House Prices, Residential Mortgage Credit and Monetary Policy

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Preliminary
December 2004

Objectives

- Should the Bank respond to house price growth?
- Use model with a financial accelerator in household sector to answer this question
- Answer this question in the presence of deviations from fundamentals

Outline

- Baseline Model
- Model assessment
- Deviation from fundamental experiment
- Policy rule comparison

Related Literature

- Household Financial Accelerator:

❑ Aoki et al. (2002)

❑ Iacoviello (2004)

Model Overview

- 2 types of households: patient and impatient
- Financial intermediary
- House producers
- Intermediate good producers
- Final good producers
- Monetary authority

Patient Consumers

$$\max_{C_t^p, H_{t+1}^p, L_t^p, B_{t+1}} E_t \sum_{j=0}^{\infty} b_p^t \left[\log C_{t+j}^p + g \log H_{t+j}^p + x \log\left(1 - L_{t+j}^p\right) \right]$$

subject to:

$$P_{t+j} C_{t+j}^p + Q_{t+j}\left(H_{t+j+1}^p - (1-d) H_{t+j}^p\right) + Q_{t+j} \Phi\left(\frac{H_{t+j+1}^p}{H_{t+j}^p}\right) H_{t+j}^p + D_{t+j+1} + T_{t+j}^p$$

$$= W_{t+j} L_{t+j}^p + R_{t+j} D_{t+j} + V_{t+j}^p$$

where:

$$\Phi\left(\frac{H_{t+j+1}^p}{H_{t+j}^p}\right) = \frac{f}{2}\left(\frac{H_{t+j+1}^p}{H_{t+j}^p} - 1\right)^2$$

Impatient Consumers

$$\max_{C_t^i, H_{t+1}^i, L_t^i, B_{t+1}} E_t \sum_{j=0}^{\infty} b_i^t \left[\log C_{t+j}^i + g \log H_{t+j}^i + x \log\left(1 - L_{t+j}^i\right)\right]$$

subject to:

$$P_{t+j} C_{t+j}^i + Q_{t+j}\left(H_{t+j+1}^i - (1-d) H_{t+j}^i\right) + Q_{t+j} \Phi\left(\frac{H_{t+j+1}^i}{H_{t+j}^i}\right) H_{t+j}^i + Z_{t+j-1} B_{t+j}$$

$$= W_{t+j} L_{t+j}^i + B_{t+j+1}$$

In equilibrium:

$$Z_{t+j} = y\left(\frac{B_{t+j+1}}{Q_{t+j} H_{t+j+1}}\right) R_{t+j}$$

House Producers

Evolution process for housing stock:

$$H_{t+1} - (1-d)H_t = F(I_t, I_{t-1})$$

where

$$F(I_t, I_{t-1}) = \left[1 - \frac{h}{2}\left(\frac{I_t}{I_{t-1}} - 1\right)^2\right] I_t$$

House producers' profit maximization problem:

$$\max_{I_t} E_t \sum_{j=0}^{\infty} b_p^j l_{t+j}^p \left[Q_{t+j} F(I_{t+j}, I_{t+j-1}) - P_{t+j} I_{t+j}\right]$$

Final Good Producer

- Technology:

$$Y_t = \left[\int_0^1 Y_t(z)^{\frac{e-1}{e}} dz \right]^{\frac{e}{e-1}}$$

- Profit maximization implies:

$$Y_t(z) = \left(\frac{P_t(z)}{P_t} \right)^{-e} Y_t$$

Intermediate Good Producers

- Intermediate good $z \in (0,1)$ is produced by a monopolist with technology:

$$Y_t(z) = A_t L(z)^{1-a}$$

- They hire labour in a perfectly competitive market

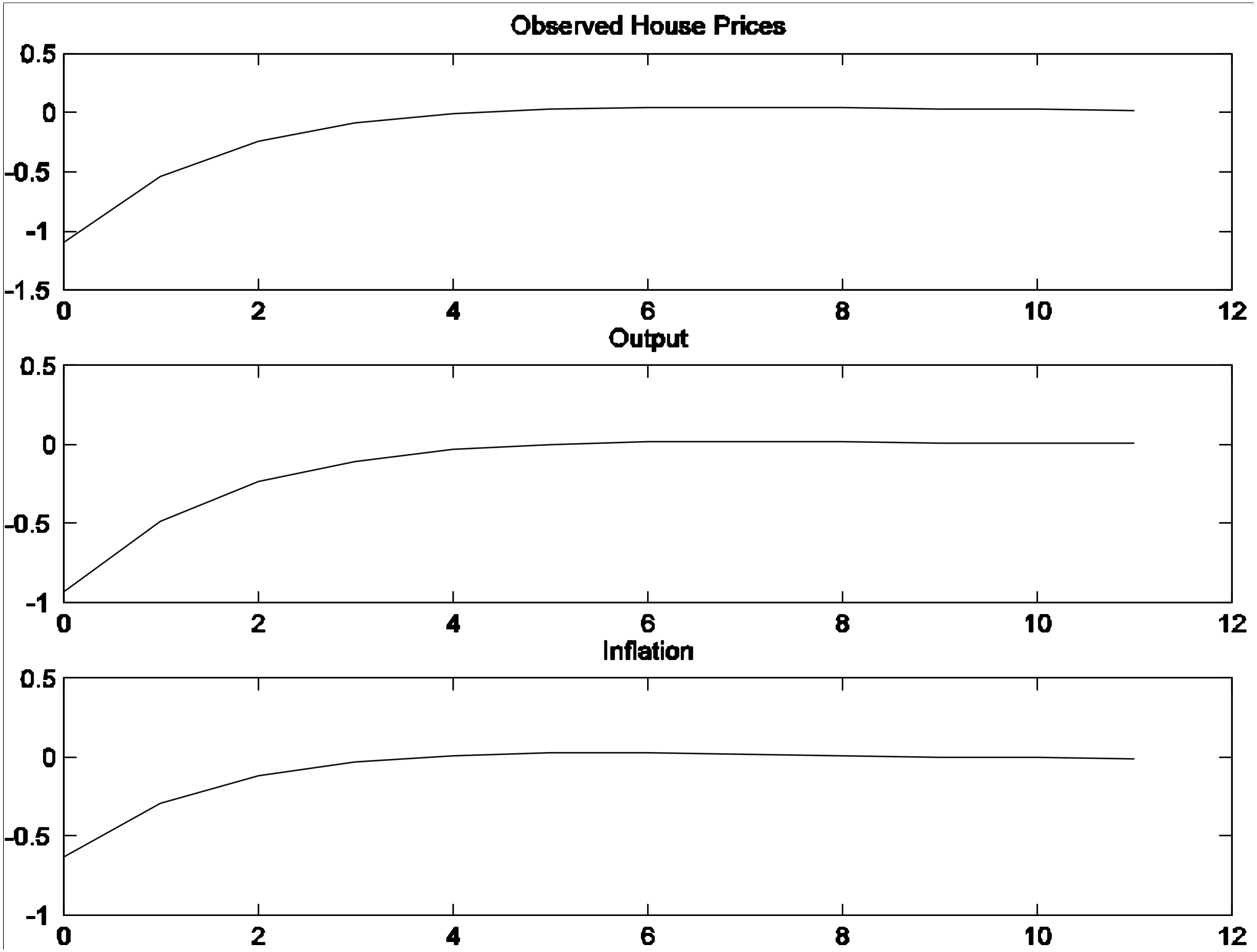
Policy Reaction Function

$$\hat{R}_t = r_R \hat{R}_{t-1} + \left(1 - r_R\right)\left[m_p \hat{p}_t + m_y \hat{y}_t\right] + e_{R,t}$$

Key Parameter Values

Parameter	Calibrated Value	Target
$ß_p$	0.995	SS annual real interest rate of 2 per cent
$ß_i$	0.989	SS EFP of 245 bps
?	0.09	C/H ratio of 0.35
d	0.025	
$?$	2.48	
$?$	0.042	

Rise of 100 bps in Interest Rate



Random Deviation From Fundamental

- The fundamental price of housing is still determined by the linearized adjustment cost equation:

$$\hat{q}_t = h\left(\hat{I}_t - \hat{I}_{t-1}\right) - b_p h\left(E_{t+1}\hat{I}_{t+1} - \hat{I}_t\right)$$

