Discussion of: The Equilibrium Real Funds Rate: Past, Present and Future

Discussion by Evi Pappa (EUI)

Secular Stagnation, Growth and Real Interest Rates

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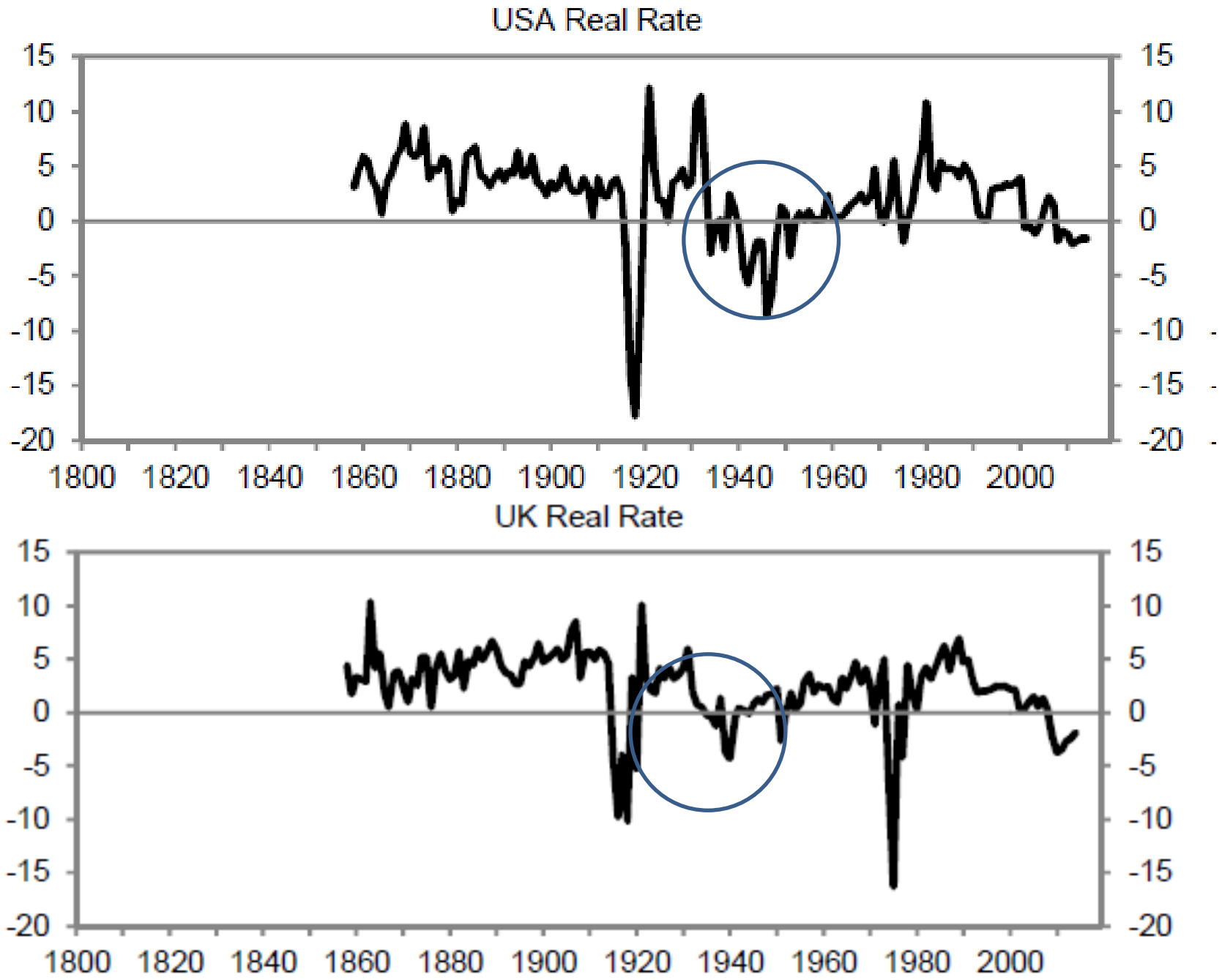
Secular stagnation and this paper

- The real rate interest rate a historical and cross country perspective
- How strong is the connection between growth and real interest rates?
- A narrative interpretation of historical real rates
- On the stationarity of the real rate
- Policy implications for uncertainty of equilibrium rate

Definition: Real interest rate

- *Real rate* = nominal rate – expected inflation
- *Expected inflation*: time-varying forecast of an autoregressive model fit to inflation
- Empirical analysis 21 countries go back as far as two centuries for some countries


