Rules and Discretion: An Empirical Assessment

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Federal Reserve Bank of Boston Annual Conference

October 13, 2017

Fuhrer and Olivei Monetary Policy Reaction Function

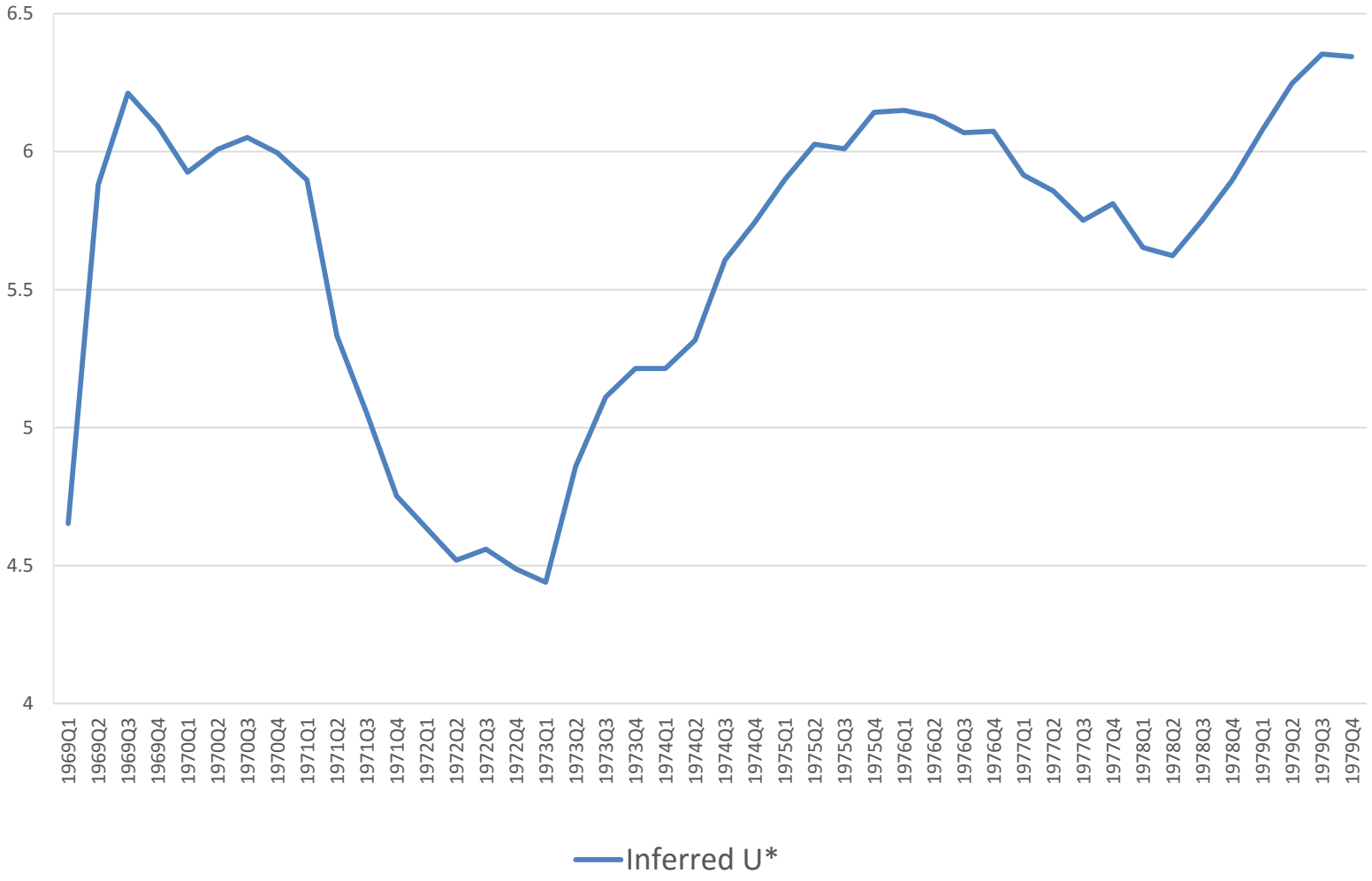
$$ff_t = \rho_1 ff_{t-1} + \rho_2 ff_{t-2} + (1-\rho_1-\rho_2)[r_t^* + \pi_t^* + \alpha_\pi(\pi_{t,t+4}^{4,f} - \pi_t^*) + \alpha_u(u_{t,t+4}^f - u_t^*) + \alpha_{dY}(\Delta y_{t,t+4}^{4f} - \Delta y_t^*)] + \varepsilon_t^{MP}$$

- Estimated for 1969:1 – 1979:3 and 1983:1 – 2007:4
- Inflation, Unemployment, and Output Growth Forecasts
- Estimated Values for Unobservables r_t^* , π_t^* , u_t^* , and Δy_t^*
- Two Lags of the Federal Funds Rate
- Estimates are the Systematic Component of Monetary Policy
- ε_t^{MP} Measures Discretionary Monetary Policy

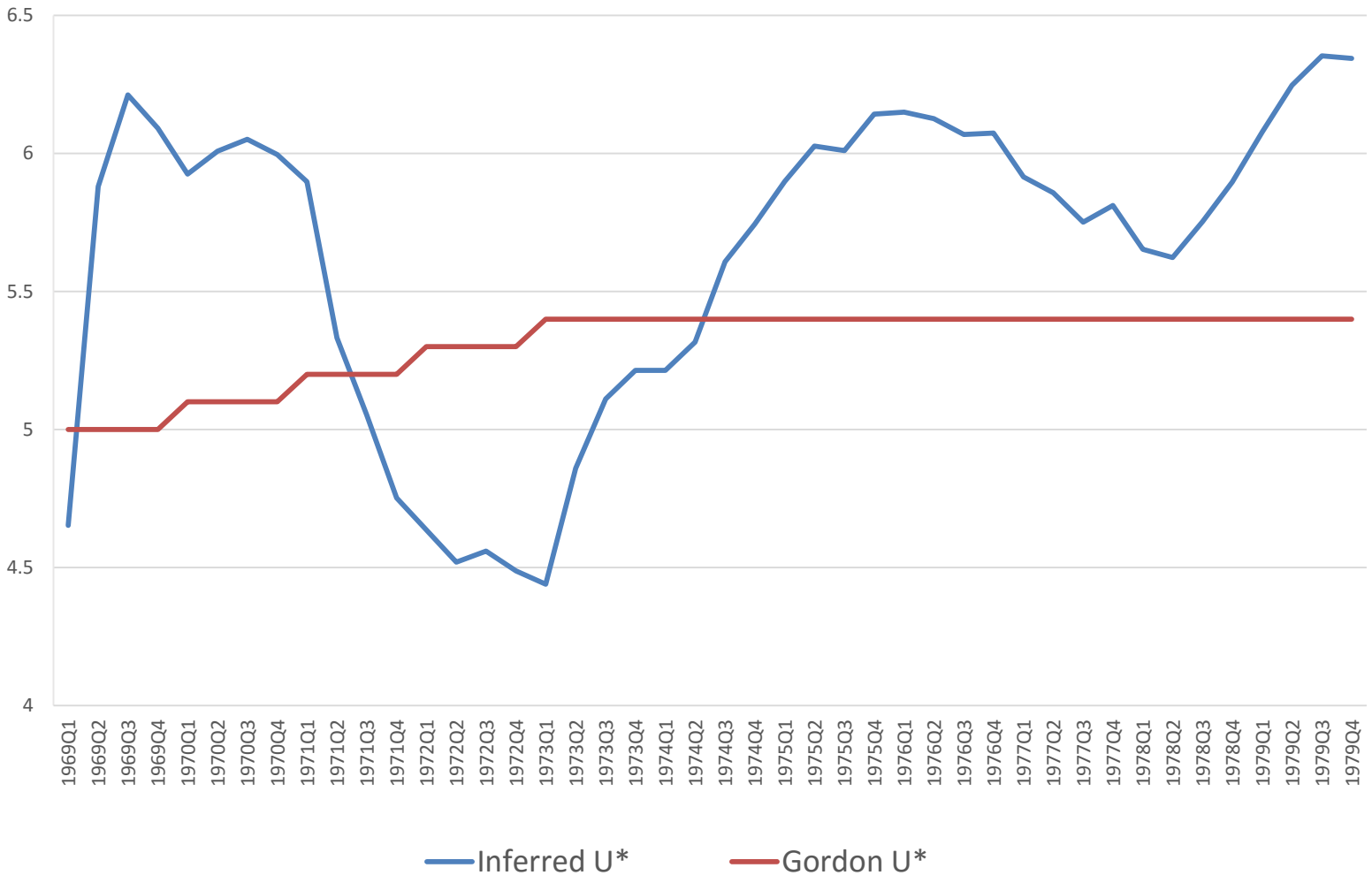
Estimated Unobservables

- Real-Time Data
  - Known to FOMC Members at Time of Meetings
  - Revised Data Can Be Very Misleading
- Estimated Unobservables
  - Problematic for Y* Before 1987 (Greenbook and CBO Data)
  - Not Sufficient to Use Real-Time Data
  - Need a Real-Time Measure

