Policy Rules and Economic Performance

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MMCN Third Research Conference
June 14, 2019

(Policy) Rules *versus* (Constrained) Discretion

- Rules *versus* Discretion
  - Friedman (1959), Council of Economic Advisors (1962)
  - Sargent and Wallace (1975), Kydland and Prescott (1977)
- Policy Rules *versus* Constrained Discretion
  - Taylor (1993)
  - Bernanke (2003)
- What Type of Rules Based Policy is Best?
- Models do Not Provide a Clear Answer
- Propose Evaluation by Economic Performance

What Type of Rules Based Policy?

- Taylor Rules
  - $i_t = \pi_t + \alpha(\pi_t - \pi^*) + \gamma y_t + R^*$
- Coefficients α and γ can take any values
- Constrained Discretion
  - Inflation Target
    - Taylor Principle
    - $\alpha > 0$ so that $\delta > 1$
  - Dual Mandate
    - $\gamma > 0$

What Type of Rules Based Policy?

- Taylor Rules
  - $i_t = \pi_t + \alpha(\pi_t - \pi^*) + \gamma y_t + R^*$
- Balanced if $\alpha = \gamma$
  - $\alpha = \gamma = 0.5$ in Taylor (1993)
- Inflation Gap Tilting if $\alpha > \gamma$
  - $\alpha = 1.0$ and $\gamma = 0.5$
- Output Gap Tilting if $\alpha < \gamma$
  - $\alpha = 0.5$ and $\gamma = 1.0$ in Yellen (2012)

What Type of Rules Based Policy?

- Smets and Wouters (2007)
- Calculate Loss Functions for Policy Rules

$$Loss = Var(\pi) + Var\ (\mathrm{y}) + Var(\Delta i)$$

  - α and γ are Coefficients on the Inflation and Output Gap
  - α and γ between 0.1 and 1.0
  - Equal Weight on Variance of π, y, and Δi in Loss Function
- Lower Loss with $\alpha > \gamma$ in Policy Rule

Smets and Wouters (2007) Model

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
1	*29.97*	*29.45*	*29.40*	*29.76*	*30.46*	*31.45*	*32.69*	*34.15*	35.80	37.61	1
0.9	*29.94*	*29.48*	*29.58*	*30.14*	*31.08*	*32.36*	*33.91*	35.70	37.68	39.84	0.9
0.8	*29.95*	*29.60*	*29.89*	*30.72*	*32.00*	*33.64*	35.59	37.79	40.20	42.78	0.8
0.7	*30.03*	*29.83*	*30.41*	*31.62*	*33.34*	*35.47*	37.94	40.67	43.62	46.73	0.7
0.6	*30.23*	*30.27*	*31.28*	*33.02*	*35.36*	38.16	41.31	44.74	48.38	52.18	0.6
0.5	*30.62*	*31.07*	*32.72*	*35.27*	38.49	42.22	46.32	50.68	55.23	59.90	0.5
0.4	*31.38*	*32.56*	*35.26*	39.05	43.59	48.66	54.07	59.69	65.44	71.23	0.4
0.3	*32.95*	35.51	40.06	45.87	52.45	59.49	66.76	74.10	81.41	88.62	0.3
0.2	36.69	42.21	50.23	59.51	69.35	79.32	89.17	98.76	107.99	116.84	0.2
0.1	48.82	61.39	76.24	91.45	106.16	120.02	132.92	144.85	155.85	165.99	0.1
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	

Inflation gap coefficient, α

Output gap coefficient, γ

What Type of Rules Based Policy?

- FRB-US Model
  - Optimal (Loss Minimizing) Taylor Rule
  - $Loss = \sum_{t=0}^{T} 0.99^t((\pi_t - \pi^*)^2 + (u_t - u^*)^2 + (\Delta i_t)^2)$
- 2015 Vintage of FRB-US Model
  - Calculate Loss Functions with α and γ between 0 and 1
- Opposite Results Compared with Smets and Wouters (2007)

FRB-US Model: Zero bound on the nominal interest rate and R*=2%

Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1	70.54	68.39	66.60	65.14	63.97	63.05	62.36	61.88	61.57	61.44
0.9	70.04	67.86	66.05	64.58	63.40	62.49	61.80	61.33	61.04	60.92
0.8	69.57	67.36	65.52	64.04	62.85	61.95	61.27	*60.81*	*60.53*	*60.42*
0.7	69.13	66.88	65.02	63.52	62.33	61.43	*60.76*	*60.31*	*60.04*	*59.95*
0.6	68.72	66.42	64.53	63.02	61.83	60.93	*60.28*	*59.83*	*59.58*	*59.50*
0.5	68.34	65.99	64.08	62.55	61.36	*60.46*	*59.82*	*59.39*	*59.15*	*59.09*
0.4	67.99	65.59	63.65	62.10	*60.91*	*60.02*	*59.39*	*58.97*	*58.75*	*58.70*
0.3	67.67	65.22	63.25	61.69	*60.50*	*59.61*	*58.98*	*58.58*	*58.37*	*58.33*
0.2	67.39	64.88	62.88	61.31	*60.11*	*59.23*	*58.61*	*58.22*	*58.02*	*58.00*
0.1	67.14	64.58	62.54	60.96	*59.76*	*58.88*	*58.27*	*57.89*	*57.71*	*57.69*
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1