USA Real Rate
15
10
5
0
-5
-10
-15
-20
1800
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
UK Real Rate
15
10
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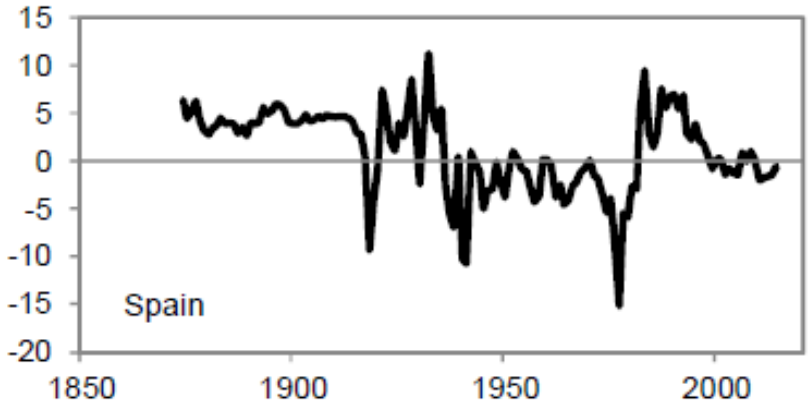
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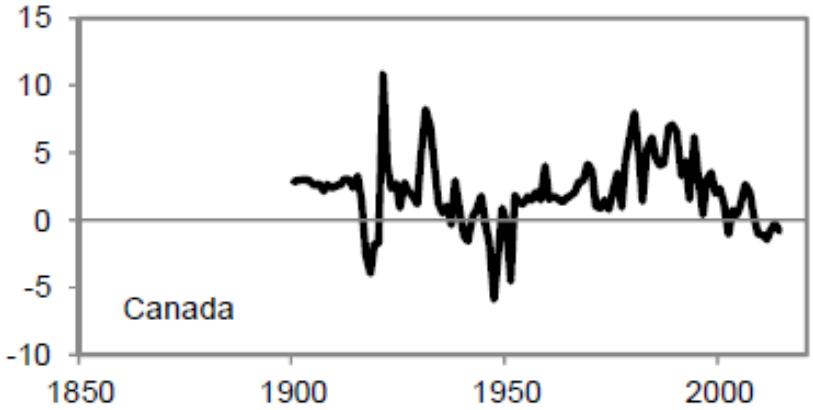
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Canada
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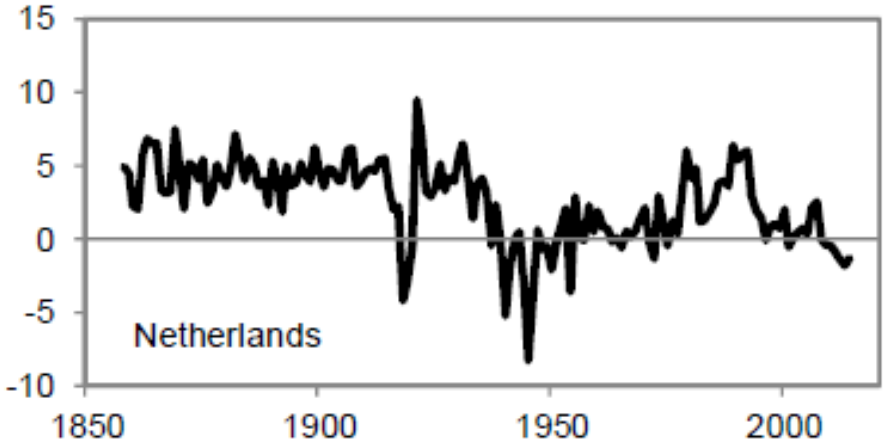
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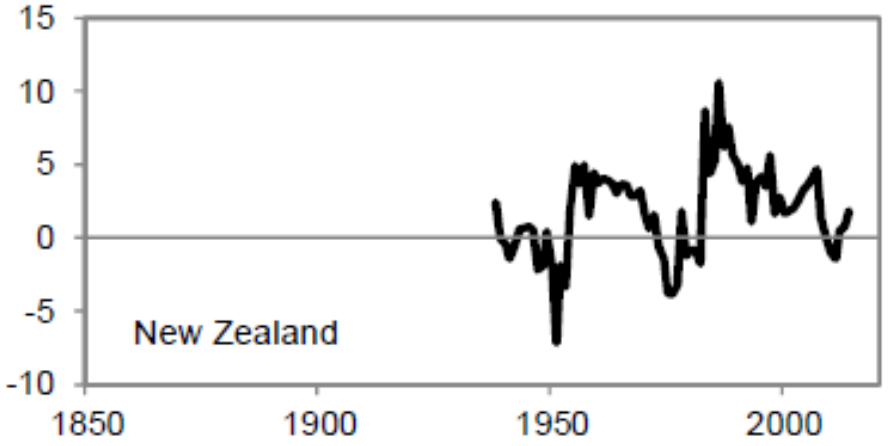
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New Zealand
1850
1900
1950
2000

