12. Robustness of Monetary Policy Rules

John B. Taylor, May 13, 2013

Why Study Robustness?

- Monetary models differ
  - Even within the sticky-price rational expectations world (NKE or DSGE)
    - Volker Wieland's model data base has 50 models!
  - Even wider when we go outside of that world
    - Old Keynesian, RBC, or Austrian schools
- Optimizing with one model will tend to make the rule exploit special features of that model
  - But some special features may be arbitrary
    - Example of different forms of staggered pricing
- Much interesting research

Trying out policy in different models

Considering five rules in nine different models of which Ball and Woodford are two.
Look especially inertia example in which future $E_t i_{t+1}$ will react to increases in π_t today and have a stabilizing effect without affecting y_t

NBER monetary policy rules conference:

$$i_t = g_\pi \pi_t + g_y y_t + \rho i_{t-1}$$

	g_π	g_y	ρ
Rule I	3.0	0.8	1.0
Rule II	1.2	1.0	1.0
Rule III	1.5	0.5	0.0
Rule IV	1.5	1.0	0.0
Rule V	1.2	.06	1.3

Robustness of Rule III and Rule IV

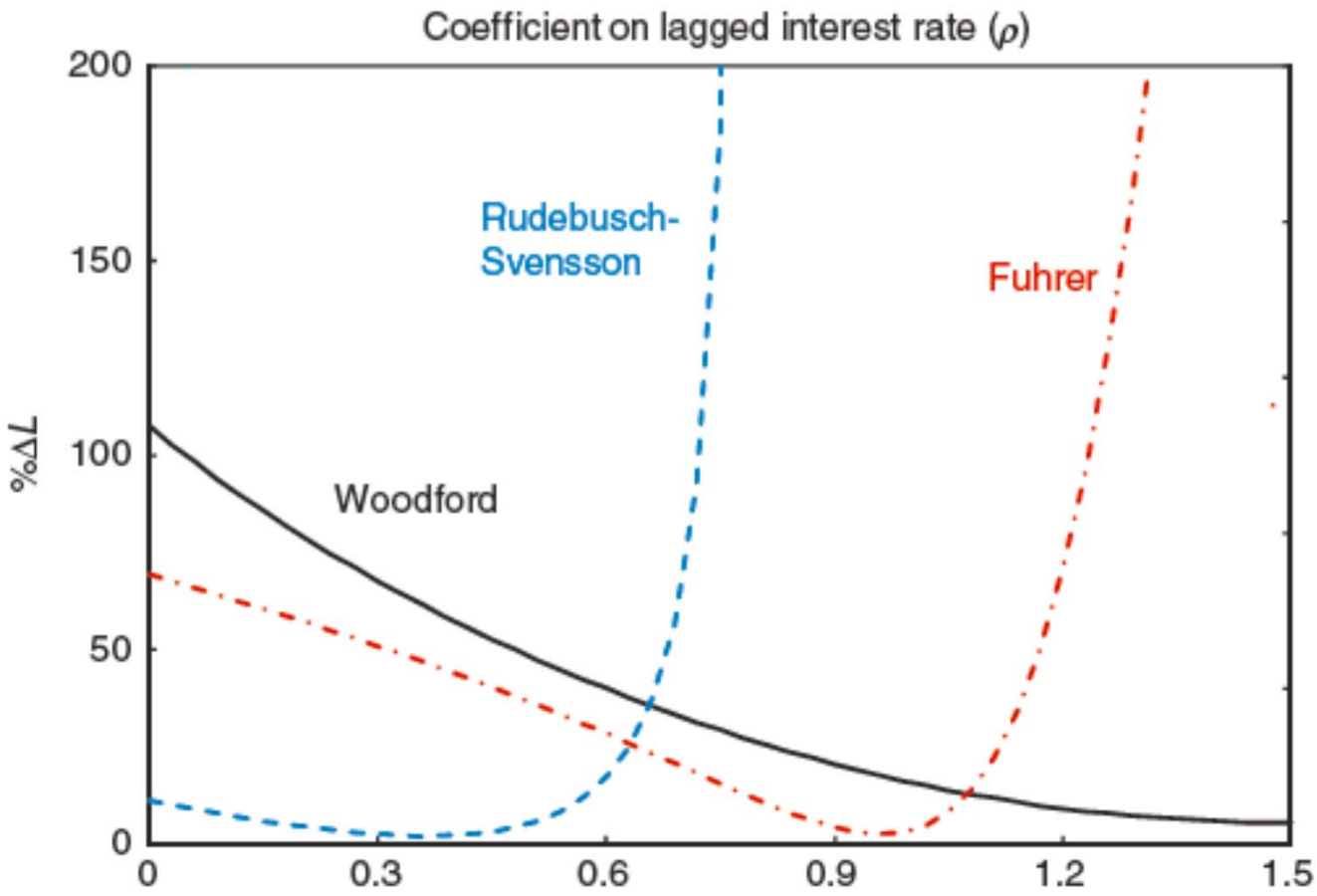
	Standard Deviation of: Inflation	Output	Interest Rate
	----------Rule III----------		
Ball	1.85	1.62	--
Haldane-Batini	1.38	1.05	0.55
McCallum-Nelson	1.96	1.12	3.94
Rudebusch-Svensson	3.46	2.25	4.94
Rotemberg-Woodford	2.71	1.97	4.14
Fuhrer-Moore	2.63	2.68	3.57
MSR	0.70	0.99	1.01
FRB	1.86	2.92	2.51
TMCM	2.58	2.89	4.00
Average	2.13	1.94	2.82
	----------Rule IV----------		
Ball	2.01	1.36	--
Haldane-Batini	1.46	0.92	0.72
McCallum-Nelson	1.93	1.10	3.98
Rudebusch-Svensson	3.52	1.98	4.97
Rotemberg-Woodford	2.60	1.34	4.03
Fuhrer-Moore	2.84	2.32	3.83
MSR	0.73	0.87	1.19
FRB/US	2.02	2.21	3.16
TMCM	2.36	2.55	4.35
Average	2.16	1.63	3.03

