THAI MONETARY POLICY UNDER INFLATION TARGETING REGIME

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Presentation outline:

- Introduction and Motivation
- Thai macroeconomic effects of inflation targeting
- The New Keynesian Model
- The Bayesian estimation
- Impulse responses
- The inflation targeting and the potential level
- Implications for monetary policy
- Conclusions

Introduction:

- A nominal anchor is widely agree to be a way to achieve the primary objectives of monetary policy.
- Inflation targeting has been adopted by Thailand in 2000
- Inflation targeting results in the independent monetary policy.
- Thai inflation has been lower than the targeting roughly since adopted the headline inflation target
- BOT adjusted the inflation targeting to 1-3% for the year 2020

Motivation

- What are the effects of inflation targeting on Thai macroeconomic performance?
- What have happened to the monetary policy rule under inflation targeting regimes
- Given other exogenous shocks, what have happened to Thailand
- More importantly, what have happened to Thai economy if the BOT decides to adjust the inflation target.

Thai macroeconomic effects of inflation targeting

- Managing inflation to hit the target is not a proper way to measure the success of inflation targeting, Corbo et al. (2001)
- A central bank is able to maintain its credibility with temporary deviation from target. Schaechter et al., (2000)
- From 21 inflation targeting countries that inflation targeting leads on average to a 2.5% to more than 3% fall in inflation. Pétursson (2005)
- Inflation targeting stabilizes inflation. Mishkin (2003), Neumann and von Hagen (2002)

Thai macroeconomic effects of inflation targeting

Anchor	Monetary targeting	Inflation targeting	Core inf. 0-3.5 %	Core inf. 0.5-3.0 %	Headline inf. 2.5 ±1.5 %
Average inflation	3.8	2.1	2.6	2.5	0.3
Fluctuations in inflation	4.4	1.9	2.1	1.4	0.8
Persistency of inflation	0.83	0.71			
Average growth	2.5	3.9	4.2	3.8	3.6
Fluctuations in growth	5.6	3.1	3.1	4.3	0.6
Average short term nominal interest rate	6.8	2.2	2.5	2.2	1.5
Fluctuations in short term real interest rate	4.1	1.6	1.8	1.3	0.9

The table documents the year on year percentage changes in CPI quarterly data

Targeting the exchange rate was Thai monetary policy strategy from November 1984 until June 1997. The strategy after the adoption of the floating was a monetary targeting by targeting domestic money supply. BOT decided to switch its monetary policy to flexible inflation targeting regime in May 2000.

Sources: CEIC

Thai macroeconomic effects of inflation targeting

- The univariate AR(2) model in line with Pétursson (2005) is used to find how inflation targeting changes inflation persistence in Thailand

$$\pi_t = \theta + \beta_1 \pi_{t-1} + \beta_2 \pi_{t-2} + \alpha IT_t \pi_{-1} + P(t) + \varepsilon_t$$

- The persistency of inflation before targeting is explained by $\beta_1 + \beta_2$ and by $\beta_1 + \beta_2 + \alpha$ after targeting

Thai macroeconomic effects of inflation targeting

source: Bank of Thailand

The New Keynesian Model

- New Keynesian models have become the benchmark to analyze the effects of monetary policy
- New Keynesian models introduce channels through which inflation is costly.
  - Firms set prices at different times. There is price dispersion across firms
  - Firms set prices higher than their marginal costs
  - Monetary policy become less effective at higher rates of inflation targeting.

The New Keynesian Model

- The zero inflation at steady state, a simplification but counterfactual assumption. Ascari (2004), Ascari and Ropele (2007), Ascari and Ropele (2009).
- To fix the problems of zero inflation at steady state
  - Indexation
    - Indexing the price that cannot be reset to the trend inflation rate. Yun(1996) and Jeanne(1998)
    - Indexing the price that cannot be reset to the past inflation rate. Christiano et al.,(2001)
  - State depend pricing. Dotsey et al.,(1999)
  - A time varying trend inflation. Cogley and Sbordone(2008)

The New Keynesian Model

- This study explores that when trend inflation is considered for Thai economy how the long-run properties of DSGE model based on the Calvo staggered price model change.

The New Keynesian Model

- Households: Cost minimization problem
  - Firstly, household would like to consume a final consumption goods C_t, at the lowest cost.
  - Following Dixit and Stiglitz (1977), the consumption index is given by:

$$C_t = \left(\int_0^1 C_t(m)^{\frac{\zeta-1}{\zeta}} d(m) \right)^{\frac{\zeta}{\zeta-1}}$$

  - Firm m produces goods $C_t(m)$ and its price is $P_t(m)$
  - ζ is the elasticity of substitution.

The New Keynesian Model

- Households: Cost minimization problem
  - The household seeks to minimize its expenditure

$$\int_0^1 P_t(m)\, C_t(m) dm \text{ s.t. } C_t = \left(\int_0^1 C_t(m)^{\frac{\zeta-1}{\zeta}} d(m)\right)^{\frac{\zeta}{\zeta-1}}$$

  - This results in
    - the aggregate price index P_t

$$P_t = \left(\int_0^1 P_t(m)^{1-\zeta} d(m)\right)^{\frac{1}{1-\zeta}}$$

    - a consumption demand equation of each differentiated good *m*:

$$C_t(m) = \left(\frac{P_t(m)}{P_t}\right)^{-\zeta} C_t$$

The New Keynesian Model

- Households: Utility maximization problem
  - Secondly, households optimally choose consumption good C_t and labor N_t to maximize their expected utility with respect to their period budget constraint
  - The preferences follow external habit formation as below:

$$U(C_t, L_t) = \frac{((C_t - \chi C_{t-1})^{(1-\varrho)}(1 - N_t)^{\varrho})^{1-\sigma}}{1-\sigma}$$

    - χ is a coefficient of persistence in habits
    - $\varrho \in (0,1)$ is the consumption and labor share
    - σ stands for the risk aversion coefficient

The New Keynesian Model

- Households: Utility maximization problem
  - The budget constraint is given by:

$$B_t = R_{t-1}B_{t-1} + r_t^k K_{t-1} + W_t N_t - C_t - I_t - T_t$$

    - B_t is the given net stock of financial assets at the end of period t
    - r_t^k is the rental rate, W_t is the real wage rate
    - R_t is the gross real interest rate paid on assets held at the beginning of period t to pay out interest in period $t+1$
    - I_t is investment, T_t are lump-sum taxes.

