TREND INFLATION IN MODERATE AND LOW INFLATION PERIODS: THE IMPLICATIONS OF THAI MONETARY POLICY

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Presentation outline:

- Introduction
- Motivation
- Contribution
- The NK model
- The Phillips curve with trend inflation
- The Bayesian estimation
- Optimal stabilization policy
- The anchoring of expectations
- Monetary policy implications and conclusions

Introduction:

- Taylor(1999), and Clarida, Gali and Gertler (2000) proposed that the Fed failed to respond sufficiently strongly to inflation in the late 1960s and 1970s, leaving the US economy subject to self-fulling expectation-driven fluctuations.
- Hornstein and Wolman (2005), Kiley (2007), Ascari and Ropele (2009) claimed that the Taylor principle breaks down when trend inflation is positive.
- The central bank's inflation response satisfied the Taylor principle does not necessarily imply that Rational Expectations Equilibrium (REE) could occur.

Introduction:

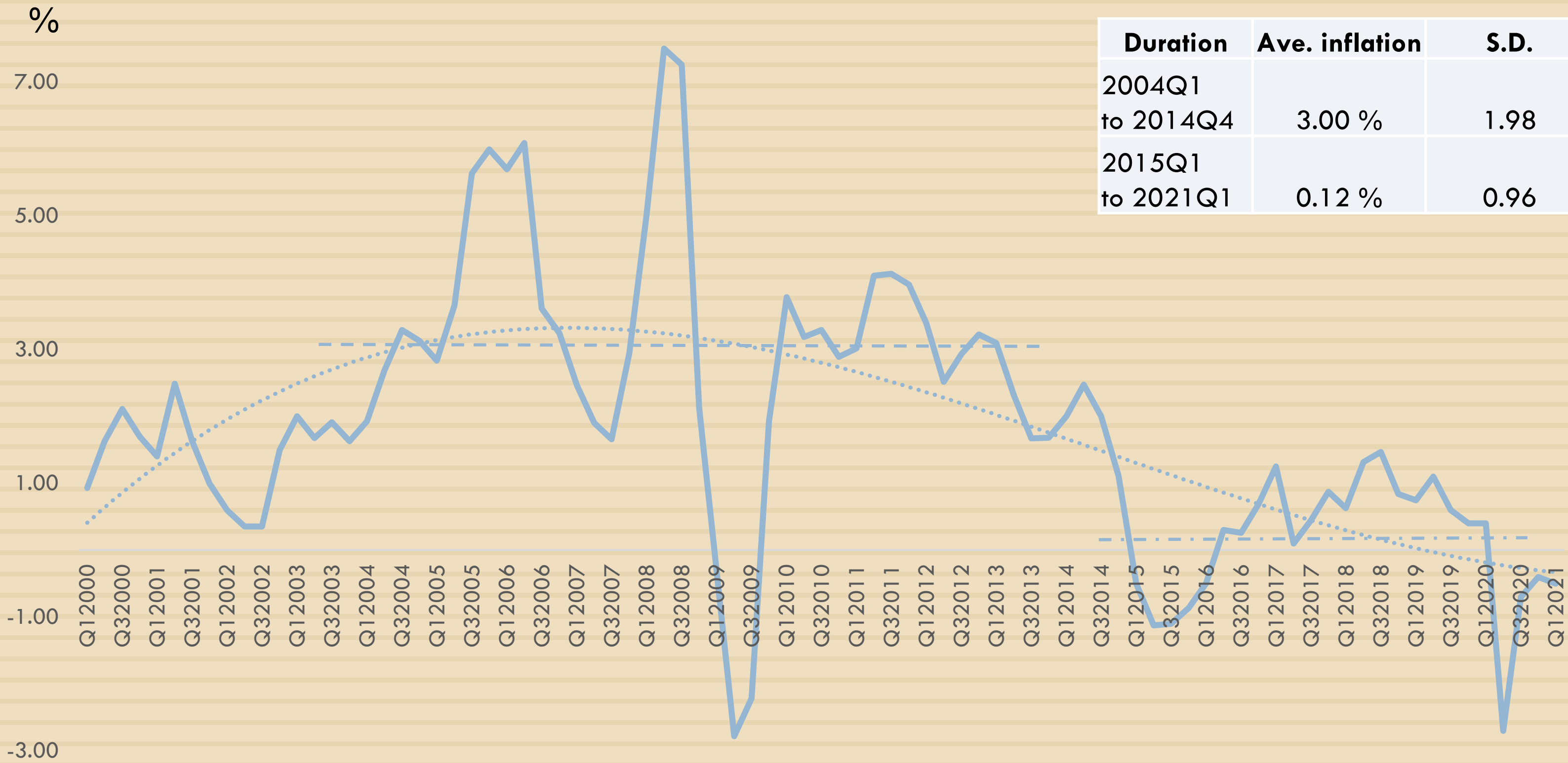
- The notion of price stability in monetary theory and central bank practice today is typically associated with a moderate rate of price inflation.
- Nonetheless, most macroeconomic models for monetary policy analysis are approximated around zero inflation steady state.
- The zero inflation at steady state, a simplification but counterfactual assumption. Ascari (2004), Ascari and Ropele (2007), Ascari and Ropele (2009).

