

**Policy Commitment and Market Expectations: Survey Based
Evidence under Japan's Quantitative Easing Policy**

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- Views expressed in this paper are those of the authors and do not necessarily reflect the official views of the Bank of Japan.

Motivation

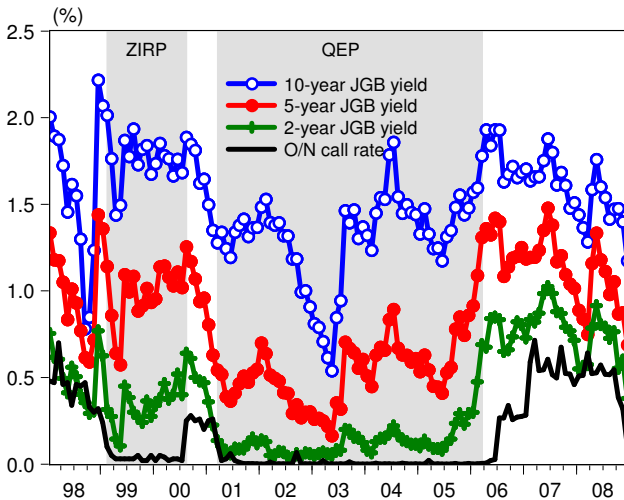
- Quantitative easing policy (QEP) by the BOJ
 - March 2001 to March 2006
- CPI commitment policy
 - BOJ promised to keep their accommodative policy until the CPI inflation rate became stably zero or higher.
 - Bank of Canada, Riksbank, etc
- We estimate the effect using survey data.

QEP and the CPI Commitment Policy 1

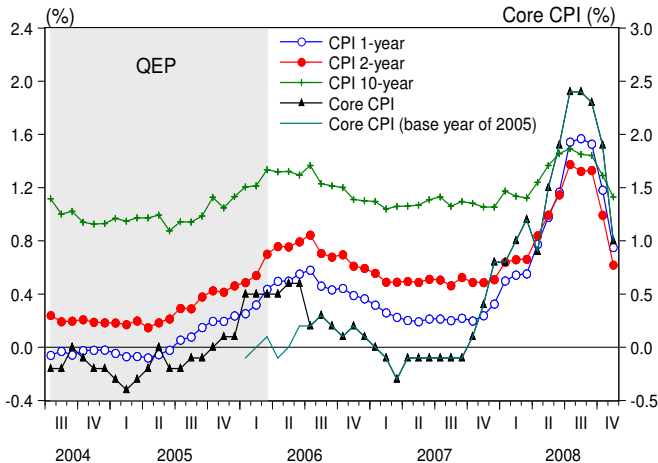
Date	Policy
Mar. 19 2001	Committing that the QEP continues to be in place until the CPI (excluding perishables) inflation registers stably a zero percent or an increase year on year.
Oct. 10 2003	Enhancing monetary policy transparency. BOJ's commitment is underpinned by the following two conditions. <ol style="list-style-type: none"> 1. it requires not only that the most recently published CPI inflation should register a zero percent or above, but also that such tendency should be confirmed over a few months. 2. the BOJ needs to be convinced that the prospective CPI inflation will not be expected to register below a zero percent. The above conditions are the necessary condition. There may be cases, however, that the BOJ will judge it appropriate to continue with the QEP even if these two conditions are fulfilled.

QEP and the CPI Commitment Policy 2

Date	Policy
Mar. 9 2006	Exit from the QEP by changing the operating target to the uncollateralized overnight call rate. Encouraging the uncollateralized overnight call rate to remain at effectively zero percent.
Jul. 14 2006	Encouraging the uncollateralized overnight call rate to remain at around 0.25 percent.



Actual and expected inflation



Past Empirical Studies 1

- Supporting evidence of the effect of the CPI commitment policy
 - Survey by Ugai (2006)
 - Baba *et al.* (2005) and Oda and Ueda (2007) develop a macro-finance model.
- Two findings
 - Interest rates became lower for the short- to medium-term range by 0.4 to 0.5 % points.
 - A threshold existed at about 1 % of the CPI inflation rate.

