11. Monetary Policy: International Considerations

John B. Taylor, May 13, 2013

Why Study International Monetary Issues?

- International issues have always been an important part of monetary economics
  - Gold standard
  - Bretton Woods system, post WWII
- And many international monetary problems loom today
  - ECB and Euro zone mess
  - Origins of 2008 financial crisis
  - Emerging market complaints about US
- Financial markets more connected than ever
- The models and theories are very interesting
  - Though quite complex

With economic intuition based on simple models, consider monetary shocks in a two country model

-- Start with no-arbitrage conditions

$$i_t = i_t^* + E_t e_{t+1} - e_t$$

Simple "no-arbitrage" between domestic and foreign currency denominated assets

$$r_t = i_t - (E_t p_{t+1} - p_t)$$

$$i_t = i_t^* + E_t e_{t+1} - e_t$$

$$r_t^* = i_t^* - (E_t p_{t+1}^* - p_t^*)$$

Definition of real interest rate or simple no-arbitrage between real and nominal assets

$$p_t = e_t + p_t^*$$

$$r_t = i_t - (E_t p_{t+1} - p_t)$$

$$i_t = i_t^* + E_t e_{t+1} - e_t$$

$$r_t^* = i_t^* - (E_t p_{t+1}^* - p_t^*)$$

$$p_t^* = p_t - e_t$$

Purchasing power parity or simple no arbitrage between domestic and foreign goods

$$x_t = .25\sum_{i=0}^{3} E_t w_{t+i} + .25\sum_{i=0}^{3} E_t y_{t+i}$$

$$y_t = -dr_t + f(e_t + p_t^* - p_t) + gy_t^*$$

$$m_t - p_t = -\beta i_t + \alpha y_t$$

$$p_t = e_t + p_t^*(1-\theta) + \theta w_t \qquad w_t = .25\sum_{i=0}^{3} x_{t-i}$$

$$r_t = i_t - (E_t p_{t+1} - p_t)$$

$$i_t = i_t^* + E_t e_{t+1} - e_t$$

$$r_t^* = i_t^* - (E_t p_{t+1}^* - p_t^*)$$

$$p_t^* = p_t - e_t(1-\theta^*) + \theta^* w_t^* \qquad w_t^* = .25\sum_{i=0}^{3} x_{t-i}^*$$

$$m_t^* - p_t^* = -\beta^* i_t^* + \alpha^* y_t^*$$

$$y_t^* = -d^* r_t^* + f^*(e_t + p_t^* - p_t) + g^* y_t$$

$$x_t^* = .25\sum_{i=0}^{3} E_t w_{t+i}^* + .25\sum_{i=0}^{3} E_t y_{t+i}^*$$

$$x_t = (1/3)\sum_{i=0}^{2} \hat{w}_{t+i} + (1/3)\sum_{i=0}^{2} \hat{y}_{t+i}$$

$$y_t = -dr_t + f(e_t + p_t^* - p_t) + gy_t^*$$

$$m_t - p_t = -bi_t + ay_t$$

$$p_t = (e_t + p_t^*)(1 - \theta) + \theta w_t$$

$$r_t = i_t - \hat{\pi}_t$$

$$w_t = \frac{1}{3}\sum_{i=0}^{2} x_{t-i}$$

$$i_t = i_t^* + \hat{e}_{t+1} - e_t$$

$$r_t^* = i_t^* - \hat{\pi}_t^*$$

$$w_t^* = \frac{1}{3}\sum_{i=0}^{2} x_{t-i}^*$$

$$p_t^* = (p_t - e_t)(1 - \theta^*) + \theta^* w_t^*$$

$$m_t^* - p_t^* = -b^* i_t^* + a^* y_t^*$$

$$y_t^* = -d^* r_t^* - f^*(e_t + p_t^* - p_t) + g^* y_t$$

$$x_t^* = (1/3)\sum_{i=0}^{2} \hat{w}_{t+i}^* + (1/3)\sum_{i=0}^{2} \hat{y}_{t+i}^*$$

