Understanding Policy in the Great Recession: Some Unpleasant Fiscal Arithmetic

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Fiscal + monetary policy analysis

- *Two* conditions in *all* monetary models.

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{\Lambda_{t+\tau}}{\Lambda_t} \left[T_{t+\tau} - G_{t+\tau} \left(+ i_{t+\tau} \frac{M_{t+\tau}}{P_{t+\tau}} \right) \right] d\tau \\ M_t V(\cdot_t) &= P_t Y_t \end{aligned}$$

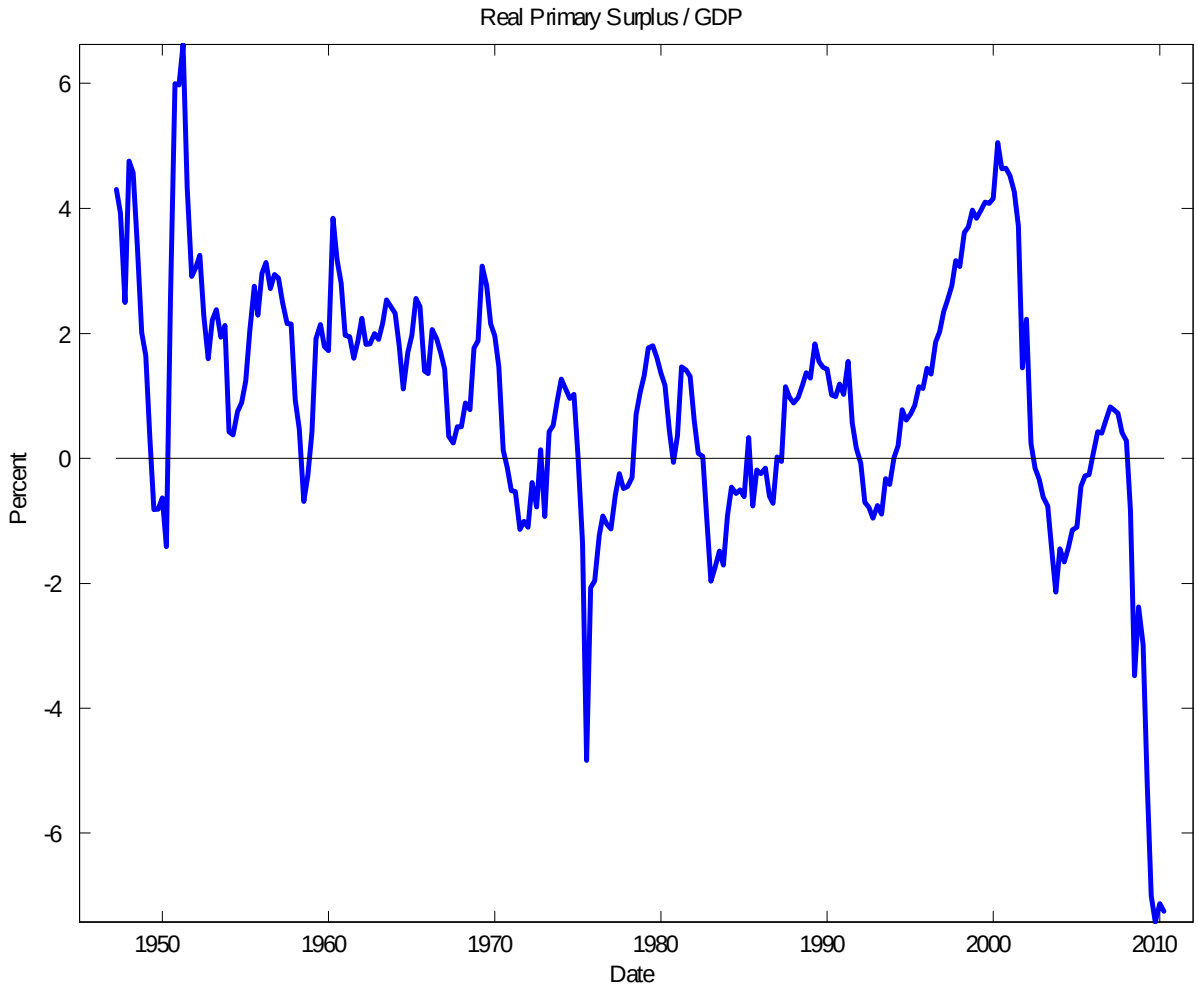
- Simpler,

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t \to t+\tau}} s_{t+\tau} d\tau$$

- Mechanism: Low $s_{t+\tau}$, will inflate $\longrightarrow$ sell M, B now $\longrightarrow$ inflation now. "Aggregate demand." (Rolling over is the warning)
- Now: monetary policy in an era of fiscal constraints.
- Note: s is endogenous! No "test"

What surpluses??