The New Keynesian Model

- Households: Utility maximization problem
  - The law of motion of capital is governed over time by:

$$K_t = (1-\delta)K_{t-1} + (1-\phi(\frac{I_t}{I_{t-1}}))I_t$$

  - capital adjustment costs denoted by the function ϕ
    - Where $\phi(I_t/I_{t-1}) = \phi_X(I_t/I_{t-1} - 1)$
    - With $\phi(1) = \phi'(1) = 0$ and $\phi''(1) \geq 0$ implying that there is cost associated with changing the level of investment

The New Keynesian Model

- Households: Utility maximization problem
  - The household's utility maximization leads to:
    - $U_{C,t} = R_t \mathrm{E}_t[\beta U_{C,t+1}]$
    - $\frac{U_{L,t}}{U_{C,t}} = W_t$
    - $q_t = E_t \beta \frac{\lambda_{t+1}}{\lambda_t} (q_{t+1}(1-\delta) + r_{t+1}^K$
    - $1 = q_t - q_t \phi \left(\frac{I_t}{I_{t-1}}\right) - q_t \frac{I_t}{I_{t-1}} \phi' \left(\frac{I_t}{I_{t-1}}\right) +$

$$E_t \beta \frac{\lambda_{t+1}}{\lambda_t} [q_{t+1} \left(\frac{I_{t+1}}{I_t}\right)^2 \phi' (\frac{I_{t+1}}{I_t})$$

The New Keynesian Model

- Firms: Final goods sector
  - Firstly, The final goods is produced by a firm that aggregates intermediate good in to a single composite good using the following Dixit and Stiglitz aggregator:

$$Y_t = \left(\int_0^1 Y_t(m)^{\frac{\zeta-1}{\zeta}} d(m) \right)^{\frac{\zeta}{\zeta-1}}$$

  - The firm takes as given the price of intermediate good $P(m)$ and the price of the composite final good P_t and then maximizes profits, resulting in the demand of intermediate good m

$$Y_t(m) = \left(\frac{P_t(m)}{P_t} \right)^{-\zeta} Y_t$$

The New Keynesian Model

- Firms: Intermediate goods sector
  - Each intermediate goods is produced by only one firm using labor and capital based on the following Cobb-Douglas production function:
    - where A_t is productivity process
    - K_t is end of period t capital stock

$$Y_t(m) = A_t N_t^{\alpha}(m) K_{t-1}^{1-\alpha}(m)$$

  - Each frim acknowledges the demand curve it faces or $Y_t(m) = C_t(m)$

The New Keynesian Model

- Firms: Intermediate goods sector
  - Firm's cost minimization problem leads to the following conditions:
    - $W_t = MC_t \alpha \frac{Y_t(m)}{N_{t\,(m)}}$
    - $r_t^K = MC_t(1-\alpha)\frac{Y_t(m)}{K_{t-1\,(m)}}$
    - where MC_t represents nominal marginal cost
- The cost function and the instantaneous real profit function of firm m can be written respectively as:

$$\pi_t(m) = \frac{P_t(m)}{P_t} Y_t(m) - \varphi_t Y_t(m)$$

    - where $\varphi_t = MC_t/P_t$ is real marginal cost

The New Keynesian Model

- Having describe the firm profit, the model is then added the feature of price stickiness using the staggered price setting established by Calvo (1983).
- In any period, the probability
  - that each firm will not adjust its price is ω
  - that each firm will change its price is $1-\omega$
- Let P_t^* be the optimal price chosen by all firms adjusting at time t. The aggregate of all prices will be:

$$P_t = \left(\omega \int_0^1 P_{t-1}^{1-\zeta}\, dt + (1-\omega)(P_t^*)^{1-\zeta}\right)^{\frac{1}{1-\zeta}}$$

The New Keynesian Model

- Consider a firm, m, that has a chance $1-\omega$ to reset prices at t. The firm's decision problem is to choose $P_t^*(m)$ to maximize its discounted real profits. Using the demand curve for good m, the real profit is given by

$$\mathrm{E}_t \sum_{k=0}^{\infty} \omega^k \Lambda_{t,t+k} \left(\left(\frac{P_t^*(m)}{P_{t+k}} \right)^{1-\zeta} + \varphi_{t+k} \left(\frac{P_t^*(m)}{P_{t+k}} \right)^{-\zeta} \right) Y_{t+k}$$

- The first order condition resulting the optimal pricing behavior of intermediate goods:

$$\frac{P_t^*}{P_t} = \frac{\zeta}{(\zeta-1)} \frac{\mathrm{E}_t \sum_{k=0}^{\infty} \omega^k \Lambda_{t,t+k} Y_{t+k} \varphi_{t+k} \left(\frac{P_{t+k}}{P_t} \right)^{\zeta}}{\mathrm{E}_t \sum_{k=0}^{\infty} \omega^k \Lambda_{t,t+k} Y_{t+k} \left(\frac{P_{t+k}}{P_t} \right)^{\zeta-1}}$$

The New Keynesian Model: The price indexation

- The price indexation is introduced to explain the inflation persistence as in Christiano, Eichenbaum and Evans (2005) and Smets and Wouters (2007).
- For firms that do not reoptimize with probability ω, their prices are partially indexed to last period's aggregate inflation:

$$P_t(i) = \pi_{t-1}^{\gamma_p} P_{t-1}(i)$$

  - where $\pi_{t-1} = P_{t-1}/P_{t-2}$
  - $\gamma_p \in [0,1]$ is the magnitude of indexation factor.

The New Keynesian Model: The price indexation

- Price dynamics evolve according to:
  - $\frac{P_t^*}{P_t} = \frac{M_t}{MM_t}$
  - $M_t = \left(\frac{1}{1-1/\zeta}\right) Y_t \varphi_t MS_t + \omega E_t\left[\Lambda_{t,t+1} \widehat{\Pi}_{t+1}^{\zeta} M_{t+1}\right]$
  - $MM_t = Y_t + \omega E_t\left[\Lambda_{t,t+1} \widehat{\Pi}_{t+1}^{\zeta-1} MM_{t+1}\right]$
- Where $\widehat{\Pi}_t = \pi_t \pi_{t-1}^{-\gamma_p}$

The New Keynesian Model: The price indexation

- Another way of indexing assumes that prices are indexed to a weighted average of last period inflation and trend inflation.
- Denote the two weights by γ_P and $\bar{\gamma}_P$ respectively
- the dynamic equations can be replaced by

$$\widehat{\Pi}_t = \pi_t/(\pi_{t-1}^{\gamma_p} \pi^{*(1-\bar{\gamma}_p)})$$

- in which π^* is inflation target.
- Smets and Wouters (2007) assumed that $\gamma_P = \bar{\gamma}_P$ so that the effect of trend inflation is eliminated.