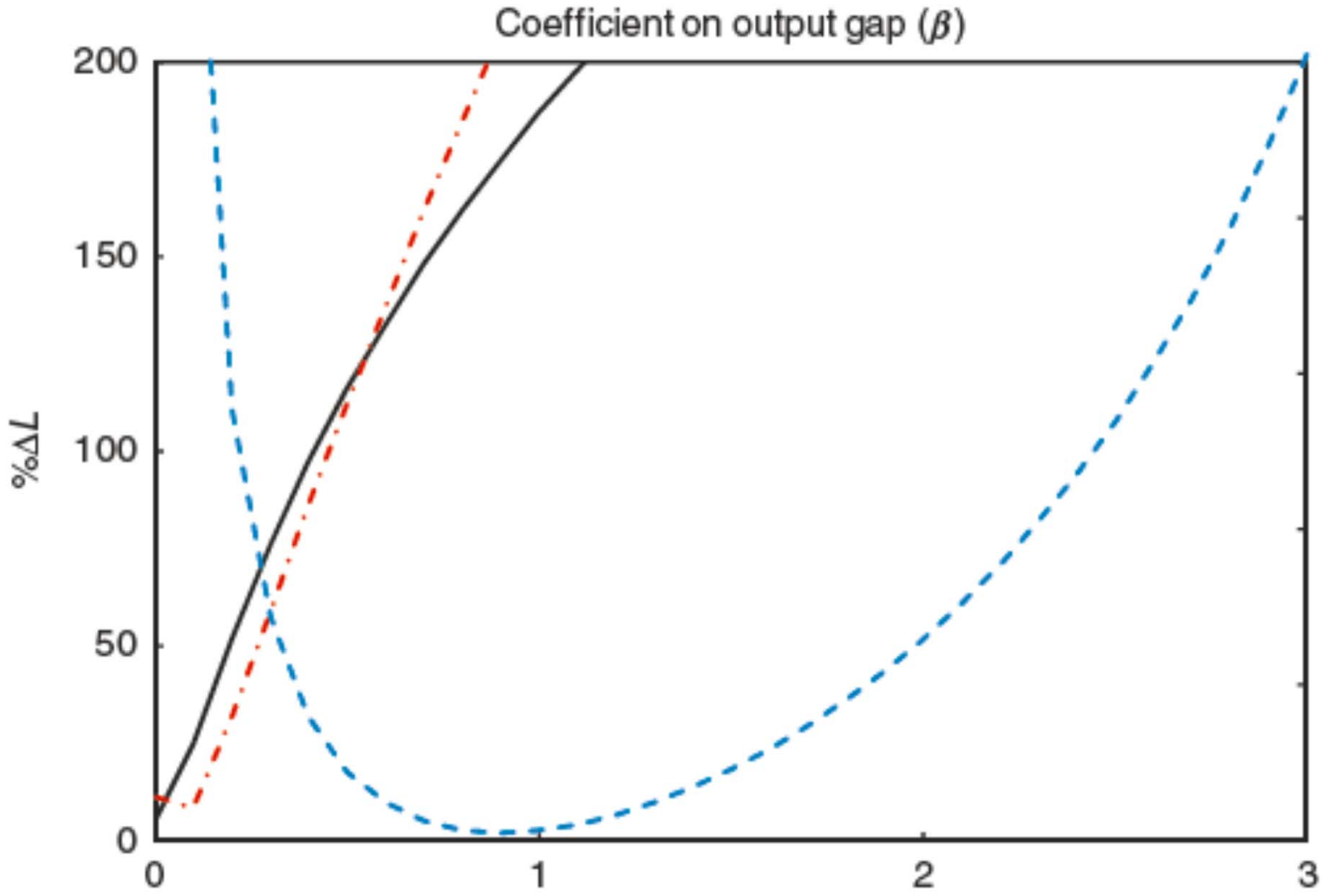
Observe tradeoff between output and inflation variance

