How to forecast ECB and Fed interest rate

Jean-Charles Bricongne and Jean-Marc Fournier

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Banque de France, CREST-INSEE and Paris I CREST-INSEE and PSE

Central banks' policies

- Institutional framework and goals
- Interest rate is a key instrument
- Taylor rules
- Understanding the central banks' communication
- Specifications

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Empirical results
- Data used in the computation
- Variable selection
- Central bank reaction's function
- Central banks' interest rates simulated in 2009H1

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- Aversion for deflation (Bernanke, 2002).

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- Fed minutes and ECB's chairman speeches : qualitative information about the central bank's goals, its appreciation of current situation and likely next decisions.

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- Central banks may have to make a balance between contradictory objectives.

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- We can propose an approximation of such a process.

Taylor rules

Interest rate depends on inflation and output gap

- The seminal Taylor (1993) rule: monetary policy of the Fed from 1987 to 1992.

$$i - i^* = 0.5(\pi - \pi^*) + 0.5(y - y^*) \quad (1)$$

where i is the nominal short-run interest rate, i^* the nominal short-run equilibrium interest rate, π and π^* current and target inflation respectively, and $(y - y^*)$ the output gap.

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- Several policy rules may be used by a central bank (Taylor, 1999 or Orphanides, 2007).

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- Grüner (2002) argues that uncertainty of central banks' decision leads to more wage discipline.
- All in all, Central banks give no more than partial information.

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Estimated Taylor rule:

$$i_t = \beta_0 + \beta_1 \pi_t + \beta_2 (y_t - y_t^*) + \varepsilon_t \quad (2)$$

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Central banks follow a wide array of indicators

- No *a priori* about explanatory variables:

$$i_t = \beta_0 + \rho i_{t-1} + \beta x_t + \varepsilon_t \quad (6)$$

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- Communication as a measure of the gap between current interest rate and the result of a Taylor rule:

$$c_t = \alpha i_{t-1} + \beta_0 + \beta x_t + \varepsilon_t \quad (8)$$

where c_t is the index of communication stance at date t.

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- If we exclude very rare large variation, we observe:

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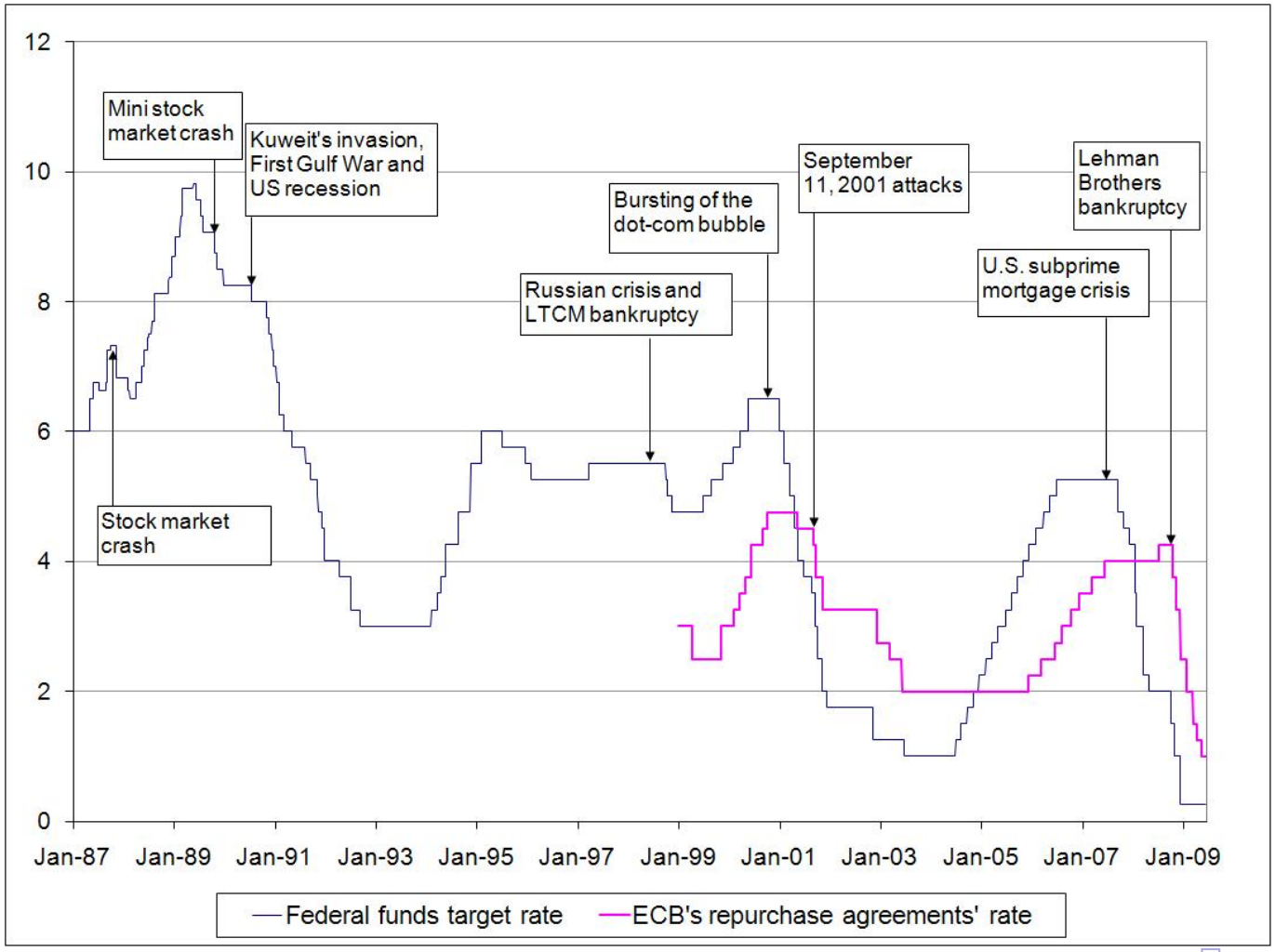
- Finally, we consider three modalities: upside, stable and downside.