Past Empirical Studies 2

- Difficulty
 - Inflation expectations are unobservable.
 - The low yield curve may simply be the result of low inflation expectations.

Contribution

- We resolve the difficulty by using a direct measure of inflation expectations.
 - Panel survey, QSS (QUICK Survey System), provided by QUICK corp.
 - Market participants
 - Views on the future interest rates and inflation rates
- The QSS enables us to directly evaluate the effect of CPI commitment policy on market participants' expectations.

What We Find, albeit Tentative

- The CPI commitment policy lowered market participants' expectations on interest rates.
 - In the short- to medium-term interest rates
 - About 0.2 percent
- There existed a threshold inflation rate, yielding a kinked curve between interest rates and inflation rates.
 - About 0 percent
 - Consistent with the BOJ's announcement
- Weaker effects than previous studies due to controlling inflation expectations

- Model
- QSS Data
- Nonparametric Perspective
- Estimation
- Concluding Remarks

Model without CPI Commitment

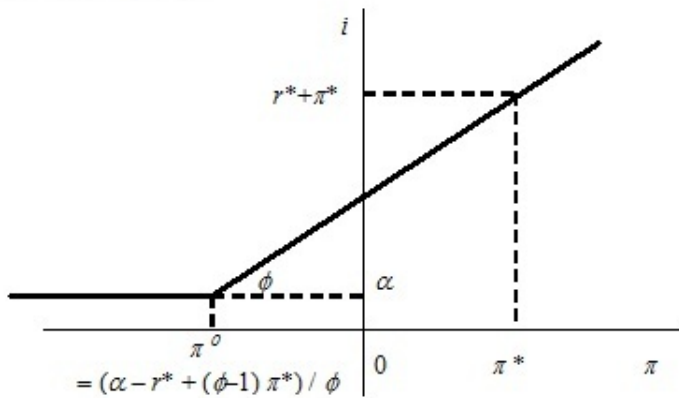
- Simple Taylor rule
 - The latent nominal interest rate i_t^* is given by

$$\tilde{i}_t^* = r^* + \pi^* + \phi(\pi_t - \pi^*) + \varepsilon_t. \quad (1)$$

- In the presence of the ZLB, the interest rate becomes

$$\hat{i}_t = \begin{cases} 0 & \text{if } \tilde{i}_t^* \leq 0 \\ \tilde{i}_t^* & \text{if } \tilde{i}_t^* > 0. \end{cases} \quad (2)$$

- Notes
 - Partial equilibrium (unlike Eggertsson and Woodford (2003))
 - No inertia in the policy rule (unlike Reifschneider and Williams (2000) and Eggertsson and Woodford (2003))



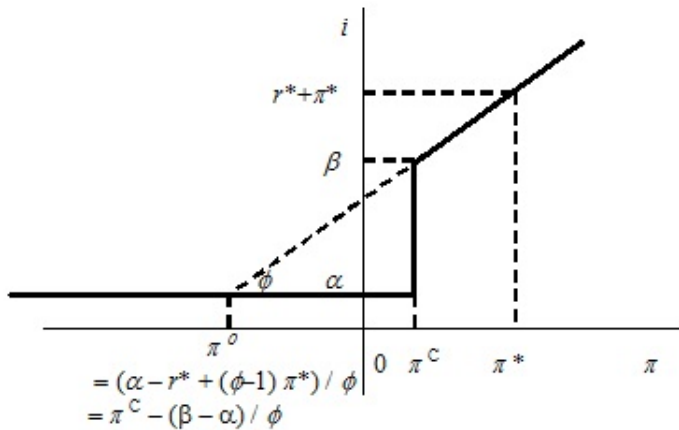
Model with CPI Commitment

- With CPI commitment, the interest rate is determined as

$$i_t = \begin{cases} 0 & \text{if } i_t^* \leq 0 \\ 0 & \text{if } \pi_t \leq \pi^c \\ i_t^* & \text{otherwise} \end{cases} . \quad (3)$$