Robustness of Rules I,II, and III

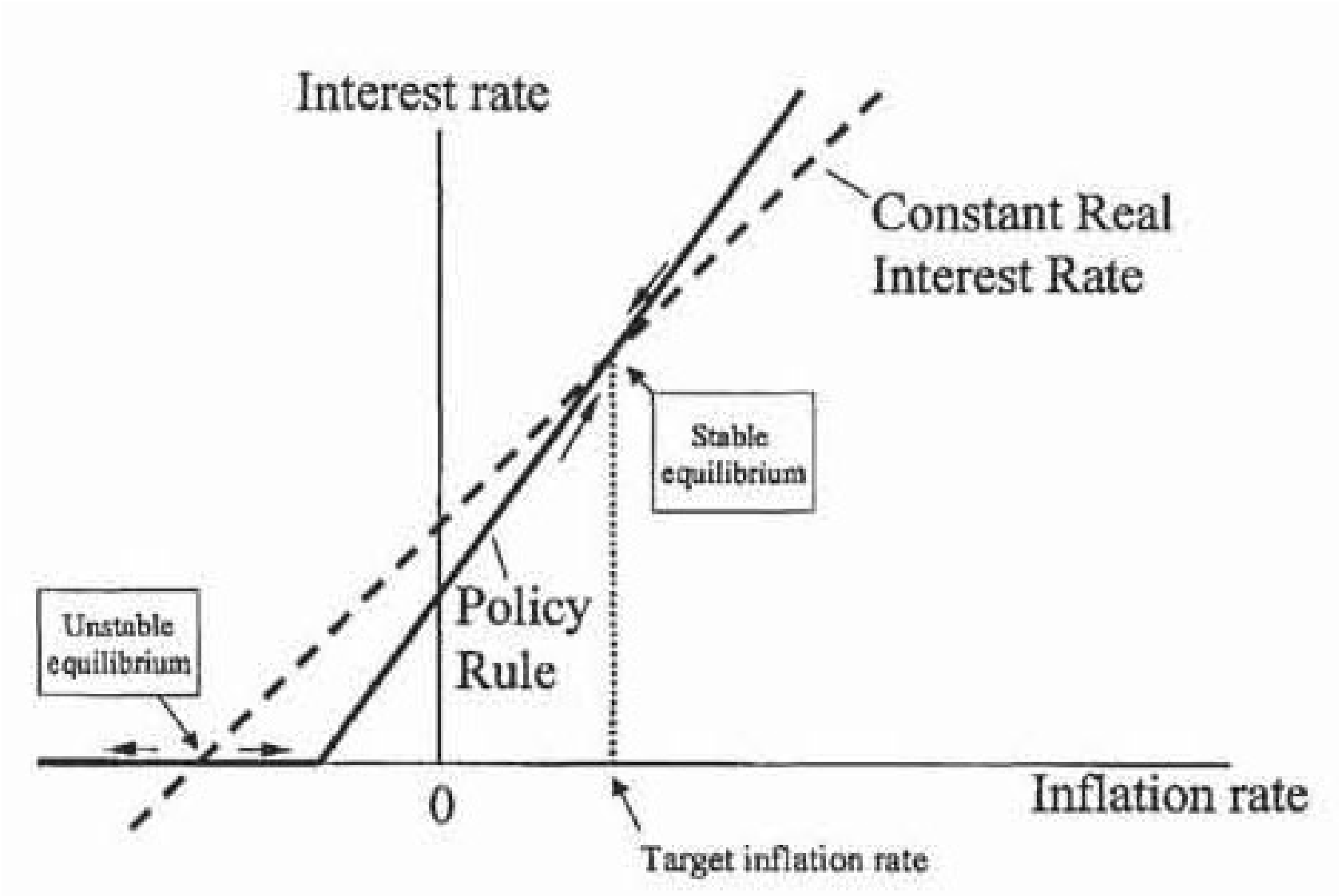
	Standard Deviation of: Inflation	Output	Interest R
	----------Rule I----------		
Ball	2.27	23.06	--
Haldane-Batini	0.94	1.84	1.79
McCallum-Nelson	1.09	1.03	5.14
Rudebusch-Svensson	∞	∞	∞
Rotemberg-Woodford	0.81	2.69	2.50
Fuhrer-Moore	1.60	5.15	15.39
MSR	0.29	1.07	1.40
FRB/US	1.37	2.77	7.11
TMCM	1.68	2.70	6.72
	----------Rule II----------		
Ball	2.56	2.10	--
Haldane/Batini	1.56	0.86	0.99
McCallum/Nelson	1.19	1.08	4.41
Rudebusch-Svensson	∞	∞	∞
Rotemberg-Woodford	1.35	1.65	2.53
Fuhrer-Moore	2.17	2.85	8.61
MSR	0.44	0.64	1.35
FRB/US	1.56	1.62	4.84
TMCM	1.79	1.95	5.03
	----------RuleV----------		
Ball	∞	∞	∞
Haldane-Batini	∞	∞	∞
McCallum-Nelson	1.31	1.12	2.10
Rudebusch-Svensson	∞	∞	∞
Rotemberg-Woodford	0.62	3.67	1.37
Fuhrer-Moore	7.13	21.2	27.2
MSR	0.41	1.95	1.31
FRB	1.55	6.32	4.67
TMCM	2.06	4.31	4.24