Natural Rate of Unemployment



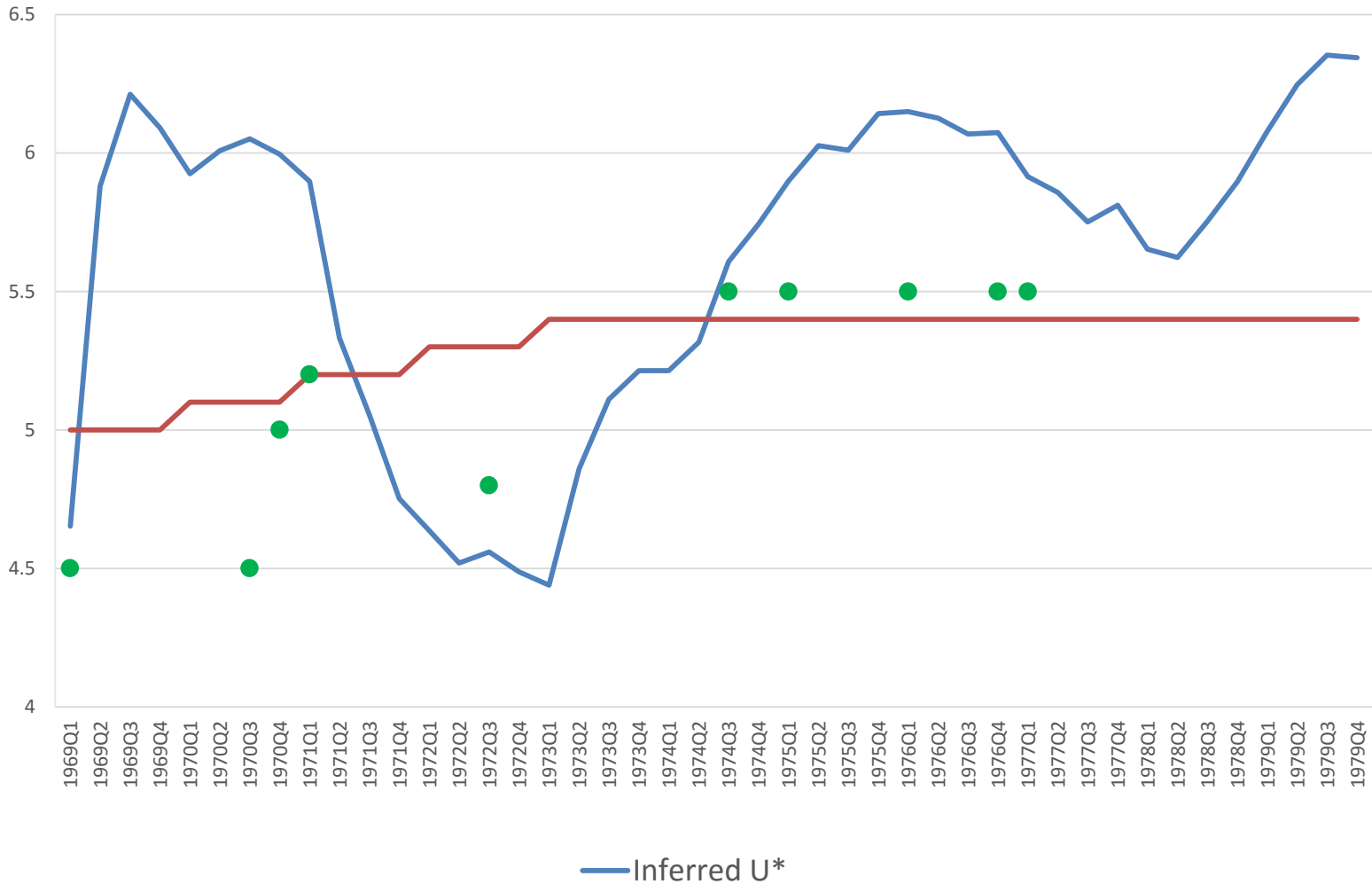
Natural Rate of Unemployment



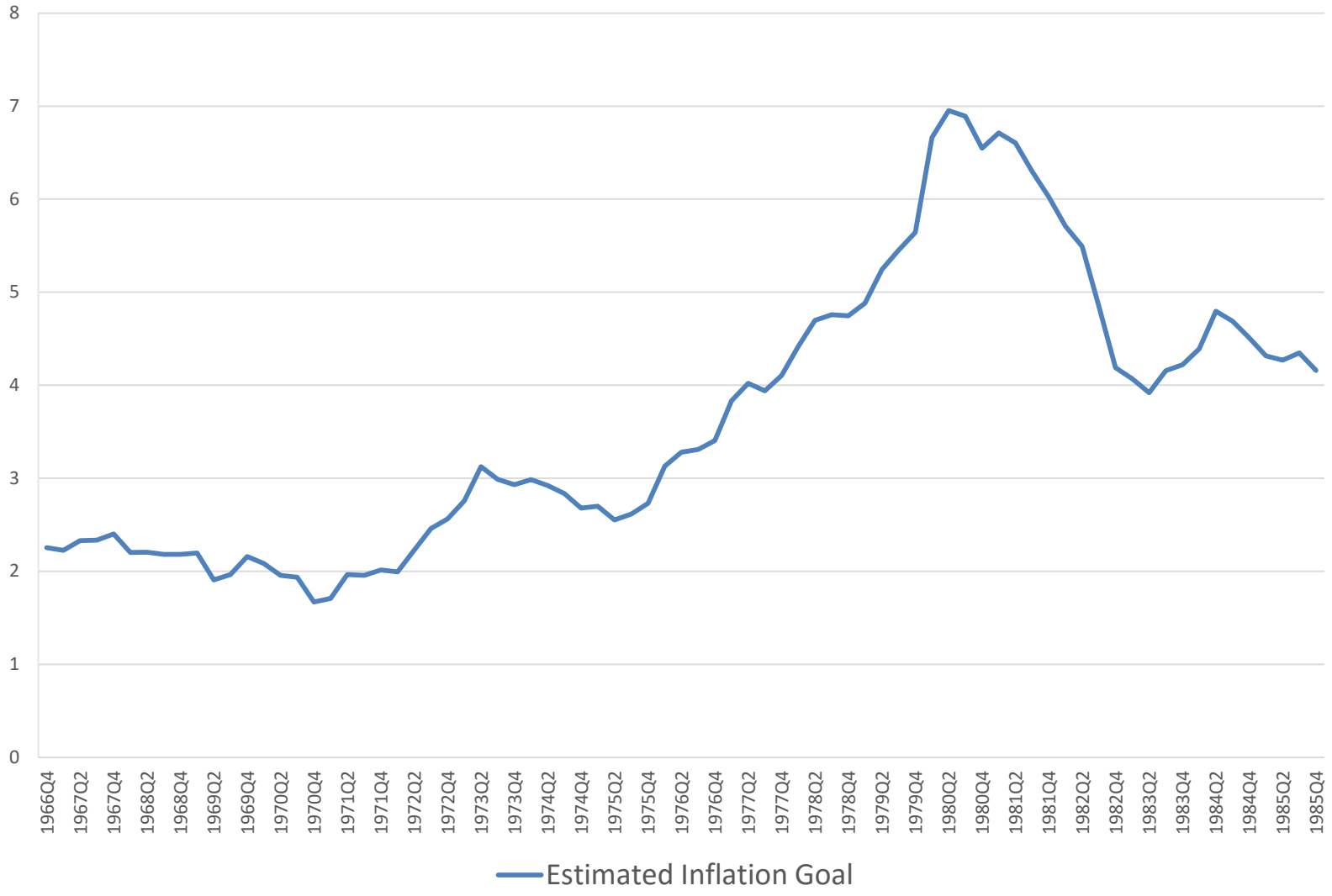
Research on U* in the 1970's

Source	Natural Rate
Task Force on Inflation (1969)	4.5%
Hall (1970)-BPEA	4.5%
Perry (1970)	5.0%
Gordon (1971)	5.2%
Gordon (1972)	4.8%
Hall (1974)	5.5%
Modigliani and Papademos (1975)	5.5%
Wachter (1976)	5.5%
Gordon (1976) - CR	5.5%
Economic Report of the President (1977)	5.5%