Code for two-country model

```
e  = if  + e(1)  - i

y  =  - b(1)  * r  + b(2)  * (e  + pf  - p)  + b(3)  * yf

x  = .25  * (w  + w(1)  + w(2)  + w(3))  + .25  * (y  + y(1)  + y(2)  + y(3))

w  = .25  * (x  + x(-1)  + x(-2)  + x(-3))

r  = i  - pi

pi  = p(1)  - p

i  = (1  / b(4))  * p  - (b(5)  / b(4))  * y  - m  / b(4)

xf  = .25  * (wf  + wf(1)  + wf(2)  + wf(3))  + .25  * (yf  + yf(1)  + yf(2)  + yf(3))

wf  = .25  * (xf  + xf(-1)  + xf(-2)  + xf(-3))

yf  =  - bf(1)  * rf  - bf(2)  * (e  + pf  - p)  + bf(3)  * y

rf  = if  - pif

pif  = pf(1)  - pf

if  = (1  / bf(4))  * pf  - (bf(5)  / bf(4))  * yf  - mf  / b(4)

p  = (e  + pf)  * (1  - b(6))  + w  * b(6)

pf  = (p  - e)  * (1  - bf(6))  + bf(6)  * wf
```

b(1) = bf(1) =1.2
b(2) = bf(2) = 0.1
b(3) = bf(3) = 0.1
b(4) = bf(4) = 4.0
b(5) = bf(5) = 1.0
b(6) = bf(6) = 0.8

Red = coefficient
Blue = exogenous variable
Black = endogenous variable

Code for two-country model (fixed exch. rate)

```
if=i and e = 0
y  =  - b(1)  * r  + b(2)  * (e  + pf  - p)  + b(3)  * yf
x  = .25  * (w  + w(1)  + w(2)  + w(3))  + .25  * (y  + y(1)  + y(2)  + y(3))
w  = .25  * (x  + x(-1)  + x(-2)  + x(-3))
r  = i  - pi
pi  = p(1)  - p
i  = (1  / b(4))  * p  - (b(5)  / b(4))  * y  - m  / b(4)
xf  = .25  * (wf  + wf(1)  + wf(2)  + wf(3))  + .25  * (yf  + yf(1)  + yf(2)  + yf(3))
wf  = .25  * (xf  + xf(-1)  + xf(-2)  + xf(-3))
yf  =  - bf(1)  * rf  - bf(2)  * (e  + pf  - p)  + bf(3)  * y
rf  = if  - pif
pif  = pf(1)  - pf
mf  = pf  + bf(5)  * yf  - bf(4) * if
p  = (e  + pf)  * (1  - b(6))  + w  * b(6)
pf  = (p  - e)  * (1  - bf(6))  + bf(6)  * wf
```