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{\Lambda_{t+\tau}}{\Lambda_t} s_{t+\tau} d\tau$$



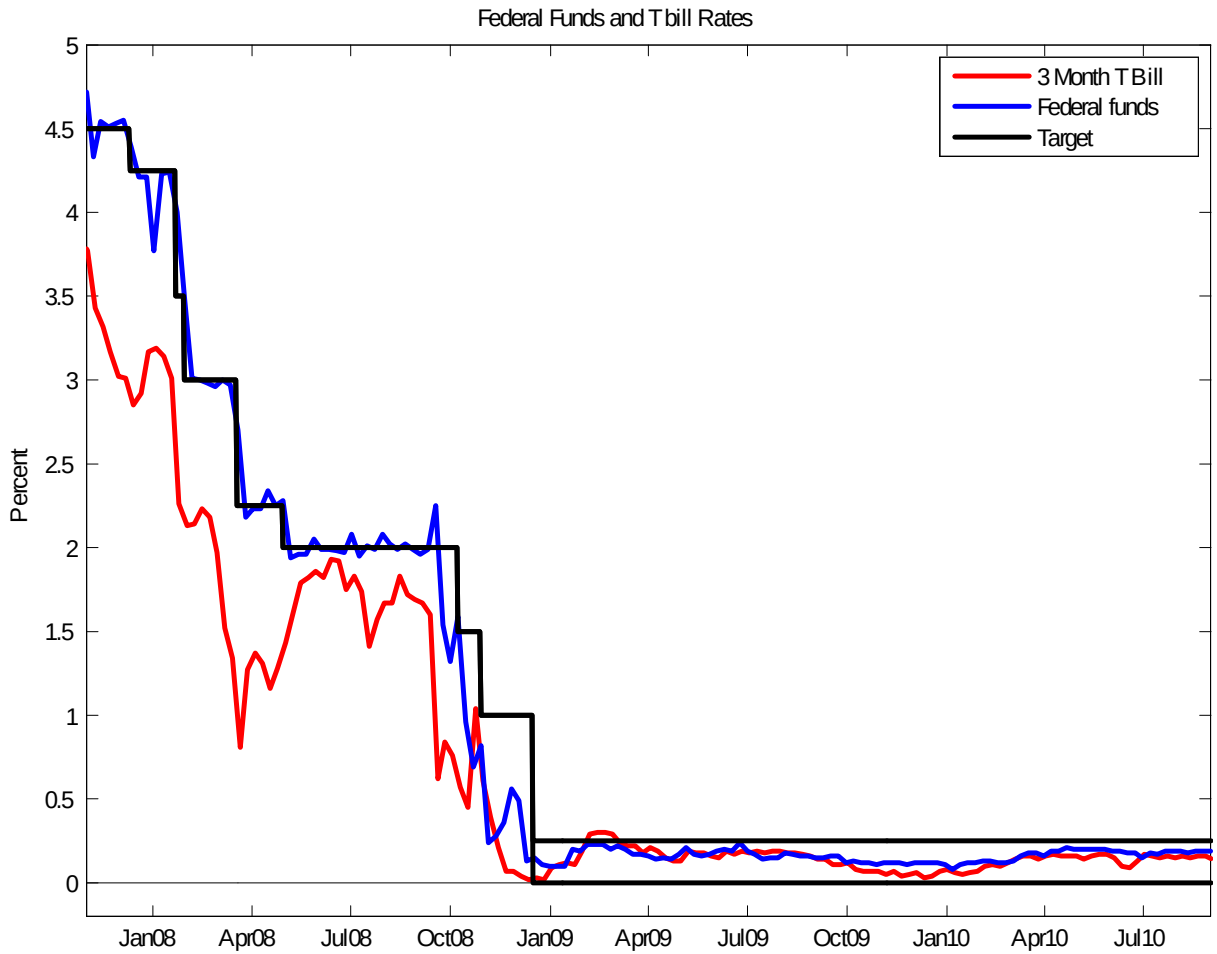
Fiscal review – classic doctrines

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{\Lambda_{t+\tau}}{\Lambda_t} s_{t+\tau} d\tau$$