The New Keynesian Model: The price dispersion

- Christiano, Trabandt and Walentin (2010) assert that under Calvo staggering price assumption, $P(m)$ differs across m resulting in an unequally allocated resources across intermediate good producers.
- Therefore price dispersion occurs in the Keynesian economy and generates an inefficient resource allocation.
- An unequally distribution of inputs causes the loss of aggregate output.
- Following Yun (1996), the price dispersion could be characterized by finding the relation between the aggregate output and aggregate factor inputs

The New Keynesian Model: The price dispersion

- Define $\hat{Y}_t$ as the integral of gross output across intermediate good firms:

$$\hat{Y}_t = \int_0^1 Y_t(m)\, dm = \int_0^1 \left(A_t N_t(m)\right)^{\alpha} K_{t-1}(m)^{1-\alpha} dm = (A_t N_t)^{\alpha} K_{t-1}^{1-\alpha}$$

- Using the demand of intermediate good m

$$\hat{Y}_t = \left(\frac{P_t^*}{P_t}\right)^{-\zeta} Y_t$$

  - where $P_t^* = \left[\int_0^1 P_t(m)^{-\zeta} dm\right]^{-1/\zeta}$
  - $\left(\frac{P_t^*}{P_t}\right)^{-\zeta}$ measures output loss due to price dispersion.

The New Keynesian Model

- Monetary policy: The Taylor rule in log form:

$$log\left(\frac{R_{n,t}}{R_n}\right) = \rho_r log\left(\frac{R_{n,t-1}}{R_n}\right) + (1-\rho_r)\alpha_\pi log\left(\frac{\pi_t}{\pi}\right) + (1-\rho_r)\alpha_y log\left(\frac{Y_t}{Y}\right) + \epsilon_{M,t}$$

  - where $0 < \rho_r < 1$ and it measures how much nominal interest rate last period influence to nominal interest rate in the current period
  - $\alpha_\pi > 0$ and it captures how much the interest rate set by the central bank responds to the deviation of inflation from its target
  - Similarly α_y and it captures how much the interest rate set by the central bank responds to the output gap.

The New Keynesian Model

- The shocking process specification
- The law of motion for the exogeneous shocks are assumed to follow the first-order auto-regression process AR(1)
- The exogenous forcing processes to technology, government spending and mark-up shocks are respectively shown below:

$$log\left(\frac{A_t}{A}\right) = \rho_A log\left(\frac{A_{t-1}}{A}\right) + \epsilon_{A,t}$$

$$log\left(\frac{G_t}{G}\right) = \rho_G log\left(\frac{G_{t-1}}{G}\right) + \epsilon_{G,t}$$

$$log\left(\frac{MS_t}{MS}\right) = \rho_{MS} log\left(\frac{MS_{t-1}}{MS}\right) + \epsilon_{MS,t}$$

  - The parameter ρ measures how persistent each shock is.

The Bayesian Estimation

- Finding the posterior distribution of the DSGE parameters conditional on the sample data by using the DSGE model likelihood and the priors on the DSGE parameters is the objective of the Bayesian influence process.
- The posterior is the density of parameters knowing the data. Using the Bayesian rule, the posterior distribution can be computed as:

$$p(\theta|\Upsilon^T, M) = \frac{p(\Upsilon^T|\theta, M)p(\theta|M)}{p(\Upsilon^T|M)}$$

  - where $p(.)$ stands for a probability density function
  - M stands for the DSGE model
  - $p(\theta|\Upsilon^T, M)$ is the posterior distribution of the parameters conditional on the DSGE model

The Bayesian Estimation

- The information set of an observed macro time series until period T or $\Upsilon^{\mathrm{T}} = \{y_1, y_2, y_3, \dots, y_{\mathrm{T}}\}$.
- The term $p(\Upsilon^{\mathrm{T}} | \theta, \mathrm{M})$ is the likelihood density of the DSGE model parameter.

- The observables are in quarterly basis and from 2001Q1 to 2019Q1. All series are seasonally adjusted.
  - The log difference of real GDP
  - The log difference of the GDP deflator
  - The Bank of Thailand policy rate
  - From CEIC that is database system from IMF and Bank of Thailand.

The Bayesian Estimation

Name		Prior	
	Density	Mean	stdev
Structural parameters			
Habit χ	beta	2.00	0.10
Calvo price ω	beta	0.75	0.10
Investment adj. cost ϕ_X	normal	2.00	1.50
Consumption utility ζ	normal	1.50	0.375
Price indexation γ_P	beta	0.50	0.15
Labor share α	beta	0.72	0.05
Inflation at steady state	normal	0.834	0.10
Trend growth rate	normal	0.956	0.10
Norminal interest rate	normal	1.399	0.10
Policy parameters			
Lagged interest rate ρ_r	beta	0.75	0.10
Feed back inflation α_π	normal	0.75	0.10
Feed back output gap α_Y	normal	2.00	1.50
Shock parameters			
Technology $\epsilon_{\mathrm{A,t}}$	inv gamma	0.10	2.00
Gov exp $\epsilon_{\mathrm{G,t}}$	Inv gamma	0.50	2.00
Mark-up $\epsilon_{\mathrm{MS,t}}$	Inv gamma	0.10	2.00
Tech persistency ρ_{A}	beta	0.50	2.00
Gov exp persistency ρ_{G}	beta	0.50	2.00
Mark-up persistency ρ_{MS}	beta	0.50	2.00

Table 2 contains the priors for the model, following Smets and Wouters (2007).

