 - \theta\frac{d^*_{a,t-1}}{d^*_{a,t}}\right)} + \theta\Omega^*_{a,t}\right]^{-1} MC_t$$

The Real Exchange Rate

Domestic price index: $P_t = \gamma P_{a,t} + (1-\gamma) P_{b,t}$

Foreign price index: $P_t^* = (1-\gamma) P_{a,t}^* + \gamma P_{b,t}^*$

Real exchange rate, $e_t = \frac{P_t^*}{P_t} = f\Big(\underset{+}{\frac{P_{a,t}^*}{P_{a,t}}}, \underset{+}{\frac{P_{b,t}^*}{P_{b,t}}}, \underset{\pm}{\frac{P_{b,t}}{P_{a,t}}} \Big)$

Calibration

Parameter	Value	Description
β	0.99	Subjective discount factor (quarterly)
ϕ	0.15	Preference parameter
ω	0.5	Preference parameter
ξ	1.5	Elasticity of substitution composite
η	5	Elasticity of substitution varieties
s_g, s_g^*	0.2	Government shares

The Driving Force

$$\widehat{g}_t = B^1(L) \begin{bmatrix} \widehat{g}_{t-1} \\ \widehat{y}_{t-1} \\ \widehat{c}_{t-1} \\ \widehat{nxy}_{t-1} \\ \widehat{e}_{t-1} \end{bmatrix} + \epsilon_t^1$$

Estimation

- Goal: Estimate deep-habit parameters:

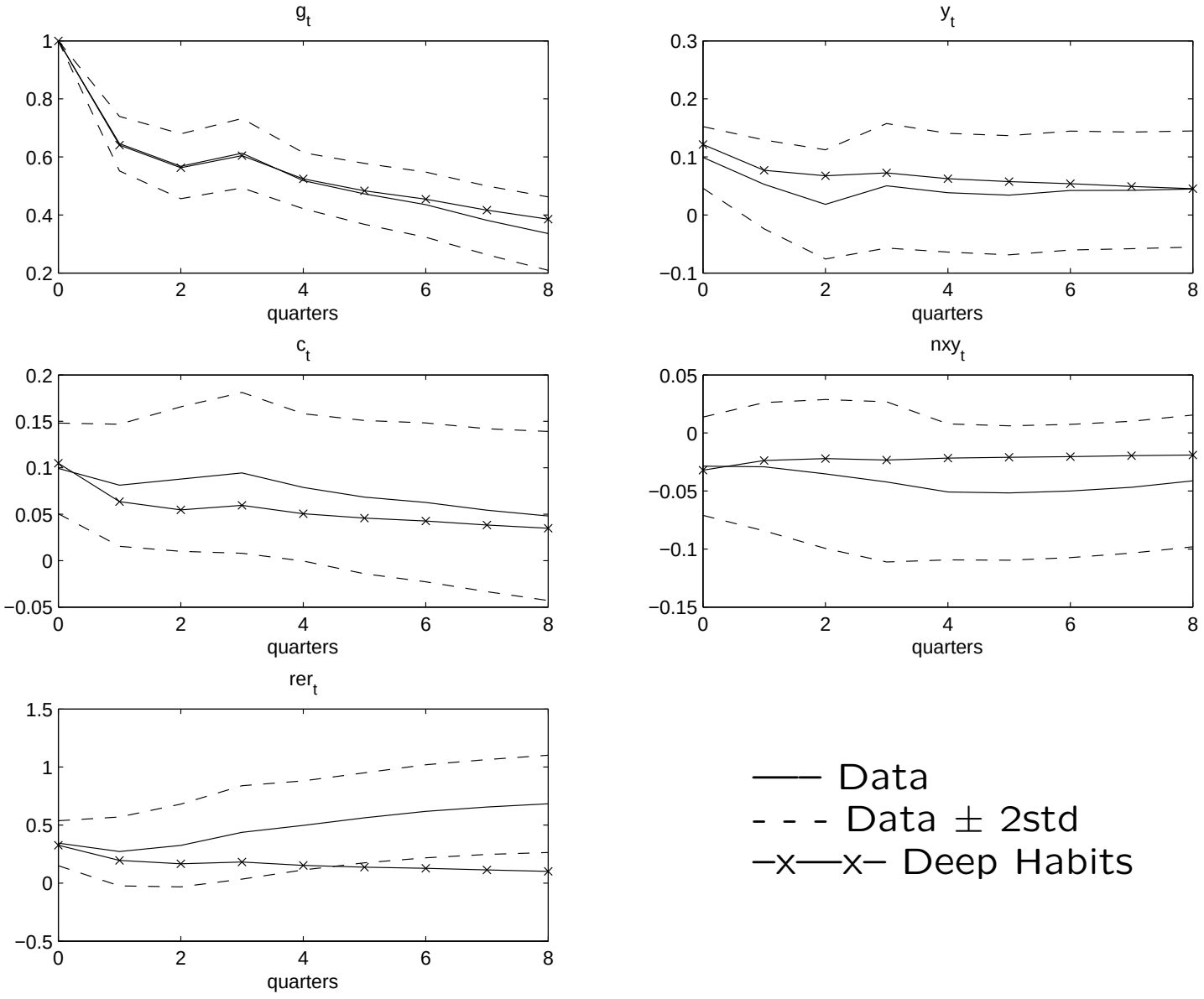
$$\Theta \equiv [\theta^c \quad \theta^g \quad \rho]$$

- Strategy: Pick Θ to minimize the distance between empirical and theoretical impulse responses of five variables.