Output gap coefficient, γ

Real-Time Data

- Data from 1965:Q4 – 2018:Q2
- Data from Fed Monetary Policy Report and Webpage
  - Spliced with Alternatives When Real-Time Data Not Available
  - Shadow FFR from Wu and Xia (2016) for 2009 - 2015
- Output Gap, Time-Varying R*, $\pi^* = 2$
  - Unemployment Gap
  - R* = 2 as in Taylor (1993)
  - Time-Varying π^* from Fuhrer and Olivei (2017)

Taylor Rule Deviations with Real-Time Data

- Policy Rule Deviations = Actual FFR – Prescribed FFR
  - Absolute Value
- Nikolsko-Rzhevskyy, Papell, and Prodan (2014)
  - Statistical Methods for Low and High Deviations
- Approximation
  - Low Deviations < 2.0
  - High Deviations > 2.0

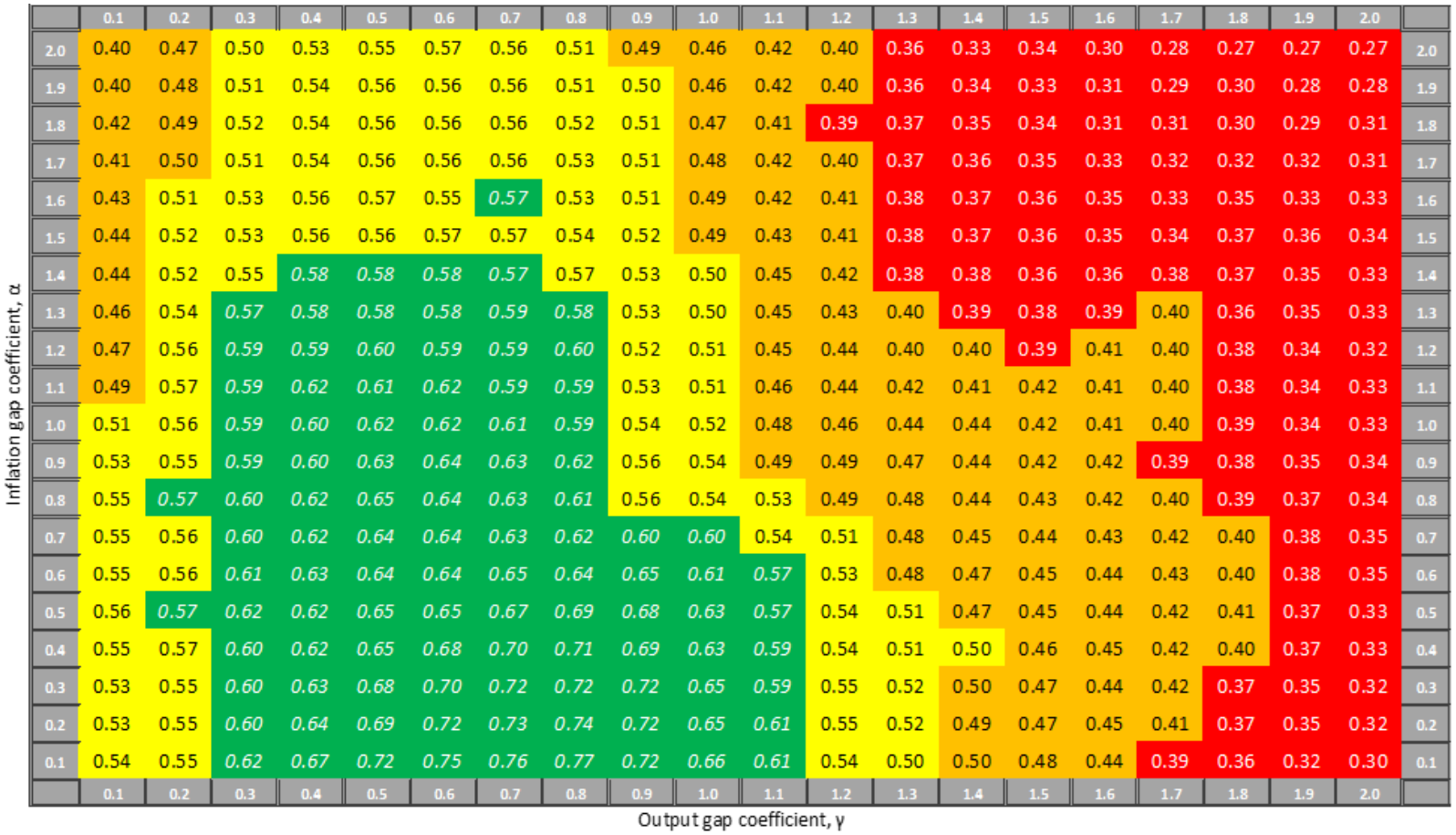
Taylor Rules and Constrained Discretion

- Optimal α and γ
  - Taylor and Wieland (2012)
  - FRB/US Model in Tetlow (2015)
  - Boehm and House (2014)
  - All Coefficients Between 0 and 2
- Estimated α and γ
  - Most Coefficients Between 0 and 1