Introduction:

- The BOT adopted
  - May 2000 to August 2009: the target range for average core inflation from 0 to 3.5 %.
  - After August 2009: a narrower range of inflation targeting from 0.5 to 3.0%.
  - In 2015: an annual average of headline inflation at 2.5±1.5%.
  - December 2019: the inflation range target of 1.0–3.0%.

Introduction

Thai inflation



Duration	Ave. inflation	S.D.
2004Q1 to 2014Q4	3.00 %	1.98
2015Q1 to 2021Q1	0.12 %	0.96

Source: Bank of Thailand

Motivation

- To introduce trend inflation in the standard medium scale NK theory.
- To investigate the implications of trend inflation for the conduct of monetary policy for Thai economy during high and low level of inflations.
  - To evaluate the effects of trend inflation on optimal stabilization policy. We ask if there exists a strategy to have the stabilization policy.
  - To investigate trend inflation and the anchoring of expectations. We ask if there exists a type of rule that would more safely guarantee determinacy for Thai economy.

Contributions

- This study provides theoretical results on the effects of monetary policy in Ney Keynesian models with positive trend inflation.
- It also combines these theoretical results with empirical evidence for Thailand during moderate (2004Q1 to 2014Q4) and low (2015Q1 to 2021Q1) inflation periods.
  - Estimating the BOT's reaction function using the Bayesian statistic method
  - Analyzing how trend inflation causes variations in impacts of policy shocks in term of responses of welfare loss.
  - Evaluating the Thai monetary policy rule based on the determinacy. The approach is to search for the lowest possible response to inflation consistent with determinacy.

The New Keynesian Model

- The medium scale NK model accounting for trend inflation
- Households would like to consume a final consumption goods C_t , at the lowest cost where

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

  - Firm m produces goods $C_t(m)$ and its price is $P_t(m)$, ζ is the elasticity of substitution
- Households optimally choose consumption good C_t and labor N_t to maximize their expected utility with respect to their period budget constraint

The New Keynesian Model

- 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 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

- 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

- Firms: Final goods sector
  - The final goods is produced by a firm that aggregates intermediate good in to a single composite good

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

- Firms: Intermediate goods sector
  - Each intermediate goods is produced based on:

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

    - where A_t is productivity process
    - K_t is end of period t capital stock

The New Keynesian Model

- 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 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

- Monetary policy: The Taylor rule in log form:

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

- The exogenous forcing processes to technology, government spending, mark up and interest rate shocks:

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

Price dispersion

- It is perhaps the crucial behavior of price staggering models because it determines the costs of inflation.
- The price dispersion could be characterized by finding the relation between the aggregate output and aggregate factor inputs. Yun(1996).
- The price dispersion can be written as:

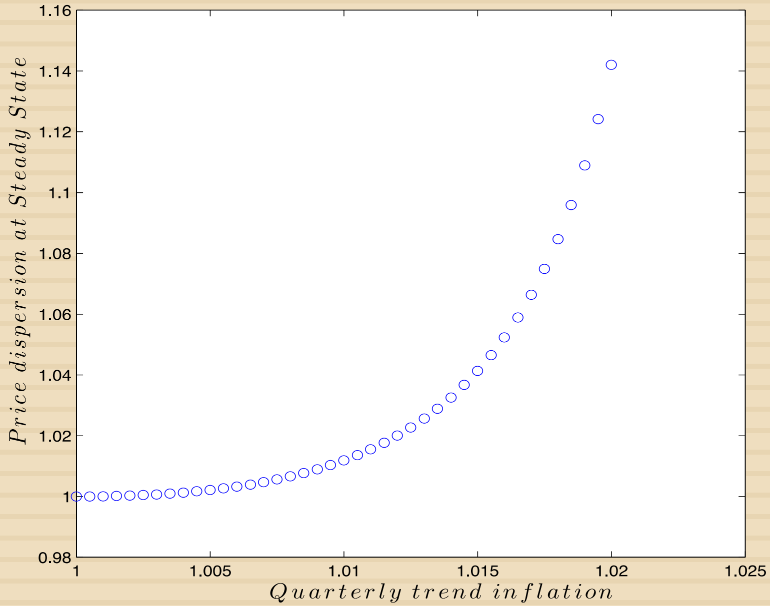
$$\Delta_t = \omega {\pi_t}^{\zeta} \Delta_{t-1} + (1-\omega)\left(\frac{M_t}{MM_t}\right)^{-\zeta}$$