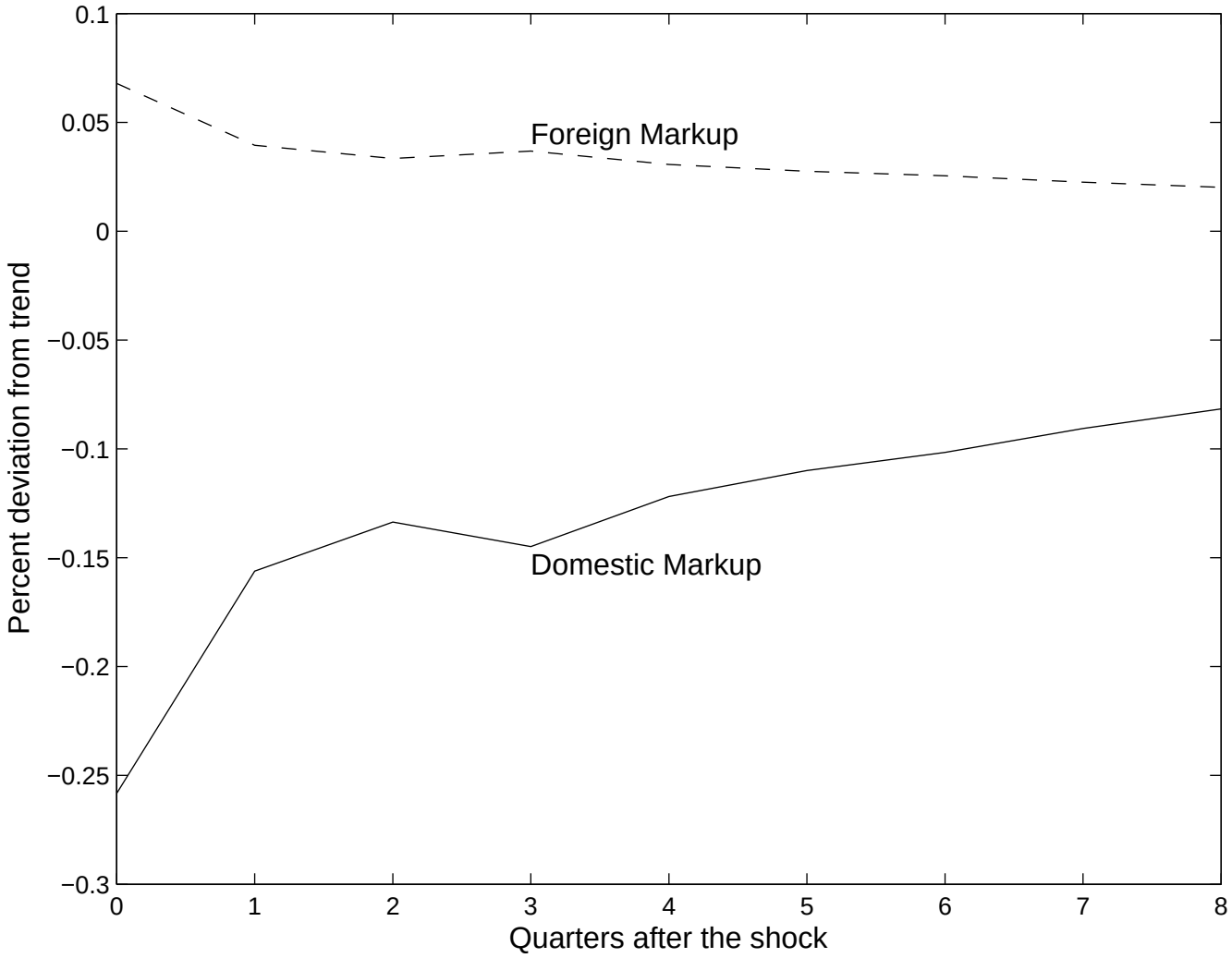
Estimated Parameters

Parameter	Point Estimate	Standard Deviation
θ^c	0.52	0.08
θ^g	0.57	0.15
ρ	0.9876	0.03

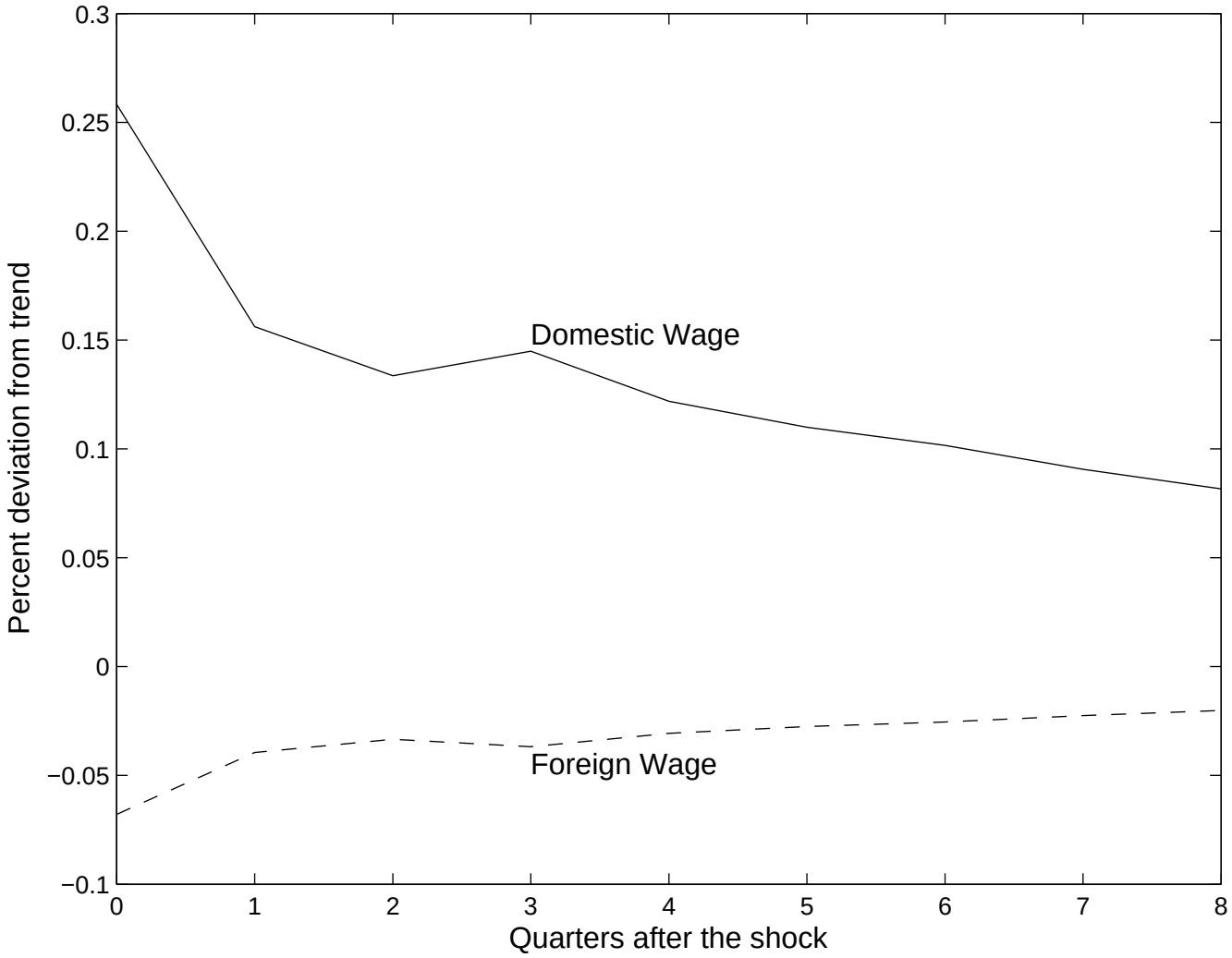
Predicted and Estimated Impulse Responses