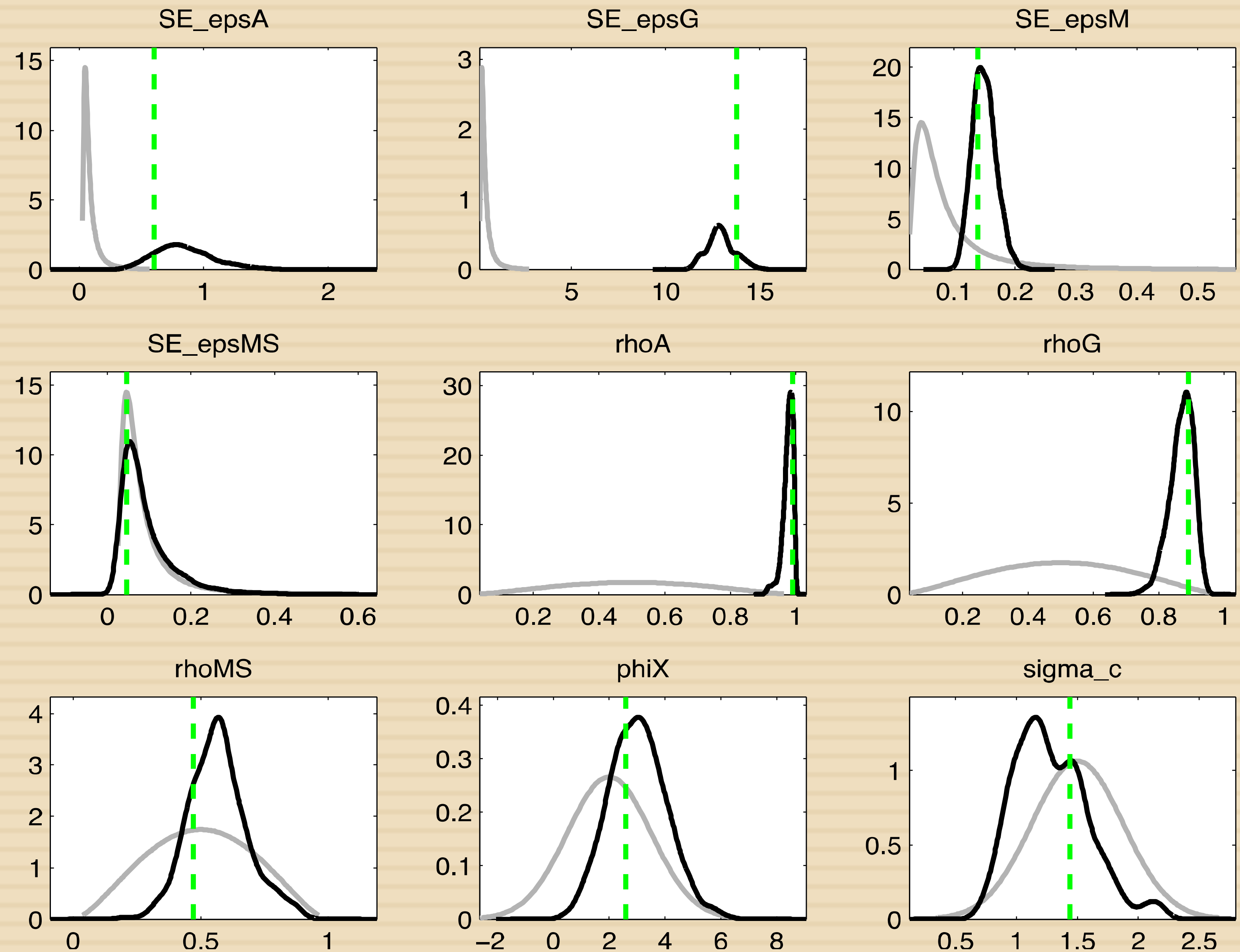
The Bayesian Estimation

Name		Prior	Post.		
	Density	Mean	Mean	90% HPD interval	
Structural parameters					
Habit χ	beta	2.00	0.7586	0.5957	0.9279
Calvo price ω	beta	0.75	0.1792	0.1073	0.2457
Investment adj. cost ϕ_X	normal	2.00	2.7750	0.9446	4.7069
Consumption utility ζ	normal	1.50	1.4199	0.8707	1.9506
Price indexation γ_P	beta	0.50	0.5007	0.2746	0.7483
Labor share α	beta	0.72	0.7322	0.6498	0.8062
Inflation at steady state	normal	0.834	0.8987	0.7030	1.0585
Trend growth rate	normal	0.956	0.9725	0.8852	1.0505
Norminal interest rate	normal	1.399	1.3305	1.1780	1.4766
Policy parameters					
Lagged interest rate ρ_r	beta	0.75	0.9691	0.9569	0.9818
Feed back inflation α_π	normal	2.00	1.6105	1.0549	2.0314
Feed back output gap α_Y	normal	0.125	0.1566	0.0966	0.2141
Shock parameters					
Technology $\epsilon_{A,t}$	inv gamma	0.10	0.9482	0.2754	1.6600
Gov exp $\epsilon_{G,t}$	Inv gamma	0.50	14.9967	11.8339	17.6081
Mark-up $\epsilon_{MS,t}$	Inv gamma	0.10	0.1451	0.1104	0.1791
Tech persistency ρ_A	beta	0.50	0.9778	0.9571	0.9984
Gov exp persistency ρ_G	beta	0.50	0.8841	0.8230	0.9469
Mark-up persistency ρ_{MS}	beta	0.50	0.5333	0.2032	0.8348