- At the steady state

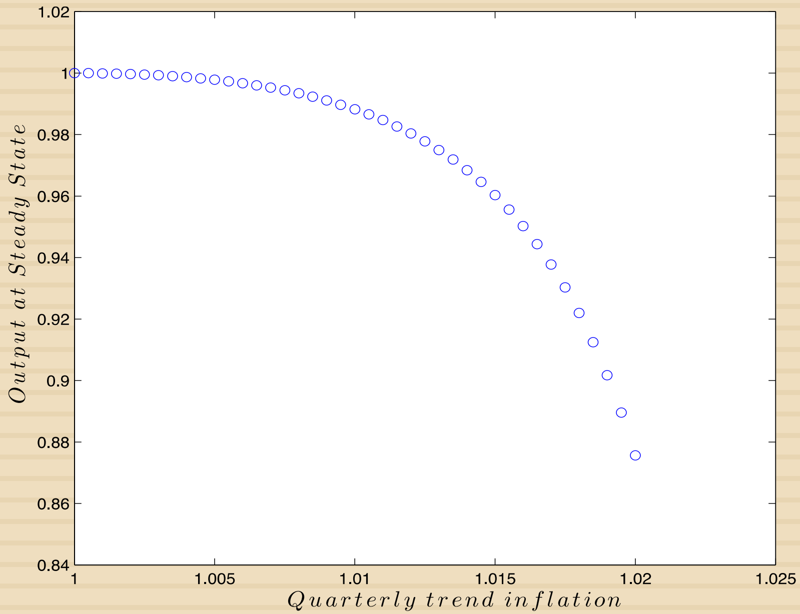
$$\Delta = \frac{(1-\omega)^{\frac{1}{1-\zeta}}\left(1-\omega\bar{\pi}^{\zeta-1}\right)^{\frac{-\zeta}{1-\zeta}}}{1-\omega\bar{\pi}}$$

Price dispersion

Trend inflation, price dispersion and output at steady state



Price dispersion at steady state



Output at steady state

Trend inflation in the NK model

- Price dynamics evolve according to

$$x_t = \frac{\zeta}{(\zeta - 1)} \frac{M_t}{MM_t}$$

$$M_t = Y_t U_{C,t} \, \varphi_t + \omega \, \beta E_t \left[\Pi_{t+1}^{\zeta} M_{t+1} \right]$$

$$MM_t = Y_t U_{C,t} \; + \omega \, \beta E_t \left[\Pi_{t+1}^{\zeta-1} MM_{t+1} \right]$$

- A Phillips curve with trend inflation

$$\hat{\pi}_t = \kappa(\bar{\pi})\hat{\varphi}_t + \beta(1-\bar{\pi})\left(1-\ \omega\bar{\pi}^{\zeta-1}\right)\left(\hat{U}_{C,t} + \hat{Y}_t\right) + \beta(\bar{\pi}-1)\left(1-\ \omega\bar{\pi}^{\zeta-1}\right)E_t\hat{M}_{t+1}$$
$$+\beta[\left(1-\ \omega\bar{\pi}^{\zeta-1}\right)(\zeta\bar{\pi} - \zeta + 1) -\ \omega\bar{\pi}^{\zeta-1}]E_t\hat{\pi}_{t+1}$$

$$\hat{M}_t = (1-\ \omega\beta\bar{\pi}^{\zeta})(\ \hat{U}_{C,t} + \hat{Y}_t + \hat{\varphi}_t) + \omega\beta\bar{\pi}^{\zeta}E_t\left[\hat{M}_{t+1} + \zeta\hat{\pi}_{t+1}\right]$$

where $\kappa(\bar{\pi}) = \frac{(1-\ \omega\bar{\pi}^{\zeta-1})(1-\ \omega\beta\bar{\pi}^{\zeta})}{\omega\bar{\pi}^{\zeta-1}}$

The Phillips curve with trend inflation

- Substitute out the marginal cost and with log-linearized expressions

$$\hat{\pi}_t = \kappa(\bar{\pi})\left(-\hat{U}_{C,t} - \hat{U}_{N,t} - \hat{Y}_t - \hat{N}_t\right) + \beta(1-\bar{\pi})\left(1-\ \omega\bar{\pi}^{\zeta-1}\right)\left(\hat{U}_{C,t} + \hat{Y}_t\right)$$
$$+\beta(\bar{\pi}-1)\left(1-\ \omega\bar{\pi}^{\zeta-1}\right)E_t\hat{M}_{t+1} + \beta\left[\left(1-\ \omega\bar{\pi}^{\zeta-1}\right)(\zeta\bar{\pi}-\zeta+1)-\ \omega\bar{\pi}^{\zeta-1}\right]E_t\hat{\pi}_{t+1}$$

$$\hat{M}_t = \left(1-\ \omega\beta\bar{\pi}^{\zeta}\right)\left(-\hat{U}_{N,t} + \hat{N}_t\right) +\ \omega\beta\bar{\pi}^{\zeta}E_t\left[\hat{M}_{t+1} + \zeta\hat{\pi}_{t+1}\right]$$

$$\hat{\Delta}_t = \left[\frac{\zeta\omega\bar{\pi}^{\zeta-1}(\bar{\pi}-1)}{1-\omega\bar{\pi}^{\zeta-1}}\right]\hat{\pi}_t +\ \omega\bar{\pi}^{\zeta}\hat{\Delta}_{t-1}$$

- A system of three first order difference equations characterize the NKPC under trend inflation.