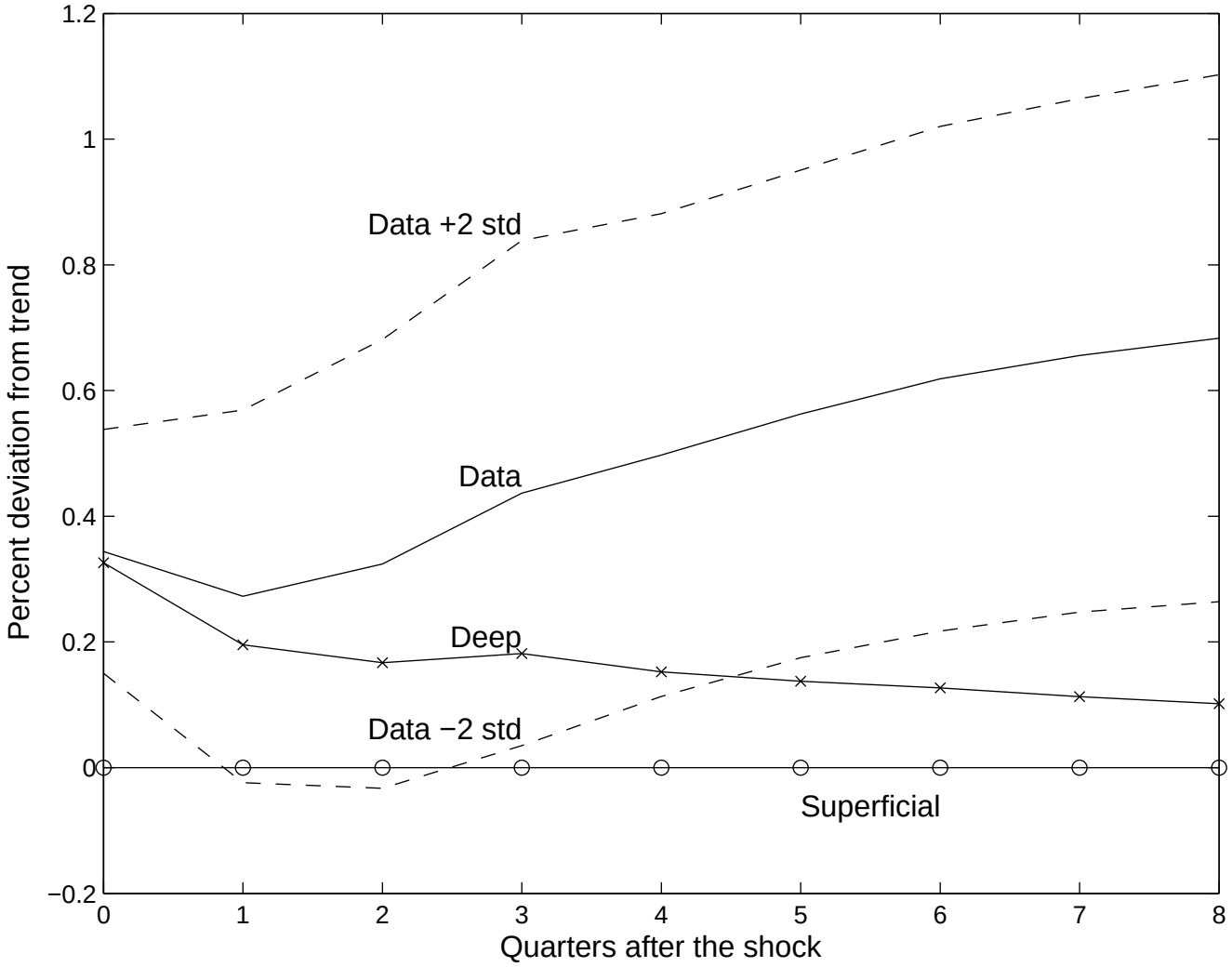
Response of the Domestic and Foreign Markups to a One-Percent Government Spending Shock



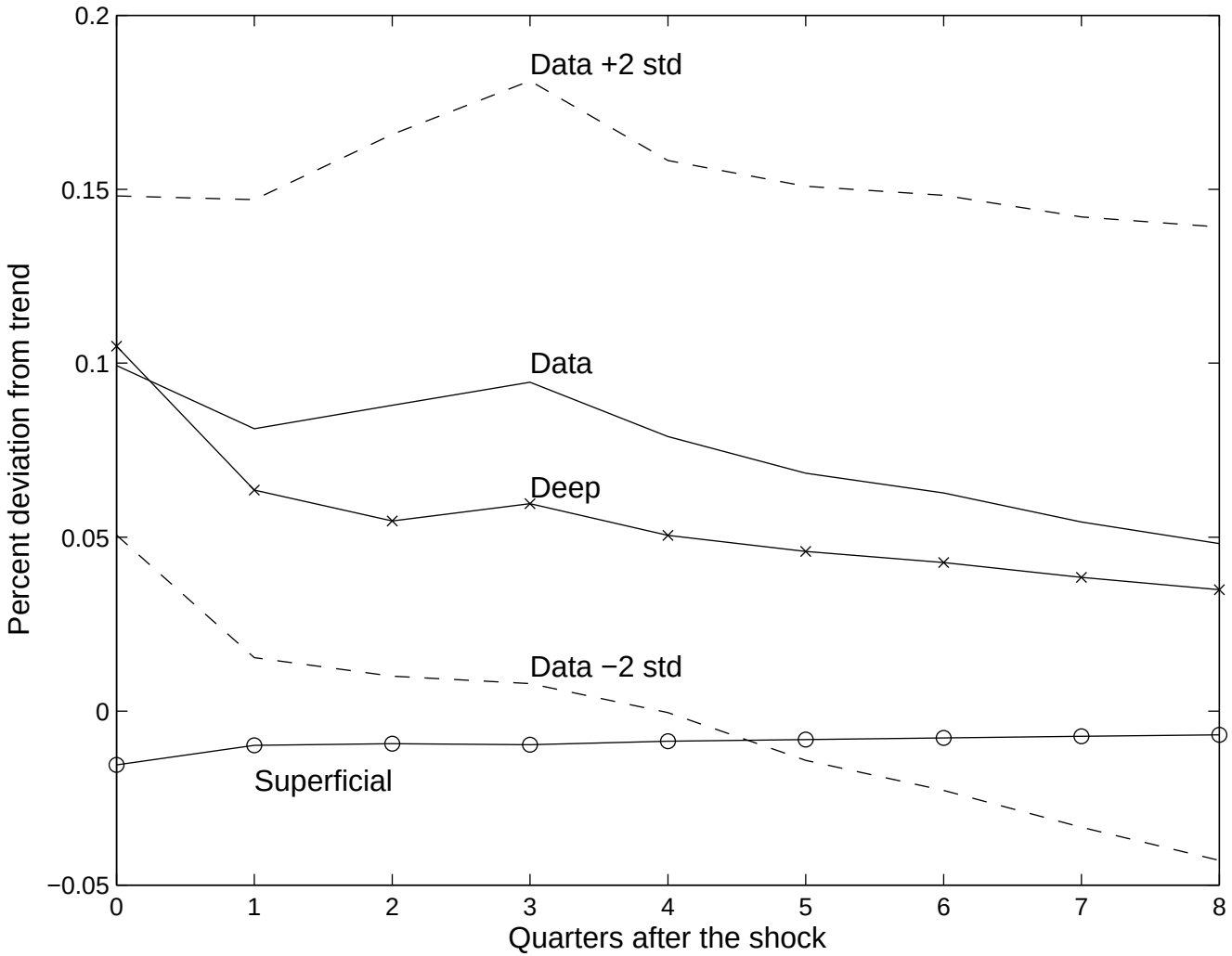
Response of the Real Wage to a Government Spending Shock