Interest rates and key historical events



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- Authors' codification after 1999 (Fed) or 2004 (ECB) with the same codification rules as before.

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- We also consider Durbin (1970) test to check that residuals are not autocorrelated in models withs lagged interest rates.

Rejected indicators via information criteria optimisation

ECB	Fed
3-month interbank spread	3-month interbank spread
	Spread during 1987 crisis
Spread during Asian crisis	Spread during Asian crisis
Public securities flows	
M3	M3
Underlying inflation	Underlying inflation
Headline inflation	Headline inflation
Stock markets index	
European unemployment	
	US IPI
	US output gap
Real estate prices	Real estate prices
US unemployment	European unemployment
US capacity utilization rate	European capacity utilization rate
US output	European output
US inflation forecast	European inflation forecast

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- GDP growth (Orphanides, 2003a), GDP forecast or output gap?

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- Spreads during financial crisis.

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- We consider as many observations as decision (a decision to keep the rate stable is a decision).

OLS estimations (ECB)

dependent variable	i_t a	i_t b	i_t c	i_t d	i_t e	i_t f	i_t g
Intercept	0.070	0.073	0.074	-2.723	-2.67	-4.42	-4.63
	(1.64)	(1.68)	(1.64)	(-2.36)	(-2.36)	(-4.62)	(-4.87)
i_{t-1}	0.965	0.963	0.963	0.858	0.896	0.890	0.88
	(74.0)	(71.3)	(68.4)	(31.4)	(30.0)	(29.2)	(30.0)
c_{t-1}	0.073	0.064	0.063	0.041	0.036		
	(7.46)	(2.94)	(2.85)	(3.35)	(3.00)		
c_{t-2}		0.011	0.009				
		(0.48)	(0.34)				
c_{t-3}			0.002				
			(0.11)				
Inflation forecast				0.154	0.144	0.172	0.182
				(1.95)	(1.87)	(2.33)	(2.46)
$\frac{(y_{t-3}-y^*_{t-3})}{y^*_{t-3}}$				0.050	0.029	0.031	0.032
				(3.18)	(1.70)	(1.80)	(1.87)
Capacity util. rate				0.034	0.033	0.054	0.057
				(2.30)	(2.26)	(4.30)	(4.56)
Subprime crisis					-0.109	-0.113	-0.126
					(-2.84)	(-2.84)	(-3.24)
Fed funds' variation						0.072	
						(1.51)	
N	156	155	154	156	156	156	156
Adj. R^2	0.98	0.98	0.98	0.98	0.98	0.98	0.98
RMSE	0.144	0.145	0.146	0.136	0.133	0.136	0.136
AIC	-605.2	-598.8	-592.2	-620.4	-626.6	-624.4	-624.1
Durbin	-0.19	-0.07	-0.11	-0.10	-1.30	-0.63	-0.31