- Assume

$$r^* + \pi^* + \phi(\pi_t^c - \pi^*) > 0 \quad (4)$$



Medium- to Long-Term Interest Rates

- A term structure model

$$i_t^T = \frac{1}{T} \mathbf{E}_t \left[\sum_{j=0}^{T-1} i_{t+j} \right]. \quad (5)$$

- A k -month forecast

$$\begin{aligned} \mathbf{E}_t i_{t+k}^T &= \frac{1}{T} \mathbf{E}_t \left[\sum_{j=k}^{T+k-1} i_{t+j} \right] \\ &= \frac{1}{T} \sum_{j=k}^{T+k-1} I(\mathbf{E}_t \pi_{t+j} - \pi^c) \cdot \{r^* + \pi^* + \phi(\mathbf{E}_t \pi_{t+j} - \pi^*)\}. \quad (6) \end{aligned}$$

Medium- to Long-Term Interest Rates

- Add a term premium

$$\begin{aligned} \mathbf{E}_t i_{t+k}^T &= \frac{1}{T} \sum_{j=k}^{T+k-1} \alpha \{1 - I(\mathbf{E}_t \pi_{t+j} - \pi^c)\} \\ &\quad + \frac{1}{T} \sum_{j=k}^{T+k-1} I(\mathbf{E}_t \pi_{t+j} - \pi^c) \cdot \{\beta + \phi(\mathbf{E}_t \pi_{t+j} - \pi^c)\}. \end{aligned} \tag{7}$$

- We require

$$\beta > \alpha. \tag{8}$$

Estimation Strategy

- From the QSS, we know $E_t i_{t+k}^T$, and $E_t \pi_{t+12}$, $E_t \pi_{t+24}$, and $E_t \pi_{t+120}$.
- Real-time π_t
- Linear interpolation

$$E_t \pi_{t+m} = \begin{cases} \{(12 - m)\pi_t + mE_t \pi_{t+12}\} / 12 & \text{for } 1 \leq m \leq 12 \\ \{(24 - m)E_t \pi_{t+12} + (m - 12)E_t \pi_{t+24}\} / 12 & \text{for } 13 \leq m \leq 24 \\ \{(120 - m)E_t \pi_{t+24} + (m - 24)E_t \pi_{t+120}\} / 96 & \text{for } 25 \leq m \leq 120 \\ E_t \pi_{t+120} & \text{for } 121 \leq m \end{cases} . \quad (9)$$

Estimation Strategy

- We estimate π^c , α , β , and ϕ from

$$\begin{aligned} \mathbf{E}_t i_{t+k}^T &= \frac{1}{T} \sum_{j=k}^{T+k-1} \alpha \{1 - I(\mathbf{E}_t \pi_{t+j} - \pi^c)\} \\ &\quad + \frac{1}{T} \sum_{j=k}^{T+k-1} I(\mathbf{E}_t \pi_{t+j} - \pi^c) \cdot \{\beta + \phi(\mathbf{E}_t \pi_{t+j} - \pi^c)\}. \end{aligned} \tag{10}$$

- As for π^c , we employ a grid-search method for maximizing the likelihood function.

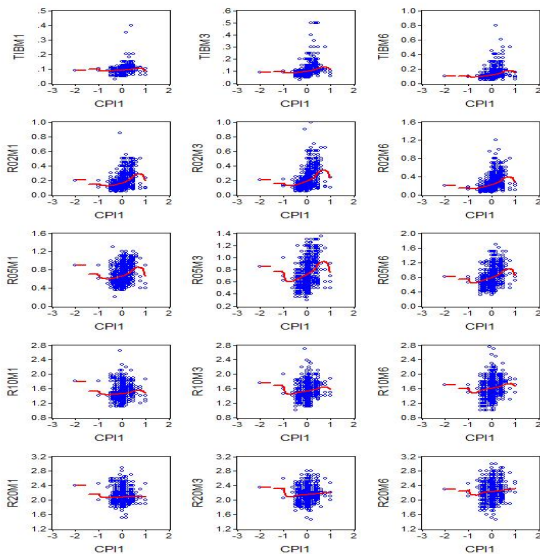
QSS Data

- Panel data
- Market participants from securities firms, banks, investment trusts, insurance firms, pension funds, and other private financial institutions
- About 150 people per month