Response of the Real Exchange Rate to a Government Spending Shock



Response of Private Consumption to a Government Spending Shock

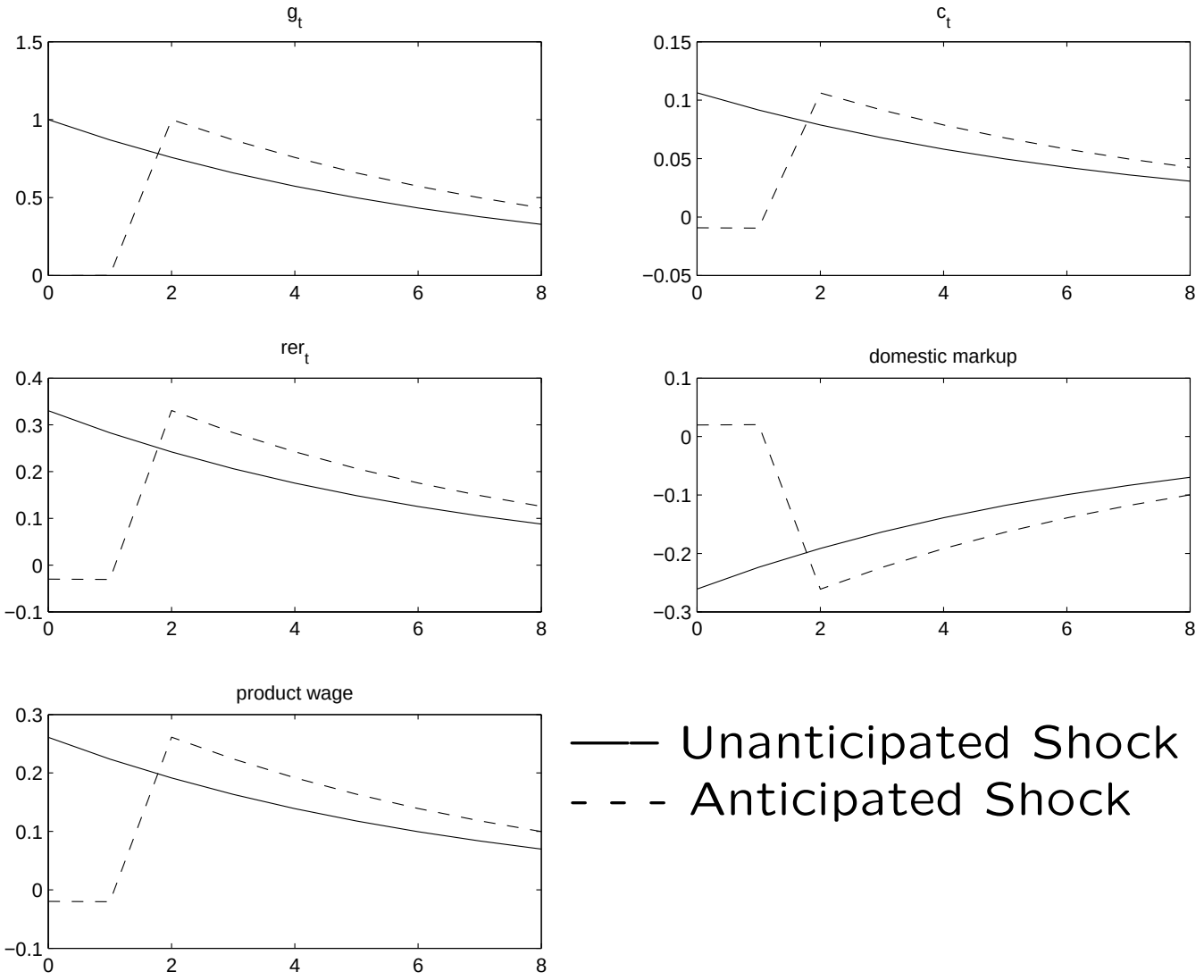


Anticipated Government Spending Shocks

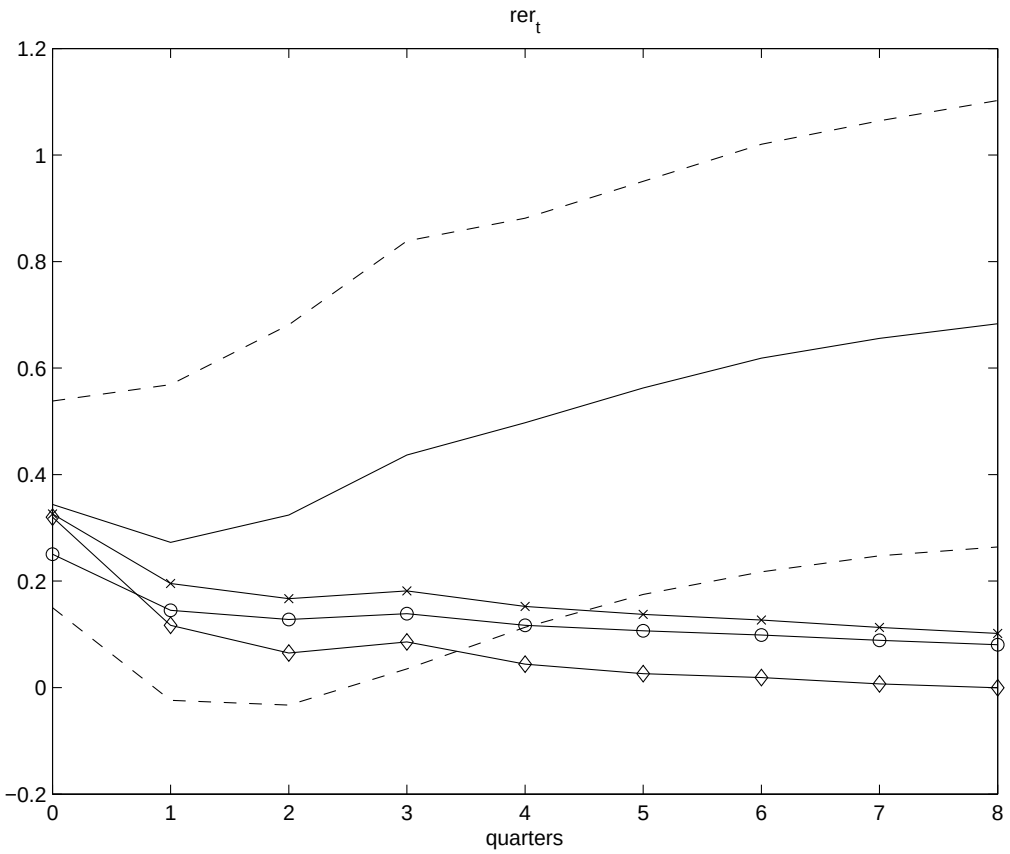
$$\ln\left(\frac{g_t}{\bar{g}}\right) = \rho^g \ln\left(\frac{g_{t-1}}{\bar{g}}\right) + \epsilon_t^0 + \epsilon_{t-2}^2$$