Reacting to lagged interest rate is not robust to models with less, or especially no, forward looking


Coefficient on lagged interest rate (ρ)
200
150
100
50
0
%ΔL
0
0.3
0.6
0.9
1.2
1.5
Rudebusch-
Svensson
Fuhrer
Woodford


Coefficient on output gap (β)
200
150
100
50
0
%ΔL
0
1
2
3

Dealing with Zero Lower Bound Problem



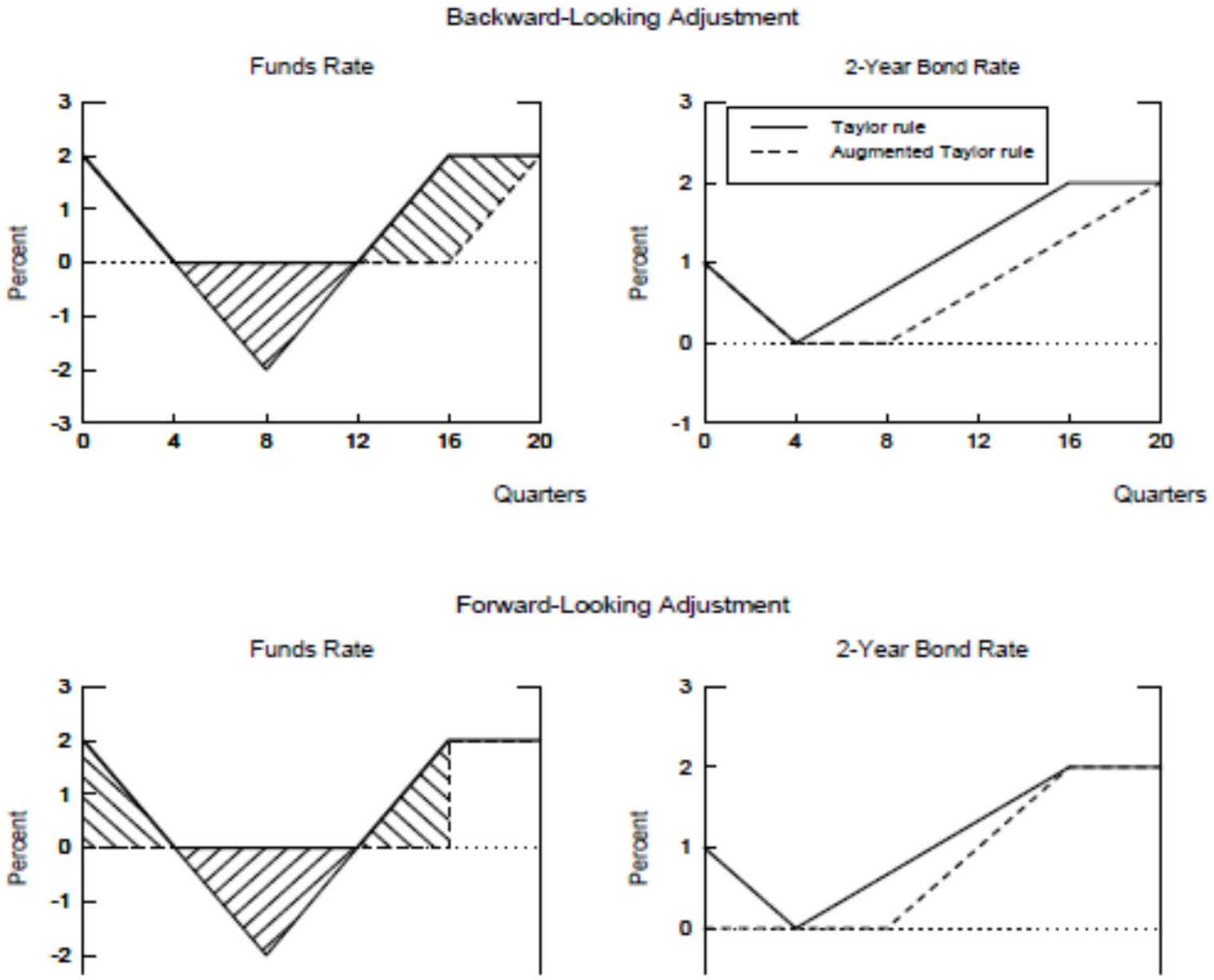
Evaluating Monetary Policy using RE models - FOMC transcript - Jan 2002