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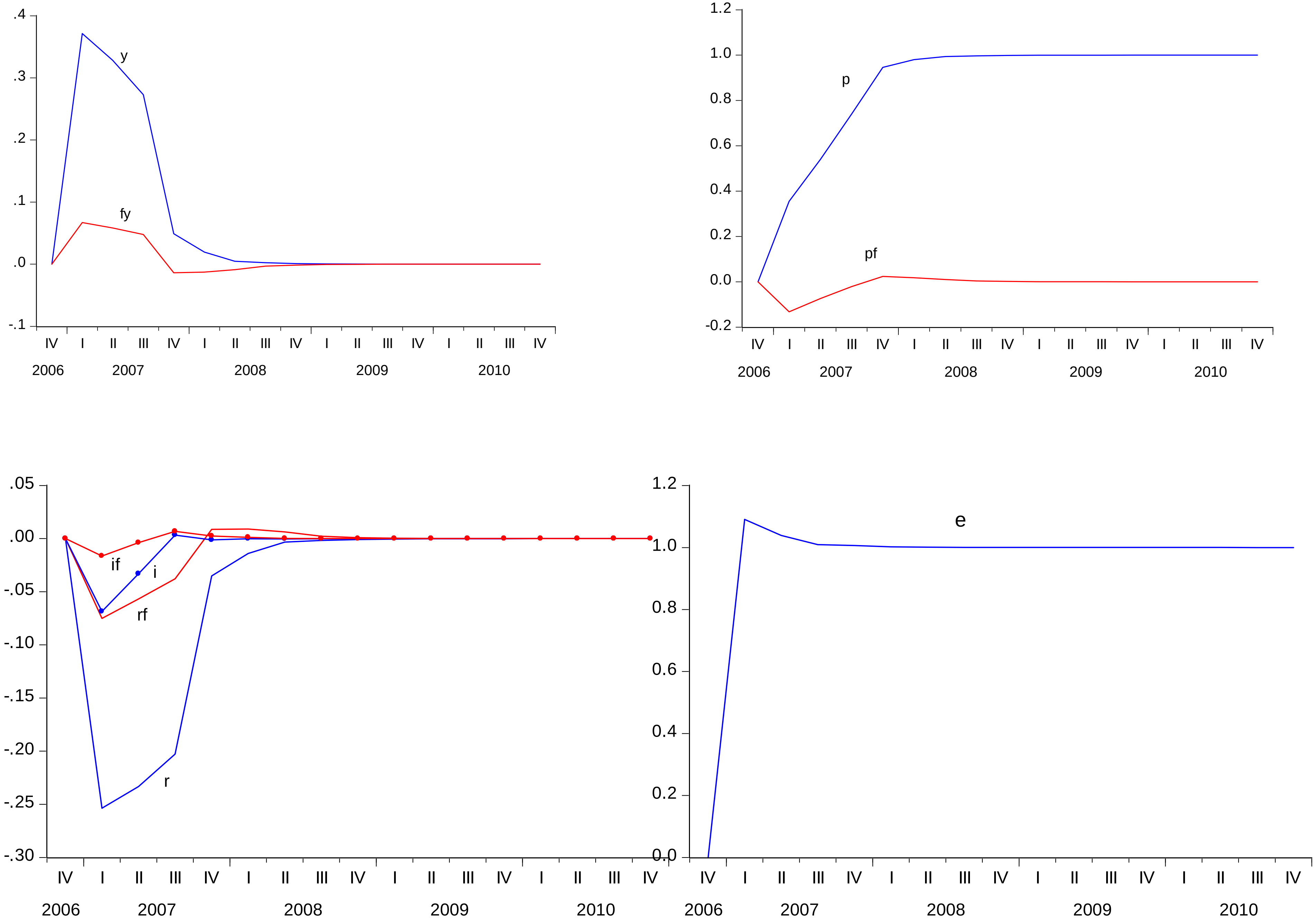
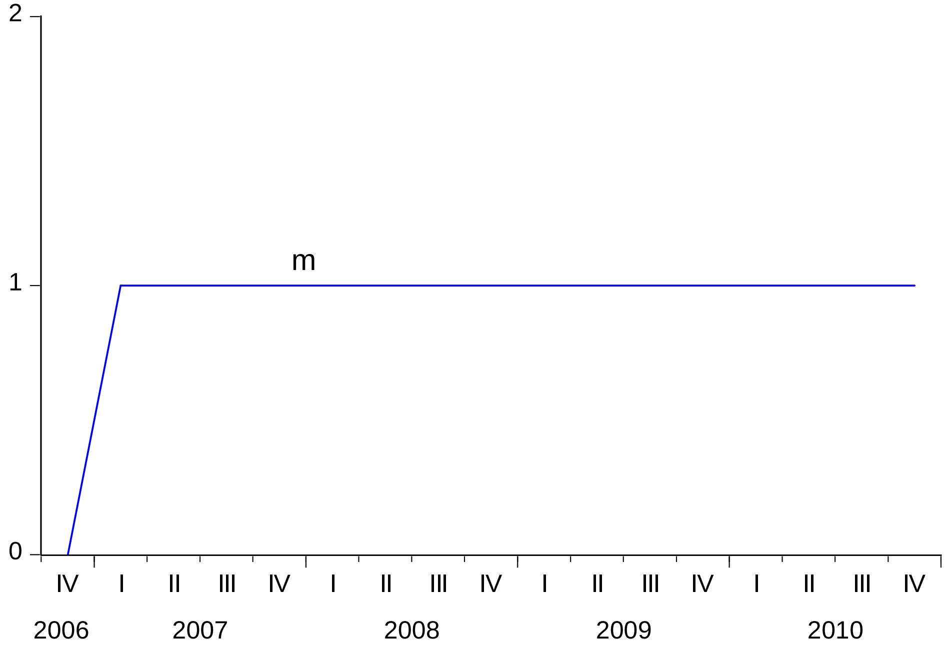
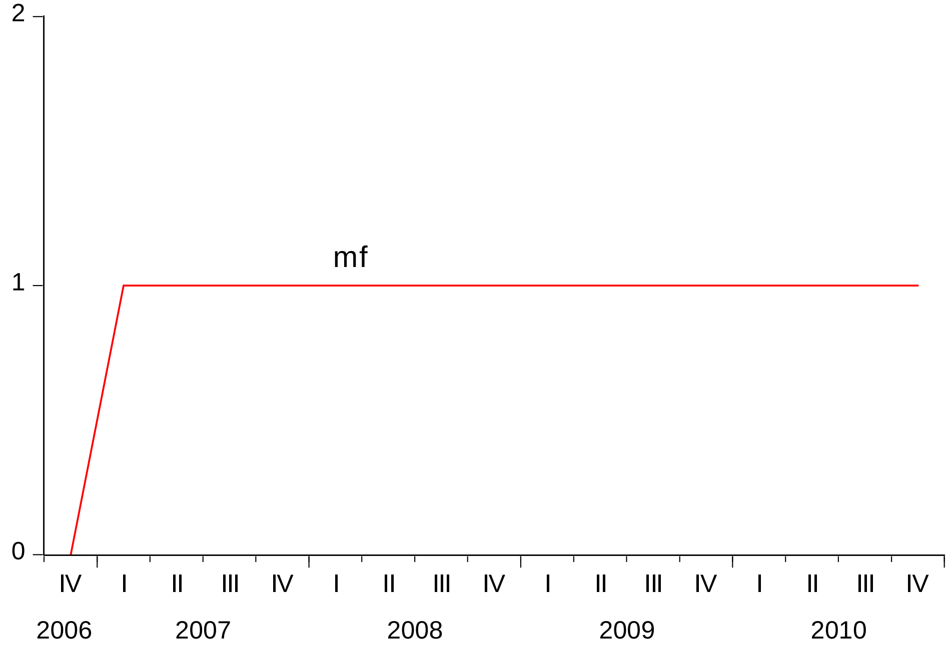
Impact (%) of a 1 % permanent unanticipated increase in money (flex exchange rate)