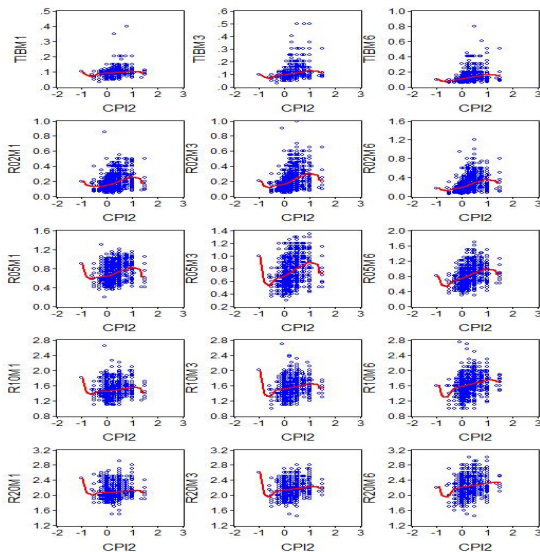
Item	Time horizon of forecast	Period
TIBOR yield (3 months)	1, 3, 6 months	2000M5 – 2008M11
Newly issued JGB yield (2 years)	1, 3, 6 months	2001M5 – 2008M11
Newly issued JGB yield (5 years)	1, 3, 6 months	2001M5 – 2008M11
Newly issued JGB yield (10 years)	1, 3, 6 months	1998M7 – 2008M11
Newly issued JGB yield (20 years)	1, 3, 6 months	2003M4 – 2008M11
CPI (excluding perishable) inflation	Average of 1, 2, 10 years	2004M7 – 2008M11

Nonparametric Perspective

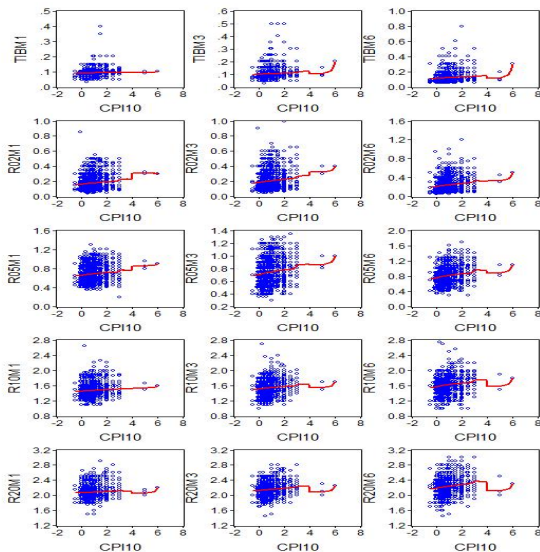
Interest rate expectations vis-a-vis 1-year inflation expectations



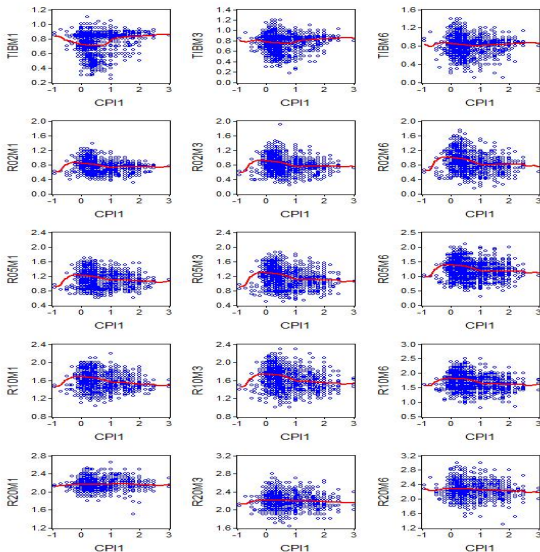
Interest rate expectations vis-a-vis 2-year inflation expectations