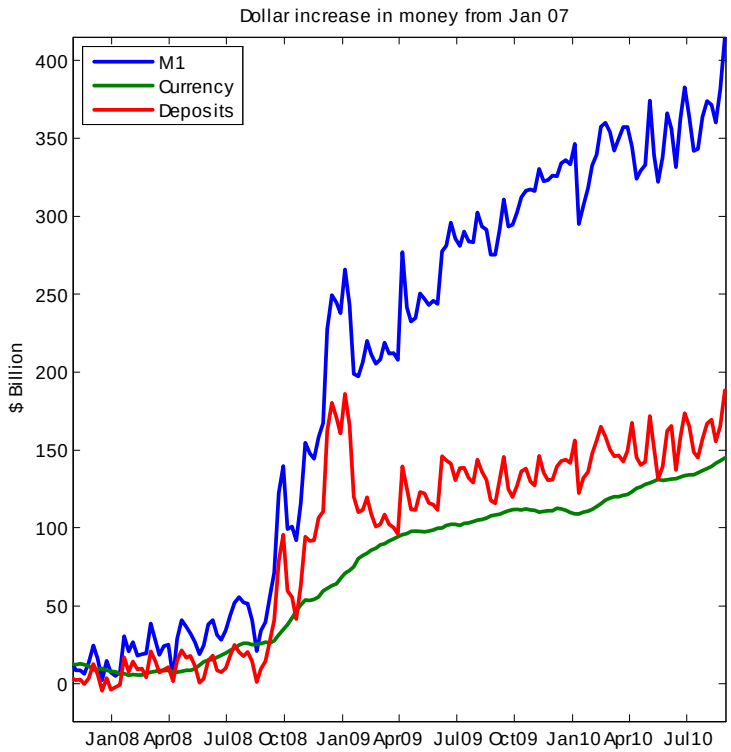
- M vs. B has (almost) no effect.
- Inside money does not matter.
- Determinate P with i =constant, passive M, "real bills."
- $M_t = 0$ works too!
- *Future* deficits, money can cause inflation *now*. "Flight from dollar" inflation that the Fed cannot control.
- Real (foreign) debt is debt – must default.
- Nominal debt is equity, "Stock in government." Other forms for Greece?

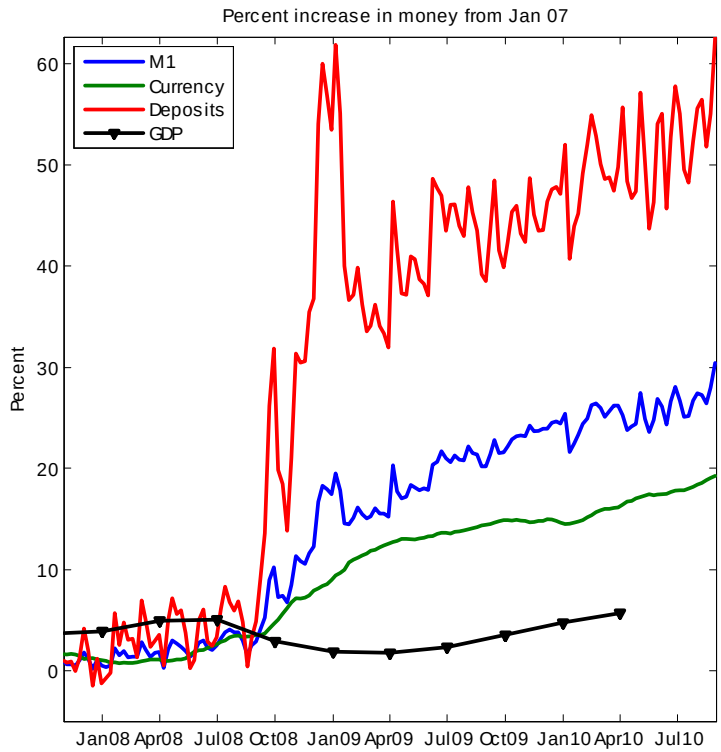
2008-2009 – Money?

- Why did GDP fall so much?
- $MV(\cdot) = PY$, $V(\cdot)$ falls, no accommodation? I don't think so...