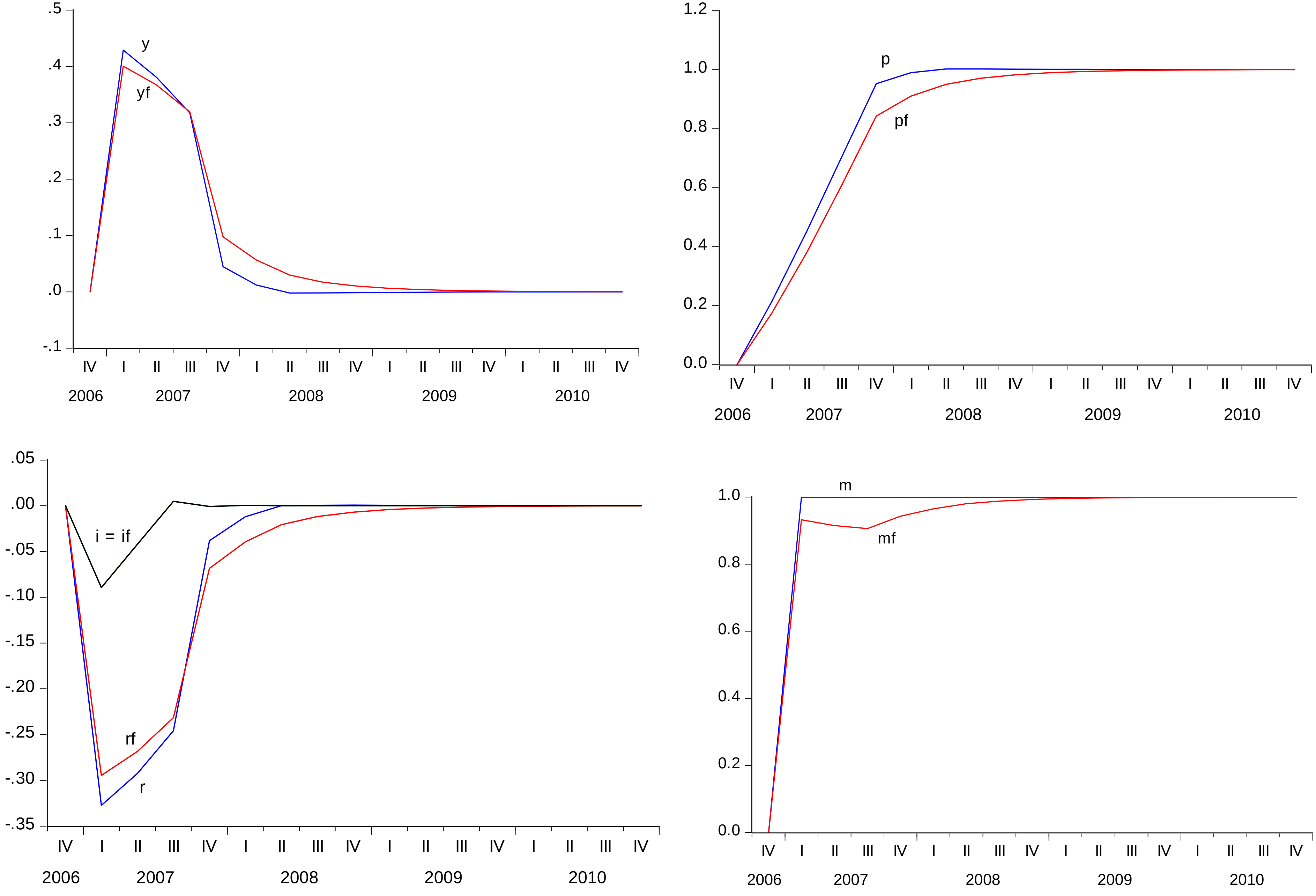


Impact of a change in m on mf with fixed exchange rates:
Symmetrical case





Impact (%) of a 1% permanent unanticipated increase in money (fixed exchange rate)
With slightly slower price adjustment abroad (.15 versus .25)



Now consider a form of policy coordination in terms of monetary policy rules

$$r_t = a_r p_t$$

$$r_t^* = a_r^* p_t^*$$

Stick these into the two country flexible exchange rate model and get the steady state distribution, or just simulate stochastically by drawing shocks