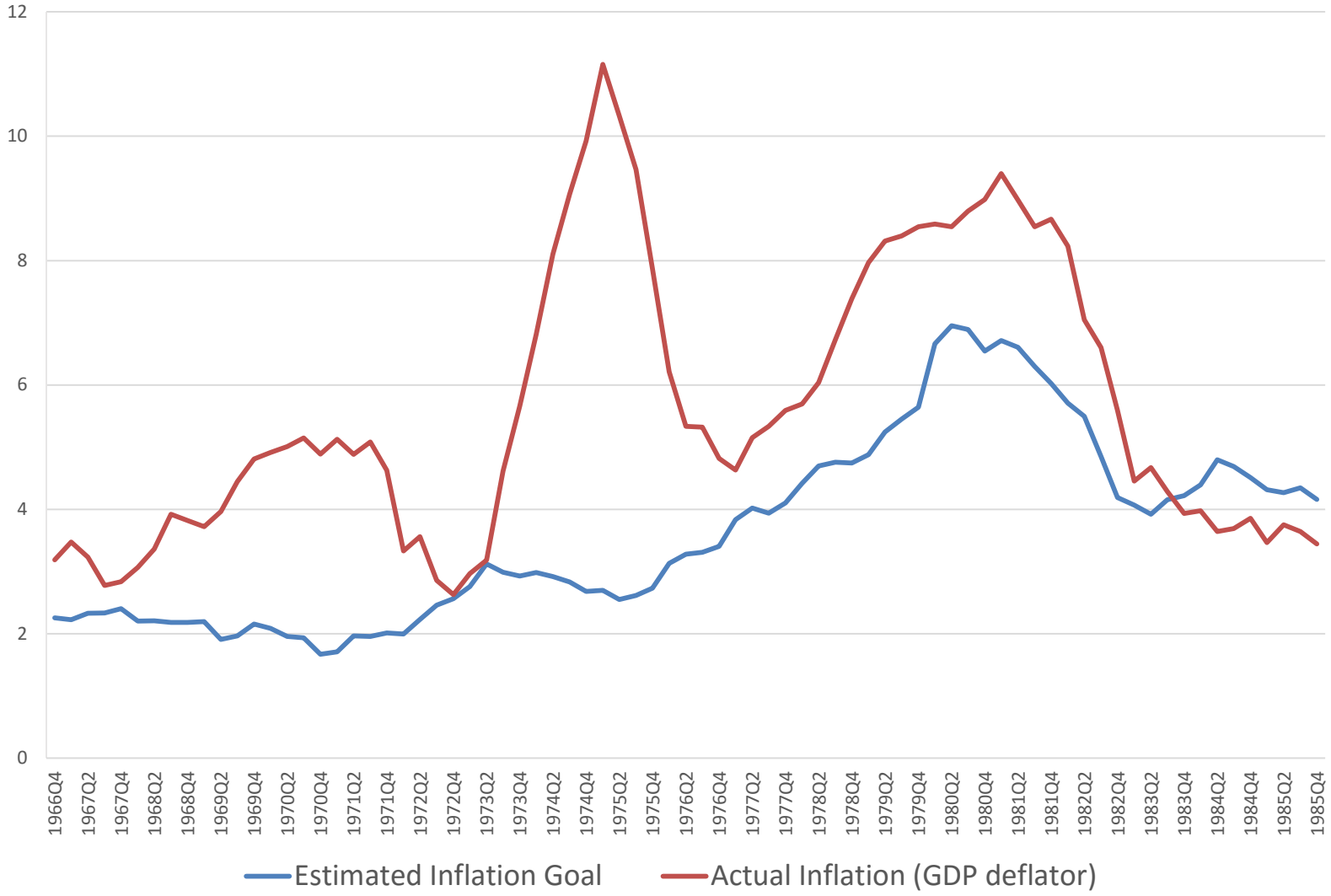
Natural Rate of Unemployment



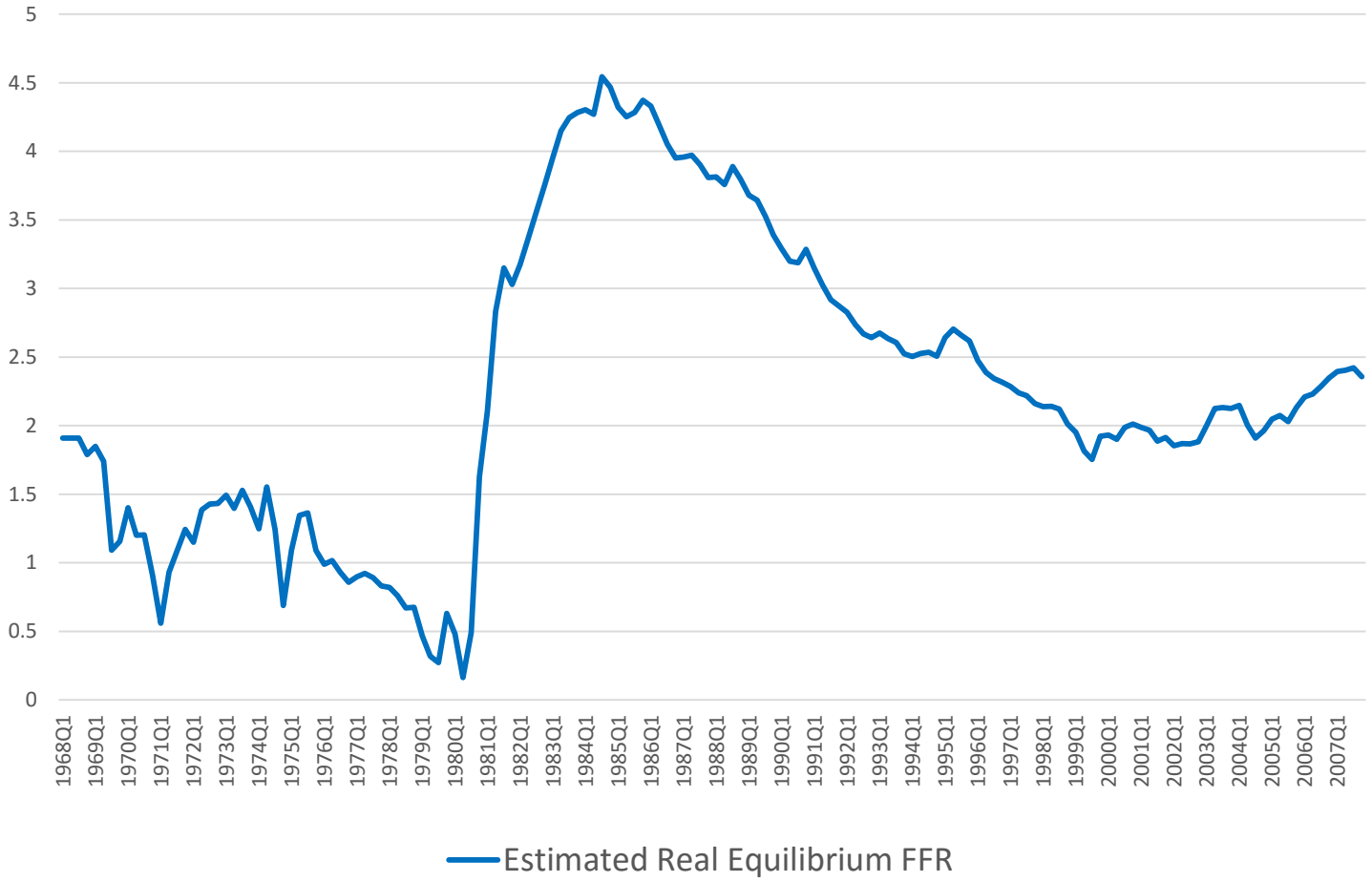
Inflation Goal



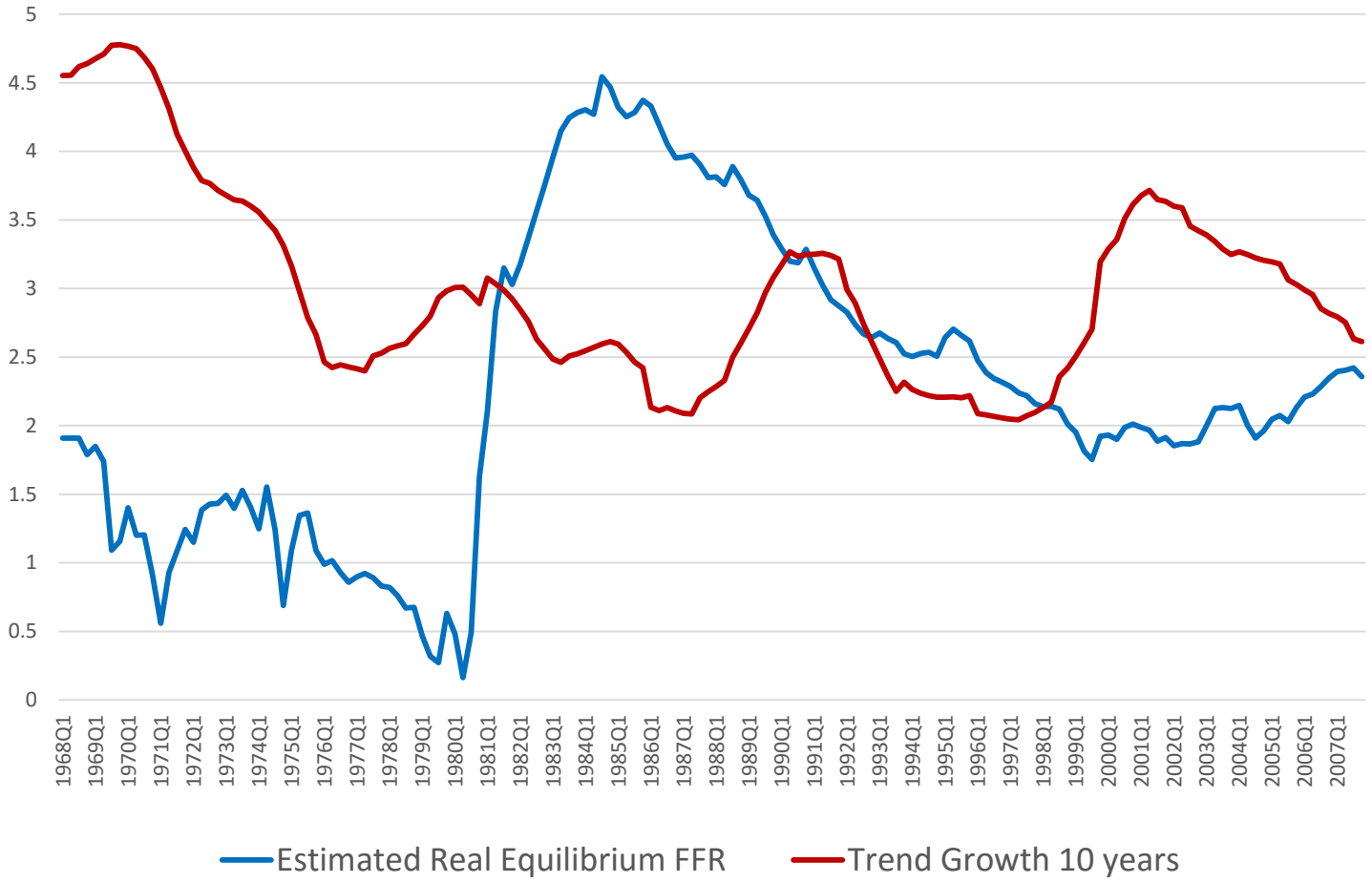
Inflation and Inflation Goal



Equilibrium Real Federal Funds Rate



Equilibrium Real Federal Funds Rate



Fuhrer and Olivei Results

$$ff_t = \rho_1 ff_{t-1} + \rho_2 ff_{t-2} + (1 - \rho_1 - \rho_2)[r_t^* + \pi_t^* + \alpha_\pi(\pi_{t,t+4}^{4,f} - \pi_t^*) + \alpha_u(u_{t,t+4}^f - u_t^*) + \alpha_{dY}(\Delta y_{t,t+4}^{4f} - \Delta y_t^*)] + \varepsilon_t^{MP}$$

- Estimates Similar for 1969:1 – 1979:3 and 1983:1 – 2007:4
  - α_π = 1.83 in 1969 - 1979 and 2.37 in 1983 - 2007
  - α_u = -2.37 in 1969 – 1979 and -3.00 in 1983 – 2007
- Taylor Principle Holds in Both Periods
- Rise of Inflation in the 1970s Not Caused by Failure to Adhere to the Taylor Principle
- Positive Response to Output Gap by Okun's Law

Forecasts and the Taylor Principle in the 1970s

- Nikolsko-Rzhevskyy and Papell (2012)
  - $ff_t = \mu + \alpha_\pi \pi_t + \alpha_y y_t + \rho_1 ff_{t-1} + \varepsilon_t$
- Estimates from 1969 - 1979
- Real-Time Linear Detrended Output Gaps
- Two-Quarter-Ahead Greenbook Inflation Forecasts
  - α_π = 1.61, α_y = 0.68, and ρ_1 = 0.59