Taylor Rules and Constrained Discretion

- Relation between Rules and Fed Policy
- Consider all Rules with α and γ between 0 and 2
  - Step Size Equals 0.1
  - Output Gap, Time-Varying R*, $\pi^* = 2$
- Calculate “Share of Time” with Low Deviations
  - Threshold = 2%
  - Low Deviations Periods / Total Periods
  - Low Deviations < 2.0

"Share in Time": 400 policy rules, Threshold = 2%, Time-Varying R*, π^* = 2, Output Gap



Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
2.0	0.40	0.47	0.50	0.53	0.55	0.57	0.56	0.51	0.49	0.46	0.42	0.40	0.36	0.33	0.34	0.30	0.28	0.27	0.27	0.27
1.9	0.40	0.48	0.51	0.54	0.56	0.56	0.56	0.51	0.50	0.46	0.42	0.40	0.36	0.34	0.33	0.31	0.29	0.30	0.28	0.28
1.8	0.42	0.49	0.52	0.54	0.56	0.56	0.56	0.52	0.51	0.47	0.41	0.39	0.37	0.35	0.34	0.31	0.31	0.30	0.29	0.31
1.7	0.41	0.50	0.51	0.54	0.56	0.56	0.56	0.53	0.51	0.48	0.42	0.40	0.37	0.36	0.35	0.33	0.32	0.32	0.32	0.31
1.6	0.43	0.51	0.53	0.56	0.57	0.55	*0.57*	0.53	0.51	0.49	0.42	0.41	0.38	0.37	0.36	0.35	0.33	0.35	0.33	0.33
1.5	0.44	0.52	0.53	0.56	0.56	0.57	0.57	0.54	0.52	0.49	0.43	0.41	0.38	0.37	0.36	0.35	0.34	0.37	0.36	0.34
1.4	0.44	0.52	0.55	*0.58*	*0.58*	*0.58*	*0.57*	0.57	0.53	0.50	0.45	0.42	0.38	0.38	0.36	0.36	0.38	0.37	0.35	0.33
1.3	0.46	0.54	*0.57*	*0.58*	*0.58*	*0.58*	*0.59*	*0.58*	0.53	0.50	0.45	0.43	0.40	0.39	0.38	0.39	0.40	0.36	0.35	0.33
1.2	0.47	0.56	*0.59*	*0.59*	*0.60*	*0.59*	*0.59*	*0.60*	0.52	0.51	0.45	0.44	0.40	0.40	0.39	0.41	0.40	0.38	0.34	0.32
1.1	0.49	0.57	*0.59*	*0.62*	*0.61*	*0.62*	*0.59*	*0.59*	0.53	0.51	0.46	0.44	0.42	0.41	0.42	0.41	0.40	0.38	0.34	0.33
1.0	0.51	0.56	*0.59*	*0.60*	*0.62*	*0.62*	*0.61*	*0.59*	0.54	0.52	0.48	0.46	0.44	0.44	0.42	0.41	0.40	0.39	0.34	0.33
0.9	0.53	0.55	*0.59*	*0.60*	*0.63*	*0.64*	*0.63*	*0.62*	0.56	0.54	0.49	0.49	0.47	0.44	0.42	0.42	0.39	0.38	0.35	0.34
0.8	0.55	*0.57*	*0.60*	*0.62*	*0.65*	*0.64*	*0.63*	*0.61*	0.56	0.54	0.53	0.49	0.48	0.44	0.43	0.42	0.40	0.39	0.37	0.34
0.7	0.55	0.56	*0.60*	*0.62*	*0.64*	*0.64*	*0.63*	*0.62*	*0.60*	*0.60*	0.54	0.51	0.48	0.45	0.44	0.43	0.42	0.40	0.38	0.35
0.6	0.55	0.56	*0.61*	*0.63*	*0.64*	*0.64*	*0.65*	*0.64*	*0.65*	*0.61*	*0.57*	0.53	0.48	0.47	0.45	0.44	0.43	0.40	0.38	0.35
0.5	0.56	*0.57*	*0.62*	*0.62*	*0.65*	*0.65*	*0.67*	*0.69*	*0.68*	*0.63*	*0.57*	0.54	0.51	0.47	0.45	0.44	0.42	0.41	0.37	0.33
0.4	0.55	0.57	*0.60*	*0.62*	*0.65*	*0.68*	*0.70*	*0.71*	*0.69*	*0.63*	*0.59*	0.54	0.51	0.50	0.46	0.45	0.42	0.40	0.37	0.33
0.3	0.53	0.55	*0.60*	*0.63*	*0.68*	*0.70*	*0.72*	*0.72*	*0.72*	*0.65*	*0.59*	0.55	0.52	0.50	0.47	0.44	0.42	0.37	0.35	0.32
0.2	0.53	0.55	*0.60*	*0.64*	*0.69*	*0.72*	*0.73*	*0.74*	*0.72*	*0.65*	*0.61*	0.55	0.52	0.49	0.47	0.45	0.41	0.37	0.35	0.32
0.1	0.54	0.55	*0.62*	*0.67*	*0.72*	*0.75*	*0.76*	*0.77*	*0.72*	*0.66*	*0.61*	0.54	0.50	0.50	0.48	0.44	0.39	0.36	0.32	0.30