OLS estimations (Fed)

dependent variable	Δi_t a	Δi_t b	Δi_t c	Δi_t d	Δi_t e
Intercept	-0.048	-0.0062	-0.050	-0.051	-2.69
	(-2.22)	(-0.12)	(-2.32)	(-2.35)	(-3.14)
i_{t-1}		-0.0089			0.21
		(-0.89)			(2.77)
i_{t-2}					-0.33
					(-5.10)
c_{t-1}	0.094	0.096	0.078	0.076	0.035
	(4.69)	(4.75)	(3.34)	(3.16)	(1.68)
c_{t-2}			0.03	0.02	
			(1.28)	(0.96)	
c_{t-3}				0.01	
				(0.56)	
square inflation forecast					0.027
					(3.30)
Smoothed Stock index					0.99
					(2.87)
Square unemployment					-0.0084
					(-2.50)
Subprime crisis					-0.27
					(-2.06)
N	172	172	172	172	173
Adj. R^2	0.11	0.11	0.11	0.11	0.39
RMSE	0.279	0.280	0.279	0.280	0.236

IV regressions

dependent variable	i_t OLS ECB a	i_t IV ECB b	i_t OLS Fed c	i_t IV Fed d
Intercept	-6.19	-5.27	-3.165	-2.41
	(-5.85)	(-4.75)	(-3.93)	(-2.95)
i_{t-1}	0.83	0.83	1.20	1.31
	(27.3)	(19.8)	(15.73)	(18.72)
i_{t-2}			-0.34	-0.43
			(-5.18)	(-6.62)
Inflation forecast	0.26	0.28		
	(3.61)	(2.78)		
$\frac{(y_{t-3}-y^*_{t-3})}{y^*_{t-3}}$	0.049	0.054		
	(2.88)	(2.26)		
capacity util. rate	0.075	0.064	0.047	0.036
	(5.55)	(4.34)	(4.35)	(3.33)
square inflation forecast			0.032	0.027
			(3.91)	(3.08)
Smoothed Stock index			1.13	0.93
			(3.38)	(2.16)
Square unemployment			-0.0109	-0.00905
			(-3.57)	(-2.68)
subprime crisis	-0.135	-0.100	-0.26	-0.38
	(-3.50)	(-1.81)	(2.04)	(-2.97)
N	155	155	175	175
R^2	0.98	0.98	0.99	0.99