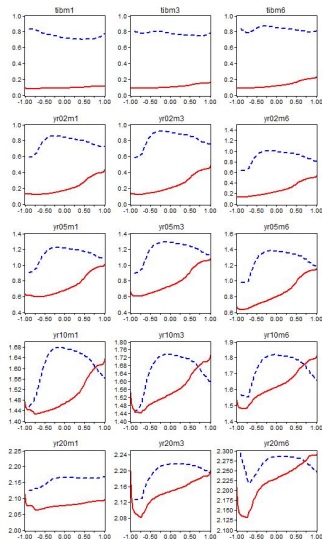
Interest rate expectations vis-a-vis 10-year inflation expectations



Interest rate expectations vis-a-vis 1-year inflation expectations after the CPI commitment policy ended



Interest rate expectations vis-a-vis 1-year inflation expectations during (red solid lines) and after (blue dashed lines) the CPI commitment policy.



Estimation

Benchmark

$$i_t = \begin{cases} \beta + \phi(\pi_t - \pi^c) \\ \alpha \end{cases} \quad (11)$$

- $\alpha < \beta$
- ϕ is positive and significant
- π^c is around 0 percent
- Adjusted R^2 is the highest for the 2-years yields

dependent variables		α	β	ϕ	π^c	Adj R2
TIBOR	3M	0.093	0.095	0.249	-0.04	0.256
2Y	3M	0.118	0.287	0.153	0.10	0.413
5Y	3M	0.551	0.757	0.206	0.09	0.232
10Y	3M	1.447	1.562	0.054	0.29	0.065
20Y	3M	1.896	2.104	0.051	-0.20	0.035

Estimation of models with and without the CPI commitment

		α	β	ϕ	π^C	π^0	Adj R ²	F test
TIBOR	benchmark	0.093	0.095	0.249	-0.04	-	0.256	0.342
	w/o commit	0.093	$\equiv \alpha$	0.259	-	-0.04	0.256	
	(S.E.)	0.001	-	0.009	-	-		
2Y	benchmark	0.118	0.287	0.153	0.10	-	0.413	0.000
	w/o commit	0.140	$\equiv \alpha$	0.395	-	-0.05	0.350	
	(S.E.)	0.002	-	0.010	-	-		
5Y	benchmark	0.551	0.757	0.206	0.09	-	0.232	0.000
	w/o commit	0.643	$\equiv \alpha$	0.346	-	0.00	0.198	
	(S.E.)	0.005	-	0.013	-	-		
10Y	benchmark	1.447	1.562	0.054	0.29	-	0.065	0.000
	w/o commit	1.479	$\equiv \alpha$	0.115	-	0.00	0.055	
	(S.E.)	0.006	-	0.009	-	-		
20Y	benchmark	1.896	2.104	0.051	-0.20	-	0.035	0.000
	w/o commit	2.096	$\equiv \alpha$	0.056	-	-0.20	0.030	
	(S.E.)	0.006	-	0.006	-	-		