- The observed market price of housing:

$$\hat{s}_t = \hat{q}_t + \hat{v}_t$$

Random Deviation From Fundamental

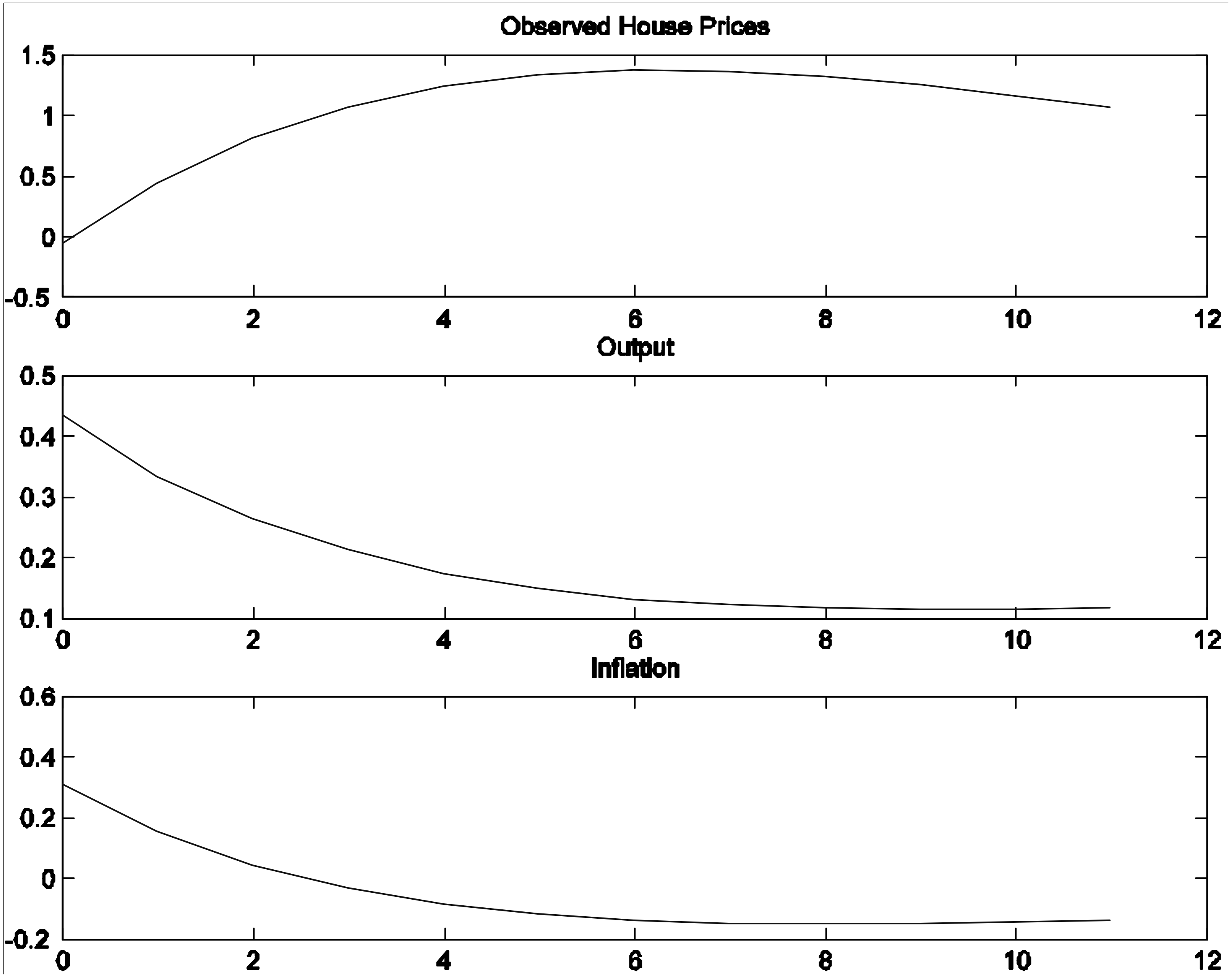
- Deviation process:

$$\hat{v}_t = r_v \hat{v}_{t-1} + \hat{u}_t$$

$$\hat{u}_t = r_u \hat{u}_{t-1} + e_t^u$$

- Auto-correlated innovation allows deviation to increase for several periods after initial shock