- Real-Time Four-Quarter-Average Inflation Rates
  - α_π = 0.95, α_y = 0.70, and ρ_1 = 0.42
- Taylor Principle Not Satisfied

Rules and Discretion

- Fuhrer and Olivei
  - Rules are the Estimates
  - Discretion is the Residuals
- Estimated Policy Reaction Functions are Not Policy Rules
  - Coefficients Measure Average Response Over the Period
  - Do Not Measure Consistent Response Each Period
- Residuals are Not a Measure of Discretion

Rules and Discretion

- Estimates Include Lags of the Federal Funds Rate
- Appropriate for Descriptive Research
  - Better Fit for Actual Policy
- Problematic for Prescriptive Research
- Analysis of Fed Policy with Taylor Rules
  - Taylor (2007), Kohn (2007), Bernanke (2010),
  - Yellen (2012, 2015, 2016, 2017)
- All Policy Rules Without Lags

Rules and Discretion

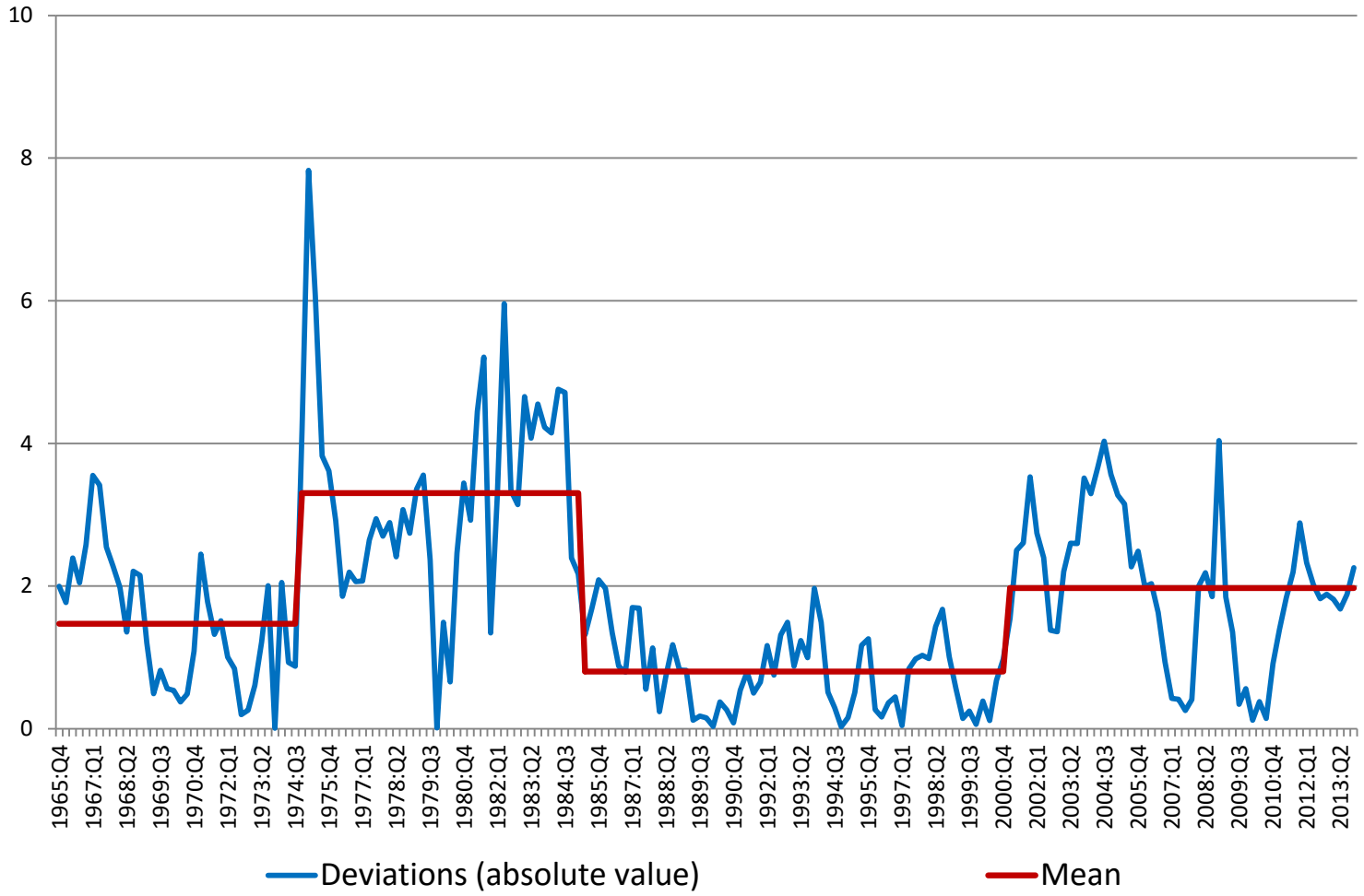
- Methodology to Analyze Rules and Discretion
- Nikolsko-Rzhevskyy, Papell, and Prodan (2014)
  - Choose One or More Monetary Policy Rules
  - Calculate Deviations from Federal Funds Rate
  - Take Absolute Value of the Deviations
- Divide into Rules-Based (Low Deviations) and Discretionary (High Deviations) Eras
- Structural Change Tests
  - Bai and Perron (1998)