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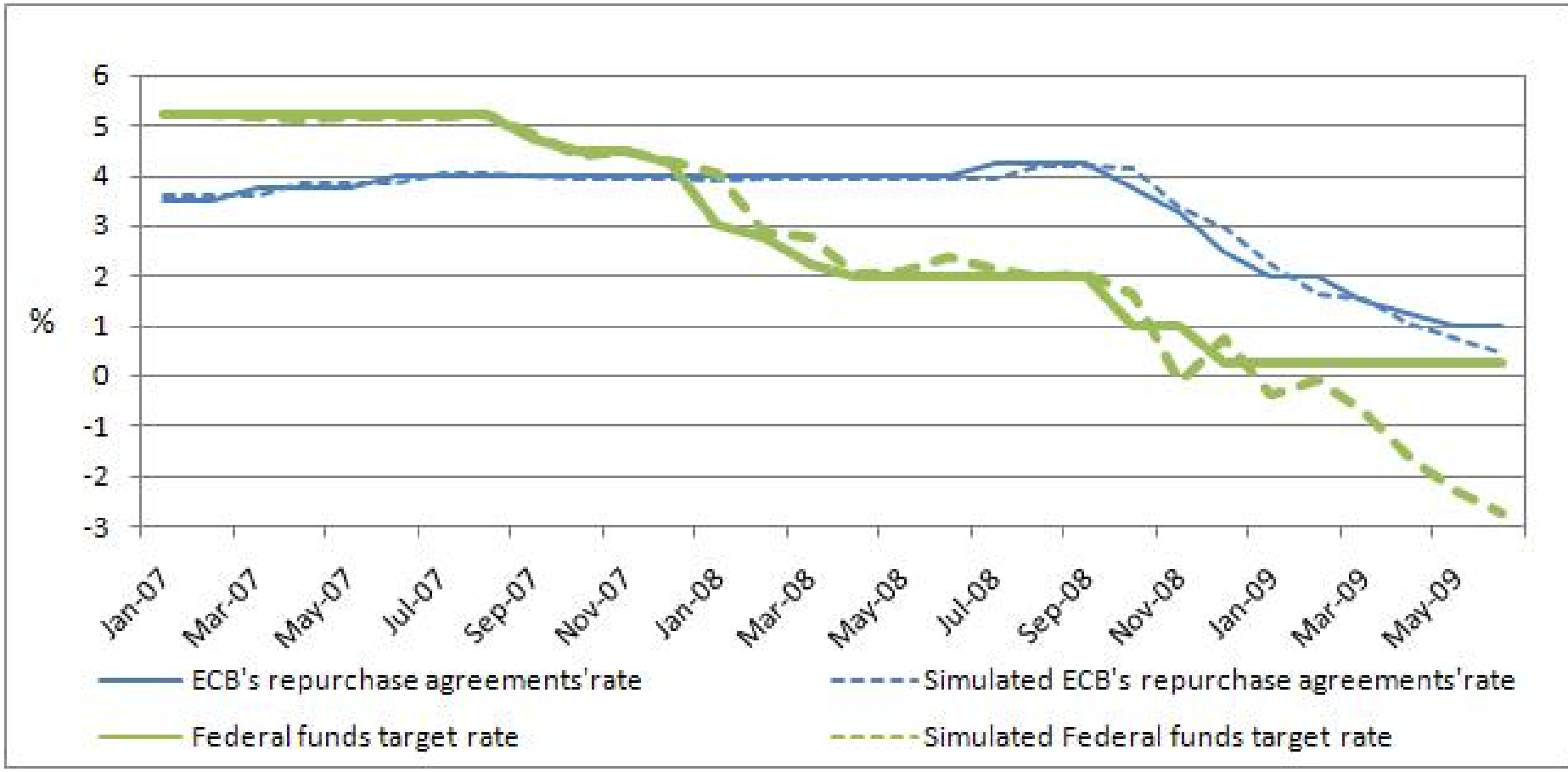
- We suggest for the ECB: $\bar{i}_t = \Delta i_t + 0.05 * c_{t-1}$
- We suggest for the Fed: $\bar{i}_t = \Delta i_t + 0.1 * c_{t-1}$

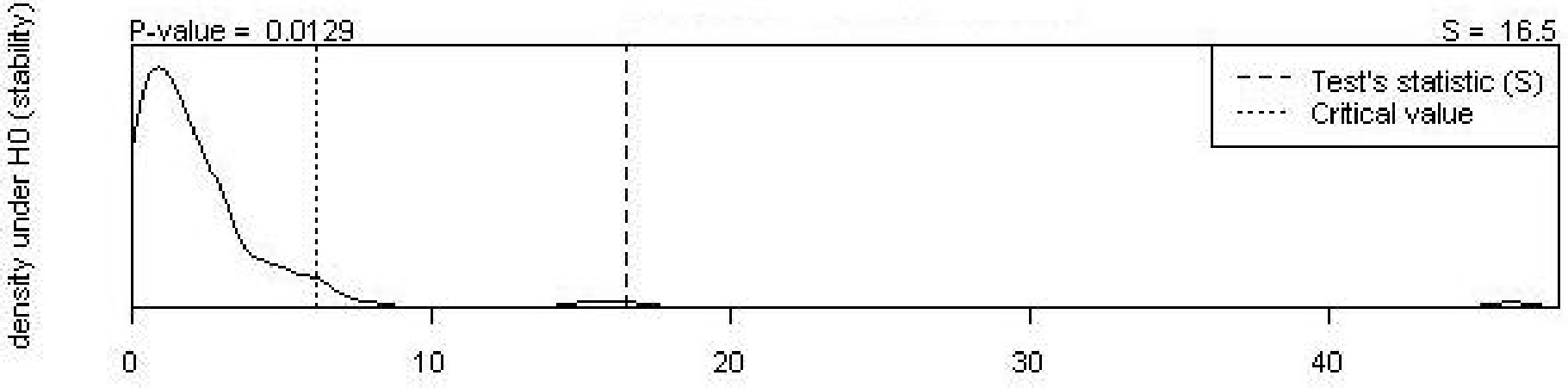
Decisions' simulation



End-of-sample instability test (Andrew, 2003)

tested breakpoint: 2009, march.

- The ECB does not follow the same rule as before.



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- Communication significantly improve the short-term forecast of interest rates.
- Our main results are robust to specification choices.
- Central banks have had a specific reaction to the subprime crise, beyond the reaction suggested by ordinary determinants.