The economy with trend inflation

- Log-linearized the utility function and substitute in the Euler equation. The aggregate demand is written as:

$$\hat{Y}_t = \left(\frac{1}{\nu_{II}(1+\chi)} + 1\right) E_t\hat{Y}_{t+1} + \frac{\chi}{\nu_{II}(1+\chi)}\hat{Y}_{t-1} + \frac{1}{\nu_I\nu_{II}(1+\chi)}(\hat{R}_{n,t} - E_t\hat{\pi}_{t+1})$$
$$+\nu_{II}[-\hat{A}_t + E_t\hat{A}_{t-1} + (1-\alpha)\left(\hat{K}_t - E_t\hat{K}_{t+1}\right) - \hat{\triangle}_t + E_t\,\hat{\triangle}_{t+1}]$$

Where $\nu_I = [-\sigma_n(1-\varrho) - \varrho](\frac{1}{1-\chi})$

$$\nu_{II} = \varrho(1-\sigma_n)(\frac{N}{N-1})(\frac{1}{\alpha})$$

The economy with trend inflation

- Trend inflation leads to a smaller coefficient on current output gap and a larger coefficient on future expected inflation.
- The short run NKPC flattens.
- The contemporaneous relation between inflation and output gap progressively weakens.
- The inflation rate becomes less sensitive to variations in the output gap (or current economic condition) and more forward looking.
- Monetary policy should response more strongly to inflation to induce a reduction in output that achieves a given change in inflation.

The Bayesian Estimation

- The observables are in quarterly basis and all series are seasonally adjusted.
- The moderate inflation period is characterized by 2004Q1 to 2014Q4
- The lower inflation period is characterized by 2015Q1 to 2021Q1
- The data collected in each period
  - Log difference of real GDP
  - Log difference of GDP deflator
  - The Bank of Thailand policy rate

The vector of observations is related to the model variables according to

$$Y_t = [4R_t, 4\pi_t, \Delta y_t + z_t]$$

The Bayesian Estimation: The moderate inflation period (2004Q1 to 2014Q4)

Parameters	Density	Prior Mean	Posterior Mean	90% HPD interval	
Structural parameters					
Habit χ	beta	0.700	0.787	0.659	0.924
Investment adj. cost ϕ_X	normal	2.000	3.436	1.453	5.480
Labor share α	beta	0.724	0.724	0.627	0.804
Inflation at steady state	normal	0.750	0.761	0.606	0.915
Trend growth rate	normal	0.943	0.869	0.753	1.000
Norminal interest rate	normal	0.641	0.637	0.508	0.757
Policy parameters					
Lagged interest rate ρ_r	beta	0.75	0.963	0.950	0.975
Feed back inflation α_π	normal	2.00	1.857	1.347	2.274
Feed back output gap α_Y	normal	0.125	0.119	0.036	0.195
Shock parameters					
Technology $\epsilon_{A,t}$	inv gamma	0.10	15.35	11.815	18.754
Gov exp $\epsilon_{G,t}$	Inv gamma	0.50	15.57	12.312	18.181
Interest rate, $\epsilon_{M,t}$	Inv gamma	0.10	0.096	0.0783	0.1179
Tech persistency ρ_A	beta	0.50	0.186	0.0276	0.3371
Gov exp persistency ρ_G	beta	0.50	0.744	0.5845	0.8945

Degree of price stickiness 0.75

The Bayesian Estimation: The lower inflation period (2015Q1 to 2021Q1)

Parameters		Prior	Posterior	90% HPD	
	Density	Mean	Mean	interval	
Structural parameters					
Habit χ	beta	0.700	0.756	0.741	0.770
Investment adj. cost ϕ_X	normal	2.000	2.5528	2.171	2.935
Labor share α	beta	0.724	0.720	0.710	0.730
Inflation at steady state	normal	0.03	0.009	0.007	0.010
Trend growth rate	normal	0.415	0.466	0.440	0.492
Norminal interest rate	normal	0.330	0.326	0.316	0.336
Policy parameters					
Lagged interest rate ρ_r	beta	0.75	0.983	0.978	0.988
Feed back inflation α_π	normal	2.00	2.325	2.235	2.415
Feed back output gap α_Y	normal	0.125	0.1306	0.128	0.134
Shock parameters					
Technology $\epsilon_{A,t}$	inv gamma	0.10	4.411	4.067	4.754
Gov exp $\epsilon_{G,t}$	Inv gamma	0.50	18.24	17.54	18.94
Interest rate, $\epsilon_{M,t}$	Inv gamma	0.10	0.053	0.045	0.056
Tech persistency ρ_A	beta	0.50	0.318	0.292	0.344
Gov exp persistency ρ_G	beta	0.50	0.748	0.723	0.773

Degree of price stickiness 0.75

Trend inflation: Optimal stabilization policy

- With trend inflation, closing the output gap is not sufficient to stabilize inflation.
- The quadratic loss function following Woodford (2003), Ascari and Ropele (2007) and Lago-Alves (2012)

$$W = \frac{1}{2} E_t \sum_{j=0}^{\infty} \beta^j \left(\pi_{t+j}^2 + \vartheta Y_{t+j}^2\right)$$

  - Where ϑ is the relative weight between output and inflation stabilization around the target.
  - The relative weight on output in the welfare function is:

$$\vartheta(\bar{\pi}) = \frac{1 - \omega\bar{\pi}^{\zeta-1}}{1 - \omega\bar{\pi}^{\zeta}} \frac{\lambda(\bar{\pi})}{\zeta} \quad \text{where} \quad \lambda(\bar{\pi}) = \kappa(\bar{\pi})(\sigma + \varrho)$$

$$\kappa(\bar{\pi}) = \frac{(1 - \omega\bar{\pi}^{\zeta-1})(1 - \omega\beta\bar{\pi}^{\zeta})}{\omega\bar{\pi}^{\zeta-1}}$$