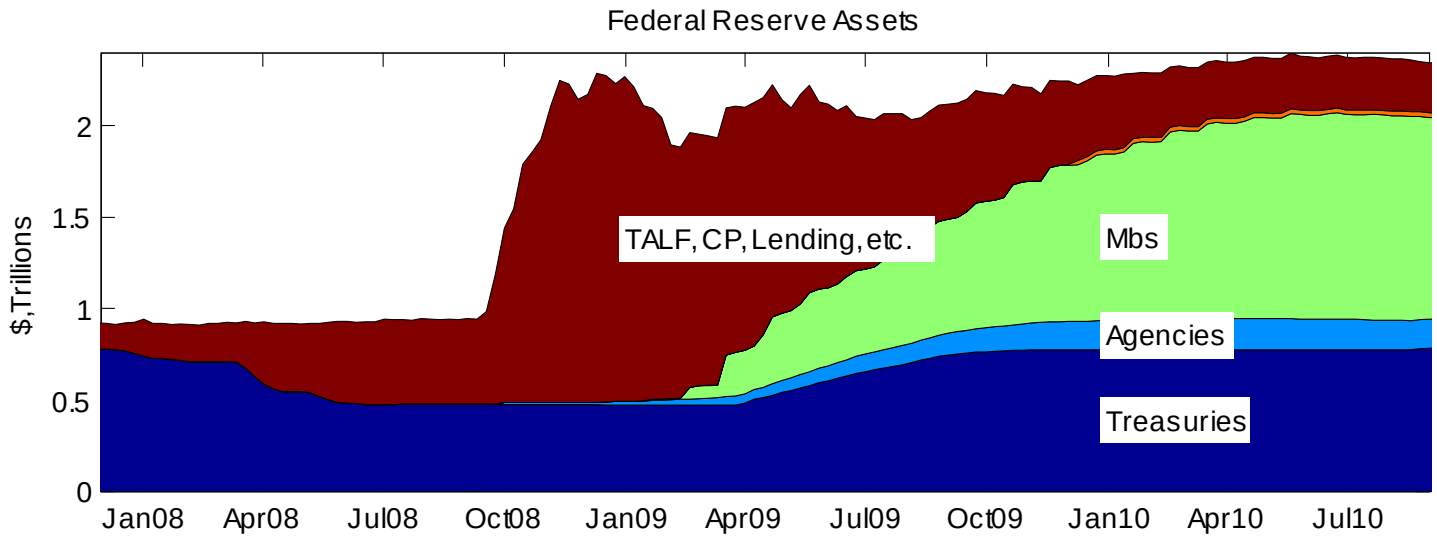
2008-2009 – Money?