Rules and Discretion

- Real-Time Data from 1965:4 – 2013:4
  - Inflation – Annual Rate of Change of the GDP Deflator
  - Output Gap – Quadratic Detrended Real GDP
  - Corresponds Well with Real-Time U* and Okun's Law

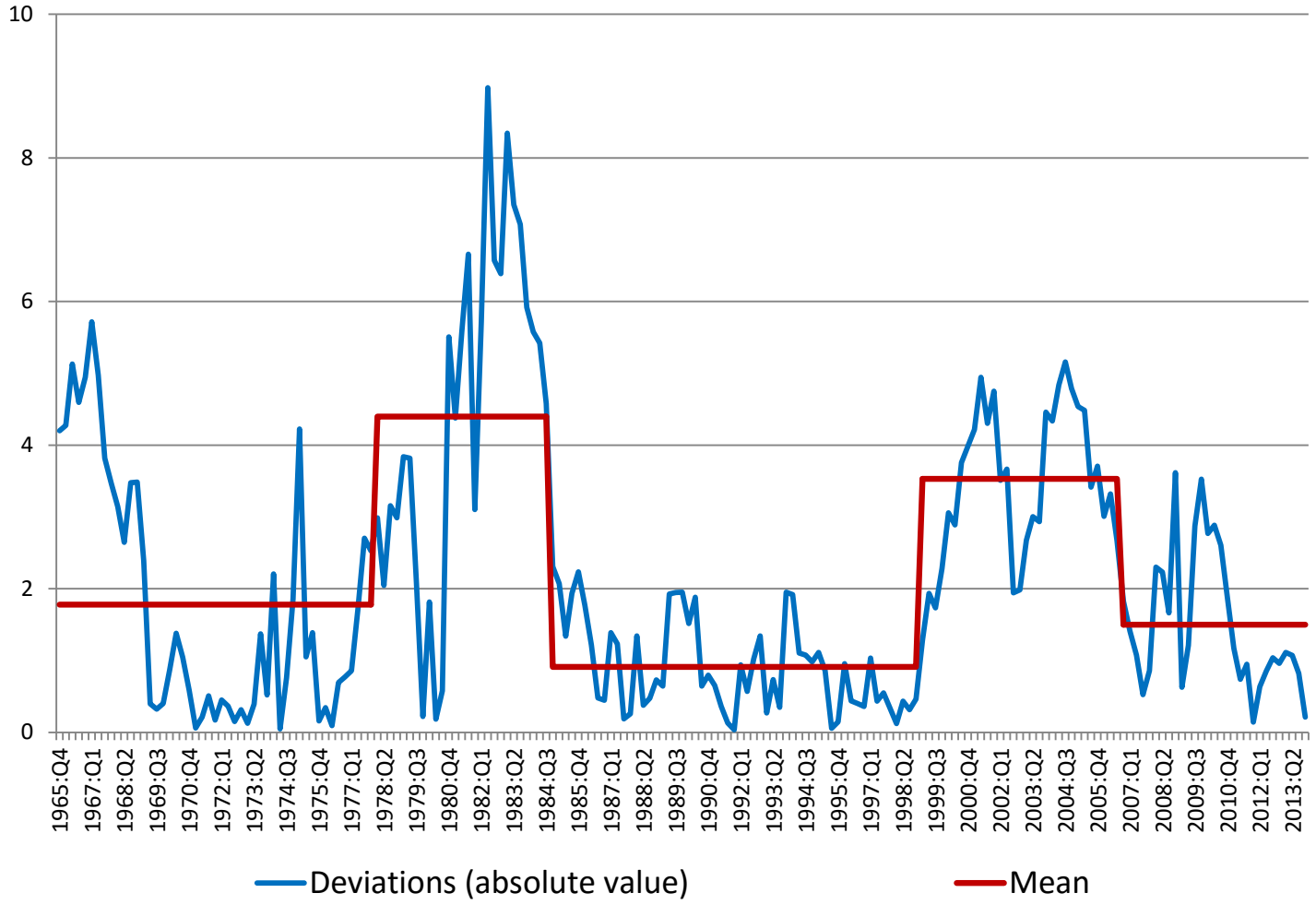
Taylor Rule

$$i_t = 1.0 + 1.5\,\pi_t + 0.5\,y_t$$

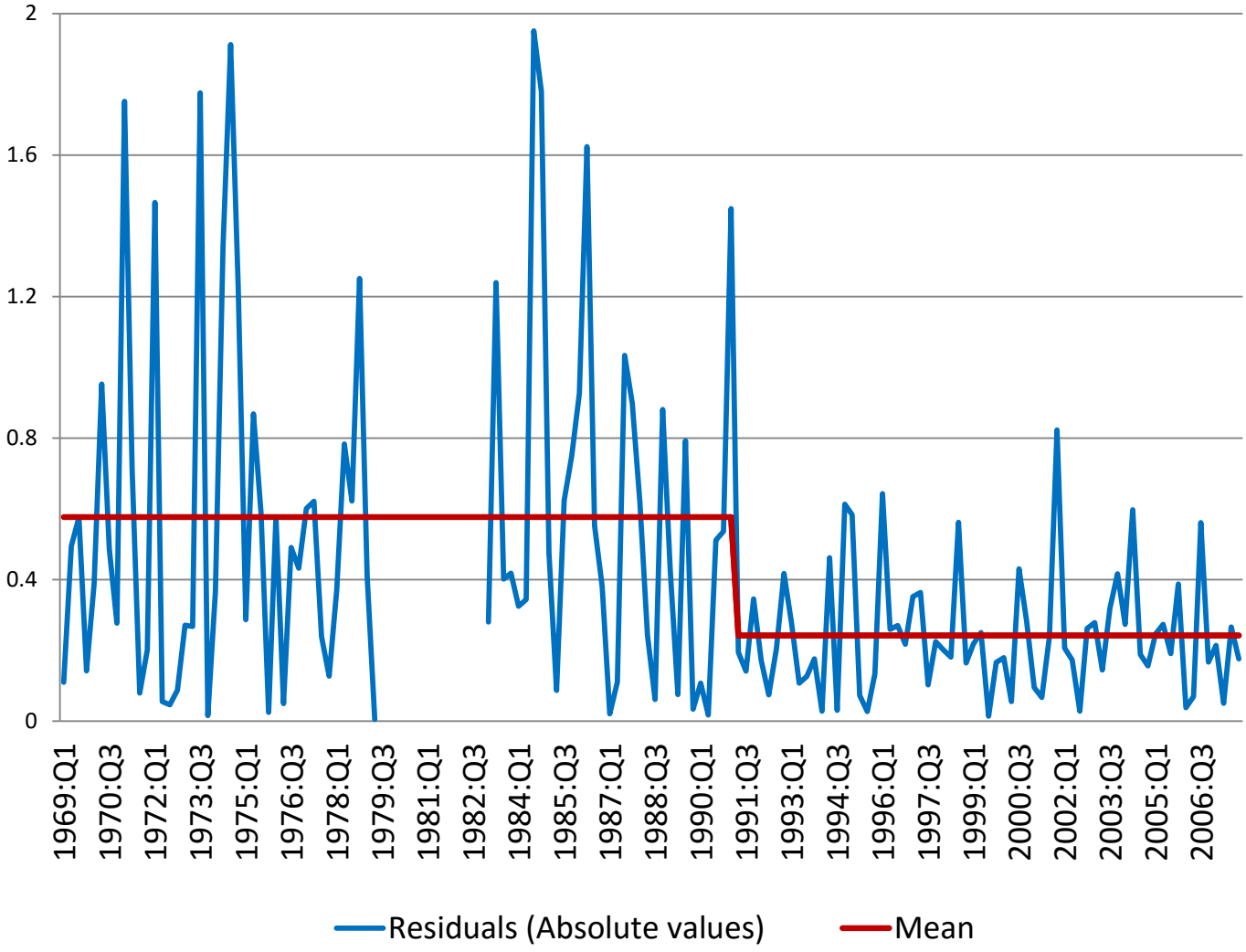


Modified Taylor Rule

$$i_t = 1.0 + 1.5\,\pi_t + 1.0\,y_t$$

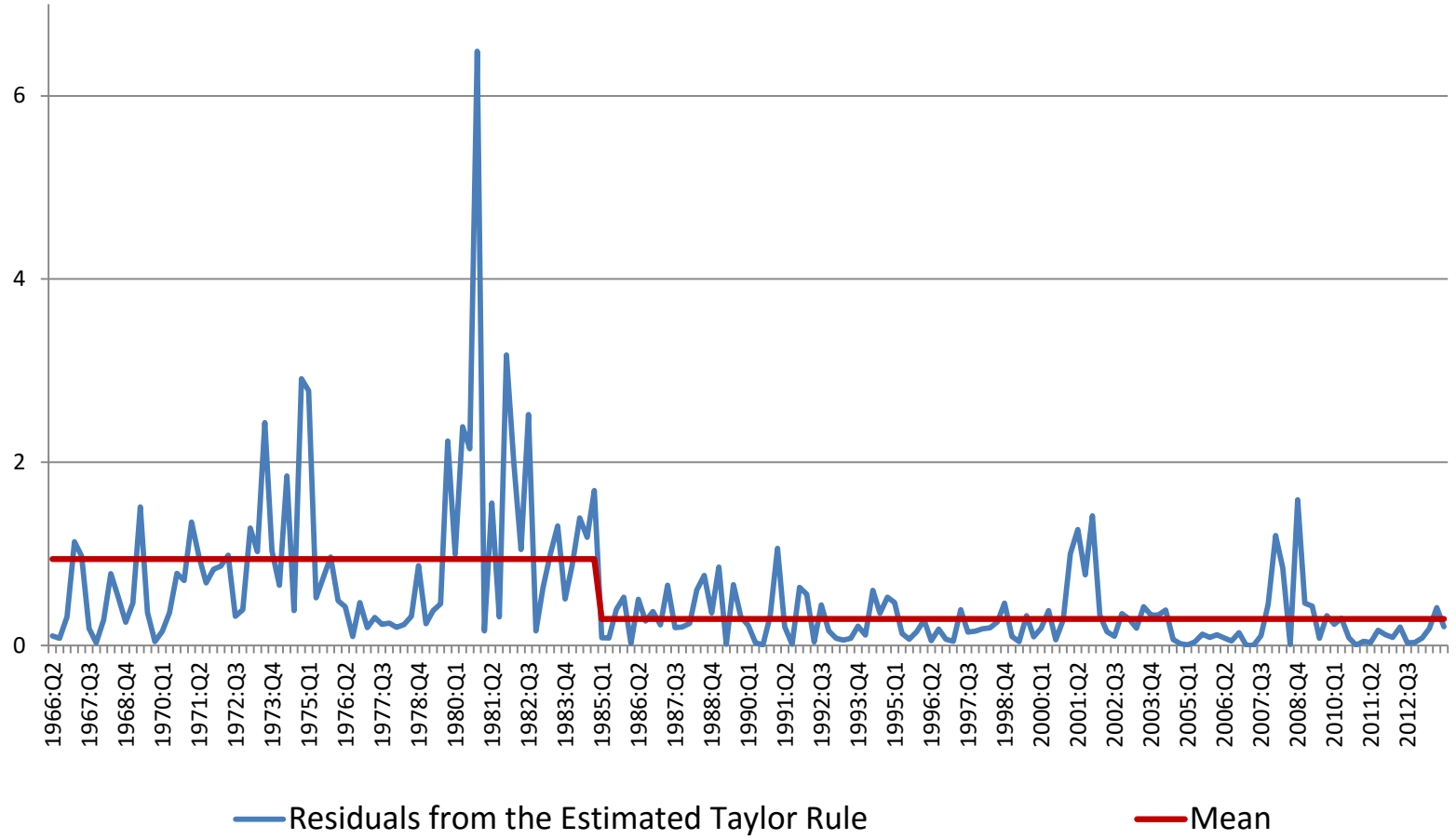


Fuhrer and Olivei Reaction Function



Estimated Taylor Rule

$$i_t = 1.09i_{t-1} - 0.21i_{t-2} + 0.12\,(0.06 + 1.55\,\pi_t + 0.74\,y_t)$$



Policy Evaluation

- Nikolsko-Rzhevskyy, Papell, and Prodan (2014)
- Quadratic Loss Functions
  - Loss = $\Sigma ((\pi - \pi^*)^2 + (U - U^*)^2)$
  - Six Quarter Policy Lag
- Loss Ratios for Each Policy Rule
  - Loss in High Deviations Periods Divided by Loss in Low Deviations Periods
  - Greater than One for a Good Rule
  - Higher Loss Ratio is Better
  - Ratio = 1.80 (Taylor Rule) and 1.25 (Modified Taylor Rule)