Growth and real rates

- Theory establishes a positive link,
- *but one who does not come to the data with a prior of such a relation concludes****: there is little evidence of a positive relationship***
- If stagnation is due to supply-side reasons, slowdown not necessarily linked to fall in real rates.

Is there a steady-state value of the real federal funds rate?

- The equilibrium rate is time varying.
- The U.S. real rate is cointegrated with a measure that is similar to the median of a 30-year-average of real rates around the world.
- Note: strange this relationship does not vary with degree of globalization!

Implications for monetary policy

- Since Brainard (1967), uncertainty about quantitative impact of policy and dynamics of economy has been widely cited as a rationale for damped policy action.

- The authors highlight uncertainty about real interest rate.

- Rudebusch (2006): evidence for inertia, but mops up residual serial correlation.

- Is there an alternative policy?

Towards a new model for monetary policy making

How about targeting money velocity?

Other empirical measures of natural rate

- *Money as Indicator for the Natural Rate of Interest*, IMF, Berger and Weber (2012)
- In a standard NK model with MIU specification:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[u(C_t, \psi_t) + q(M_t/P_t, \varepsilon_t^m) - h(N_t) \right] \ , \ 0 < \beta < 1 \ ,$$

- The shock ψ_t affects the utility of consumption and thereby, will alter the time path of consumption and the real rate of return. The shock ε_t^m affects the utility of holding real money balances represents exogenous changes in the velocity of money demand.

- The household maximizes its discounted lifetime utility subject to the flow budget constraint :

$$P_t C_t + B_t + M_t \geq (1 + i_{t-1}) B_{t-1} + M_{t-1} + (1 - \tau) W_t N_t + D_t - T_t \ .$$

- Money demand co-moves with natural interest rate because both variables depend on the marginal utility of consumption. From FOC:

$$\frac{q_m(M_t / P_t, \varepsilon_t^m)}{u_c(Y_t - G_t, \psi_t)} = \frac{i_t}{1 + i_t} \ ,$$

- where we substituted income Y_t for consumption C_t using the identity $Y_t = C_t + G_t$.
- G_t denotes autonomous aggregate demand, including the demand for credit goods and foreign demand.

- define the natural interest rate, as the real rate of return that prevails in the natural economy with fully flexible prices:

$$\beta E_t \left(\frac{u_c(Y_{t+1}^n - G_{t+1}, \psi_{t+1})}{u_c(Y_t^n - G_t, \psi_t)} (1 + r_t^n) \right) = 1 ,$$

- where Y_t^n denotes the natural output which is a function of the two shocks ψ_t and G_t and of the productivity shock

Linearized model

$$
\begin{aligned}
m_t &= \eta_y (Y_t - g_t) - \eta_i i_t + \varepsilon_t^m \ , \\
r_t^n &= -E_t (1 - L^{-1}) (a_t - \tfrac{\omega}{1+\omega} g_t) \ , \\
x_t &= E_t x_{t+1} - (i_t - E_t \pi_{t+1}) + r_t^n \ , \\
\pi_t &= \beta E_t \pi_{t+1} + \mu x_t + u_t \ .
\end{aligned}
$$

- $\eta_y > 0$ denotes income elasticity of money demand and $\eta_i > 0$ interest semi-elasticity of money demand.
- Shock g_t, IS shock, summarizes the two shocks G_t and ψ_t and constitutes link between money demand and natural interest rate. This shock is an important source of fluctuations in the natural interest rate in estimated DSGE models such as Andres, Lopez-Salido, and Nelson (2009) or Arestis, Chortareas, and Tsoukalas (2010)

Natural interest rate and money demand gap

$$m_t^g = \eta_y Y_t - \eta_i i_t - m_t$$

The money gap resembles a generalized measure of *money velocity* that is adjusted for short-term nominal interest rates easy to estimate (Teles and Uhlig (2013)). Substituting money demand this is written as:

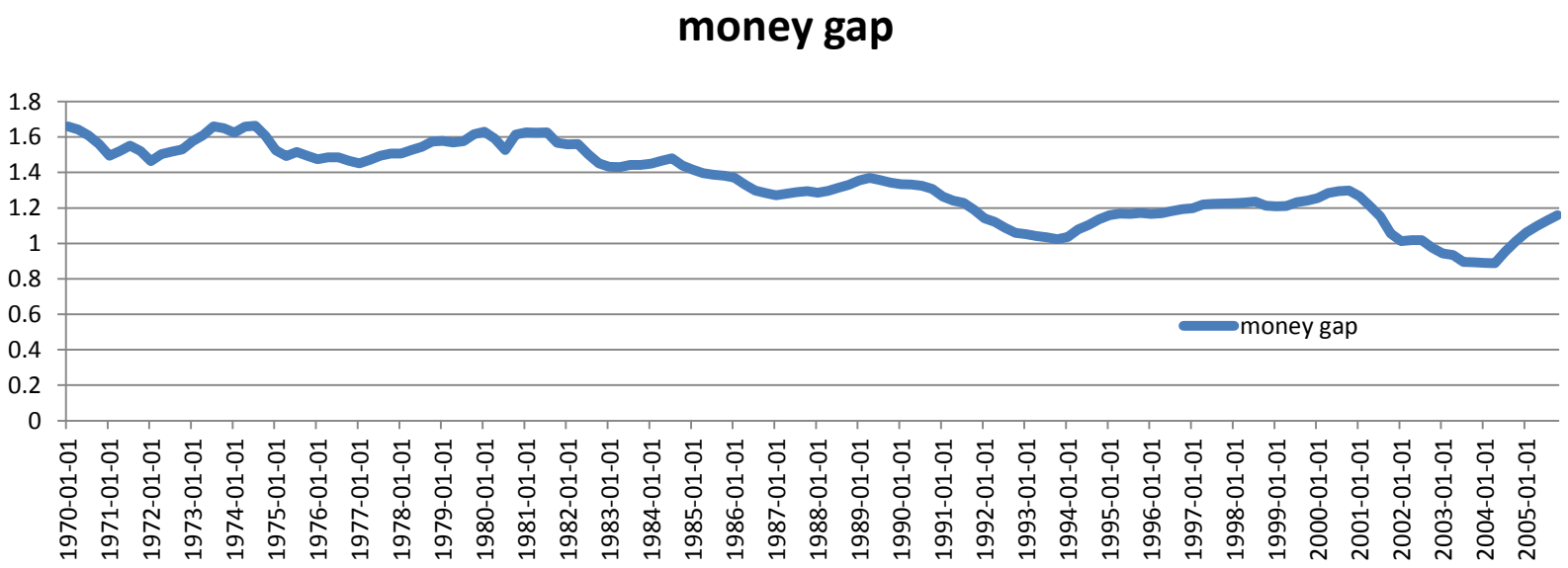
$$m_t^g = \eta_y g_t - \varepsilon_t^m$$

Independent of monetary policy and comoves with natural rate:

$$\operatorname{cor}(m_t^g, r_t^n) = \frac{\omega \eta_y}{\left(\eta_y^2 + \sigma_m^2/\sigma_g^2\right)^{\frac{1}{2}} \left(\omega^2 + (1+\omega)^2 \sigma_a^2/\sigma_g^2\right)^{\frac{1}{2}}}.$$

Going to the data

- For interest semi-elasticity of 0.44 and income elasticity of 0.97 (from Uhlig and Teles), estimate money gap between 1970-2005:



- Correlation with real interest rate = 0.82

Monetary policy with the money gap

- The central bank attempts to stabilize two types of disturbances: shocks to the natural interest rate and cost shocks. The central bank's loss , $\lambda_x > 0$:

$$\mathrm{var}(\pi_t) + \lambda_x \mathrm{var}(x_t) \ ,$$

- A simple policy rule:

$$i_t = \phi_m m_t^g + \phi_x \tilde{x}_t + \phi_\pi \pi_t \ ,$$

- $\tilde{x}_t$ output gap with noise shock, $\tilde{x}_t = Y_t - Y_{tn} + \xi_t$.