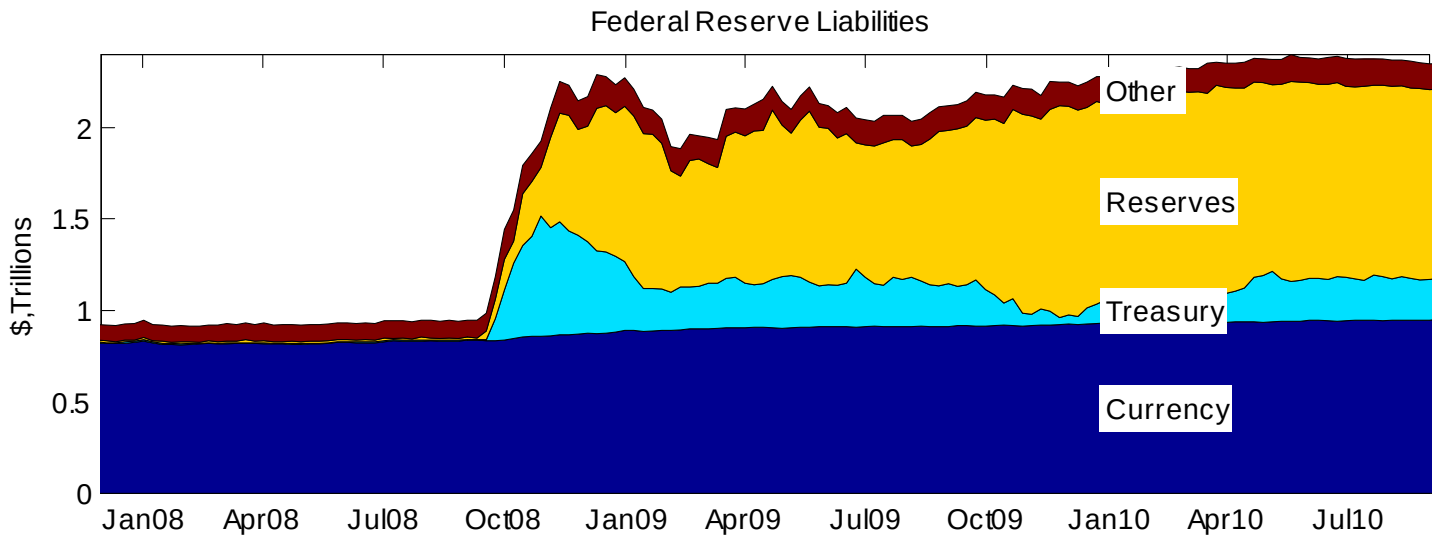




Money stock

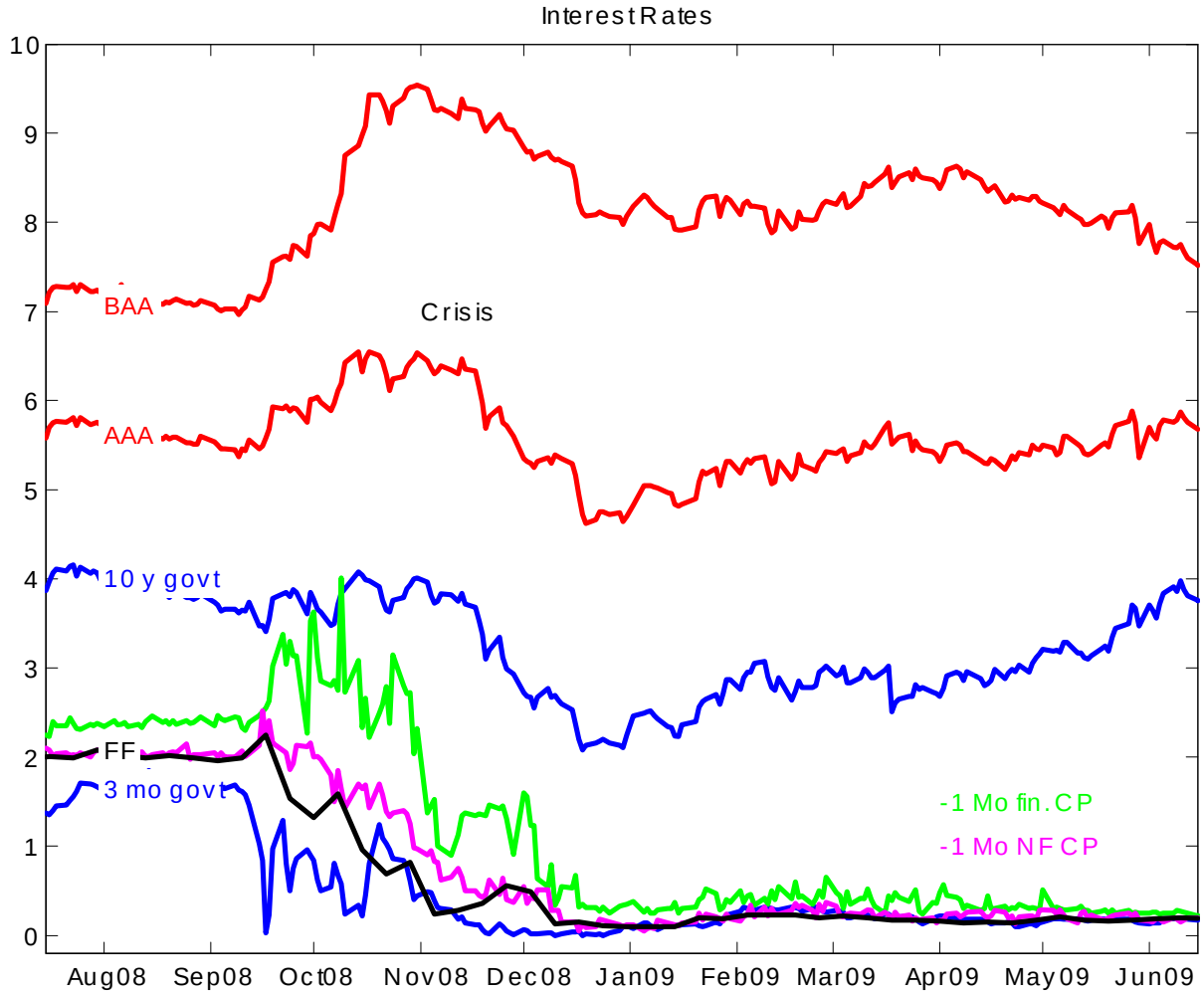
Balance sheet





Money and Debt

- Money Demand / Monetary policy: More money, *less* bonds.
- In fact, a huge demand for and supply of *both M, B.* "Flight to quality."
  1. All Government rates decline, large liquidity spread, Dollar rises. (next)
  2. The *distinction* between M, B is meaningless.(especially at $i = 0$) Banks, financial institutions *wanted more of both.*
  3. "Special?" Demand for "liquidity," "transparency" "collateral" "no credit risk," *not* "transactions services"



Interest rates. Moody's BAA and AAA; 10 year Treasury constant maturity and 3 month Treasury bill; 3 month nonfinancial and financial commercial paper

Model flight to quality / less AD?