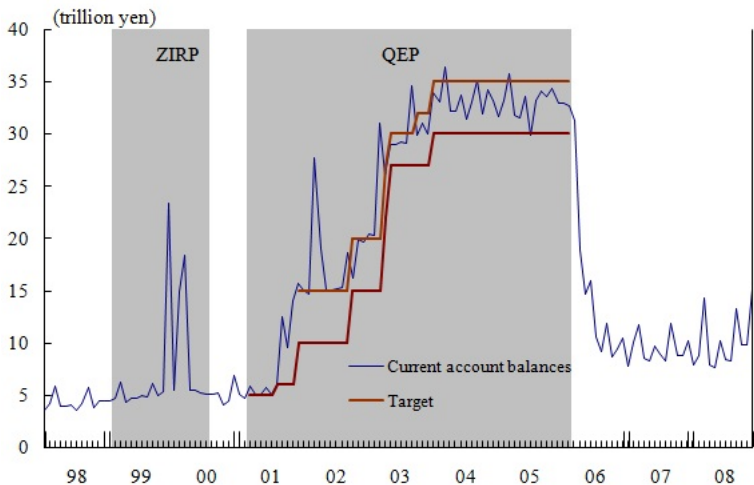
Robustness

- Different models confirm our results
- ① Various samples
- ② A model excluding food and energy
- ③ A simple model without a term structure consideration
- ④ A modified Tobit model
 - Unclear lower bound
 - Tobit and panel (with fixed effect) analysis
- ⑤ A model with policy inertia
- ⑥ A model with the restriction of $\phi = 1.1$

Concluding Remarks

- Future work
 - Effects of increases in current reserves
 - Recent episode
 - Other countries such as Canada, Sweden, and the United States

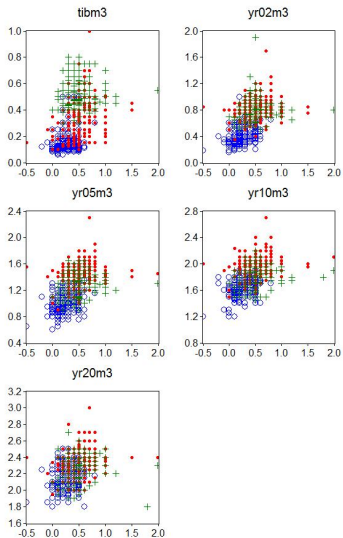
Current account balances (Source: Bank of Japan)



Estimation for the sample periods that include three months just before and after the CPI commitment policy ended

		α	β	ϕ	π^c	π^0	Adj R ²	F test
TIBOR	w commit	0.152	0.302	0.193	0.32	-	0.808	0.000
	w/o commit	0.114	$= \alpha$	0.925	-	0.02	0.518	
2Y	w commit	0.349	0.733	0.493	0.50	-	0.608	0.000
	w/o commit	0.438	$= \alpha$	2.663	-	0.20	0.296	
5Y	w commit	0.923	1.179	0.328	0.50	-	0.376	0.000
	w/o commit	1.022	$= \alpha$	0.961	-	0.20	0.170	
10Y	w commit	1.579	1.707	0.164	0.50	-	0.182	0.000
	w/o commit	1.657	$= \alpha$	0.127	-	0.25	0.079	
20Y	w commit	2.116	2.180	0.081	0.50	-	0.080	-
	w/o commit	2.161	$= \alpha$	0.057	-	0.25	0.038	

Interest rate expectations vis-a-vis 1-year inflation expectations in the short period just before and just after the CPI commitment policy ended



Estimation of models with policy inertia

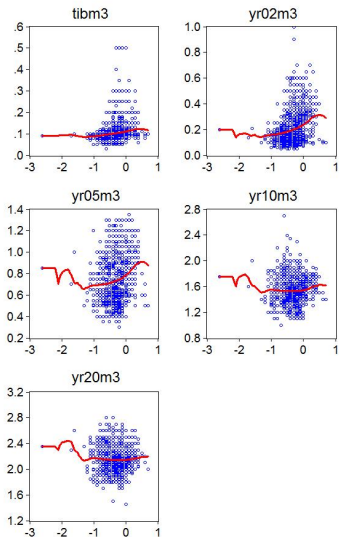
		α	β	ϕ	ρ	π^c	π^0	Adj R ²
TIBOR	w commit	0.088	0.019	0.288	0.728	-0.24		0.440
	w/o commit	0.008	$= \alpha$	0.227	0.717	—	-0.48	0.434
2Y	w commit	0.111	0.007	1.026	0.922	-0.21		0.702
	w/o commit	-0.012	$= \alpha$	0.857	0.913	—	-0.50	0.694
5Y	w commit	0.570	0.108	0.128	0.891	-0.01		0.642
	w/o commit	0.108	$= \alpha$	0.306	0.804	—	-0.50	0.624
10Y	w commit	1.229	0.595	0.061	0.597	-0.21		0.448
	w/o commit	0.658	$= \alpha$	0.058	0.549	—	-0.50	0.420
20Y	w commit	1.896	0.969	0.012	0.541	-0.21		0.361
	w/o commit	1.207	$= \alpha$	0.010	0.430	—	-0.50	0.301