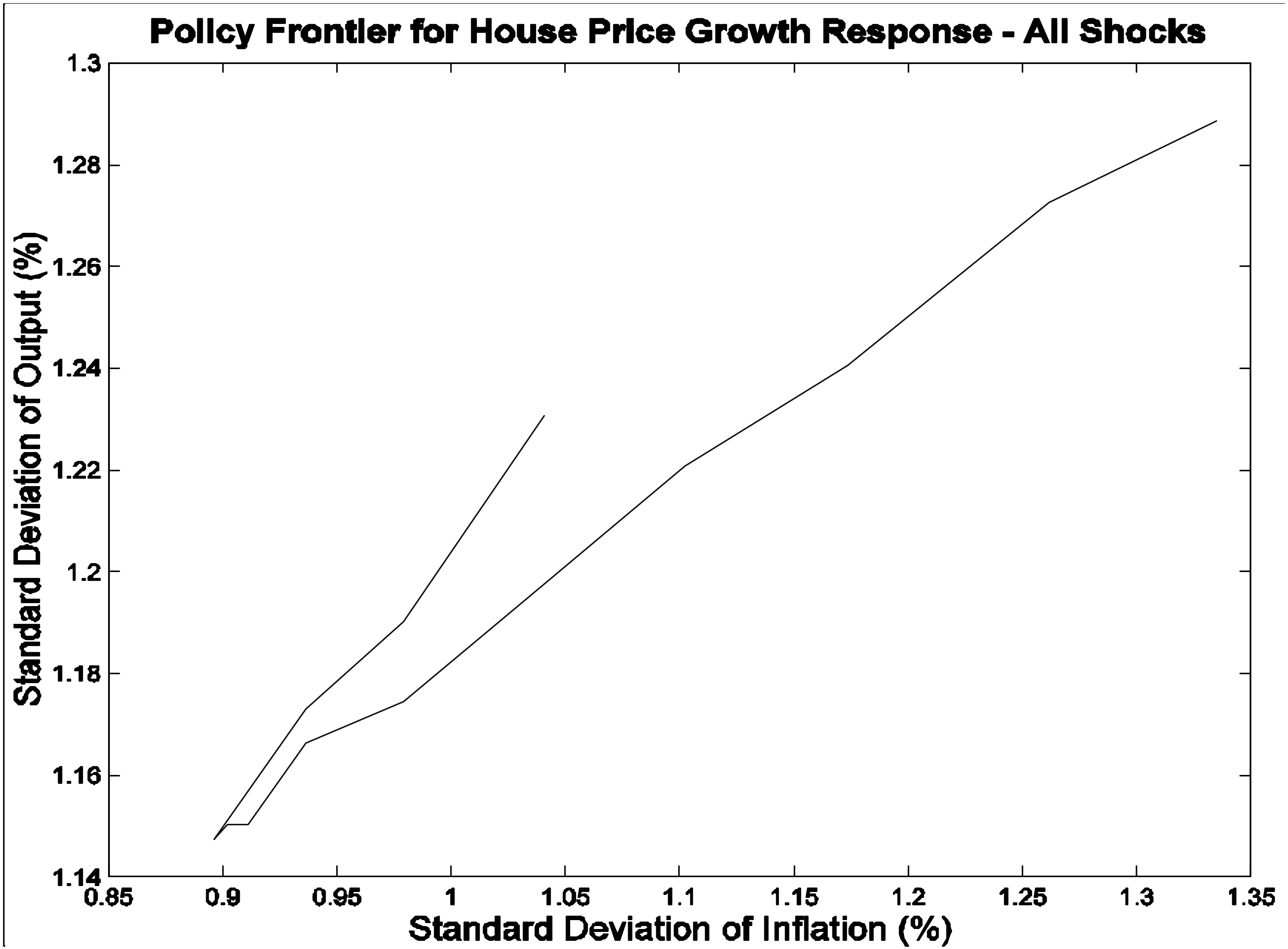
Deviation From Fundamental

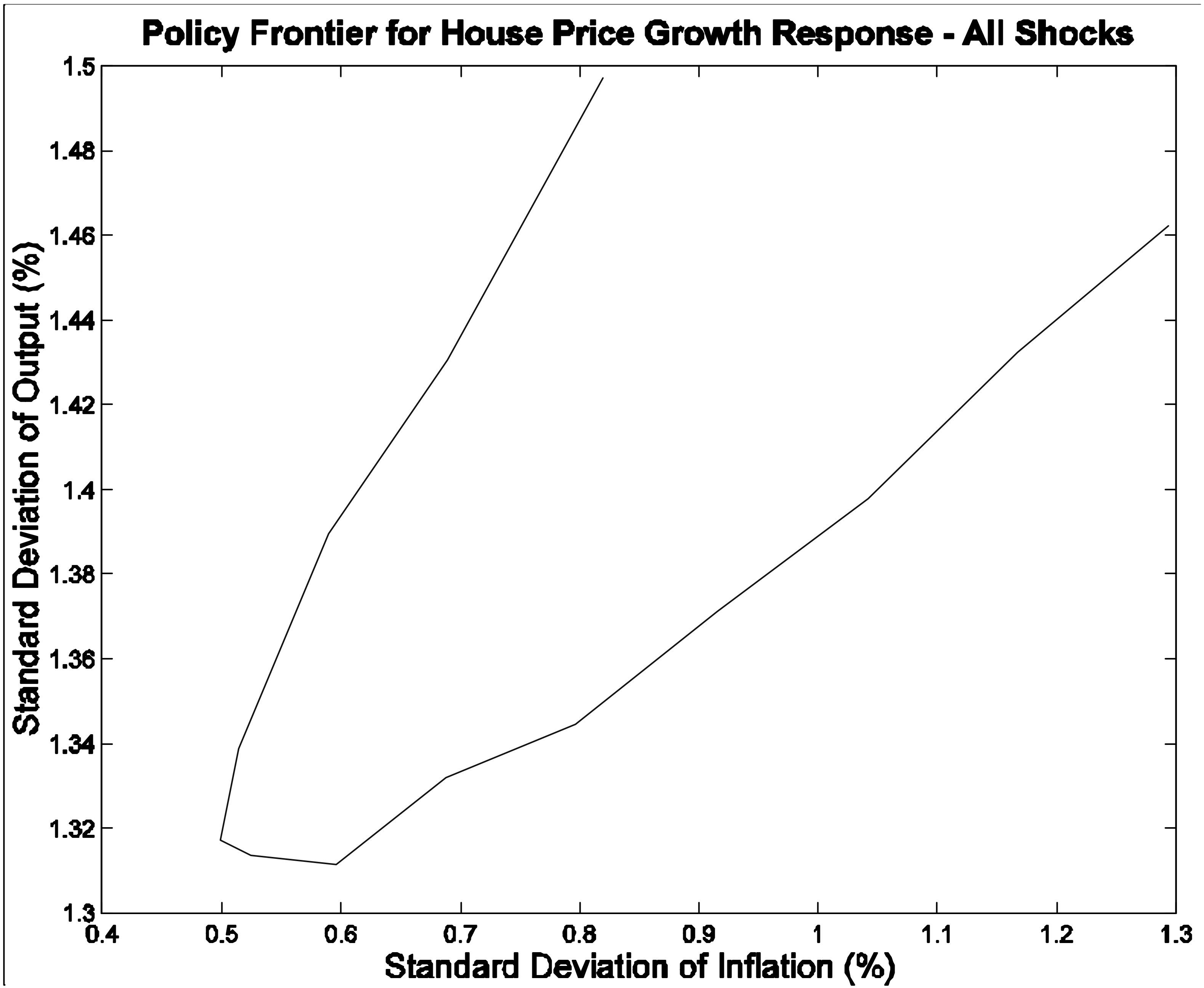


Policy Possibility Frontiers

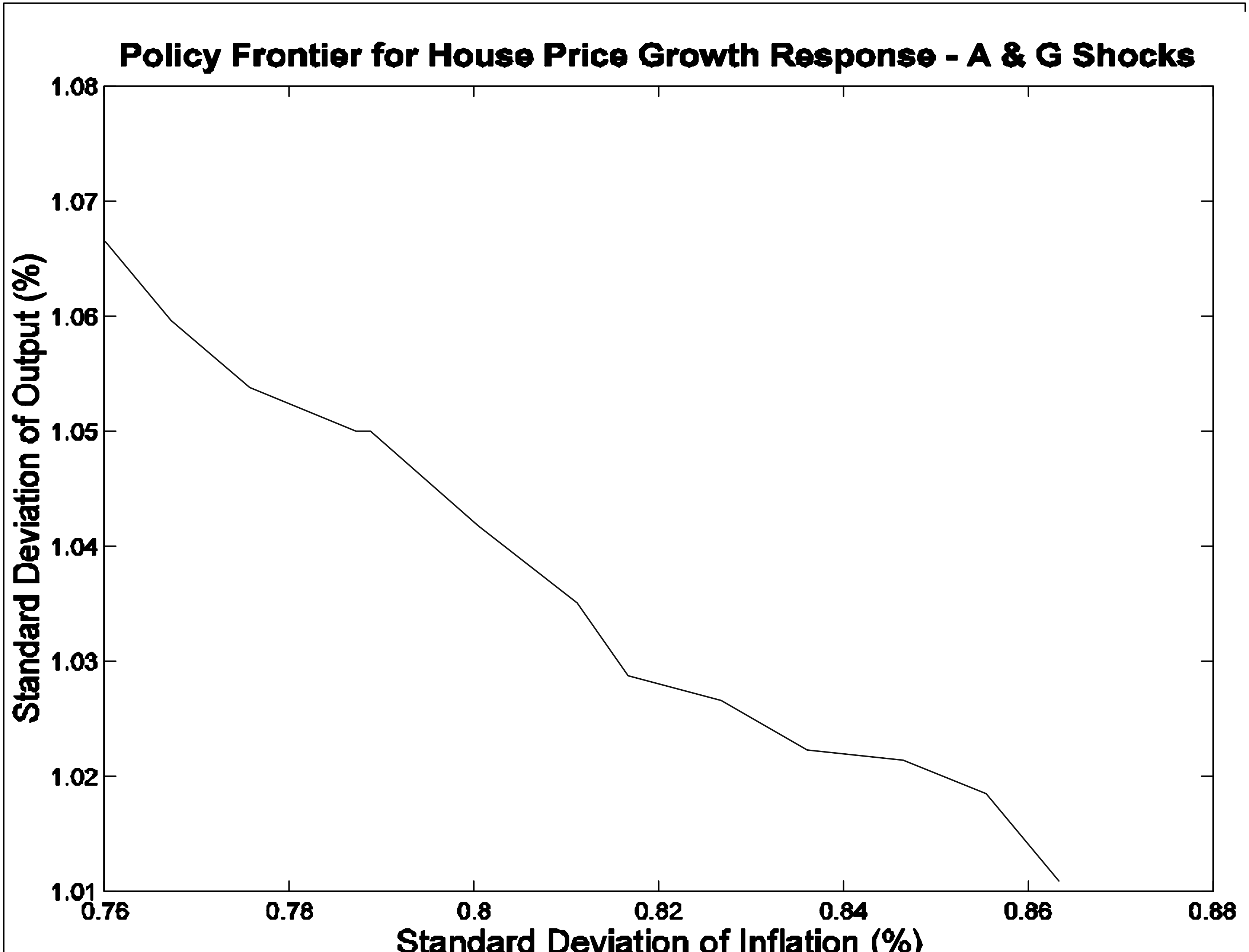
$$\hat{R}_t = r_R \hat{R}_{t-1} + (1 - r_R)\left[m_p \hat{p}_t + m_y \hat{y}_t + m_s \hat{s}_t\right] + e_{R,t}$$

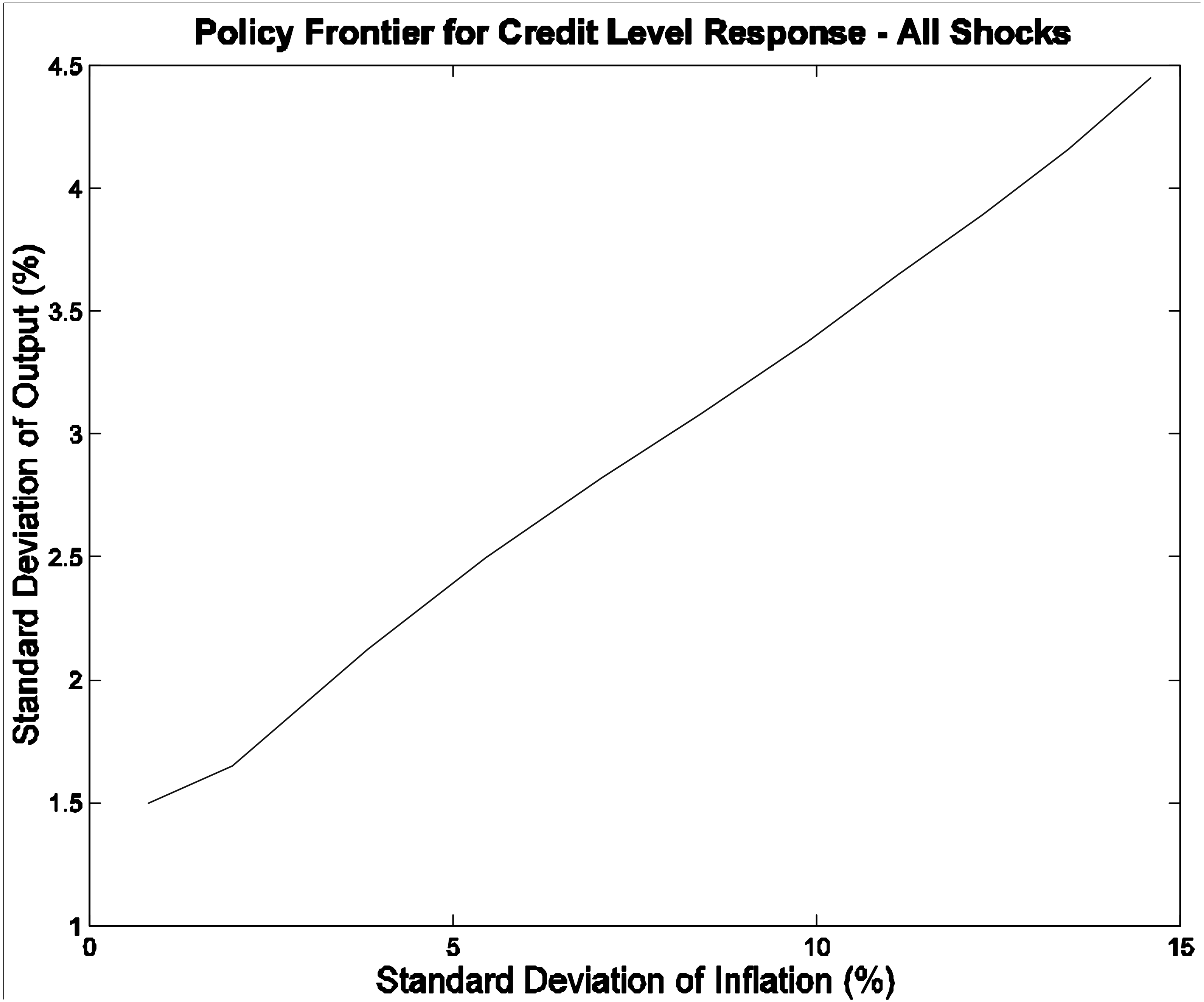
$$\hat{R}_t = r_R \hat{R}_{t-1} + (1 - r_R)\left[m_p \hat{p}_t + m_y \hat{y}_t + m_b \hat{b}_t\right] + e_{R,t}$$