- R decreased. "Liquidity" "special" demand for *all* US government debt = less "AD."

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{\underrightarrow{R_{t,t+\tau}}\underleftarrow{}} s_{t+\tau}$$

- Distinguish R relative to private (2008), vs all R lower (2010)
- + Choose your favorite non-neutrality $\longrightarrow$ lower Y as well as lower P.
- US "Reserve debt," makes more sense than "reserve currency."
- Understand "aggregate demand" fluctuations as demand for US debt, unrelated to $E_t s_{t+j}$?

M and B Accommodation

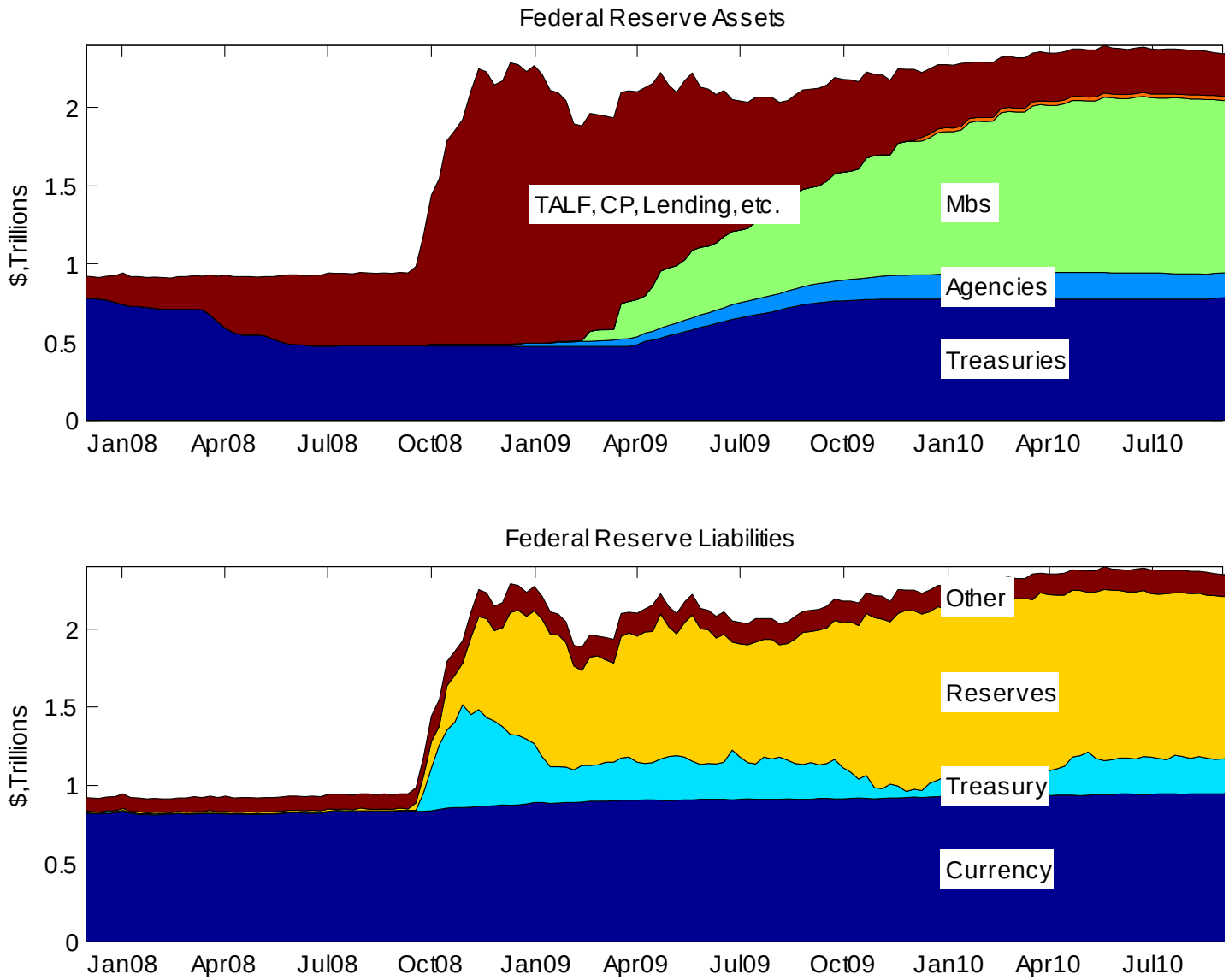
More of both M, B.