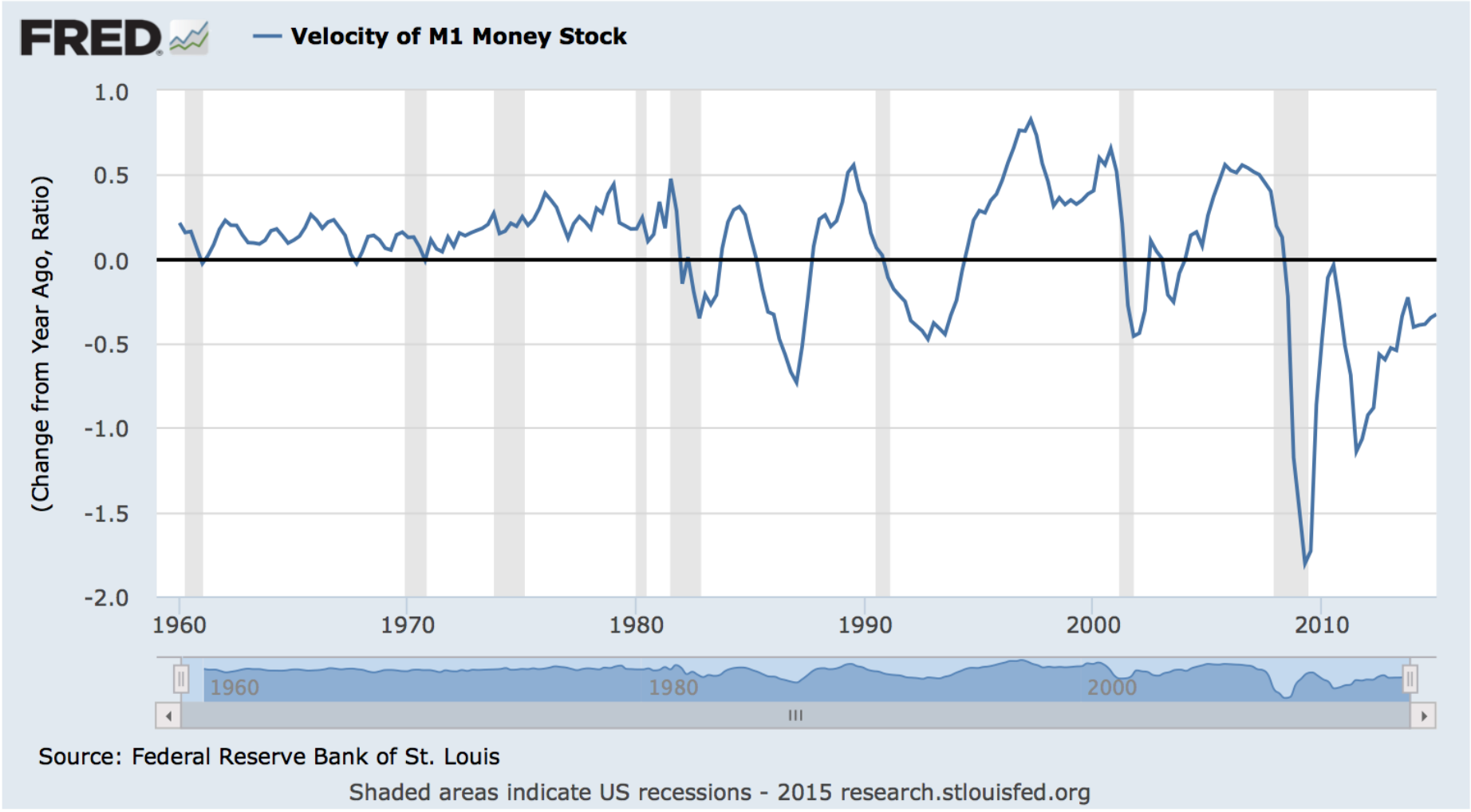
Optimal policy

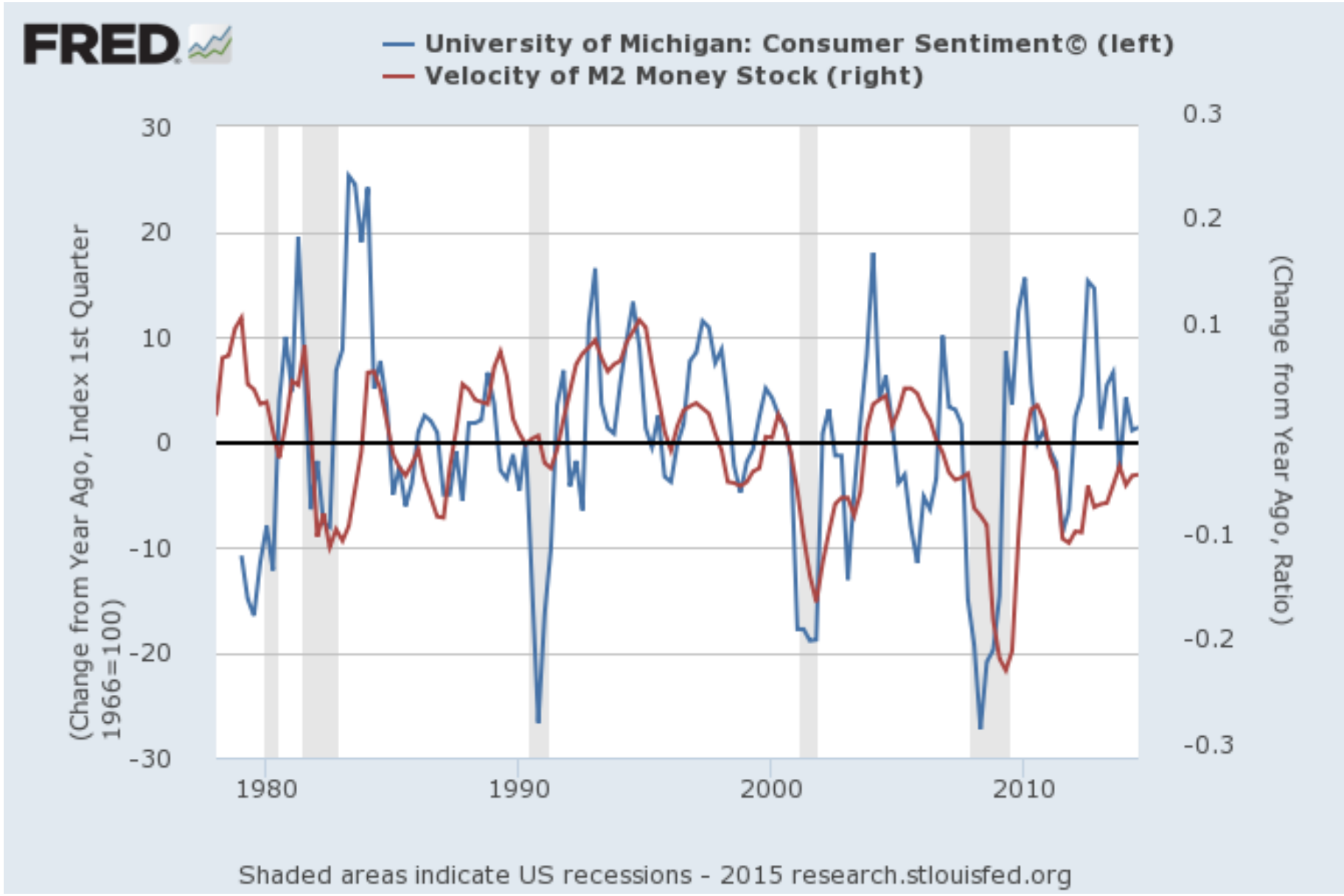
$$\phi_m^\star = \frac{1}{2}\,\frac{\eta_y}{\eta_y^2+\sigma_m^2}\,, \qquad \phi_x^\star = \frac{1}{4}\,\frac{\sigma_m^2}{\sigma_\xi^2(\eta_y^2+\sigma_m^2)}\,,$$

$$\phi_\pi^\star = \frac{\mu}{\lambda_x}\left(\frac{\sigma_\xi^2(\mu^2+\lambda_x)}{\sigma_u^2}\phi_x^\star + \phi_x^\star + 1\right)$$

The optimizing central bank combines the money gap and the observed output gap in a way that yields the strongest signal about the natural interest rate.

Velocity of money in the US




FRED
University of Michigan: Consumer Sentiment© (left)
Velocity of M2 Money Stock (right)
30
20
10
0
-10
-20
-30
0.3
0.2
0.1
-0.1
-0.2
-0.3
(Change from Year Ago, Index 1st Quarter 1966=100)
(Change from Year Ago, Ratio)
1980
1990
2000
2010
Shaded areas indicate US recessions - 2015 research.stlouisfed.org

Secular stagnation in the US?

Is something missing?…

Fiscal austerity – fiscal policy