An investigation of the gains from commitment in monetary policy

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Two possible assumptions when modeling optimal policy:

- an infinitely lived policy maker can credibly commit to a policy (function) forever
- policy maker can not credibly commit at all

the assumption of commitment usually leads to time inconsistent policies.

This Paper

This paper tries to analyze 'intermediate' cases where a policy maker can commit to a policy rule but is only in power for a random number of periods.

- draws of a Bernoulli random variable η_t indicate whether or not a new policy maker is in power.
- α: probability of policy maker being replaced next period - 'measure of credibility'
- $\frac{1}{\alpha}$: average duration of regime
- τ_j: time period policy maker j comes into power
- $\Delta\tau_j = \tau_{j+1} - \tau_j - 1$

The Private Sector

$$x_t = E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1} - r_t^e) \tag{1}$$

$$\pi_t = \kappa x_t + \beta E_t \pi_{t+1} + u_t \tag{2}$$

$$L_t = \pi_t^2 + \lambda_x (x_t - x^*)^2 \tag{3}$$

$$\mathcal{I}_t = \{r_s^e, u_s, \eta_s\}_{s \leq t} \tag{4}$$

Optimal Policy Problem

Assume for now u_t iid

$$V(u_{\tau_j}) = \max_{\phi_{k+1}} \min_{x_k,\pi_k} E_{\tau_j} \left[\sum_{k=0}^{\Delta\tau_j} \beta^k \mathfrak{L}_{\tau_j+k} + \beta^{\Delta\tau_j+1} V(u_{\tau_{j+1}}) \right] \tag{5}$$

$$\phi_{\tau_j} = 0 \tag{6}$$

$$\mathfrak{L}_t = L_t + 2\phi_{t+1}(-\pi_t + \kappa x_t + \beta E_t \pi_{t+1} + u_t) \tag{7}$$

Guess solution for π:

$$\pi_{t+1} = h_0 + h_1 u_{t+1} + h_2 \phi_{t+1} \tag{8}$$

This implies:

$$E_t \pi_{t+1} = (1-\alpha) E_t^0 \pi_{t+1} + \alpha E_t^1 \pi_{t+1} = (1-\alpha) E_t^0 \pi_{t+1} + \alpha h_0 \tag{9}$$

where

$$E_t^i \pi_{t+1} = E_t[\pi_t + 1 | \eta_{t+1} = i] \tag{10}$$

some of the FONC's:

$$\lambda_x(x_t - x^*) + \kappa\phi_{t+1} = 0 \tag{11}$$

$$\pi_t - \phi_{t+1} + \phi_t = 0 \tag{12}$$

This yields

$$\phi_{t+1} = \frac{\lambda_x}{\kappa}(x_t - x^*) \tag{13}$$

$$h_0 = \frac{\kappa\mu_1}{1 - \beta\mu_1}x^* \tag{14}$$

If no regime change ever occurred x_t would converge to

$$\bar{x} = -\frac{\alpha\beta\mu_1}{1 - \beta\mu_1}x^* \tag{15}$$

$$\tilde{x}_t = \bar{x}_t - x^* \tag{16}$$

output gap dynamics within regime:

$$\tilde{x}_t = \mu_1^{t+1} \frac{1-(1-\alpha)\beta\mu_1}{1-\beta\mu_1} x^* - \mu_1 \frac{\kappa}{\lambda_x} \sum_{s=0}^{t} \mu_1^s u_{t-s} \tag{17}$$

$$\pi_t = \frac{\kappa}{1-(1-\alpha)\beta\mu_1} \tilde{x}_t + u_t \tag{18}$$

Calibration

σ	κ	β	λ_x	x^*	σ_u
1.5	0.1	0.99	0.048	0.1	0.013

IR Definitions

Type of IRFs	Definition of IRFs
(i)	$\mathrm{E}_0[z_t \mid \{\eta_t = 0\}_{t>0}] - \mathrm{E}_{-1}[z_t \mid \eta_0; \{\eta_t = 0\}_{t>0}]$
(ia)	$\mathrm{E}_0[z_t \mid \{\eta_t = 0\}_{t>0}] - E[z_t]$
(ii)	$\mathrm{E}_0[z_t \mid \{\eta_t = \bar{\eta}_t\}_{t>0}] - E[z_t]$
(iii)	$\mathrm{E}_0[z_t] - \mathrm{E}_{-1}[z_t \mid \eta_0]$

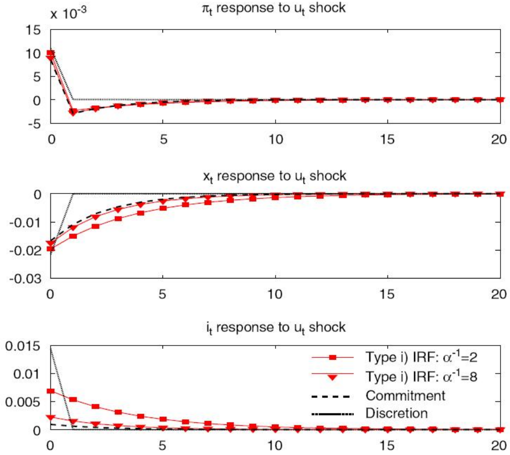

Fig. 1. *Impulse response functions of type* (i). Impulse responses to a one standard deviation cost-push shock at time $t = 0$ under commitment, discretion and quasi-commitment regimes with average durations of two quarters ($\alpha^{-1} = 2$) and two years ($\alpha^{-1} = 8$). The quasi-commitment responses are conditional on *no reoptimization* (type i). Inflation and the interest rate are expressed as annualized percentages.