Output gap coefficient, γ

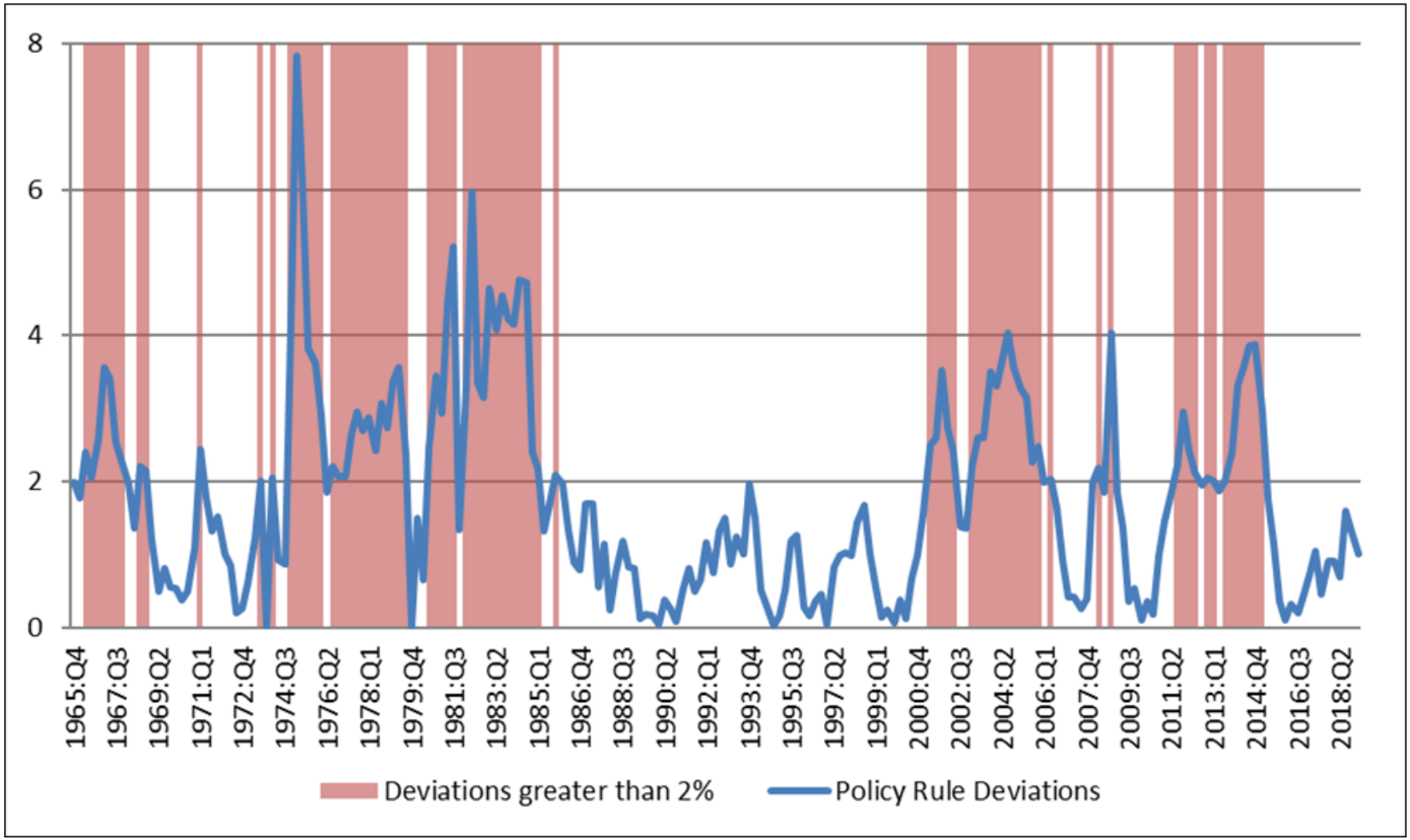
Taylor Rules and Constrained Discretion

- Two sets of “Plausible” Policy Rules
- $0 < \alpha \leq 1, 0 < \gamma \leq 1$
  - Accords with “Share of Time” and Most Estimates
- $0 < \alpha \leq 2, 0 < \gamma \leq 2$
  - Accords with Optimal Rules and Some Estimates

Policy Rules and Economic Performance

- Quadratic Loss Functions
  - Loss = $\Sigma ((\pi - \pi^*)^2 + (U - U^*)^2)$
  - Loss Independent of Rule
- Loss Ratios
  - For a Given Policy Rule
  - Average Loss in High Deviations Periods Divided by Average Loss in Low Deviations Periods
- Metric to Evaluate Policy Rules
  - Loss Ratio > 1 is the Minimal Criterion for a Good Rule
  - Higher Loss Ratio is Better