International policy coordination: little need

	$\alpha_r^* = 0.6$	$\alpha_r^* = 0.2$
$\alpha_r = 0.6$	0.188 0.147 0.188 0.147	0.423 0.111 0.181 0.144
$\alpha_r = 0.2$	0.181 0.144 0.423 0.111	0.425 0.112 0.425 0.112

Key

	σ_p^* σ_y^*
σ_p σ_y	

Usual policy tradeoff

But little impact abroad

Monetary Union

Only one interest rate, so replace

$$r_t = a_r p_t$$

$$r_t^* = a_r^* p_t^*$$

with

$$r_t = r_t^* = \alpha p_t$$

or

$$r_t = r_t^* = \alpha(\lambda p_t + (1-\lambda) p_t^*)$$

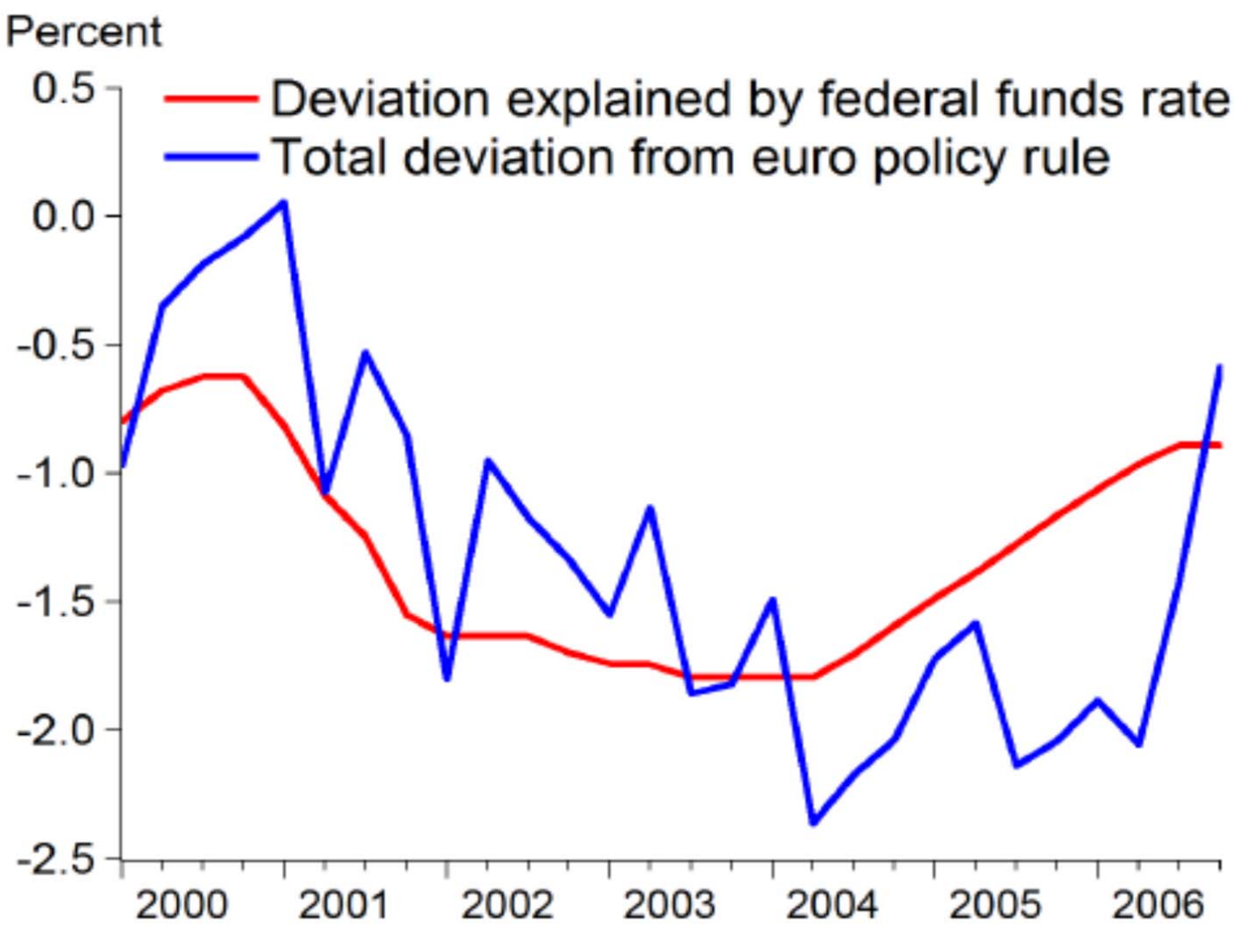
and substitute into the two countery model with shocks.