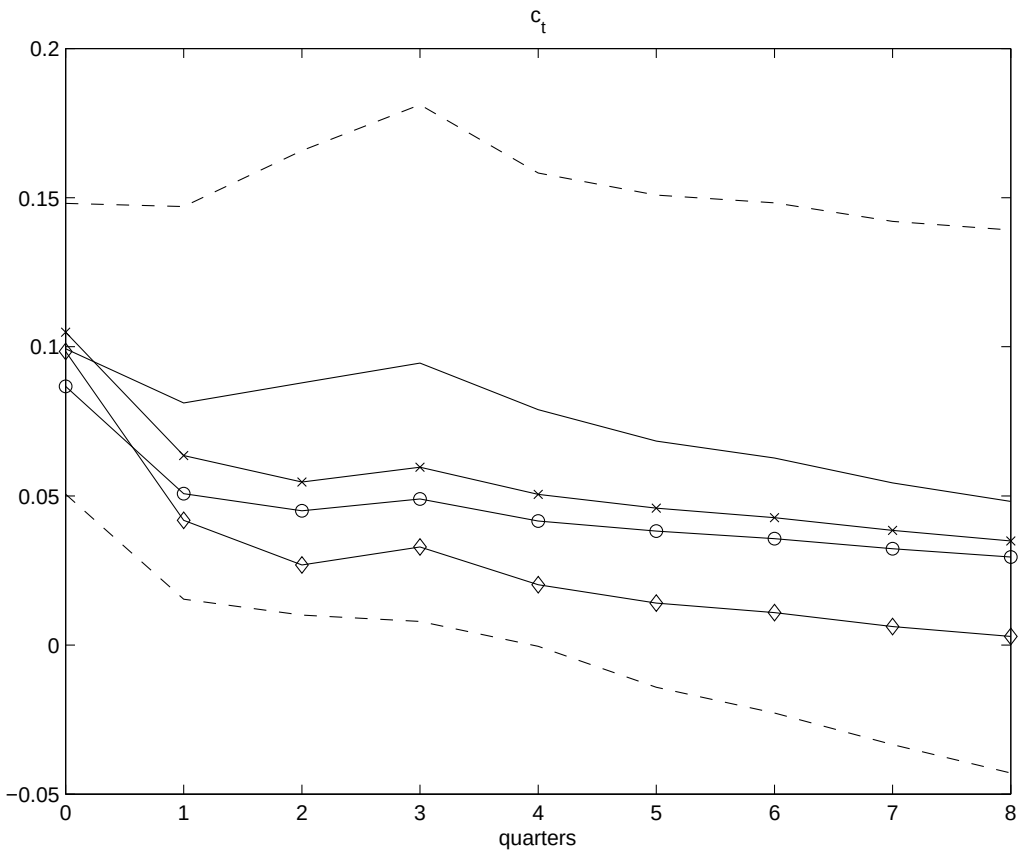
$$\rho^g = 0.87$$

Impulse Responses To a Two-Period Anticipated Innovation in Government Spending



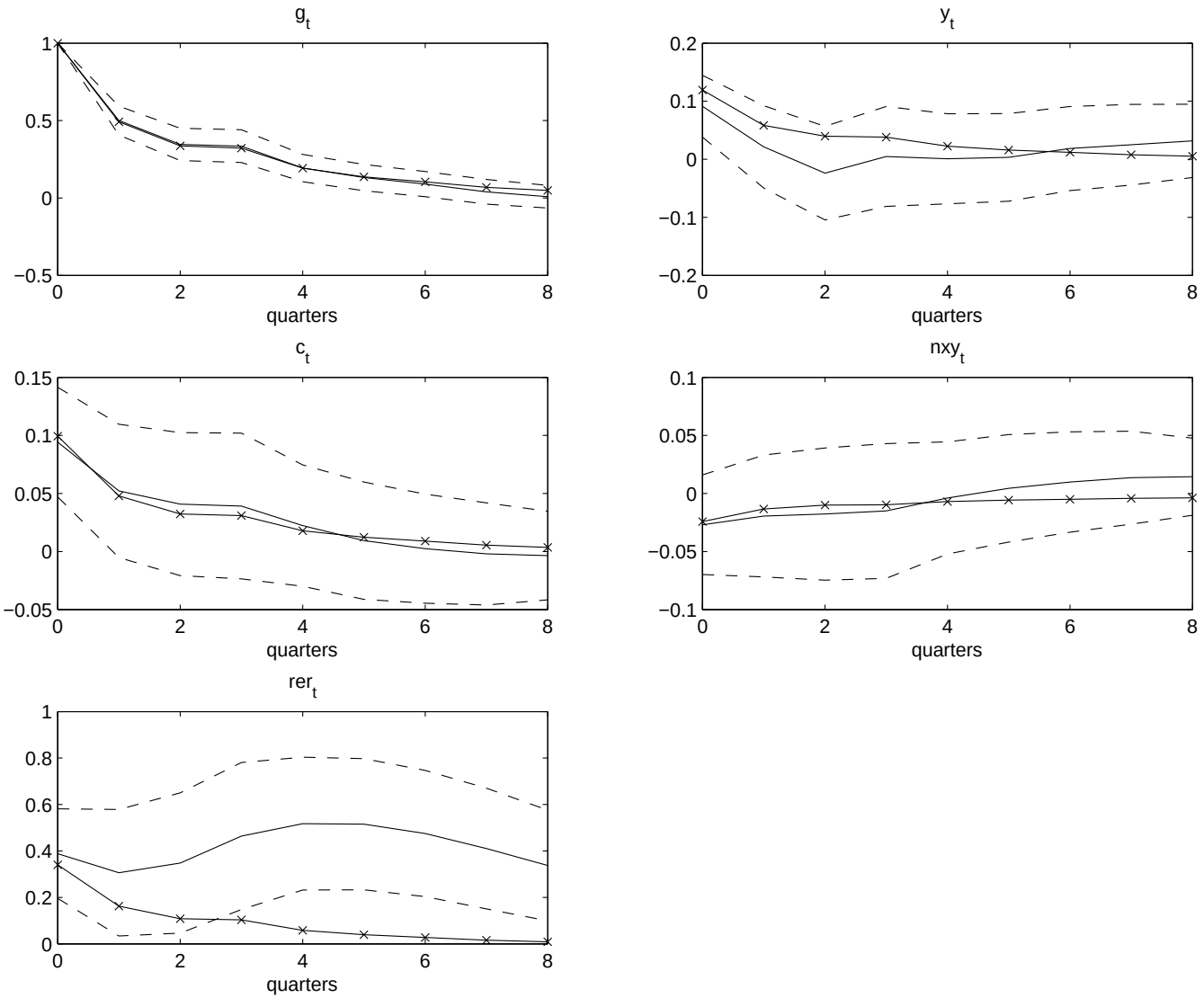
Sensitivity Analysis: Home Bias and Less Persistent Habit Stock





-x-x-x-: Baseline -o-o-o: Home bias, $\omega = 0.7$ $-\diamond-\diamond-$: Less persistence, $\rho = 0.87$

Observed and Predicted Impulse Responses: HP Filtered Data



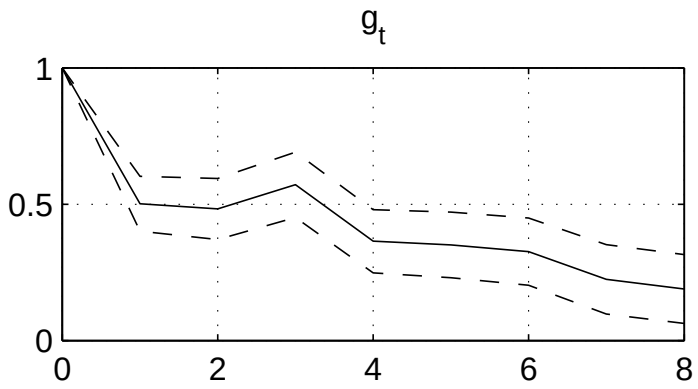
Conclusions

- Pricing to Habits can account quantitatively for the empirical regularity that in response to an **unanticipated** demand shock
  - private consumption rises
  - the real exchange rate depreciates
  - the trade balance deteriorates
- At the same time, Pricing to Habits can account for the empirical regularity that in response to an **anticipated** demand shock
  - private consumption fails to rise on impact
  - real product wages fails to rise on impact