Policy Evaluation

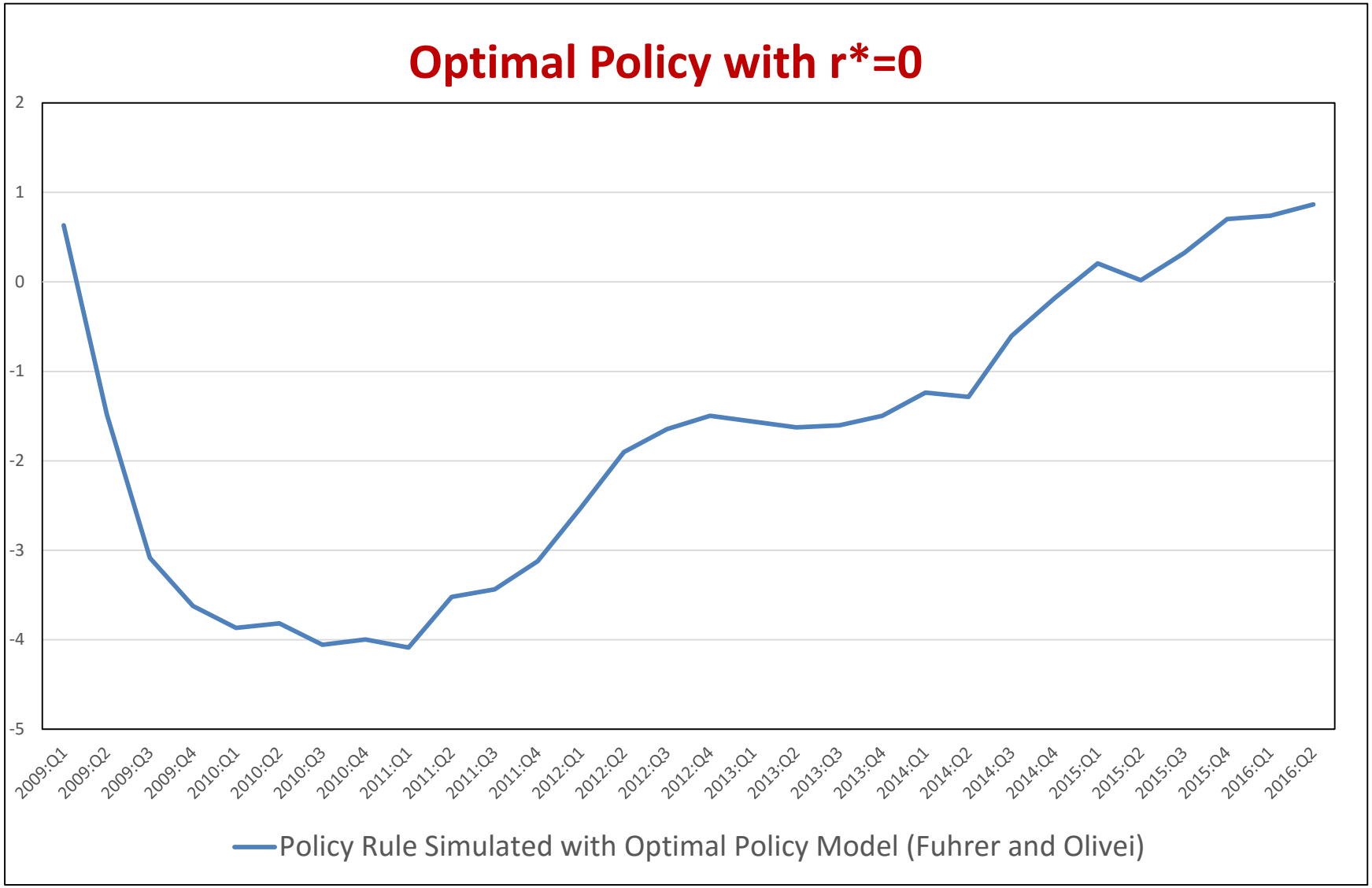
- Nikolsko-Rzhevskyy, Papell, and Prodan (2016)
- Taylor Rules
  - FFR = $\pi + \alpha\ (\pi - \pi^*) + \gamma\ y + r^*$
- Consider Rules with α and γ between 0 and 1
  - Step Size Equals 0.1
  - Evaluate 100 Rules
- Calculate Loss Ratios for High and Low Deviations Periods
- Benchmark Same as Above Except
  - Threshold for Deviations = 2.0

Discretion to Rules Loss Ratios
1:1 Weights, Threshold=2%, R*=2% and π*=2%, 6-Quarter Lag

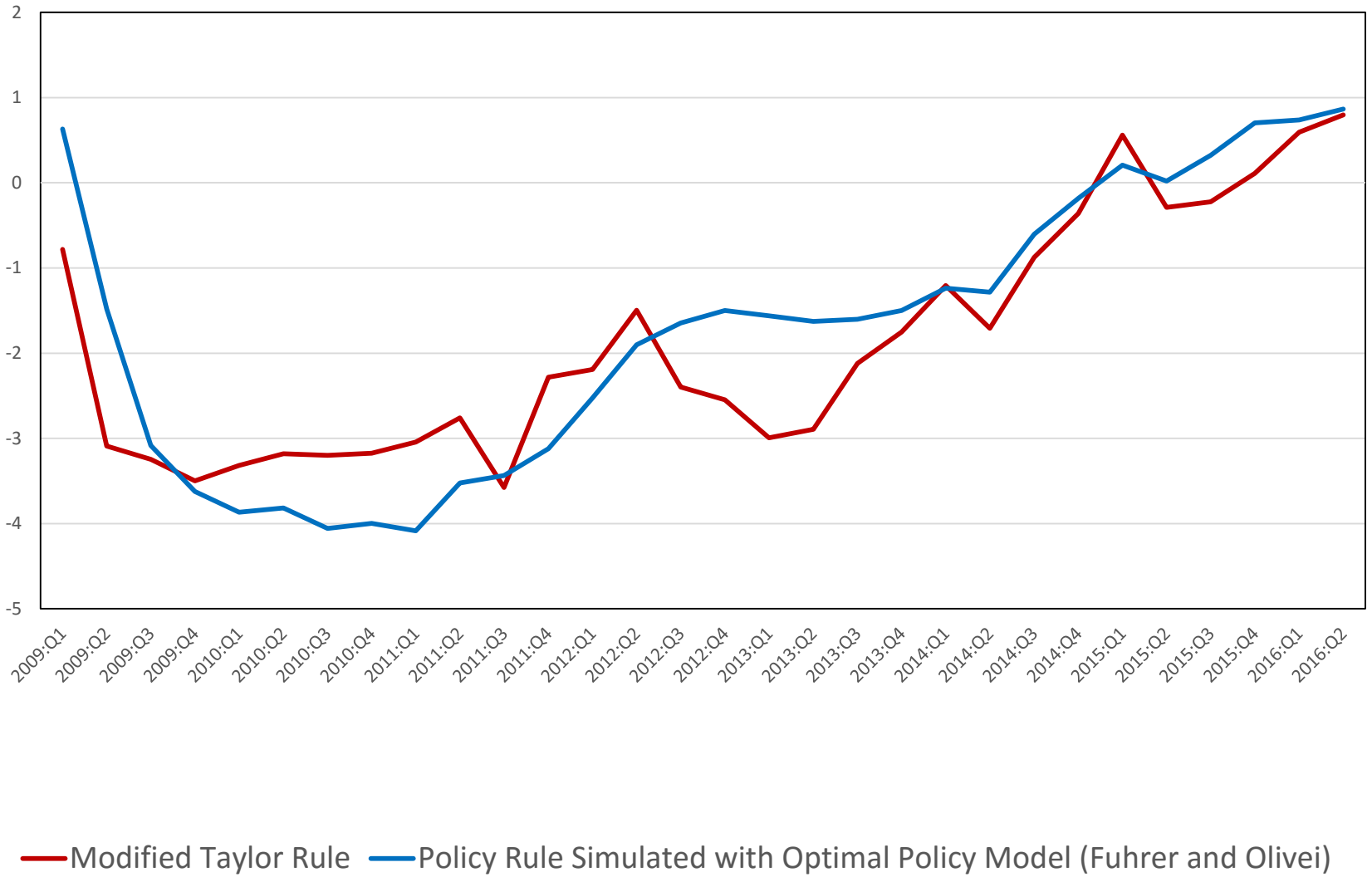
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
1.0	1.84	1.78	1.73	1.66	1.76	1.89	1.96	1.96	1.80	1.93	1.0
0.9	1.65	1.81	1.82	1.73	1.82	1.84	1.92	1.86	1.82	1.61	0.9
0.8	1.67	1.82	1.80	1.82	1.75	1.76	1.84	1.81	1.42	1.34	0.8
0.7	1.52	1.63	1.70	1.69	1.69	1.60	1.66	1.57	1.39	1.26	0.7
0.6	1.55	1.71	1.48	1.43	1.59	1.63	1.50	1.43	1.34	1.23	0.6
0.5	1.41	1.60	1.62	1.68	1.73	1.54	1.43	1.39	1.30	1.26	0.5
0.4	1.32	1.44	1.60	1.51	1.42	1.39	1.36	1.10	1.08	1.00	0.4
0.3	1.38	1.23	1.22	1.23	1.13	1.11	1.15	1.07	1.04	0.89	0.3
0.2	0.93	0.96	0.81	0.76	0.67	0.76	0.85	0.81	0.80	0.84	0.2
0.1	0.89	0.88	0.90	0.80	0.73	0.93	0.88	0.89	0.90	0.89	0.1
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	