Results generally show

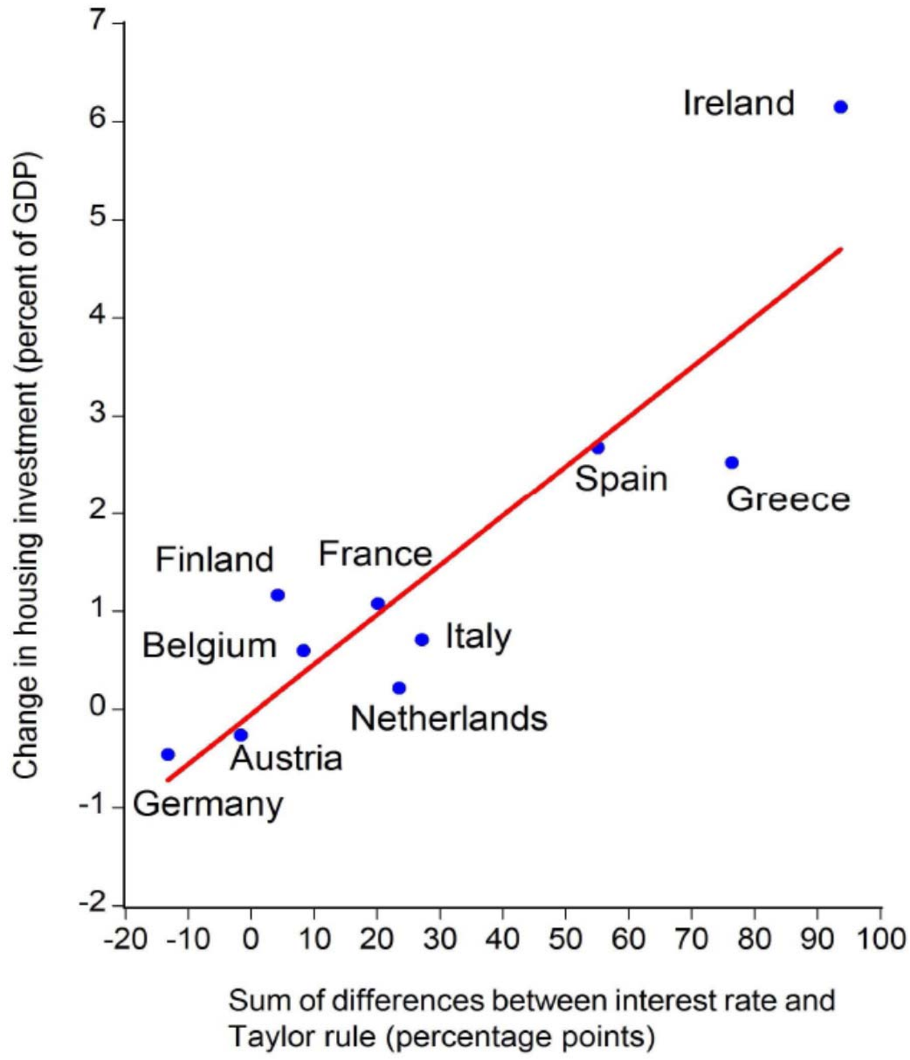
(1) poorer performance than with flexible rates (σ_y and σ_p higher)