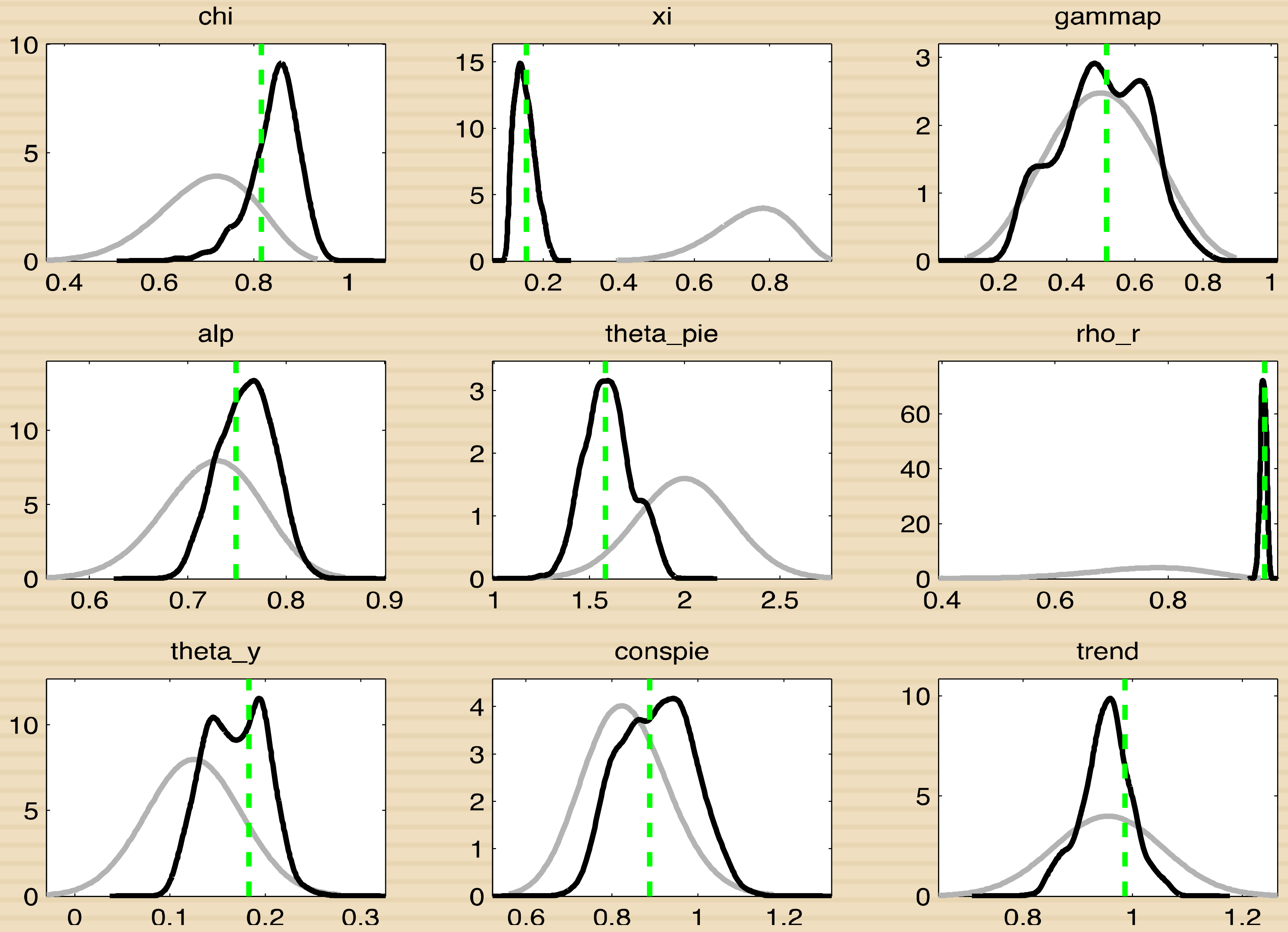
Table 3

Prior and posterior distributions

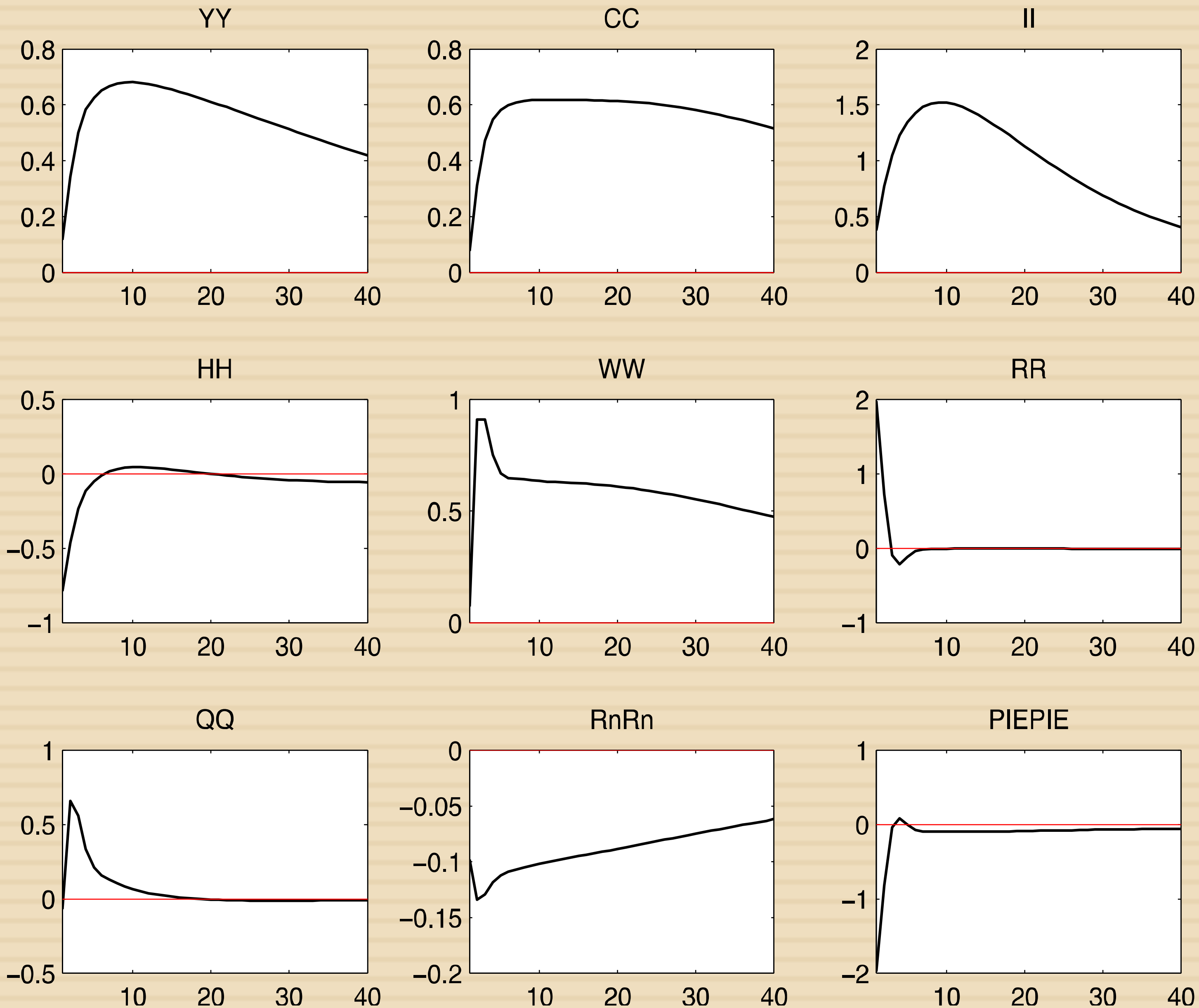
The Bayesian Estimation



The Bayesian Estimation



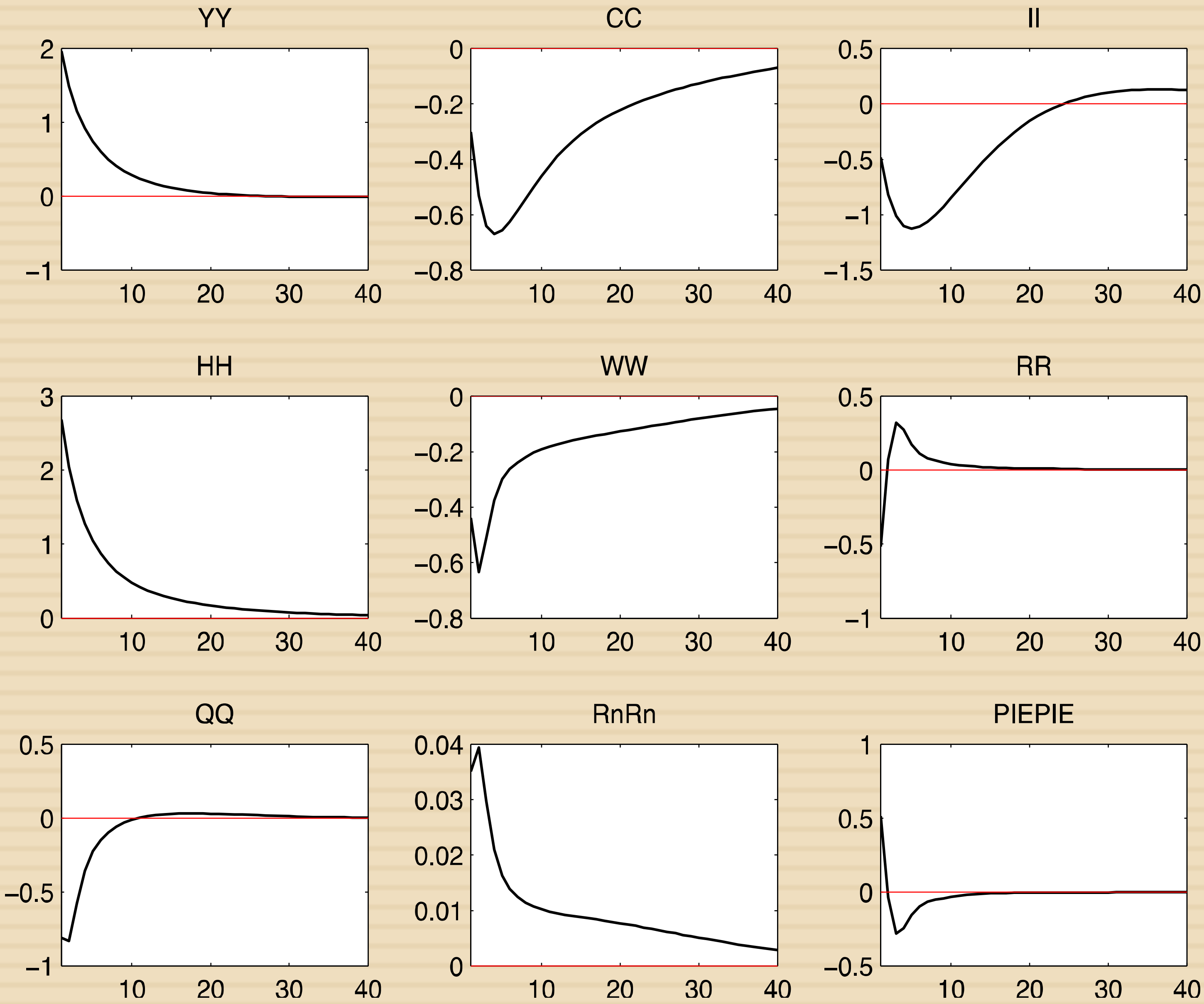
Impulse responses: Technology shock



For Thai economy, output, consumption and investment rise and then falls back to the steady state.