Deviations from the Original Taylor Rule



Policy Rules and Economic Performance

- Consider Rules with α and γ between 0 and 1 and 0 and 2
  - Step Size Equals 0.1
- Calculate Loss Ratios for High and Low Deviations Periods
- Benchmark and Other Specifications
  - Equal Weights on Inflation and Unemployment Loss
    - (1.25 - 0.75 and 1.5 – 0.5 for π and U)
  - Output Gap (Unemployment Gap)
  - Time-Varying R* (R* = 2)
  - π^* = 2 (Time-Varying π^*)
  - Threshold for Deviations = 2.0 (1.5 and 2.5)
  - Policy Lag of 6 Quarters (4 and 8)

Loss Ratios: R*=Time-Varying, π*= 2%, Output Gap

Panel A: Inflation Gap α and Output Gap γ Coefficients Range [0,1]

Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.0	*3.29*	*3.17*	*3.33*	*3.46*	*3.44*	*3.87*	*3.84*	*4.33*	*5.59*	*4.79*
0.9	*3.04*	*3.11*	*3.11*	*3.30*	*3.29*	*2.96*	*3.39*	*3.33*	*3.63*	*3.50*
0.8	2.53	2.54	2.63	*2.76*	*3.16*	*3.10*	*3.10*	*3.31*	*4.12*	*3.46*
0.7	2.54	2.56	2.67	*2.92*	*3.10*	*3.27*	*3.54*	*2.93*	*3.06*	2.62
0.6	2.27	2.37	2.54	2.73	*3.03*	*3.06*	*3.12*	*2.76*	2.25	2.06
0.5	1.93	2.00	2.07	2.56	*2.82*	*2.93*	*3.01*	2.39	2.15	1.82
0.4	1.88	2.08	2.11	2.36	2.47	2.40	2.36	2.26	2.23	1.85
0.3	1.98	1.87	1.82	1.96	1.99	1.97	2.09	1.99	1.95	1.48
0.2	1.65	1.74	1.75	1.83	1.79	1.80	1.67	1.80	1.75	1.43
0.1	1.13	1.21	1.26	1.26	1.39	1.38	1.28	1.37	1.58	1.31
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

Output gap coefficient, γ

Benchmark Specification

- Coefficients Between 0 and 1
- Economic Performance is Better in Low Deviations Periods
  - Loss Ratio >1 for All Rules (Not Robust)
  - Average Loss Ratio = 2.53
- Performance Better with Inflation Gap Tilting Rules
  - Relative Loss Ratio = 1.37

Loss Ratios: R*=Time-Varying, π*= 2%, Output Gap

Panel B: Inflation Gap α and Output Gap γ Coefficients Range [0,2]

Inflation gap coefficient, α \ Output gap coefficient, γ	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
2.0	6.66	5.68	6.56	7.14	7.53	7.06	7.41	7.97	7.68	8.20	7.96	7.91	7.19	6.67	5.08	4.65	4.31	3.00	2.38	2.09
1.9	7.04	5.84	6.62	7.25	7.50	7.00	7.38	7.91	7.90	8.10	8.38	7.91	7.19	6.23	5.01	4.08	3.41	2.68	2.30	2.12
1.8	4.98	6.08	6.75	7.11	7.41	7.03	7.18	8.07	7.87	8.24	8.36	7.80	5.86	5.05	4.42	3.59	2.77	2.51	2.21	2.16
1.7	5.14	4.75	6.47	6.90	7.30	6.96	7.05	8.03	7.87	8.43	7.35	6.41	5.91	4.40	3.95	3.16	2.96	2.51	2.07	2.10
1.6	5.34	4.87	5.22	7.24	7.47	6.86	7.16	8.19	7.27	6.76	6.92	6.64	4.82	4.32	3.73	2.81	2.40	2.32	2.08	1.73
1.5	5.33	4.91	5.13	7.24	6.95	7.00	6.45	7.60	6.97	6.78	6.17	5.79	4.18	3.70	2.92	2.53	2.49	2.09	1.78	1.61
1.4	4.35	5.10	5.39	5.46	6.50	6.64	6.77	7.34	5.77	5.66	5.49	5.04	4.18	3.17	2.79	2.30	2.21	1.95	1.82	1.72
1.3	3.47	3.45	5.23	5.59	5.27	5.96	5.64	6.01	5.78	5.66	5.49	4.85	3.25	2.80	2.38	2.46	2.14	1.93	1.82	1.80
1.2	3.38	3.62	3.65	4.25	4.91	5.58	5.64	6.22	5.79	5.17	4.87	3.86	3.13	2.76	2.75	2.14	2.14	2.05	1.87	1.79
1.1	3.24	3.43	3.59	3.64	3.91	4.07	5.66	5.59	5.36	4.91	4.54	3.87	3.01	2.84	2.22	2.06	1.96	2.09	1.75	1.61
1.0	3.29	3.17	3.33	3.46	3.44	3.87	3.84	4.33	5.59	4.79	3.86	3.51	2.67	2.24	2.29	1.97	1.86	1.71	1.65	1.64
0.9	3.04	3.11	3.11	3.30	3.29	2.96	3.39	3.33	3.63	3.50	3.40	2.75	2.42	2.16	2.04	1.81	1.87	1.86	1.61	1.54
0.8	2.53	2.54	2.63	2.76	3.16	3.10	3.10	3.31	4.12	3.46	2.55	2.20	2.24	2.04	1.98	2.02	1.96	1.68	1.55	1.44
0.7	2.54	2.56	2.67	2.92	3.10	3.27	3.54	2.93	3.06	2.62	2.29	1.91	1.70	1.61	1.63	1.51	1.44	1.41	1.29	1.17
0.6	2.27	2.37	2.54	2.73	3.03	3.06	3.12	2.76	2.25	2.06	2.03	1.78	1.53	1.44	1.34	1.28	1.55	1.39	1.32	1.18
0.5	1.93	2.00	2.07	2.56	2.82	2.93	3.01	2.39	2.15	1.82	1.92	1.83	1.51	1.43	1.33	1.33	1.29	1.20	1.40	1.27
0.4	1.88	2.08	2.11	2.36	2.47	2.40	2.36	2.26	2.23	1.85	1.47	1.63	1.56	1.33	1.23	1.15	1.27	1.17	1.10	1.01
0.3	1.98	1.87	1.82	1.96	1.99	1.97	2.09	1.99	1.95	1.48	1.36	1.25	1.43	1.39	1.36	1.31	1.25	1.13	1.08	1.02
0.2	1.65	1.74	1.75	1.83	1.79	1.80	1.67	1.80	1.75	1.43	1.23	1.10	1.06	1.34	1.47	1.35	1.26	1.08	1.01	1.05
0.1	1.13	1.21	1.26	1.26	1.39	1.38	1.28	1.37	1.58	1.31	1.22	1.13	1.06	1.20	1.20	1.17	1.12	1.18	1.18	1.21