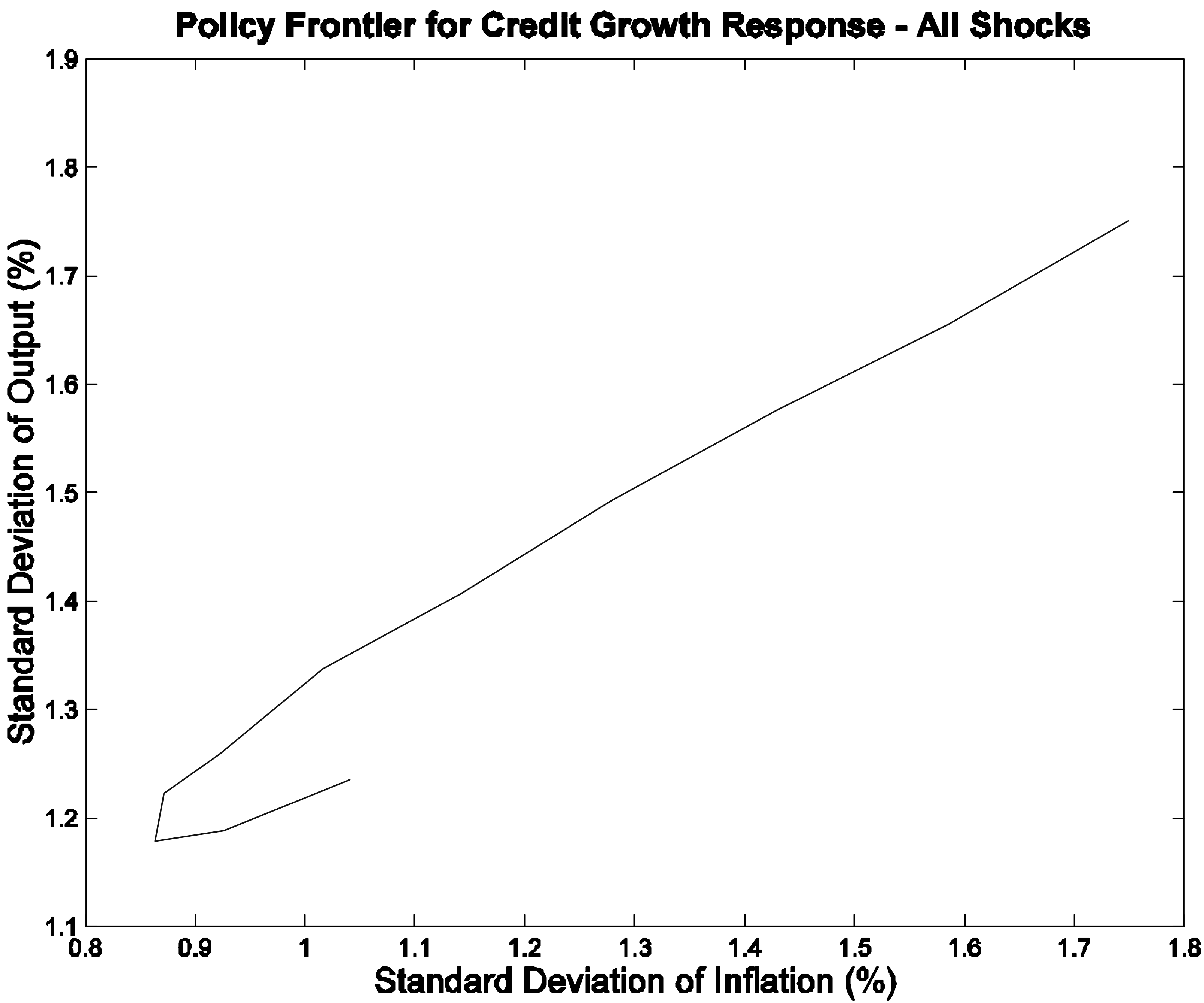

Policy Frontier for House Price Growth Response - All Shocks
Standard Deviation of Output (%)
Standard Deviation of Inflation (%)
1.3
1.28
1.26
1.24
1.22
1.2
1.18
1.16
1.14
0.85
0.9
0.95
1
1.05
1.1
1.15
1.2
1.25
1.3
1.35



Policy Frontier for House Price Growth Response - All Shocks
Standard Deviation of Output (%)
1.5
1.48
1.46
1.44
1.42
1.4
1.38
1.36
1.34
1.32
1.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
Standard Deviation of Inflation (%)


Policy Frontier for House Price Growth Response - A & G Shocks
1.08
1.07
1.06
1.05
1.04
1.03
1.02
1.01
0.76
0.78
0.8
0.82
0.84
0.86
0.88
Standard Deviation of Output (%)
Standard Deviation of Inflation (%)


Policy Frontier for Credit Level Response - All Shocks
Standard Deviation of Output (%)
Standard Deviation of Inflation (%)
4.5
4
3.5
3
2.5
2
1.5
1
0
5
10
15


Policy Frontier for Credit Growth Response - All Shocks
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
Standard Deviation of Output (%)
Standard Deviation of Inflation (%)

Conclusion - Findings

- Responding mildly to house price growth may reduce inflation and output variabilities

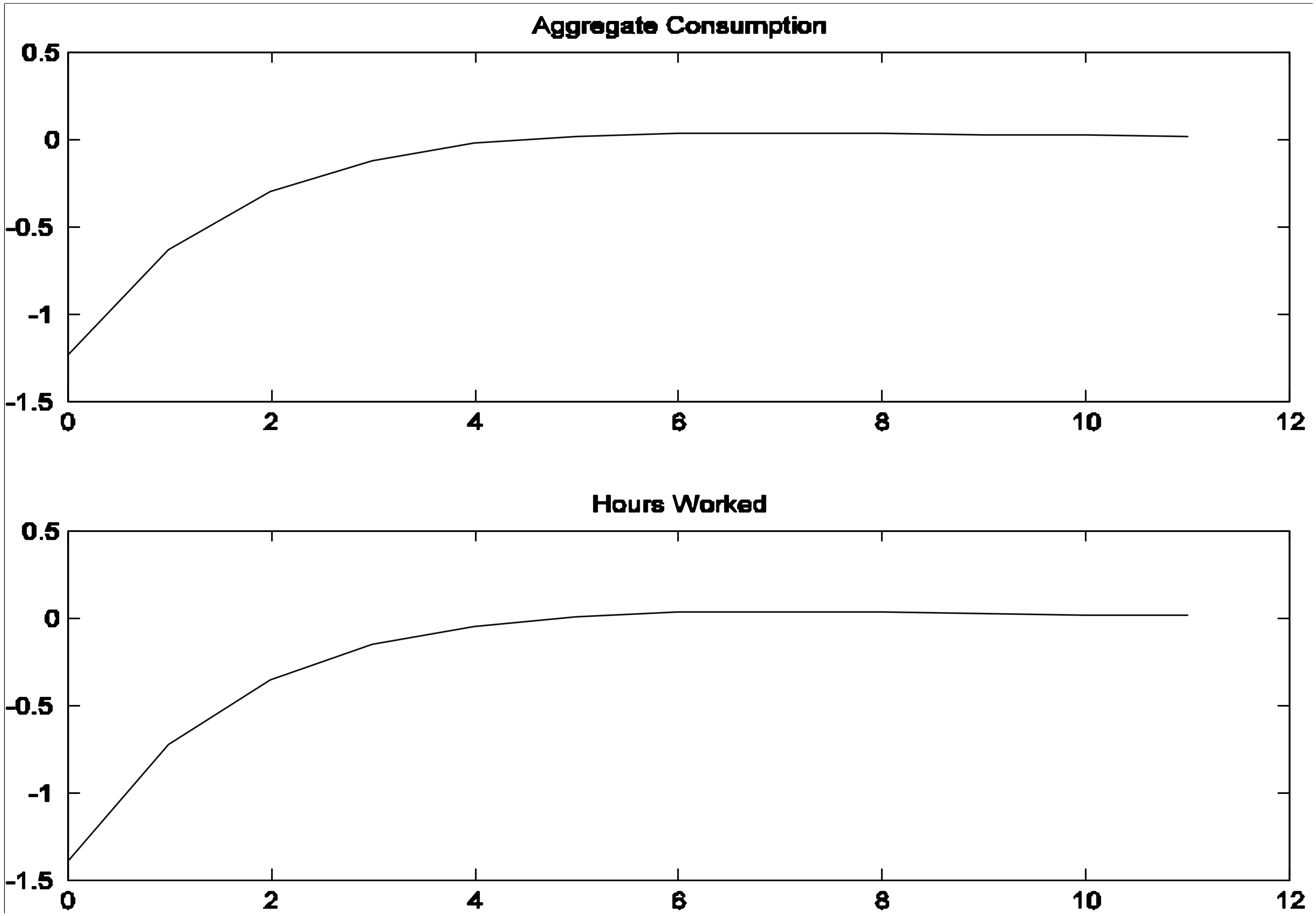
Conclusion – Future Work

- Consider other ways of modeling deviation from fundamental
- Address non-linear effects of a prolonged deviation from fundamentals
- Introduce other frictions to improve dynamics of inflation and output