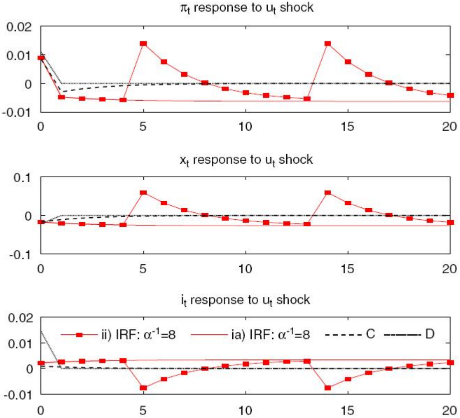

Fig. 2. *Impulse response functions of type* (ii). Impulse responses to a one standard deviation cost-push shock at time $t = 0$ under commitment, discretion and quasi-commitment with an average regime duration of two years ($\alpha^{-1} = 8$). The thin line is the quasi-commitment response conditional on *no reoptimization* (type ia). The thin line with squares is the quasi-commitment response conditional on *reoptimizations at times* $t = 5$ and 14 (type ii). At time $t = -1$ the system is assumed to be at its unconditional mean. Inflation and the interest rate are expressed as annualized percentages.

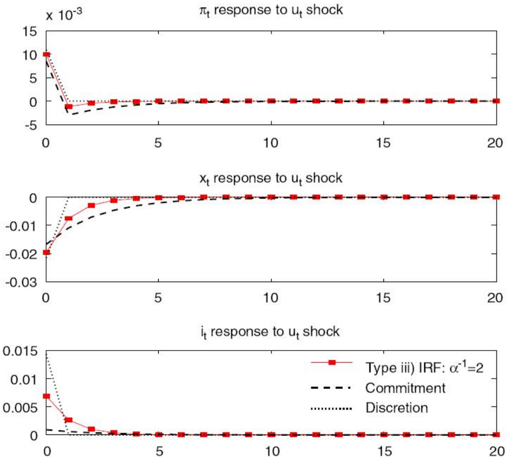

Fig. 3. *Impulse response functions of type* (iii). Impulse responses to a one standard deviation cost-push shock at time $t = 0$ under commitment, discretion and quasi-commitment with an average regime duration of two quarters ($\alpha^{-1} = 2$). The quasi-commitment response is an *average* over potential future reoptimizations (type iii). Inflation and the interest rate are expressed as annualized percentages.

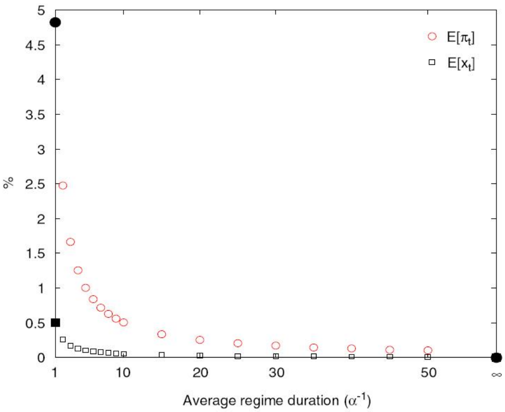

Fig. 4. *Unconditional means.* The unconditional means of inflation and the output gap as a function of credibility. Inflation is expressed as an annualized percentage.

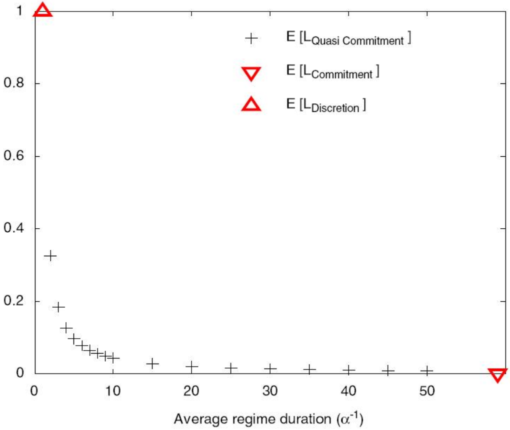

Fig. 5. *Expected loss*. The expected loss as a function of credibility. The loss is measured as a fraction of the total difference in welfare between discretion and commitment.

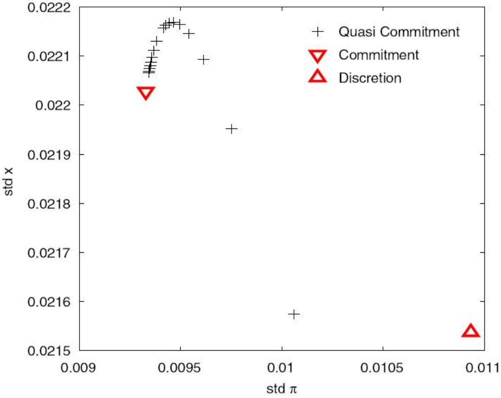

Fig. 6. *Unconditional volatilities.* The volatility frontier as a function of credibility. Each cross represents an increase in the average regime duration of one quarter, moving NW from the triangle in the lower-right corner representing discretion.