Trend inflation: Optimal stabilization policy

	Inflation periods	
Variances	Moderate (2004Q1 to 2014Q4)	Low (2015Q1 to 2021Q1)
Inflation	3.7606	3.1918
Output	3.1918	3.3675

Parameters	Trend inflation (% annually)					
	0	1	2	4	6	8
Moderate inflation period (2004Q1 to 2014Q4)						
Relative weight on output $\vartheta(\bar{\pi})$	0.2601	0.2573	0.2546	0.2489	0.2432	0.2374
Welfare loss	2.2962	2.3116	2.3272	2.3589	2.3912	2.4241
Lower inflation period (2015Q1 to 2021Q1)						
Relative weight on output $\vartheta(\bar{\pi})$	0.1121	0.1098	0.1074	0.1027	0.0978	0.0929
Welfare loss	1.7846	1.8138	1.8432	1.9029	1.9638	2.0258

- For both moderate and low inflation periods
  - The relative weights are decreasing with trend inflation.
  - Welfare losses are increasing with trend
- The relative weights and the welfare losses are smaller for low inflation period.

Optimal stabilization policy: Technology shock

	Inflation periods	
Variances	Moderate (2004Q1 to 2014Q4)	Low (2015Q1 to 2021Q1)
Inflation	2.773	1.744
Output	0.3565	0.2451

Parameters	Trend inflation (% annually)					
	0	1	2	4	6	8
Moderate inflation period (2004Q1 to 2014Q4)						
Relative weight on output $\vartheta(\bar{\pi})$	0.2601	0.2573	0.2546	0.2489	0.2462	0.2374
Welfare loss	1.4329	1.447	1.4613	1.4903	1.5198	1.55
Lower inflation period (2015Q1 to 2021Q1)						
Relative weight on output $\vartheta(\bar{\pi})$	0.1121	0.1098	0.1074	0.1027	0.0978	0.0929
Welfare loss	0.8857	0.9035	0.9215	0.9579	0.995	1.0328

- The inflation and output variations are smaller in the low inflation period.
- The relative weights and the welfare losses are smaller for low inflation period.
- For both moderate and low inflation periods
  - The relative weights are decreasing with trend inflation.
  - Welfare losses are increasing with trend

Optimal stabilization policy: Government spending shock

	Inflation periods	
Variances	Moderate (2004Q1 to 2014Q4)	Low (2015Q1 to 2021Q1)
Inflation	0.3922	0.900
Output	1.299	3.088

Parameters	Trend inflation (% annually)					
	0	1	2	4	6	8
Moderate inflation period (2004Q1 to 2014Q4)						
Relative weight on output $\vartheta(\bar{\pi})$	0.2601	0.2573	0.2546	0.2489	0.2462	0.2374
Welfare loss	0.3650	0.3653	0.3656	0.3662	0.3668	0.3674
Lower inflation period (2015Q1 to 2021Q1)						
Relative weight on output $\vartheta(\bar{\pi})$	0.1121	0.1098	0.1074	0.1027	0.0978	0.0929
Welfare loss	0.6230	0.8796	0.8800	0.8809	0.8818	0.8827

- The inflation and output variations are larger in the low inflation period.
- The relative weights are smaller but the welfare losses are larger for low inflation period.
- For both moderate and low inflation periods
  - The relative weights are decreasing with trend inflation.
  - Welfare losses are increasing with trend

Optimal stabilization policy: Interest rate shock

	Inflation periods	
Variances	Moderate (2004Q1 to 2014Q4)	Low (2015Q1 to 2021Q1)
Inflation	0.5942	0.5525
Output	0.0189	0.0343

Parameters	Trend inflation (% annually)					
	0	1	2	4	6	8
Moderate inflation period (2004Q1 to 2014Q4)						
Relative weight on output $\vartheta(\bar{\pi})$	0.2601	0.2573	0.2546	0.2489	0.2462	0.2374
Welfare loss	0.2996	0.3027	0.3058	0.3122	0.3187	0.3253
Lower inflation period (2015Q1 to 2021Q1)						
Relative weight on output $\vartheta(\bar{\pi})$	0.1121	0.1098	0.1074	0.1027	0.0978	0.0929
Welfare loss	0.2782	0.2839	0.2986	0.3012	0.3131	0.3252

- The inflation and output variations are smaller in the low inflation period.
- The relative weights and the welfare losses are smaller for low inflation period.
- For both moderate and low inflation periods
  - The relative weights are decreasing with trend inflation.
  - Welfare losses are increasing with trend

Trend inflation: Optimal stabilization policy

- In moderate inflation environment, a high level of trend inflation magnifies the welfare loss.
- Regardless of the shocks, the relative weight is decreasing and the welfare is increasing with trend inflation.
- In both periods, the technology shock and interest rate shock cause a higher variation in inflation. Nonetheless, the government spending shock leads to a high variation in output.
- Among the shocks, the technology shock generates the highest welfare loss.

Trend inflation: Optimal stabilization policy

- The policy prescriptions change under positive trend inflation.
- Optimal policy has a lower weight on output gap volatility when the target level for inflation is higher.
- A higher level of trend inflation magnifies the welfare costs and lead to more severe consequences.
- Sbordone (2007) When the loss function is welfare based, inflation stabilization weight increases in the policymaker's loss function.