Benchmark Specification

- Coefficients Between 0 and 2
- Economic Performance is Better in Low Deviations Periods
  - Loss Ratio >1 for all Rules
  - Average Loss Ratio = 3.50
- Performance Better with Inflation Gap Tilting Rules
  - Relative Loss Ratio = 2.78

Relative Loss Ratios for R*=Time-Varying, π*=2%, Output Gap

	Inflation Gap Tilting Rules/Output Gap Tilting Rules Ratio	
Inflation α and Output Gap γ Coefficients Range	[0, 1]	[0, 2]
Equal Weights on Inflation and Unemployment Loss. Threshold = 2%		
Policy Lag = 6 quarters	1.37***	2.78***
Policy Lag = 4 quarters	1.35***	2.58***
Policy Lag = 8 quarters	1.46***	3.13***
Equal weights on Inflation and Unemployment Loss. Policy Lag = 6 quarters		
Threshold = 2.5%	1.44***	2.74***
Threshold = 1.5%	1.26**	2.65***
Threshold = 2%. Policy Lag = 6 quarters		
1.25:0.75 Inflation and Unemployment Loss Weights	1.51***	3.41***
1.5:0.5 Inflation and Unemployment Loss Weights	1.65***	4.16***
0.75:1.25 Inflation and Unemployment Loss Weights	1.21**	2.24***
0.5:1.5 Inflation and Unemployment Loss Weights	1.04	1.74***

Loss Ratios: R*=Time-Varying, π*= 2%, Unemployment Gap

Panel A: Inflation Gap α and Output Gap γ Coefficients Range [0,1]

Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.0	3.15	3.15	3.07	2.96	3.10	3.08	3.15	2.97	2.80	2.56
0.9	2.88	2.88	2.96	2.64	2.82	2.87	2.73	2.82	2.40	2.15
0.8	2.30	2.61	2.67	2.75	2.80	2.92	2.85	2.70	2.28	2.03
0.7	2.38	2.68	2.70	2.52	2.56	2.64	2.63	2.13	1.98	1.69
0.6	2.16	2.45	2.67	2.49	2.68	2.44	2.19	1.95	1.67	1.62
0.5	1.84	2.04	2.34	2.30	2.47	2.14	1.91	1.68	1.67	1.43
0.4	1.83	2.10	2.21	2.12	1.81	1.67	1.65	1.47	1.48	1.42
0.3	1.84	1.62	1.68	1.44	1.34	1.26	1.29	1.14	1.23	1.19
0.2	1.44	1.42	1.01	0.96	0.99	1.07	1.08	1.00	0.97	0.96
0.1	0.94	0.89	0.90	0.89	0.96	1.06	1.02	1.02	1.01	1.06
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

Output gap coefficient, γ

Loss Ratios: R*=2, π*= 2%, Output Gap

Panel A: Inflation Gap α and Output Gap γ Coefficients Range [0,1]

Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.0	1.69	1.82	*2.10*	*2.15*	*2.39*	*2.50*	*2.76*	*2.77*	*2.63*	*2.66*
0.9	1.54	1.89	*2.11*	*2.20*	*2.38*	*2.48*	*2.66*	*2.56*	*2.64*	*2.23*
0.8	1.65	1.87	*2.02*	*2.31*	*2.27*	*2.41*	*2.57*	*2.55*	*2.11*	*1.93*
0.7	1.52	1.60	1.85	*2.04*	*2.19*	*2.21*	*2.21*	*2.25*	*2.09*	1.77
0.6	1.51	1.67	1.59	1.82	*2.04*	*2.22*	*2.08*	*2.04*	*2.02*	1.71
0.5	1.38	1.53	1.72	*1.98*	*2.21*	*1.98*	1.86	*1.92*	*1.91*	1.67
0.4	1.30	1.34	1.63	1.79	1.81	1.80	1.70	1.57	1.63	1.40
0.3	1.30	1.19	1.26	1.42	1.47	1.46	1.47	1.57	1.59	1.24
0.2	0.91	0.94	0.82	0.84	0.88	1.01	1.15	1.14	1.23	1.18
0.1	0.84	0.88	0.91	0.88	0.97	1.11	1.21	1.24	1.32	1.28
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

Output gap coefficient, γ

Loss Ratios: R*=Time-Varying, π*=Time-Varying, Output Gap

Panel A: Inflation Gap α and Output Gap γ Coefficients Range [0,1]

Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.0	1.74	1.95	2.07	2.22	2.36	2.46	2.17	2.13	1.95	1.79
0.9	1.67	1.74	1.88	2.21	2.36	2.36	2.21	2.17	1.98	1.67
0.8	1.76	1.89	2.07	2.25	2.28	2.17	2.20	2.25	1.96	1.63
0.7	1.60	1.61	1.96	2.30	2.33	2.18	2.26	2.13	1.80	1.71
0.6	1.60	1.76	1.90	2.05	2.18	2.27	2.22	1.96	1.86	1.72
0.5	1.76	1.79	1.91	1.95	2.09	1.91	1.68	1.61	1.62	1.51
0.4	1.59	1.56	1.79	1.67	1.71	1.71	1.63	1.63	1.58	1.51
0.3	1.66	1.52	1.50	1.51	1.72	1.69	1.52	1.60	1.61	1.66
0.2	1.22	1.20	1.16	1.23	1.42	1.74	1.59	1.56	1.53	1.33
0.1	0.97	1.09	1.07	1.19	1.40	1.44	1.34	1.37	1.30	1.21
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

Output gap coefficient, γ

Perspectives

- Better Performance with Inflation Gap Tilting Rules
- Theory
  - Woodford (2003)
    - Optimal Taylor Rule Depends on All Parameters
    - Flexible Inflation Targeting (Page 531)
    - Coefficient on π > Coefficient on y in Taylor Rule *iff*
      - Coefficient on Expected π > Coefficient on y in NKPC
  - Accords with Mavroeidis, Plagborg-Moller and Stock (2014)
    - Survey of NKPC Estimates

Perspectives

- Uncertainty and Misperception
- Orphanides and Williams (2007)
  - Uncertainty in Measuring Output Gaps
  - More Subject to Revision than Inflation
  - Stronger Response to Inflation
- Laubach and Williams (2015)
  - Uncertainty in Measuring R*
  - Intercept Changes One-for-One with Changes in R*
  - Strong Response to Inflation to Reduce Influence of Intercept