Tobit model using 3M forecast of 2Y yields as a dependent variable and 1Y π^e as an explanatory variable

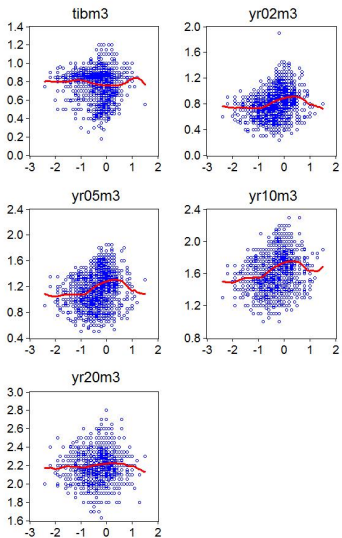
$$i_t = \begin{cases} \gamma + \phi\pi_t + \varepsilon_t \\ \alpha \end{cases} \quad (12)$$

α (preset) [#N, #N]	γ	ϕ	σ_ε	$\pi^c =$ $(\alpha - \gamma)/\phi$
0 [0, 2096]	0.191	0.299	0.096	-0.64
0.10 [413, 1683]	0.173	0.353	0.113	-0.21
0.15 [919, 1177]	0.136	0.453	0.138	0.03
0.20 [1242, 854]	0.100	0.575	0.150	0.17

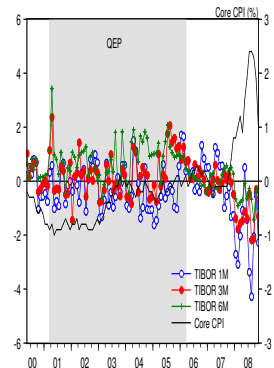
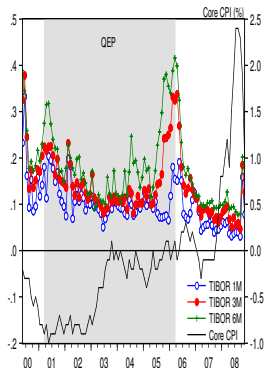
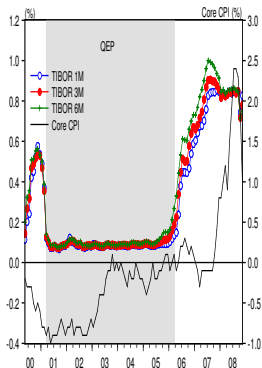
Interest rate expectations vis-a-vis 1-year inflation expectations excluding food and energy during the CPI commitment policy



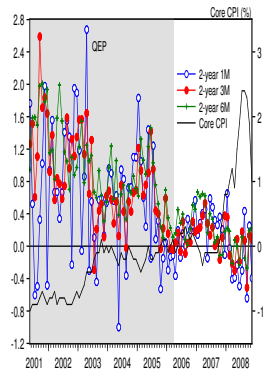
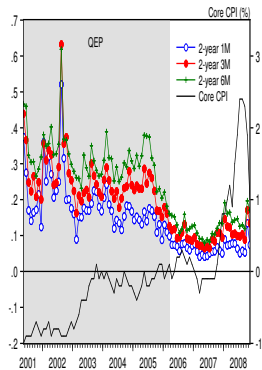
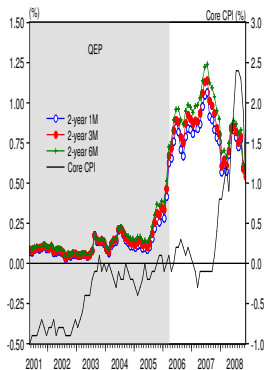
Interest rate expectations vis-a-vis 1-year inflation expectations excluding food and energy after the CPI commitment policy ended