- Goal – estimate the effect on average economic performance of lowering the target rate of inflation (which makes the zero bound more of a constraint on policy)
- Approach – simulate the FRB/US model under rational expectations, subject to shocks like those experienced over the past 35 years
- Policy assumption – the Taylor rule
  - $I_t = R^*_t + \pi_t + .5\ GAP_t + .5\ (\pi_t - \pi^*)$

Economic Performance Under Rules With Alternative Degrees of Responsiveness [1]

	Core CPI inflation target		
	0	**2**	4
Standard deviation of the unemployment rate (percent)			
1. Taylor rule	1.8	**1.5**	1.4
2. More responsive rule	1.3	**1.1**	1.1
Frequency of deep recessions (number per 100 years)			
3. Taylor rule	5.2	**4.6**	4.4
4. More responsive rule	3.1	**2.6**	2.3

1. Output gap coefficient equals 1.0 in the more responsive rule, 0.5 in the Taylor rule.


Backward-Looking Adjustment
Funds Rate
2-Year Bond Rate
Taylor rule
Augmented Taylor rule
Percent
Quarters
Forward-Looking Adjustment
Funds Rate
2-Year Bond Rate
Percent

Augmented rule for the zero lower bound :

$$i_t = \max(i_t^{rule} - \alpha Z_t, 0)$$

where

$$Z_t = d_t + d_{t-1} + d_{t-2} + d_{t-3} + \ldots$$

$$d_t = i_t - i_t^{rule}$$

Augmented Rule

	Inflation Target			
	-1.0	0.0	1.0	2.0
Percent of time funds rate bounded at zero[1]	33	19	9	4
Mean duration of periods funds rate bounded[2]	7	5	4	3
Standard deviation of:				
Output gap	3.0	3.0	2.9	2.9
Inflation	1.8	1.8	1.9	1.9
Federal funds rate	1.9	2.2	2.4	2.4

Notes:

1. Percent of quarters funds rate ≤ 5 basis points.
2. Mean number of consecutive quarters funds rate ≤ 5 basis points.

Regular rule

	Inflation Target				
	0	1	2	3	4
Percent of time funds rate bounded at zero[1]	14	9	5	1	<1
Mean duration of periods funds rate bounded[2]	6	5	4	3	2
Constant bias adjustment to target inflation	.7	.3	.1	.0	.0
Standard deviation of:					
Output gap	3.6	3.2	3.0	2.9	2.9
Inflation	2.0	1.9	1.9	1.9	1.9
Federal funds rate	2.3	2.4	2.5	2.5	2.5

Notes:

1. Percent of quarters funds rate ≤ 5 basis points.
2. Mean number of consecutive quarters funds rate ≤ 5 basis points.