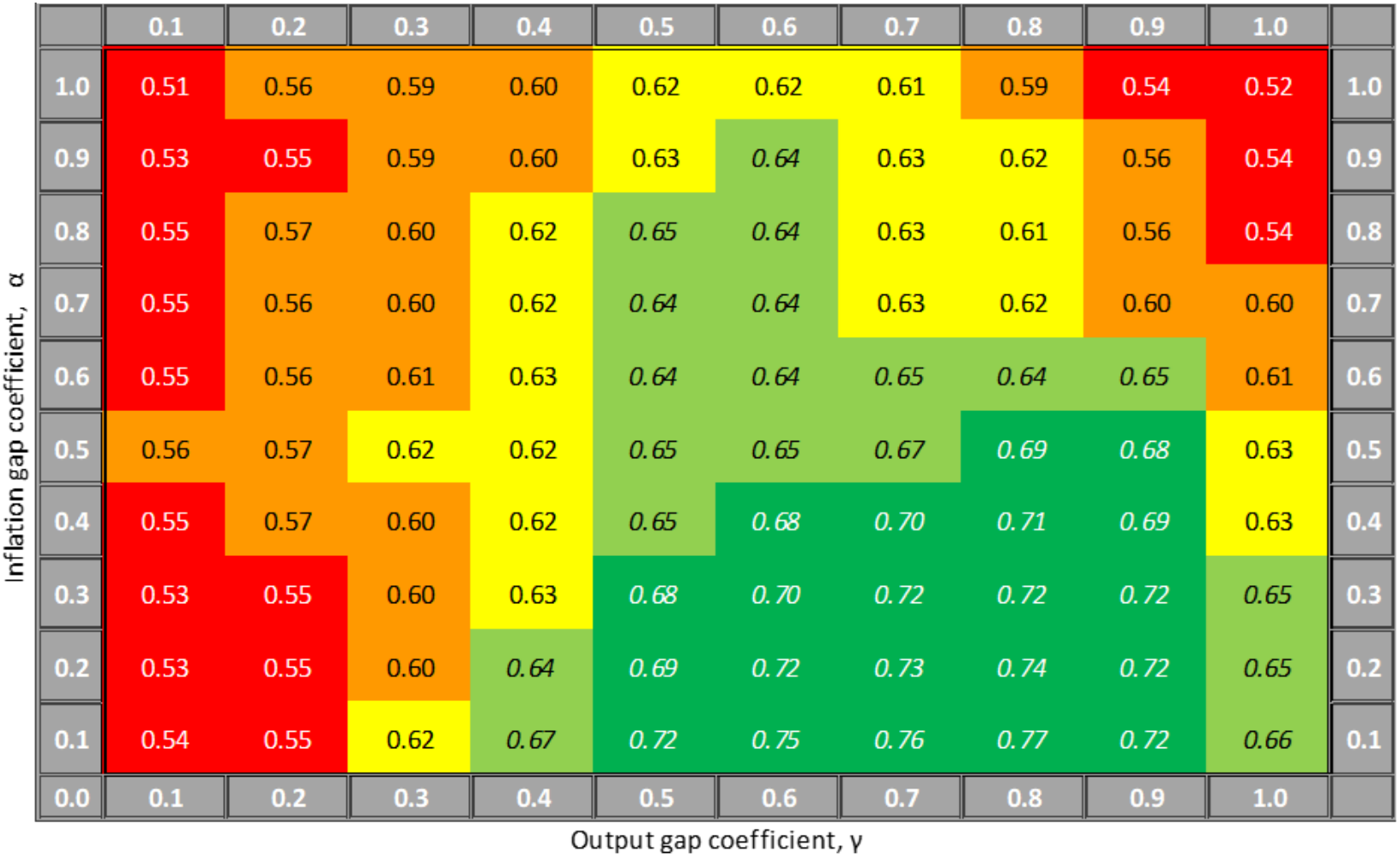
Perspectives

- Bullard (2018)
  - "Modernized" Policy Rule
    - Strongly Inflation Gap Tilting
    - Time-Varying R*
    - $\alpha = 0.5$ and $\gamma = 0.1$
    - Fourth Quintile
  - Modification with $\alpha = 1.0$ and $\gamma = 0.2$
    - Equally Inflation Gap Tilting
    - Second Quintile

Fed Policy

- Consider Rules with α and γ between 0 and 1
  - $\pi^* = R^* = 2$
- Low Deviations < 2.0
- High Deviations > 2.0
- Calculate Share of Time with Low Deviations
- Fed Policy Tilted Towards Output Gap Stabilization

Share of Time in the Rules Regime: 100 policy rules, R*=Time-Varying, π*=2%, Output gap



Inflation gap coefficient, α	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.0	0.51	0.56	0.59	0.60	0.62	0.62	0.61	0.59	0.54	0.52
0.9	0.53	0.55	0.59	0.60	0.63	*0.64*	0.63	0.62	0.56	0.54
0.8	0.55	0.57	0.60	0.62	*0.65*	*0.64*	0.63	0.61	0.56	0.54
0.7	0.55	0.56	0.60	0.62	*0.64*	*0.64*	0.63	0.62	0.60	0.60
0.6	0.55	0.56	0.61	0.63	*0.64*	*0.64*	*0.65*	*0.64*	*0.65*	0.61
0.5	0.56	0.57	0.62	0.62	*0.65*	*0.65*	*0.67*	*0.69*	*0.68*	0.63
0.4	0.55	0.57	0.60	0.62	*0.65*	*0.68*	*0.70*	*0.71*	*0.69*	0.63
0.3	0.53	0.55	0.60	0.63	*0.68*	*0.70*	*0.72*	*0.72*	*0.72*	*0.65*
0.2	0.53	0.55	0.60	*0.64*	*0.69*	*0.72*	*0.73*	*0.74*	*0.72*	*0.65*
0.1	0.54	0.55	0.62	*0.67*	*0.72*	*0.75*	*0.76*	*0.77*	*0.72*	*0.66*
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

Output gap coefficient, γ

Conclusions

- Monetary Policy Evaluation with Taylor Rules
  - We Propose Outcomes-Based Measure of Rules
  - Rules Consistent with Constrained Discretion
- Rules that Produce Better Results
  - Higher Coefficient on Inflation than Output Gap
- Accords with Theory and Model Simulations
- The Fed Should “Constrain” Constrained Discretion

Implementation

- Monetary Policy Reports for 2017 - 2019
  - Taylor Rules with Time-Varying R* and Unemployment Gap
  - Taylor (1993) Balanced and Yellen (2012) Output Gap Tilting
- Add Inflation Gap Tilting Rule to Monetary Policy Report
  - α = 1.0 and γ = 0.5 Obvious Choice
  - Top Quintile for All Four Specifications
- Balanced Rule
  - Top Quintile for One and Second Quintile for Three Specifications
- Output Gap Tilting Rule
  - Fourth Quintile for all Four Specifications