Extras

Country-by-Country Regressions

Australia


g_t
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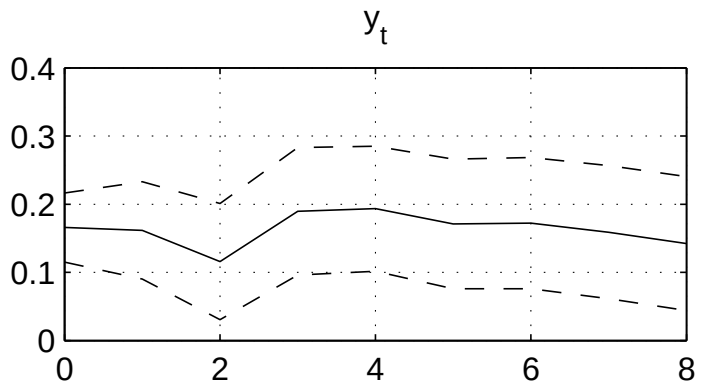
0
0
2
4
6
8


y_t
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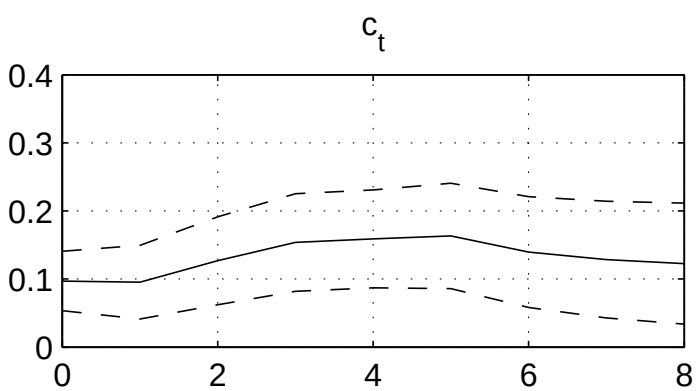
0.3
0.2
0.1
0
0
2
4
6
8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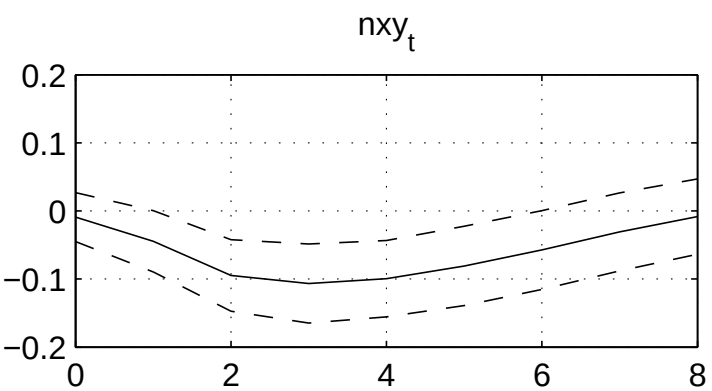
0.2
0.1
0
0
2
4
6
8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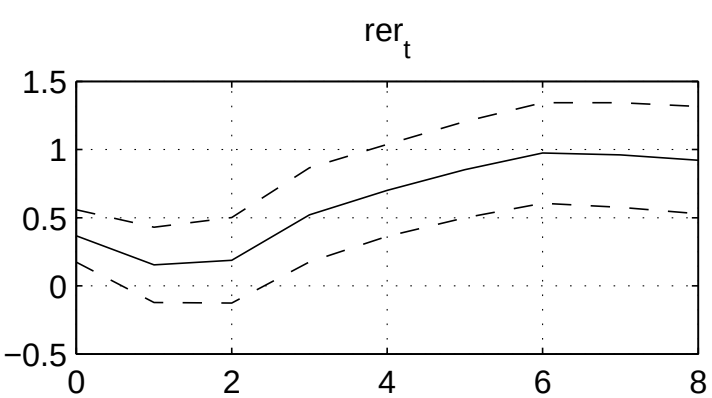
−0.2
0
2
4
6
8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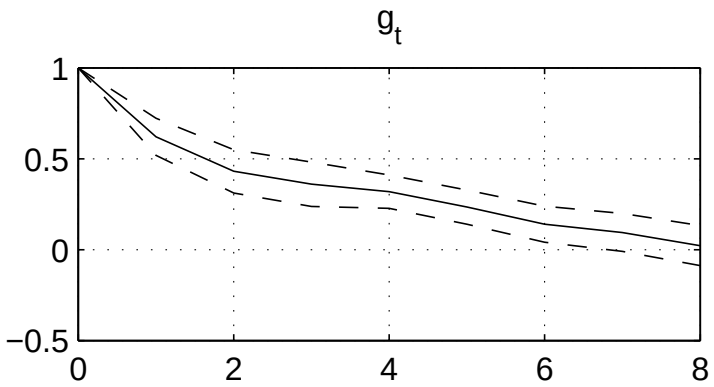
Canada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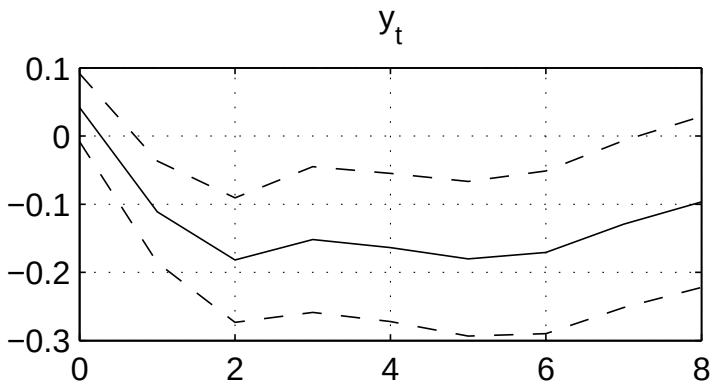