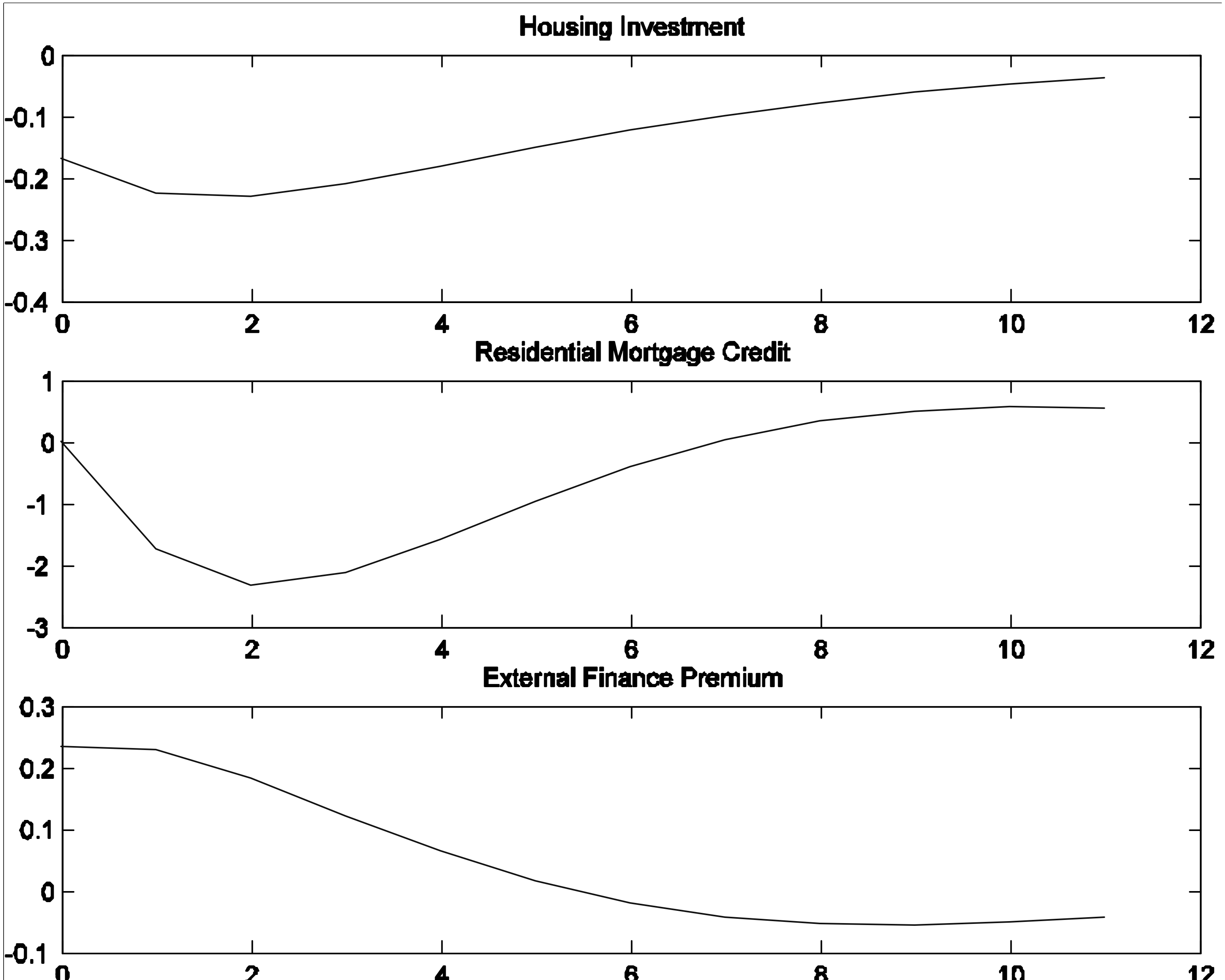
Conclusion – Future Work

- In the presence of non-fundamental house price movements, what is the optimal horizon for returning inflation back to target?

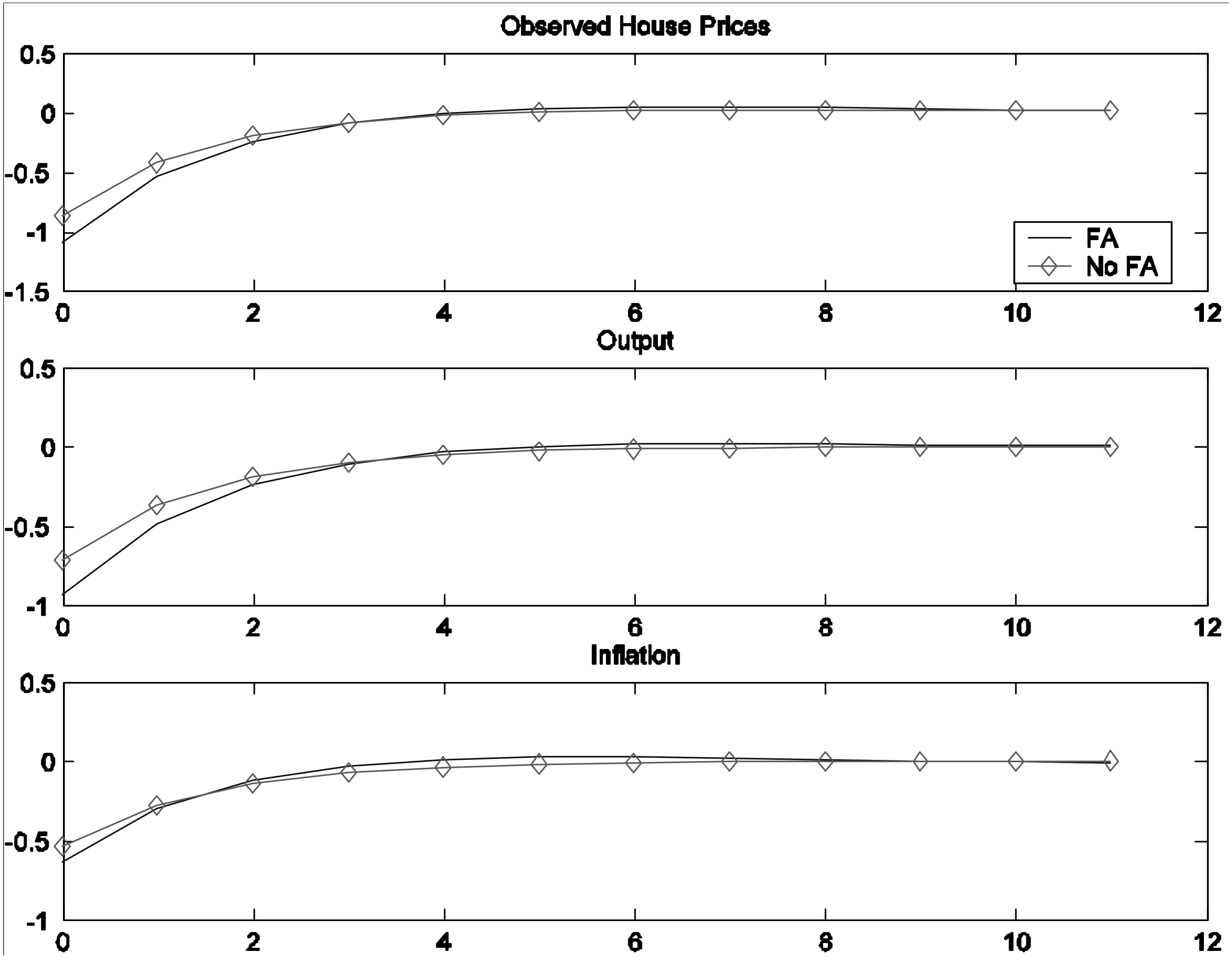
Interest Rate Rise of 100 bps (2)