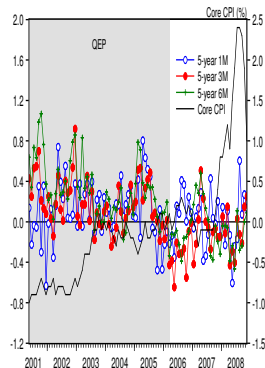
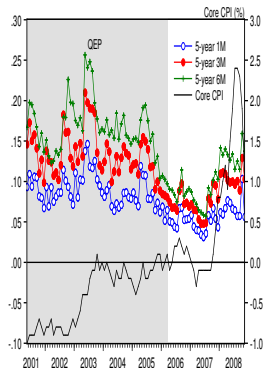
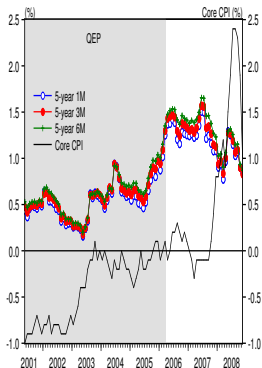
3-months TIBOR yields expectations (top: means; middle: standard deviations / means; bottom: skewness)



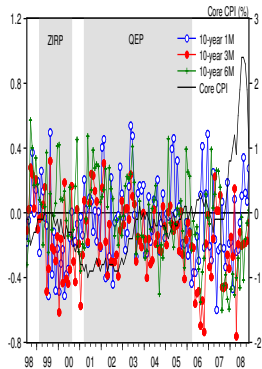
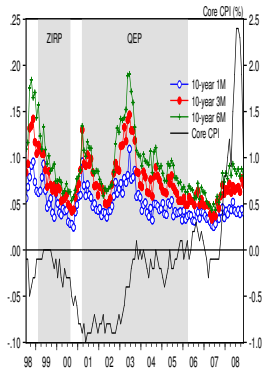
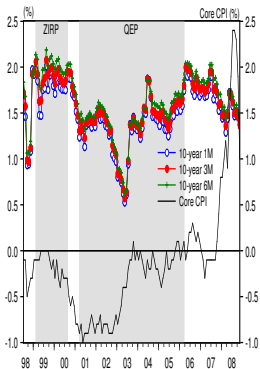
2-years JGB yields expectations (top: means; middle: standard deviations / means;
bottom: skewness)



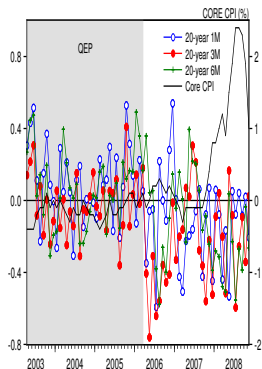
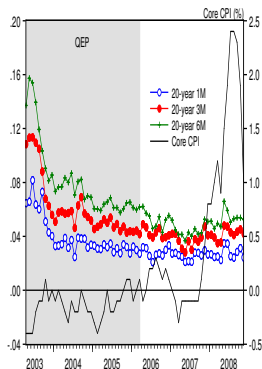
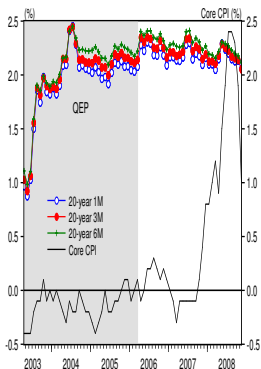
5-years JGB yields expectations (top: means; middle: standard deviations / means; bottom: skewness)



10-years JGB yields expectations (top: means; middle: standard deviations / means; bottom: skewness)



20-years JGB yields expectations (top: means; middle: standard deviations / means; bottom: skewness)



Inflation expectations (top: means; middle: standard deviations / means; bottom: skewness)