Trend inflation: The anchoring expectations

- Following Woodford(2003), the rational expectation equilibrium (REE) can be derived from the Taylor principle as follows:

$$\left.\frac{\partial \hat{R}_n}{\partial \hat{\pi}}\right|_{LR} = \alpha_\pi + \alpha_Y \left.\frac{\partial \hat{Y}}{\partial \hat{\pi}}\right|_{LR} > 1$$

- Bullard and Mitra (2002) and Woodford (2003) among others, the condition above generalizes the original Taylor principle or α_π>1.
- α_Y is not important.
- However, with trend inflation the Taylor principle only hold as necessary conditions for REE determinacy.

Trend inflation: The anchoring expectations

- With trend inflation, the slope of the LR Phillips curve is heavily complicated and can be written as

$$\left.\frac{\partial \hat{Y}}{\partial \hat{\pi}}\right|_{LR} = \frac{-1}{\kappa(\bar{\pi})\Upsilon_I + \eta(\bar{\pi})\Upsilon_{II}}\left[\big(\kappa(\bar{\pi}) + \eta(\bar{\pi})\big)\nu_I \Omega(\bar{\pi})(\bar{\pi} - 1) - \eta(\bar{\pi})\frac{\zeta\omega\beta\bar{\pi}^{\zeta}}{1 - \omega\beta\bar{\pi}^{\zeta}}\right.$$

where $\kappa(\bar{\pi}) = \frac{(1 - \omega\bar{\pi}^{\zeta-1})(1 - \omega\beta\bar{\pi}^{\zeta})}{\omega\bar{\pi}^{\zeta-1}}$ $\qquad \eta(\bar{\pi}) = \beta(1 - \bar{\pi})(1 - \omega\bar{\pi}^{\zeta-1})$

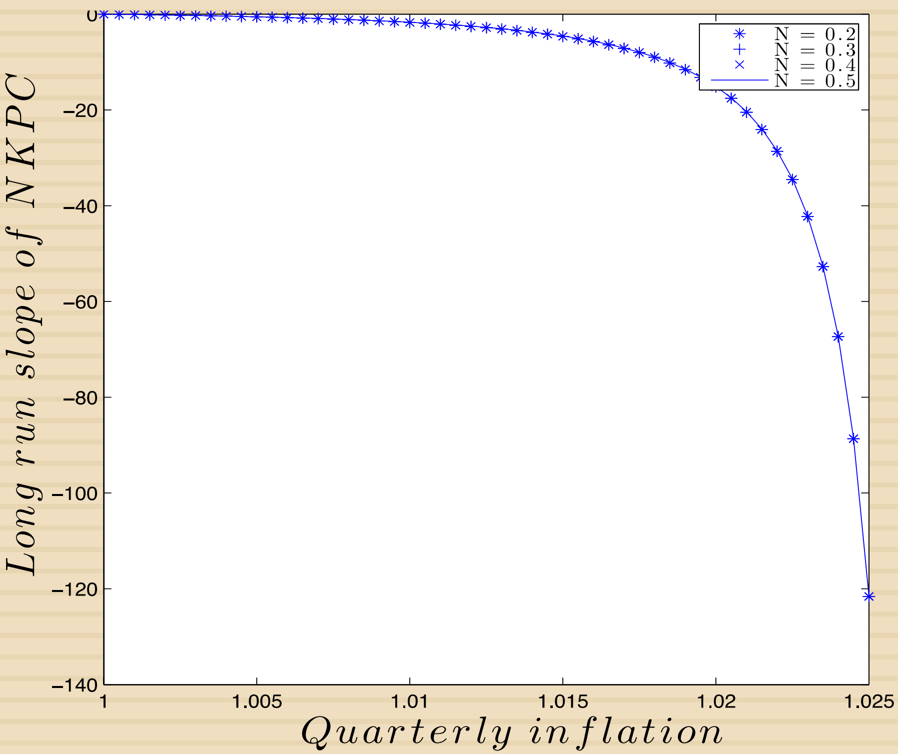
$$\Omega(\bar{\pi}) = \frac{\zeta\omega\bar{\pi}^{\zeta-1}}{(1 - \omega\bar{\pi}^{\zeta})(1 - \omega\bar{\pi}^{\zeta-1})} \qquad \nu_I = \frac{N}{N-1}[2\varrho(\sigma - 1) + 1] + 1$$

$$\Upsilon_I = \big(1 - 2\varrho(1 - \sigma)\big)\frac{N}{N-1}\frac{1}{\alpha} + \frac{1}{\alpha} + 2\sigma(1 - \varrho) + 2\varrho - 2$$