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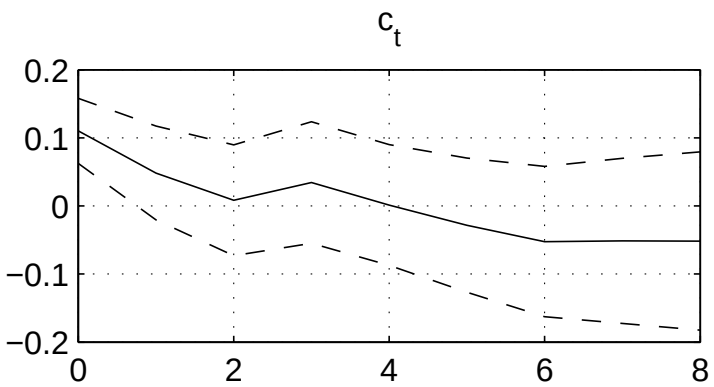
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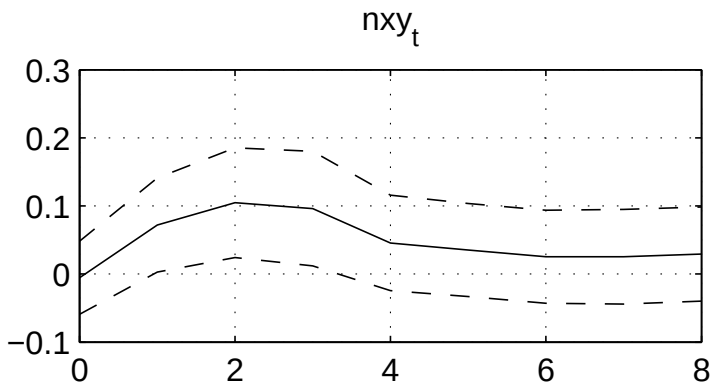
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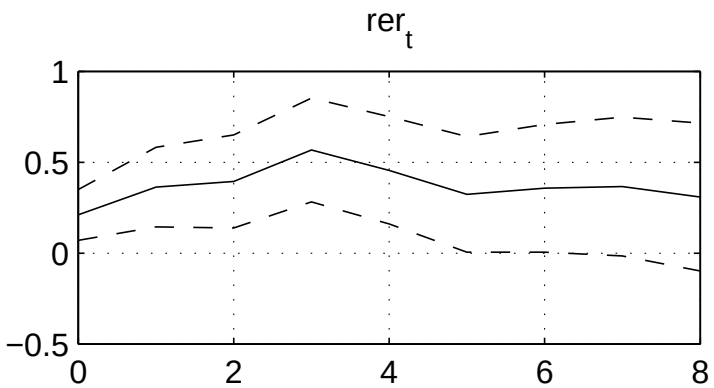
rer_t
1
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−0.5
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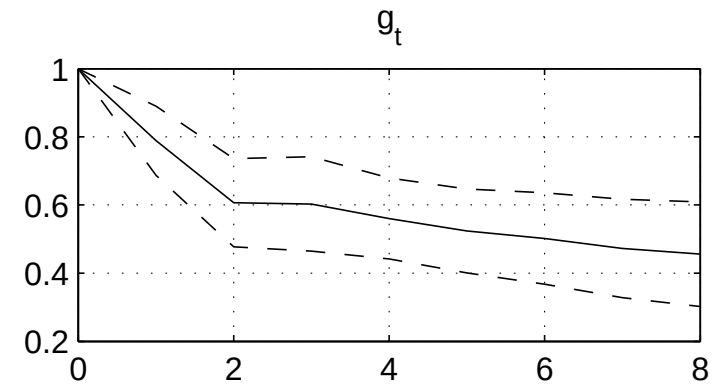
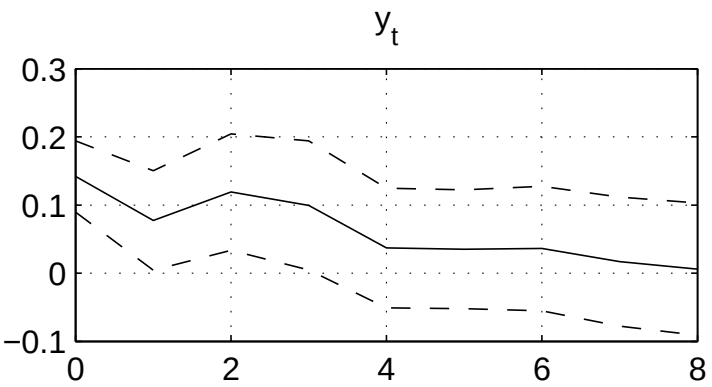
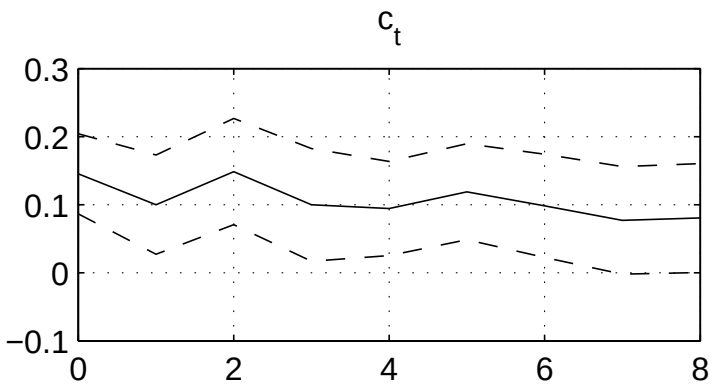
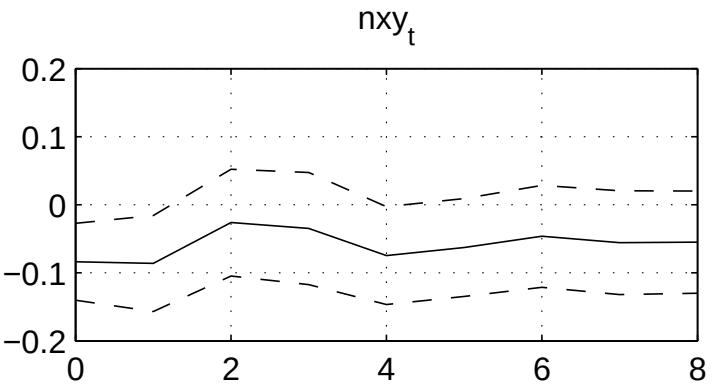
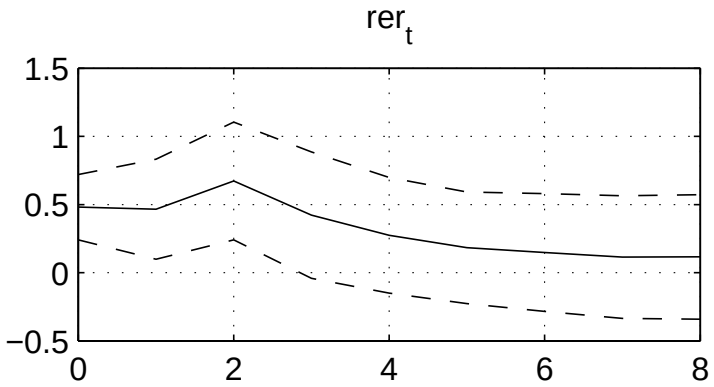
United Kingdom