1. "Open market debt operations" ("Treasury" in next graph)
2. More of both" raises "AD" by lowering the liquidity premium.

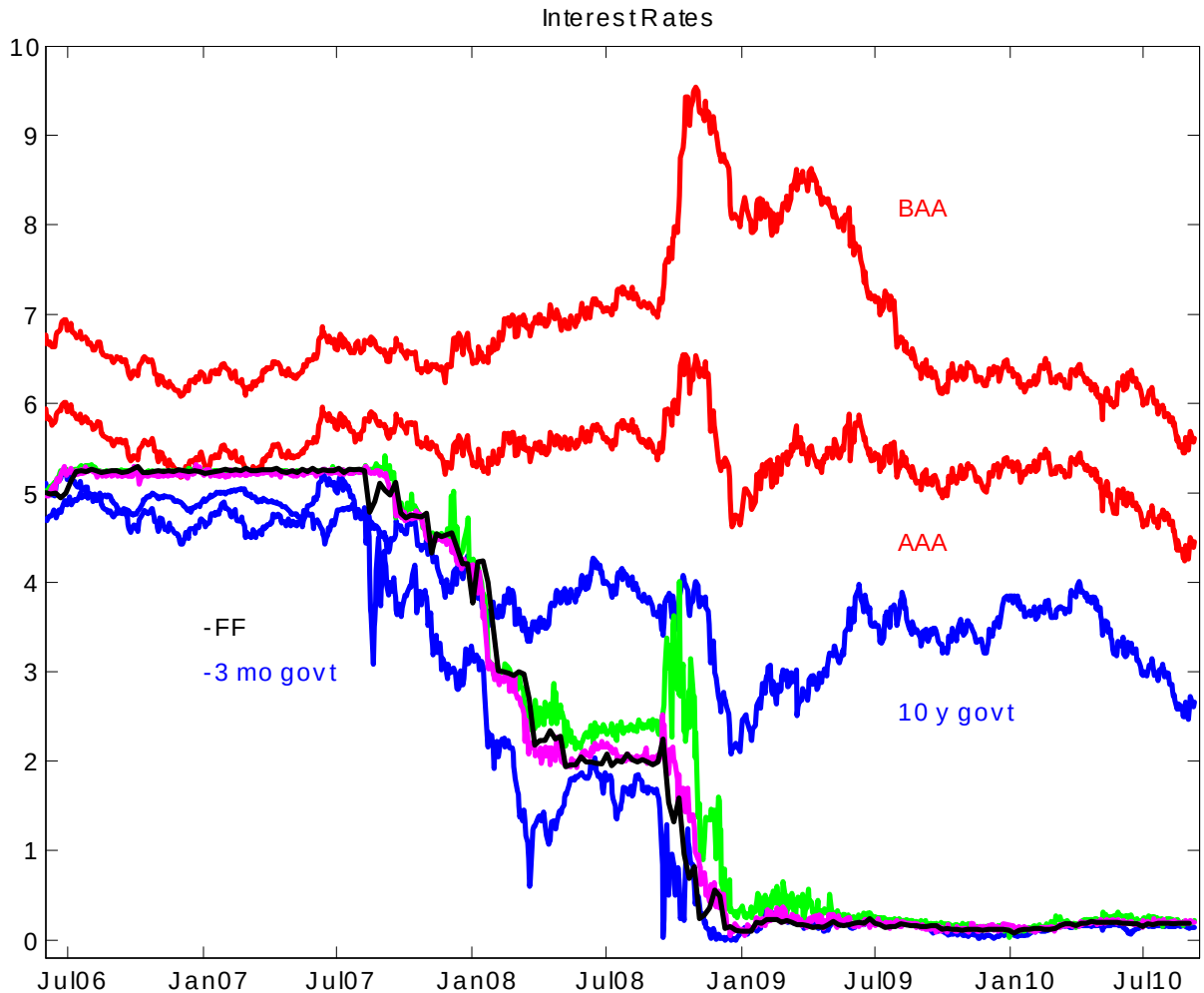
$$\begin{aligned} D_t &= \text{Private debt owned by the Government} \\ \frac{M_t + B_t - D_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{1}{\rightarrow R_{t,t+\tau}(M+B) \leftarrow} s_{t+\tau} d\tau \end{aligned}$$

3. Balance sheet expansion: Issued \$1 trillion M, B, took in private assets.
4. Government guarantees change private to public debt.
5. Massive B issue even if accompanied by more s.
6. Friedman/Schwartz advice applied to *debt*
7. Fed: segmented markets, interest rates, "demand" via frictions