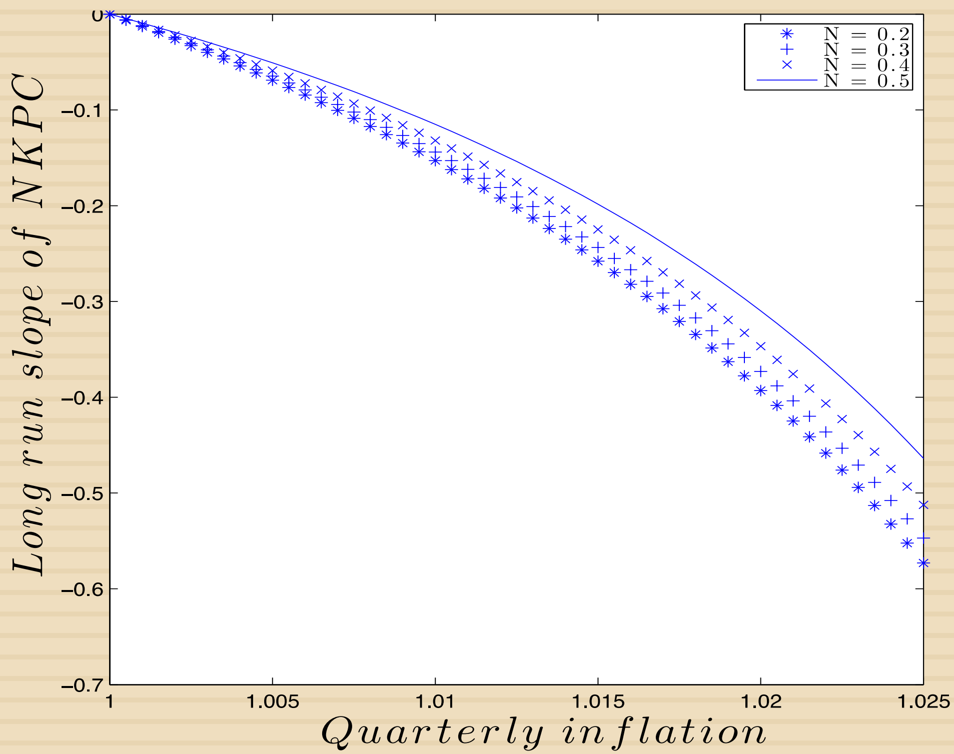
$$\Upsilon_{II} = [2\varrho(1 - \sigma) - 1]\frac{N}{N-1}\frac{1}{\alpha} + (1 - \varrho)(-2\sigma + 1) - \varrho - \frac{1}{\alpha} + 1$$