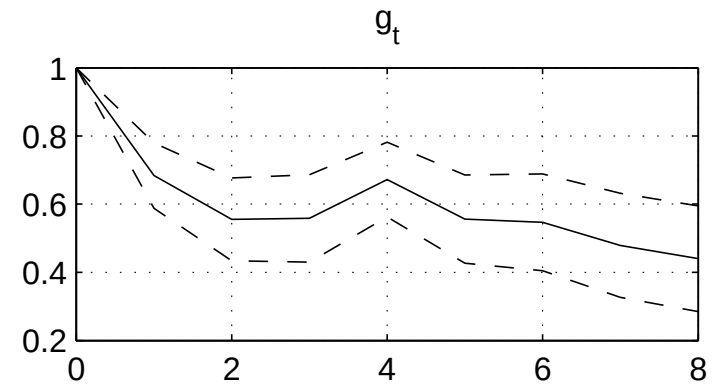


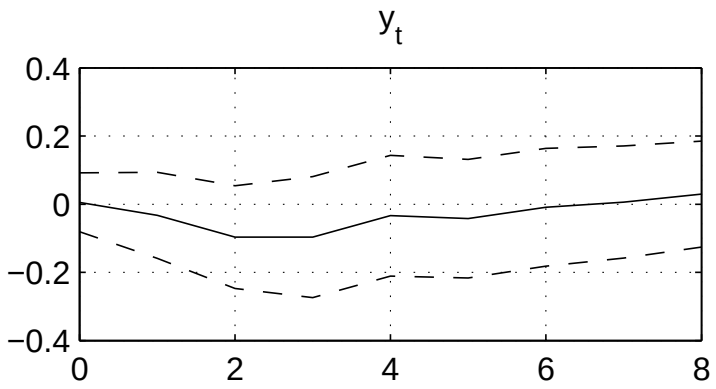


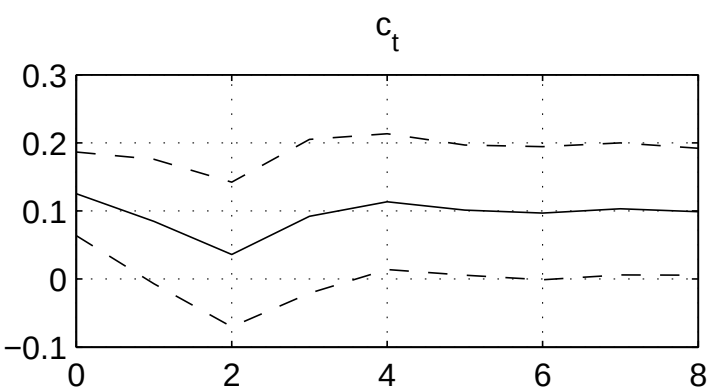


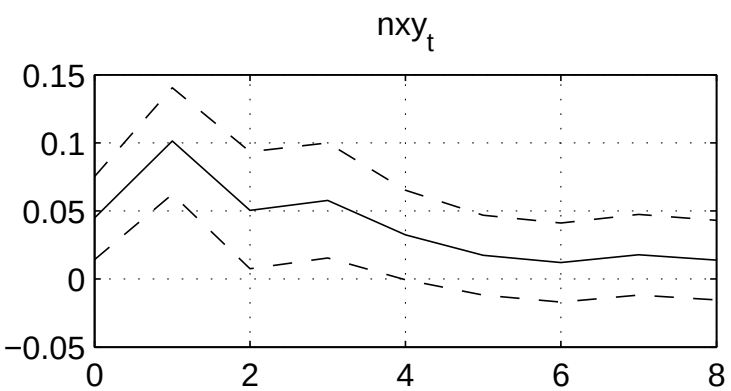


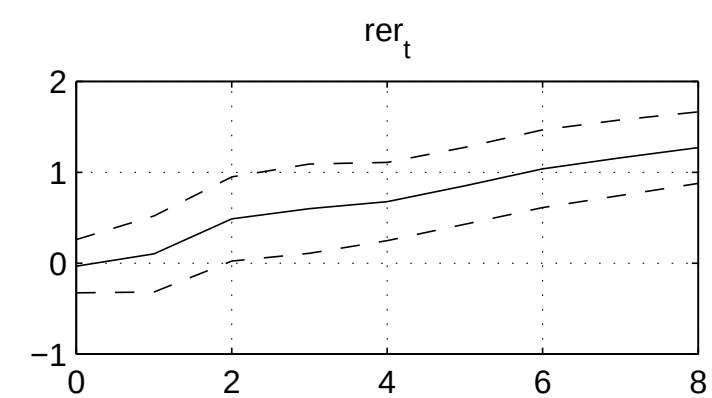
United States



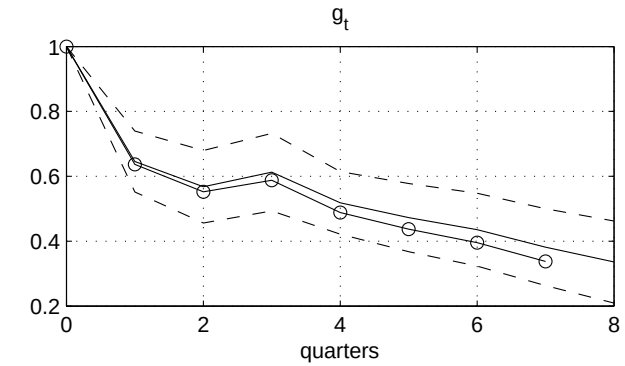


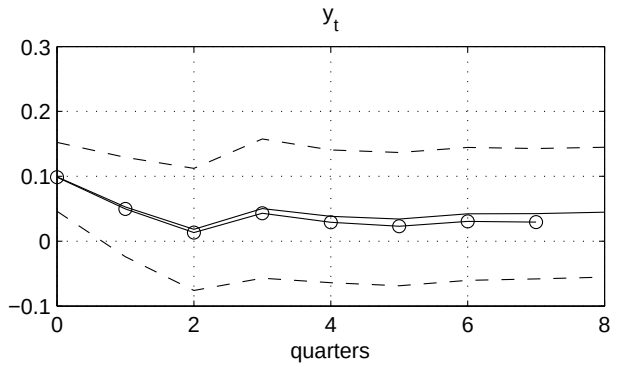


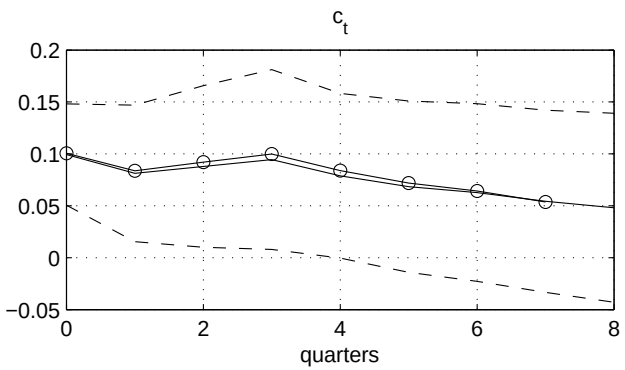


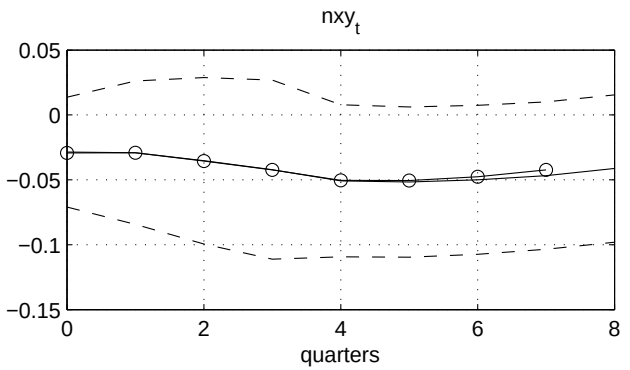


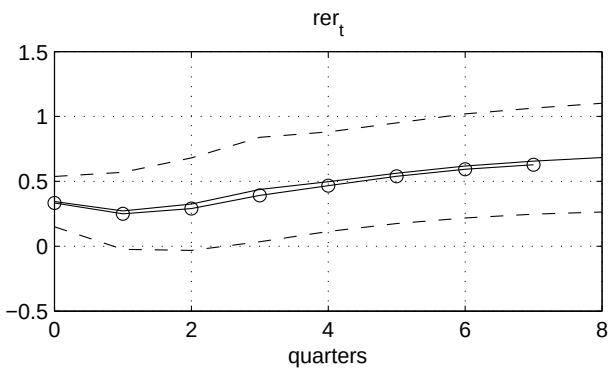
Montecarlo Experiment











—— Point estimate

–o– Median Montecarlo

- - - Point estimate ± 2std