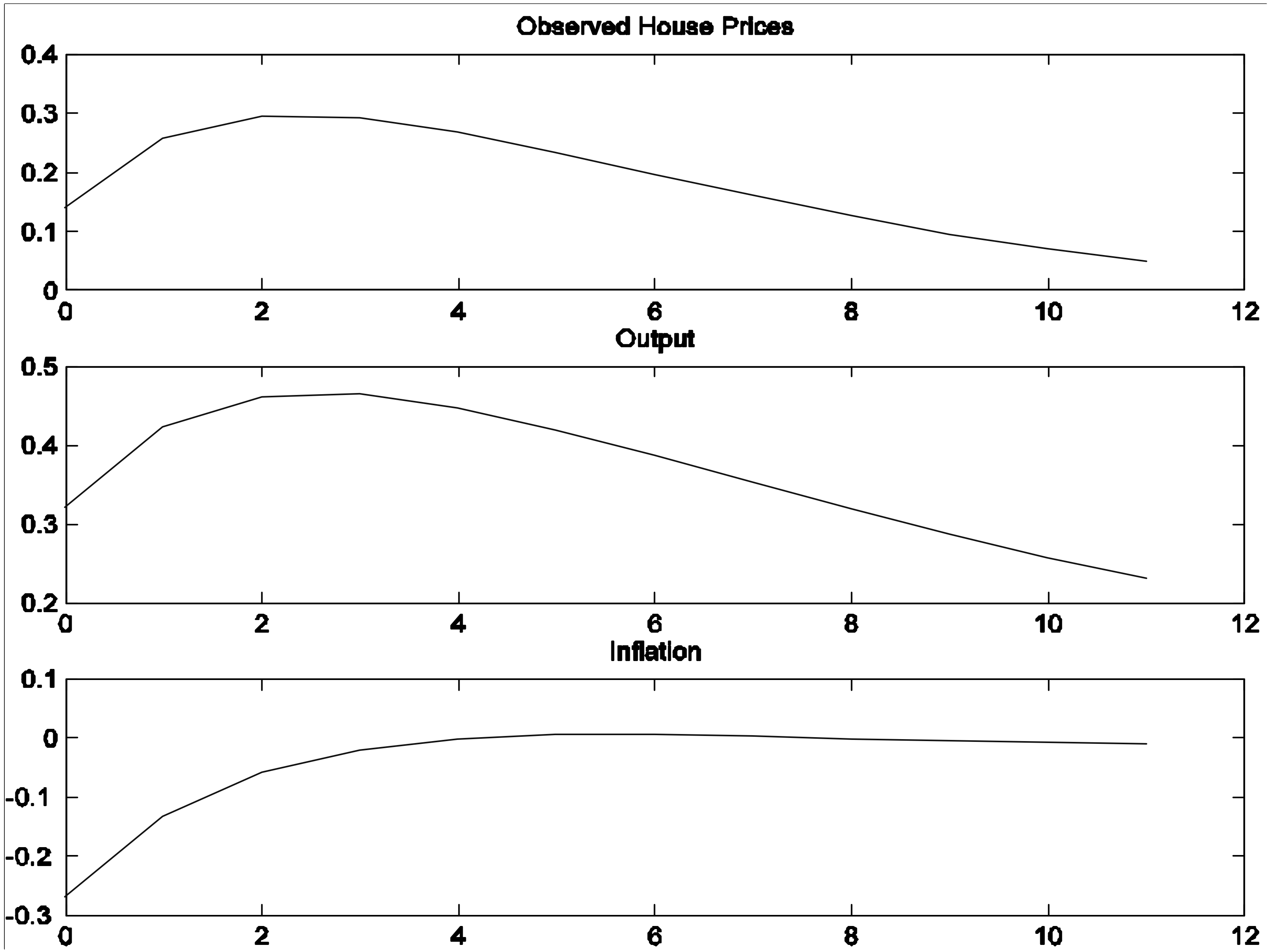
Interest Rate Rise of 100 bps (3)



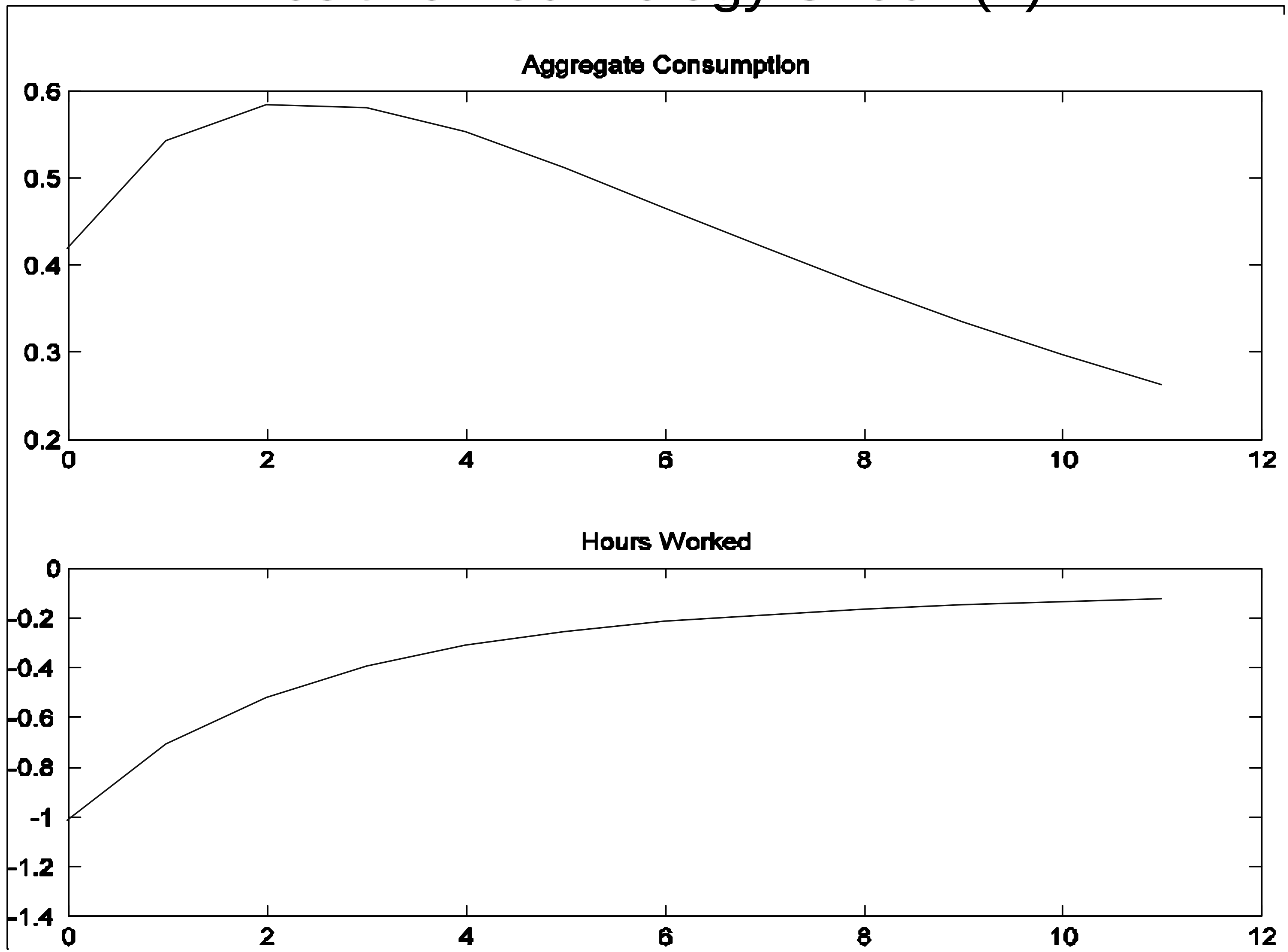
Interest Rate Rise of 100 bps (4)



