Rules and Discretion: An Empirical Assessment

Jeff Fuhrer and Giovanni Olivei

Federal Reserve Bank of Boston

Discussion by: David Papell

University of Houston

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Fuhrer and Olivei Monetary Policy Reaction Function

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

- Inflation, Unemployment, and Output Growth Forecasts
- Estimated Values for Unobservables \( r_t^* , \pi_t^* , u_t^* , \) and \( \Delta y_t^* \)
- Two Lags of the Federal Funds Rate
- Estimates are the Systematic Component of Monetary Policy
- \( \varepsilon_t^{MP} \) 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

[Graph showing the natural rate of unemployment from 1969Q1 to 1979Q4, with labeled years and a line indicating the inferred U*]
Natural Rate of Unemployment

Inferred U*  Gordon U*

## Research on U* in the 1970’s

<table>
<thead>
<tr>
<th>Source</th>
<th>Natural Rate</th>
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<tr>
<td>Task Force on Inflation (1969)</td>
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<tr>
<td>Hall (1970)-BPEA</td>
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<tr>
<td>Perry (1970)</td>
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<tr>
<td>Gordon (1971)</td>
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<tr>
<td>Gordon (1972)</td>
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<td>Hall (1974)</td>
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<tr>
<td>Modigliani and Papademos (1975)</td>
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<td>Wachter (1976)</td>
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<td>Gordon (1976) - CR</td>
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<td>Economic Report of the President (1977)</td>
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Natural Rate of Unemployment

Inferred U*
Inflation Goal
Equilibrium Real Federal Funds Rate
Fuhrer and Olivei Results

\[ f_t = \rho_1 f_{t-1} + \rho_2 f_{t-2} + (1 - \rho_1 - \rho_2)[r_t^* + \pi_t^* + \alpha_\pi(\pi_{t,t+4}^{4,f} - \pi_t^*)
+ \alpha_u(u_{t,t+4}^f - u_t^*) + \alpha_{dy}(\Delta y_{t,t+4}^{4,f} - \Delta y_t^*)] + \epsilon_t^{MP} \]

  - \( \alpha_\pi = 1.83 \) in 1969 - 1979 and 2.37 in 1983 - 2007
  - \( \alpha_u = -2.37 \) 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)
  \[ f_{ft} = \mu + \alpha_{\pi} \pi_t + \alpha_{y} y_t + \rho_1 f_{ft-1} + \varepsilon_t \]
- Estimates from 1969 - 1979
- Real-Time Linear Detrended Output Gaps
- Two-Quarter-Ahead Greenbook Inflation Forecasts
  - \( \alpha_{\pi} = 1.61, \ \alpha_{y} = 0.68, \text{ and } \rho_1 = 0.59 \)
- Real-Time Four-Quarter-Average Inflation Rates
  - \( \alpha_{\pi} = 0.95, \ \alpha_{y} = 0.70, \text{ and } \rho_1 = 0.42 \)
- 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
- 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

Residuals (Absolute values)
Estimated Taylor Rule

\[ i_t = 1.09 i_{t-1} - 0.21 i_{t-2} + 0.12 \left( 0.06 + 1.55 \pi_t + 0.74 y_t \right) \]
Policy Evaluation

- Nikolsko-Rzhevskyy, Papell, and Prodan (2014)
- Quadratic Loss Functions
  \[ \text{Loss} = \sum \left( (\pi - \pi^*)^2 + (U - U^*)^2 \right) \]
  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
  \[ FF = \pi + \alpha (\pi - \pi^*) + \gamma y + r^* \]
  - Consider Rules with \( \alpha \) and \( \gamma \) 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**

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Policy Exercises

  - 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 $r^*=0$

Policy Rule Simulated with Optimal Policy Model (Fuhrer and Olivei)
Modified Taylor Rule and Optimal Policy

Modified Taylor Rule
Policy Rule Simulated with Optimal Policy Model (Fuhrer and Olivei)
Rules and Policy

- Modified Taylor Rule
- Policy Rule Simulated with Optimal Policy Model (Fuhrer and Olivei)
- Shadow Federal Funds Rate (Wu and Xia)
Taylor Rule with Laubach and Williams $r^*$

- Policy Rule in Yellen 2015
- Policy Rule Simulated with Optimal Policy Model (Fuhrer and Olivei)
- Shadow Federal Funds Rate (Wu and Xia)
Conclusions

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