(2) averaging rule evens out loss

But central banks seem to react to each other: Exchange market intervention or changing interest rates as in this example.

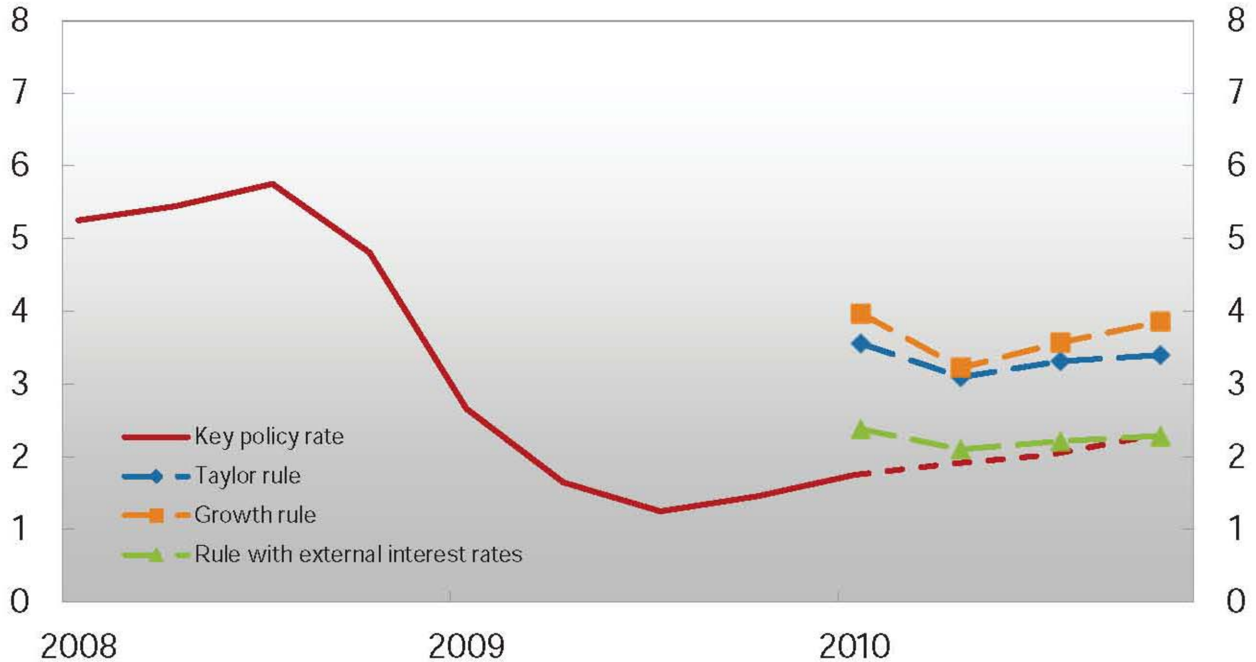


Housing Investment versus deviations from policy rule in Europe during 2001-6 (OECD study)



More evidence that central banks follow each other

Chart 1.19 Key policy rate and calculations based on simple monetary policy rules[1)]. Per cent. 2008 Q1 – 2010 Q4