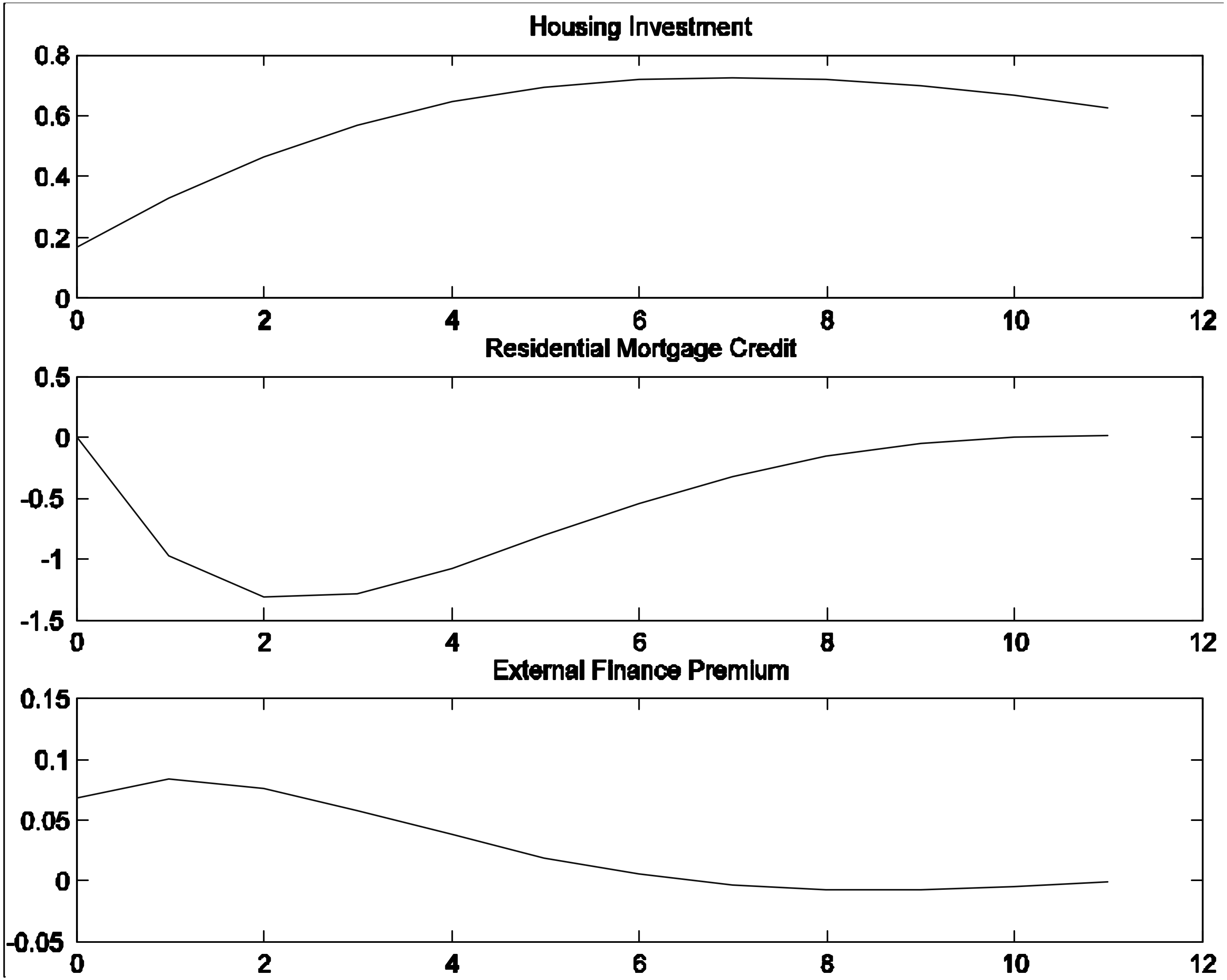
Positive Technology Shock (1)



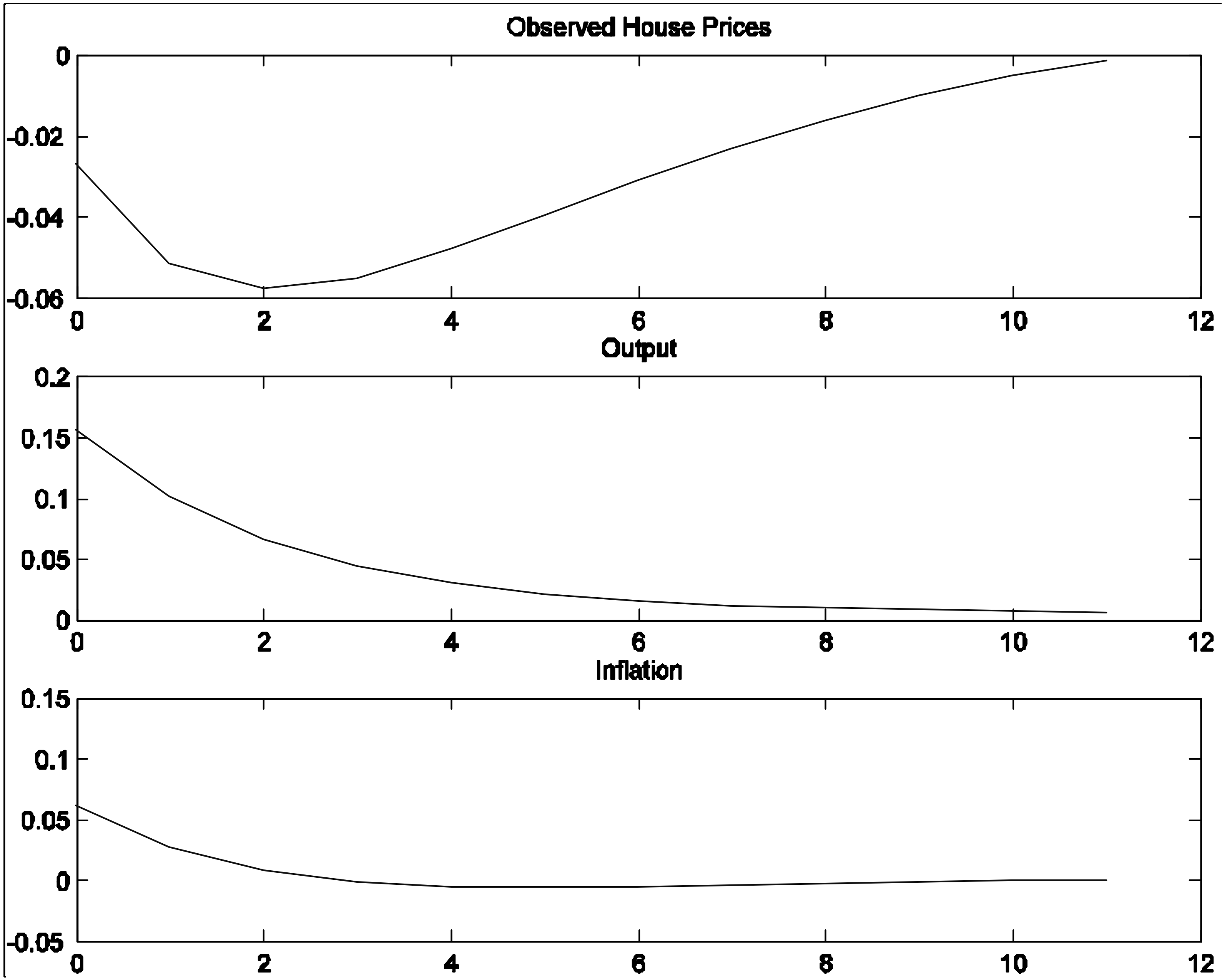
Positive Technology Shock (2)



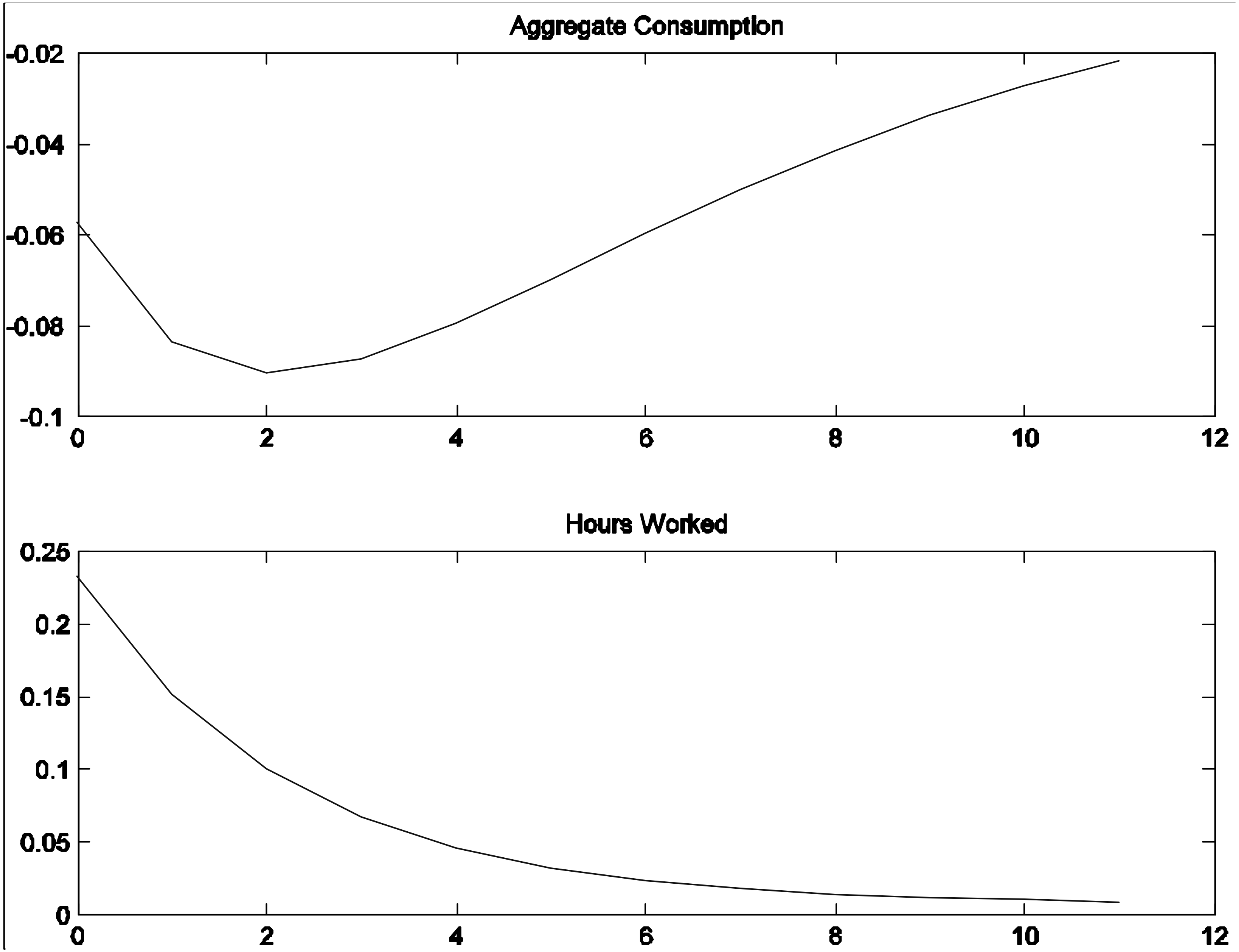
Positive Technology Shock (3)