Slope of the long run PC

In the moderate inflation period



The degree of price stickiness is 0.75

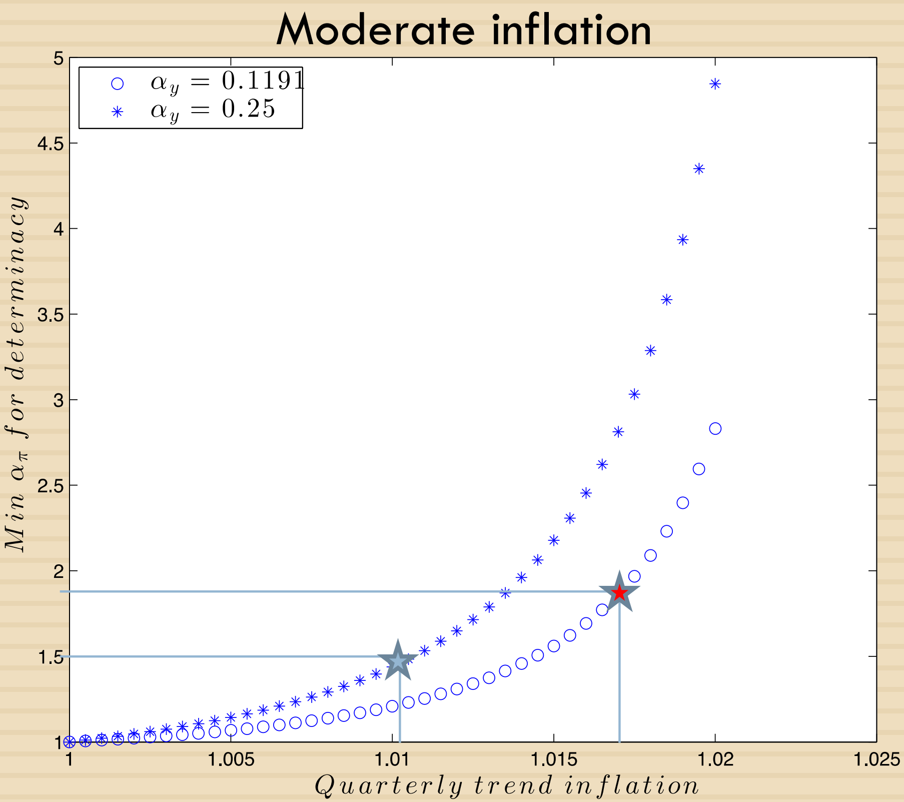


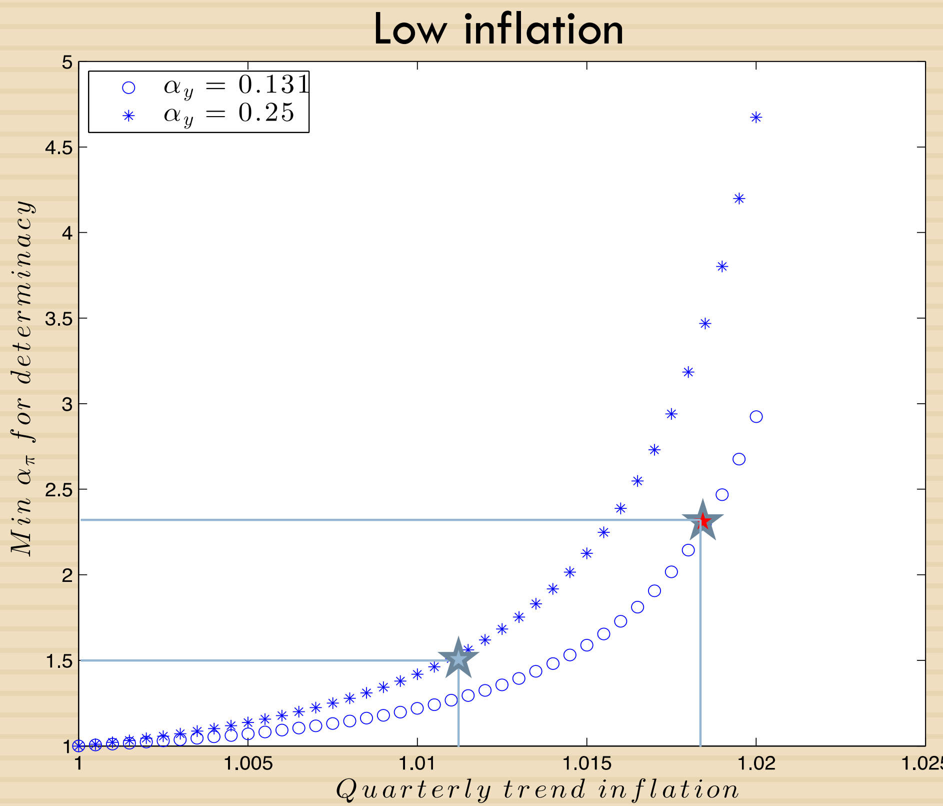
The degree of price stickiness is 0.5

Slope of the long run PC

- As trend inflation rises, the slope of the long run PC switches sign from positive to negative.
- Trade off between α_{π} and α_{Y} disappears.
- The slope of the long run PC increases with trend inflation. The α_{Y} then plays the key role even for moderate levels of trend inflation.
- α_{Y} cannot be neglected and it should be generally very low for realistic value of trend inflation

Trend inflation: The anchoring expectations





- The Taylor principle (standard values)
- Thai monetary policy rule (Taylor rule)

Trend inflation: The anchoring expectations

- The smallest α_π values consistent with determinacy deviate from the original Taylor principle.
  - During moderate inflation environment, achieving determinacy requires a minimum α_π of 1.1379 1.4214 2.1318 and 2.9523 for a trend inflation 2 4 6 and 8% respectively.
  - During low inflation environment, achieving determinacy requires a minimum α_π of 1.1372 1.419 2.1252 2.9407 for a trend inflation 2 4 6 and 8% respectively.
- This finding suggests that the proposals to raise inflation target are dependent of the systematic response of monetary policy to inflation.
- A higher inflation target makes the anchoring of inflation expectations more difficult for the central bank.

Trend inflation: The anchoring expectations

Thai monetary policy prescription associated with the REE determinacy.

		Response of consistent α_π with determinacy	
	Trend inflation (% annually)	Degree of price stickiness = 0.75	Degree of price Stickiness = 0.5
$\alpha_Y = 0.2$	2	>1.1103	>1.0116
	4	>1.3371	>1.0271
	6	>1.9055	>1.0488
$\alpha_Y = 0.4$	2	>1.2206	>1.0260
	4	>1.6742	>1.0578
	6	>2.8110	>1.0976
$\alpha_Y = 0.6$	2	>1.2872	>1.0390
	4	>1.9156	>1.0867
	6	>3.7164	>1.1464
$\alpha_Y = 0.8$	2	>1.2872	>1.0520
	4	>1.9156	>1.1156
	6	>3.7164	>1.1953

To be guarantee in the determinacy, the feedback on output should be low and the feedback of inflation should be high.

Using Thai data during moderate inflation period

Trend inflation: The anchoring expectations

- After conducting the inflation targeting framework since the year 2000, the Bank of Thailand has set the upper ranges of the inflation targeting rates approximately slightly above 3%.
  - During the moderate inflation years of 2004Q1 to 2014Q, the value of $\alpha_{\pi}= 1.875$ is safely ensure determinacy.
  - The value of $\alpha_{\pi} = 2.325$ during the low inflation period of 2015Q1 to 2021Q1 is more safely guarantee determinacy for Thailand.

Implications for monetary policy

- As trend inflation rises, monetary rules call for increasing large and positive feedback on inflation and small feedback on output gap.
- Eventually, for large enough values of trend inflation, the central bank has no choice but being an inflation targetor.
- For Thai economy, even though the monetary policy rules are save in the determinacy region both moderate and low inflation periods, a trend inflation results in treat to the determinacy.

Conclusion

- Monetary policy is less effective when trend inflation rises.
- Optimal policy has a lower weight on output gap volatility when the target level for inflation is higher.
- A higher level of trend inflation magnifies the welfare loss.
- Moderate levels of trend inflation alter the determinacy region, changing the Taylor principle.

Conclusion

- The particular choice of monetary policy rule can have important implications for macroeconomic stability.
- The higher trend inflation tends to decrease average output, unachor inflation expectation, increase volatility of the economy, worsen policy trade-off, and reduce welfare.

Thank you