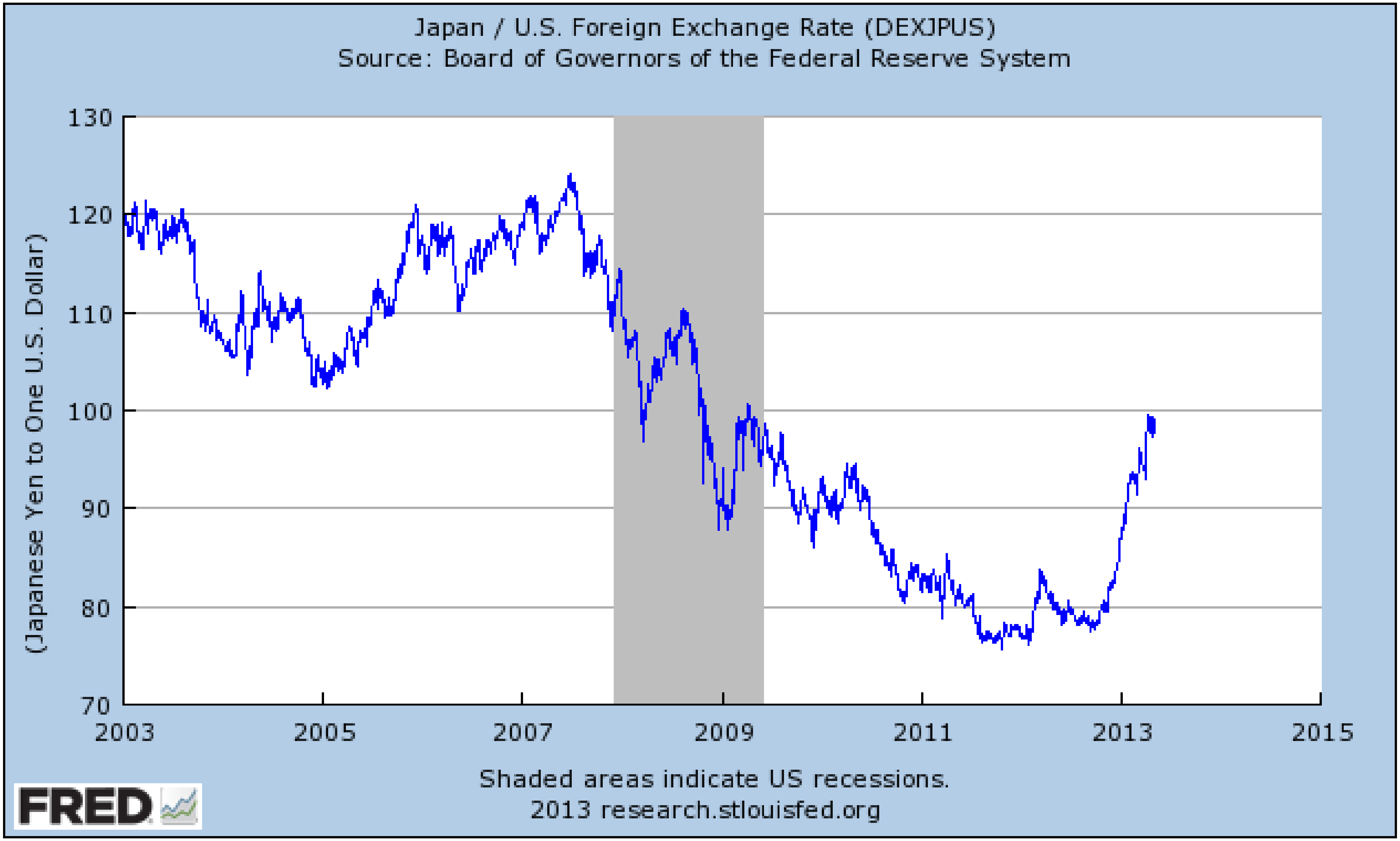
1) The calculations are based on Norges Bank's projections for the output gap, consumer prices adjusted for tax changes and excluding temprary changes in energy prices (CPIXE) and three-month money market rates. To ensure comparability with the key policy rate the simple rules are adjusted for risk premiums in three-month money market rates
Source: Norges Bank

Policy Implications

Why were interest rates so low in 2003-05?

- Fed's decision or global saving glut?
- Low rates in US → currency intervention = buy U.S. assets like mortgages → driving rates down

- Spread of monetary policy mistakes
  - "Brazilian President Dilma Rousseff complained about U.S. monetary policy in a White House meeting with President Barack Obama" Reuters, April 9, 2012
  - Recent Japan easing



Japan / U.S. Foreign Exchange Rate (DEXJPUS)
Source: Board of Governors of the Federal Reserve System
(Japanese Yen to One U.S. Dollar)
130
120
110
100
90
80
70
2003
2005
2007
2009
2011
2013
2015
Shaded areas indicate US recessions.
2013 research.stlouisfed.org
FRED