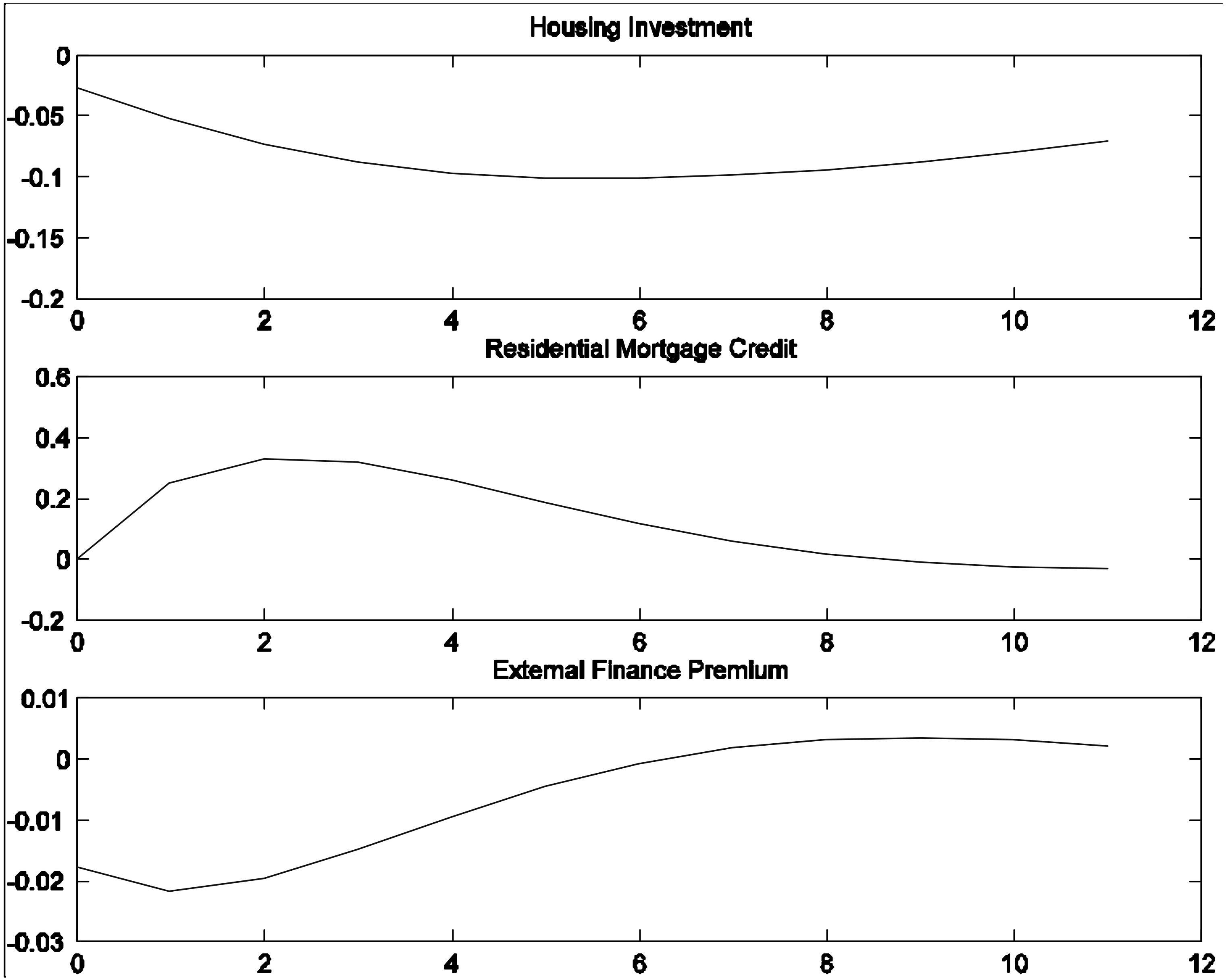
Positive Government Spending Shock (1)



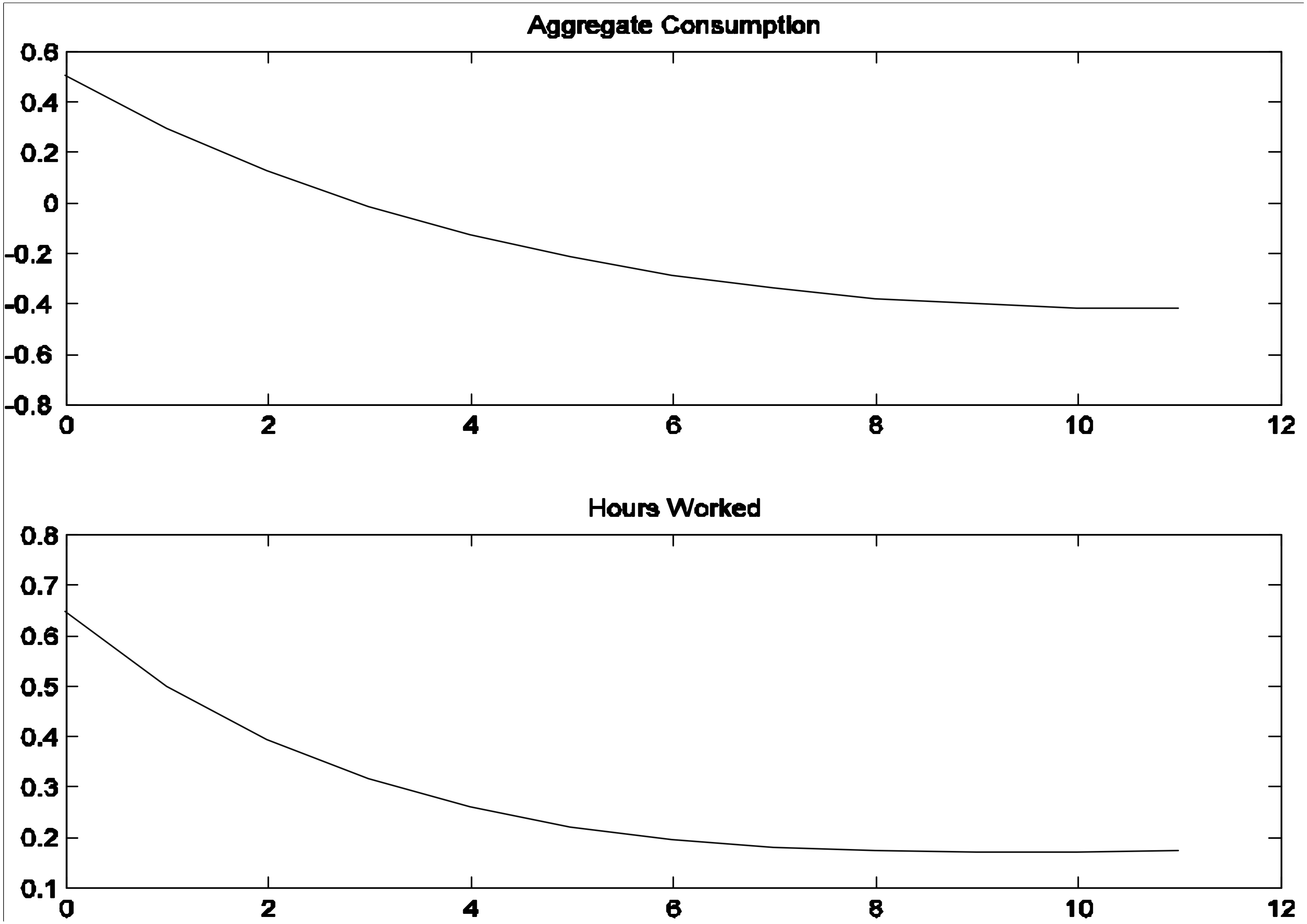
Positive Government Spending Shock (2)



Positive Government Spending Shock (3)



Deviation from Fundamental (2)



Deviation from Fundamental (3)