The technological improvement leads to an immediate employment decline

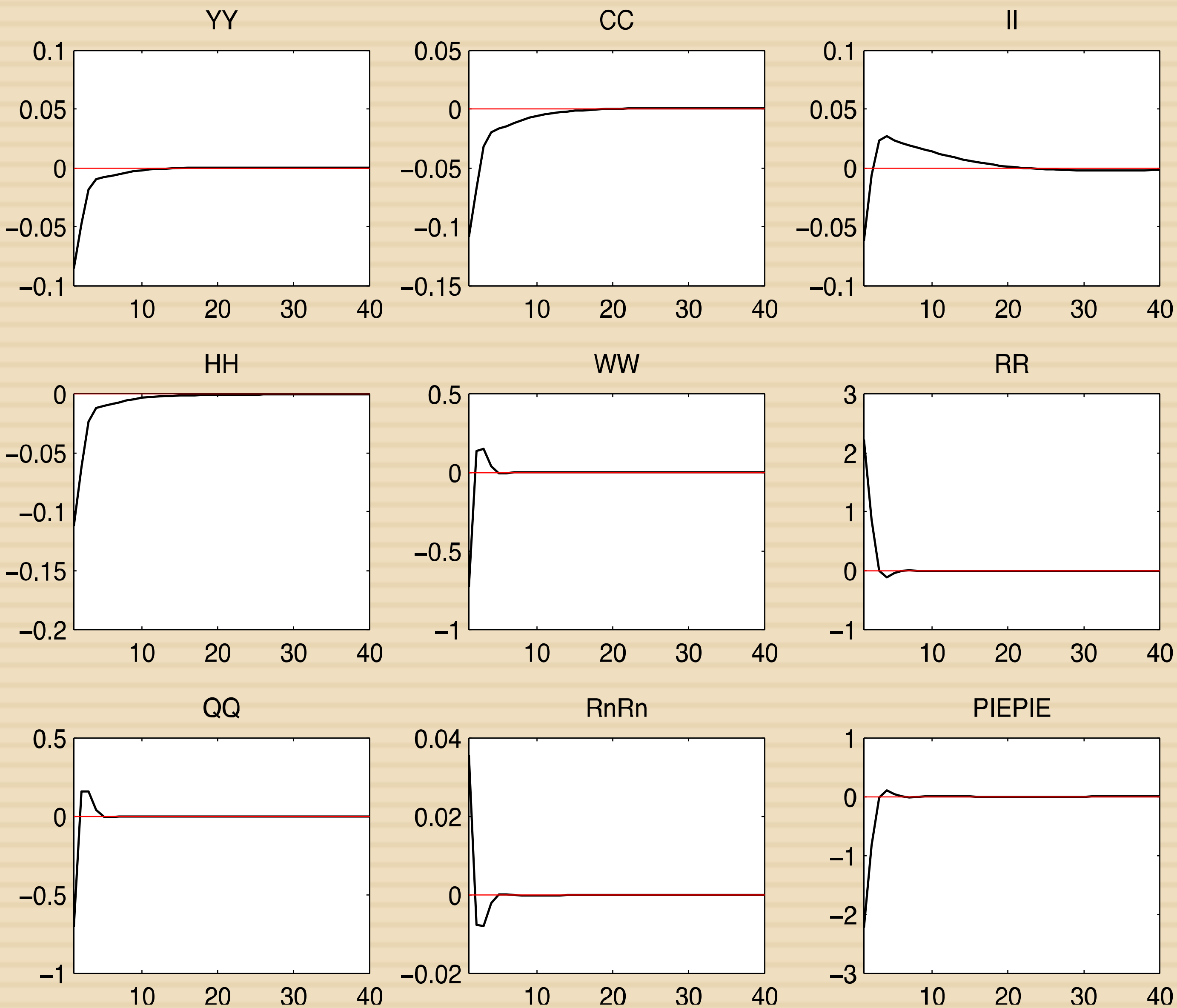
Impulse responses: Gov. spending shock



Consumption and investment are crowded out in response to the shock. Tobin q and investment decreases

Thus, the government spending shock creates a negative wealth effect, causing a lower in consumption and higher in hours supplied.