Policy Exercises

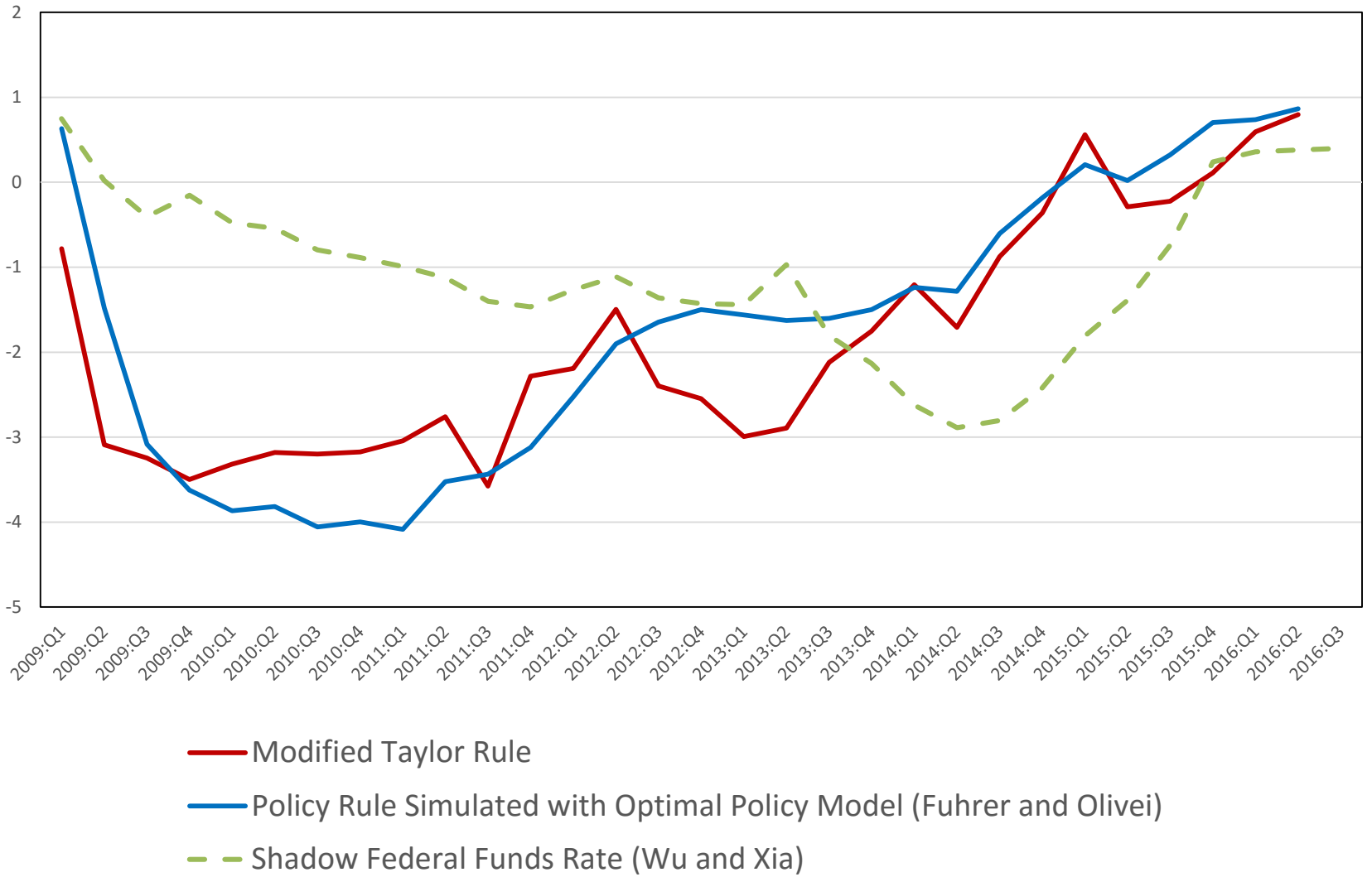
- Estimated Policy Reaction Function for 1983 - 2007
  - Residuals Can Be Interpreted as Shocks
  - Small Impact on Variance of Unemployment and Inflation
- Historical Versus Optimal Policy
  - Loss Function with Penalty for Changes in the FFR
  - Rules w/o Smoothing Inferior to Estimates with Smoothing
  - Not Surprising Given Loss Function
- Implications for Great Recession and Recovery Period


Optimal Policy with r*=0
2
1
0
-1
-2
-3
-4
-5
2009:Q1
2009:Q2
2009:Q3
2009:Q4
2010:Q1
2010:Q2
2010:Q3
2010:Q4
2011:Q1
2011:Q2
2011:Q3
2011:Q4
2012:Q1
2012:Q2
2012:Q3
2012:Q4
2013:Q1
2013:Q2
2013:Q3
2013:Q4
2014:Q1
2014:Q2
2014:Q3
2014:Q4
2015:Q1
2015:Q2
2015:Q3
2015:Q4
2016:Q1
2016:Q2
Policy Rule Simulated with Optimal Policy Model (Fuhrer and Olivei)

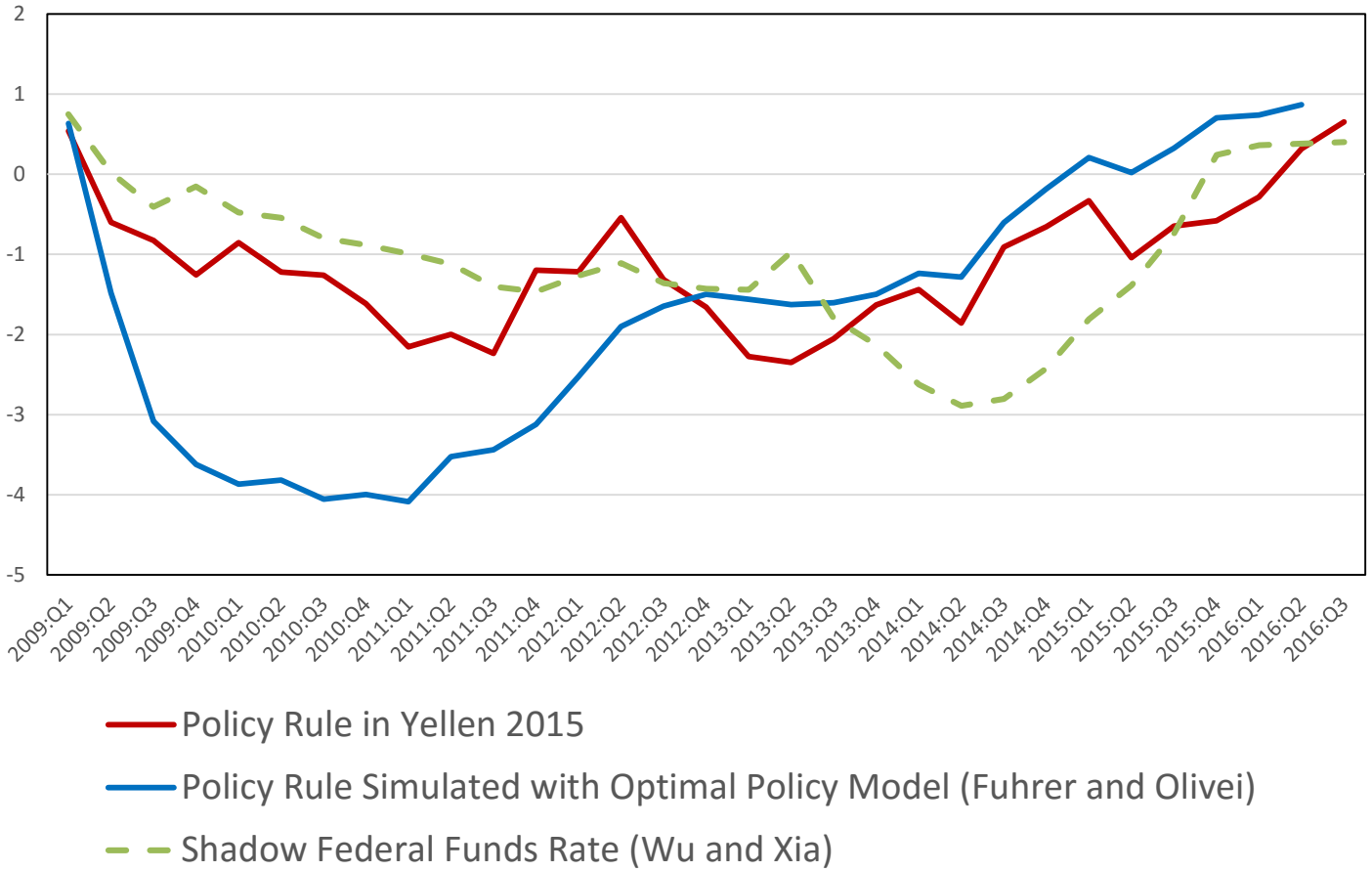
Modified Taylor Rule and Optimal Policy



Rules and Policy



Taylor Rule with Laubach and Williams r*



Conclusions

- Very Interesting Paper
- Estimates of Monetary Policy Reaction Functions
  - Systems Methods of Estimation
  - Greenbook Forecasts and Estimated Unobservables
  - Generally Confirms Rather that Contradicts Previous Work
- Interpretation of Rules and Discretion
  - Conflates Policy Reaction Functions and Policy Rules
  - Less Convincing