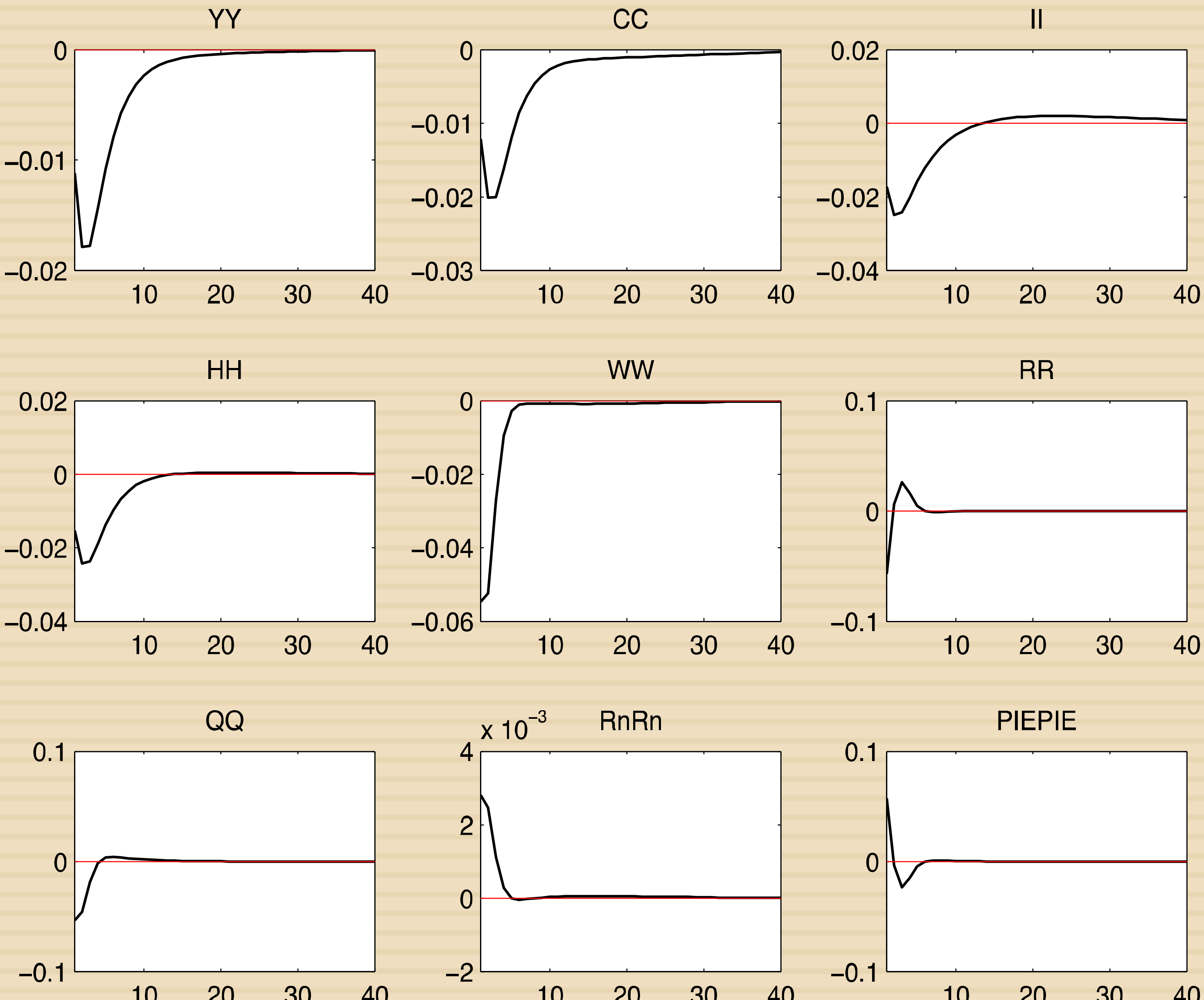
Impulse responses: Interest rate shock



Both output and so does inflation fall. The central bank influences the real interest rate by changing the nominal interest rate.

The key monetary mechanism exits through changes in the real interest rate which affect consumption

Impulse responses: Mark up shock



A positive mark up shock leads to a fall in output, consumption, investment and hour worked.

The shock generates an increase in inflation at the same time reducing in output.

The inflation targeting, price indexation and the potential level

- The model structure with the price indexation in this study enables us to introduce a trend inflation at the steady state
- The positive in trend inflation causes a decrease in marginal cost but an increase in the price dispersion
- Changes in marginal cost and price dispersion leads to changes in output and other macro economic variables in the long run.

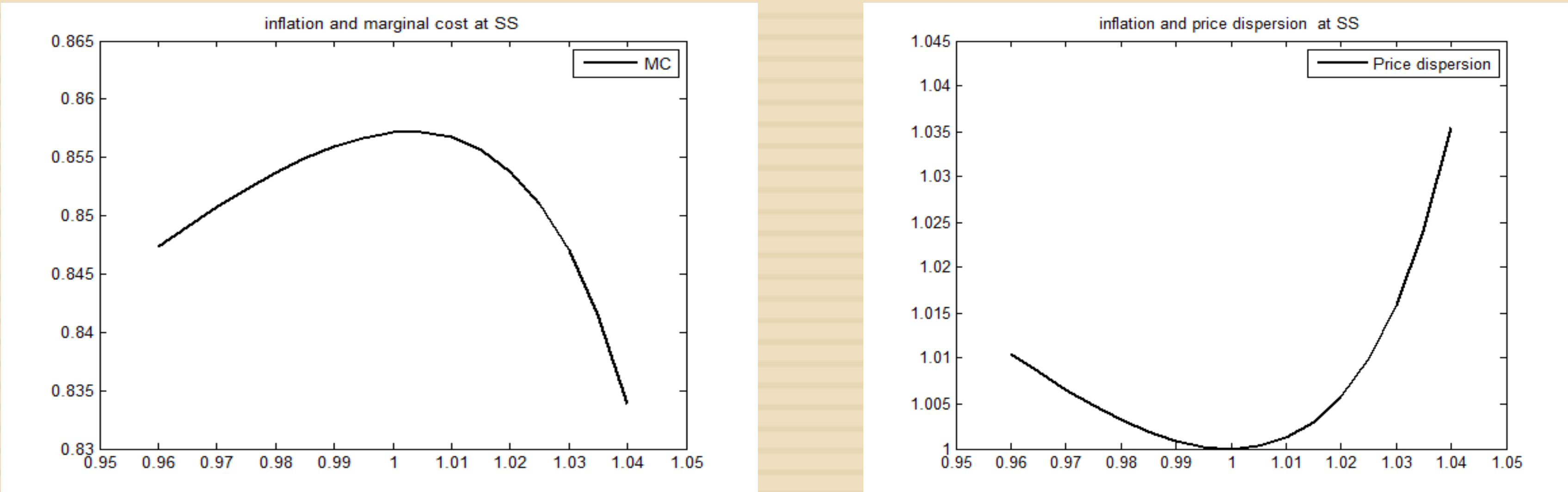


Figure 7 plots steady state marginal cost and price dispersion as a function of inflation targeting using $\omega = 0.75$, $\beta = 0.75$, $\gamma_P = 0.5$ and $\zeta = 0.7$.

The inflation targeting, price indexation and the potential level

- Price dispersion also creates an inefficient resource allocation, leading to the loss of aggregate output.
- A higher inflation targeting rate should associate with a lower potential output relative to the potential with zero inflation target.
- The standard new Keynesian model with no trend inflation creates a higher level of potential output relative to the one with trend inflation.

The inflation targeting, price indexation and the potential level

Inflation targets	$\pi^* = 2.5\%$	$\pi^* = 2.0\%$	$\pi^* = 1.5\%$	$\pi^* = 1.0\%$
$\gamma_P = 0.3$				
Output	-3.1603	-1.7358	-0.8409	-0.3186
Consumption	-2.6251	-1.4475	-0.7084	-0.2748
Investment	-4.9528	-2.6971	-1.2775	-0.4563
Gov. spending	-3.1565	-1.7321	-0.8372	-0.3148
$\gamma_P = 0.5$				
Output	-1.2865	-0.7413	-0.3729	-0.1448
Consumption	-1.0765	-0.6259	-0.32016	-0.12865
Investment	-1.9839	-1.1199	-0.5409	-0.1893
Gov. spending	-1.2827	-0.7375	-0.3691	-0.1410
$\gamma_P = 0.7$				
Output	-0.3686	-0.2191	-0.1126	-0.0437
Consumption	-0.3165	-0.1914	-0.1012	-0.0416
Investment	-0.5341	-0.30269	-0.1410	-0.0410
Gov. spending	-0.3648	-0.2154	-0.1088	-0.0400

π^* is the inflation targeting at the mid range

γ_P is price indexation parameter, indexing to past inflation

The figures are the percent deviation of each parameters from its natural level of zero inflation at the steady state

Table 4 documents the effect of inflation targeting rate and the past inflation indexation to the steady state for Thai economy during headline inflation targeting 2015q1 to 2019q1. Over the headline inflation targeting in Thailand, the hours work is 0.34 and the government spending-output ratio is 0.17.

The inflation targeting, price indexation and the potential level

- Given price indexation parameter γ_P, the higher is the inflation targeting rate, the greater the output at the steady state below its potential level at no trend inflation.
- If $\gamma_P = 0.5$, potential output is lower than its potential level at no inflation at the steady state
  - by 1.29% for inflation targeting at 2.5%
  - but only by 0.74% for inflation targeting at 2.0%.
- Additionally, given inflation targeting rate table 4 explains that the higher is the degree of price indexation, the smaller the potential output below its potential level at no inflation at the steady state.
- The larger the inflation targeting rate is, the lower the potential output from its potential level with no trend inflation.

The inflation targeting, price indexation and the potential level

Inflation targets	$\pi^* = 2.5\%$			$\pi^* = 1.5\%$		
	$\bar{\gamma}_P = 0$	$\bar{\gamma}_P = 0.5$	$\bar{\gamma}_P = 1$	$\bar{\gamma}_P = 0$	$\bar{\gamma}_P = 0.5$	$\bar{\gamma}_P = 1$
$\gamma_P = 0.3$						
Output	-0.2960	-0.1423	-3.1603	-0.1257	-0.0435	-0.8409
Consumption	-0.2202	-0.1265	-2.6251	-0.0893	-0.0414	-0.7084
Investment	-0.5415	-0.1856	-4.9528	-0.2382	-0.0406	-1.2775
Gov. spending	-0.2923	-0.1385	-3.1565	-0.1219	-0.0397	-0.8372
$\gamma_P = 0.5$						
Output	-0.6925	-0.0021	-1.2865	-0.2985	-0.0021	-0.3729
Consumption	-0.5300	-0.0004	-1.0765	-0.2221	-0.0004	-0.3201
Investment	-1.2300	0.0016	-1.9839	-0.5459	0.0016	-0.5409
Gov. spending	-0.6887	0.0015	-1.2827	-0.2947	0.0015	-0.3692
$\gamma_P = 0.7$						
Output	-1.1837	-0.1489	-0.3686	-0.5243	-0.0639	-0.1126
Consumption	-0.9176	-0.1070	-0.3165	-0.3981	-0.0430	-0.1012
Investment	-2.0703	-0.2802	-0.5341	-0.9396	-0.1246	-0.1410
Gov. spending	-1.1800	-0.1452	-0.3648	-0.5205	-0.0602	-0.1088

π^* is the inflation targeting at the mid range

γ_P is price indexation parameter, indexing to past inflation

$\bar{\gamma}_P$ is price indexation parameter, indexing to inflation targeting

The figures are the percent deviation of each parameters from its natural level of zero inflation at the steady state

Table 5 documents The effect of inflation targeting rate and the average inflation indexation to the steady state for Thai economy during headline inflation targeting 2015q1 to 2019q1. Over the headline inflation targeting in Thailand, the hours work is 0.34 and the government spending-output ratio is 0.17.

The inflation targeting, price indexation and the potential level

- Given the inflation targeting rate and $\bar{\gamma}_P = 0$, when price indexation parameter γ_P rises, the price dispersion rises and the steady state output is further below its potential level at no trend inflation
- If $\gamma_P = \bar{\gamma}_P = 0.5$, the indexation is identical to the case of no trend inflation, leading to output is at its potential level. The deviation of the degree of past inflation indexation from 0.5 will have quite a similar impact to output.
- If $\bar{\gamma}_P = 1$, the indexation is identical to the case of the past inflation indexation.
- In any case from Table 4 and 5, an increase in inflation targeting rate causes potential output larger below its potential level at no trend inflation

Implications for monetary policy

- The channels through which inflation is costly have implications both for monetary policy in the long run and for the conduct of short run policy
- Long run: The choice of steady state level of inflation
  - Price dispersion and markup distortion are minimized in the steady state when the level of inflation target is equal to zero
  - price dispersion is an increasing function of trend inflation and causes potential output to be a decreasing function of inflation targeting rates.
  - The negative trade off between the level of inflation target and output

Implications for monetary policy

- Short run: The trade off between inflation and output gap. Ascari and Ropele (2006)
  - The level of inflation target alters the relation between inflation and output and in turn alters the dynamics of inflation.
  - Output gap is decreasing in inflation targeting rate
  - A decline in the central bank's inflation targeting rate
    - Strengthen the link between inflation and output gap
    - The Phillips curve is steeper
    - Monetary policy is more effective.

Implications for monetary policy

- Lower the level of inflation target could
  - bring up the long run output
  - make the Thai economy near its natural level
  - describe better the Thai actual inflation
  - Monetary policy is more effective
- Adjusting the inflation targeting down should be the appropriate strategy.

Conclusions

- It is important to understand the channels in New Keynesian models through which inflation is costly that are absent from traditional analysis
- There is a long run inflation-output trade off in the choice of inflation targeting rate.

Thank you