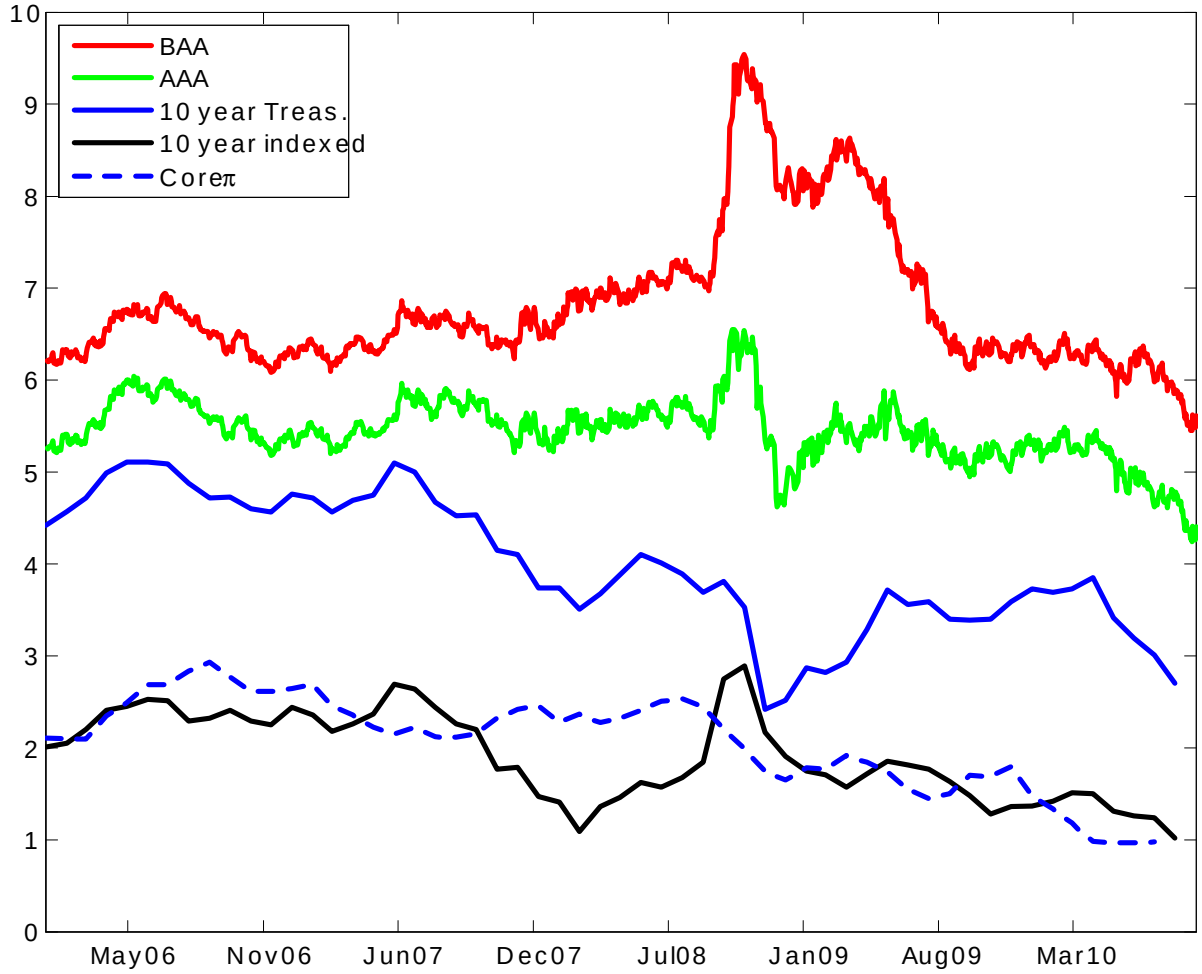
Fed Balance Sheet



Inflation vs. deflation worries



Long rates, TIPS, inflation and expected inflation



Fiscal/Monetary stimulus/fighting deflation?

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau. \\ M_t V_t(i_t, \cdot) &= P_t Y_t \end{aligned}$$

- Tools?
  1. Rates? $= 0$
  2. Quantitative Easing I – short bonds. V adapts
  3. Quantitative Easing II – long bonds.
  4. Quantitative Easing III – private/government debt.
  5. Announcements: Desperation? (Higer $E\pi =$ extreme desperation!)

Announcements

COURTESY: GERALD R. FORD PRESIDENTIAL MUSEUM

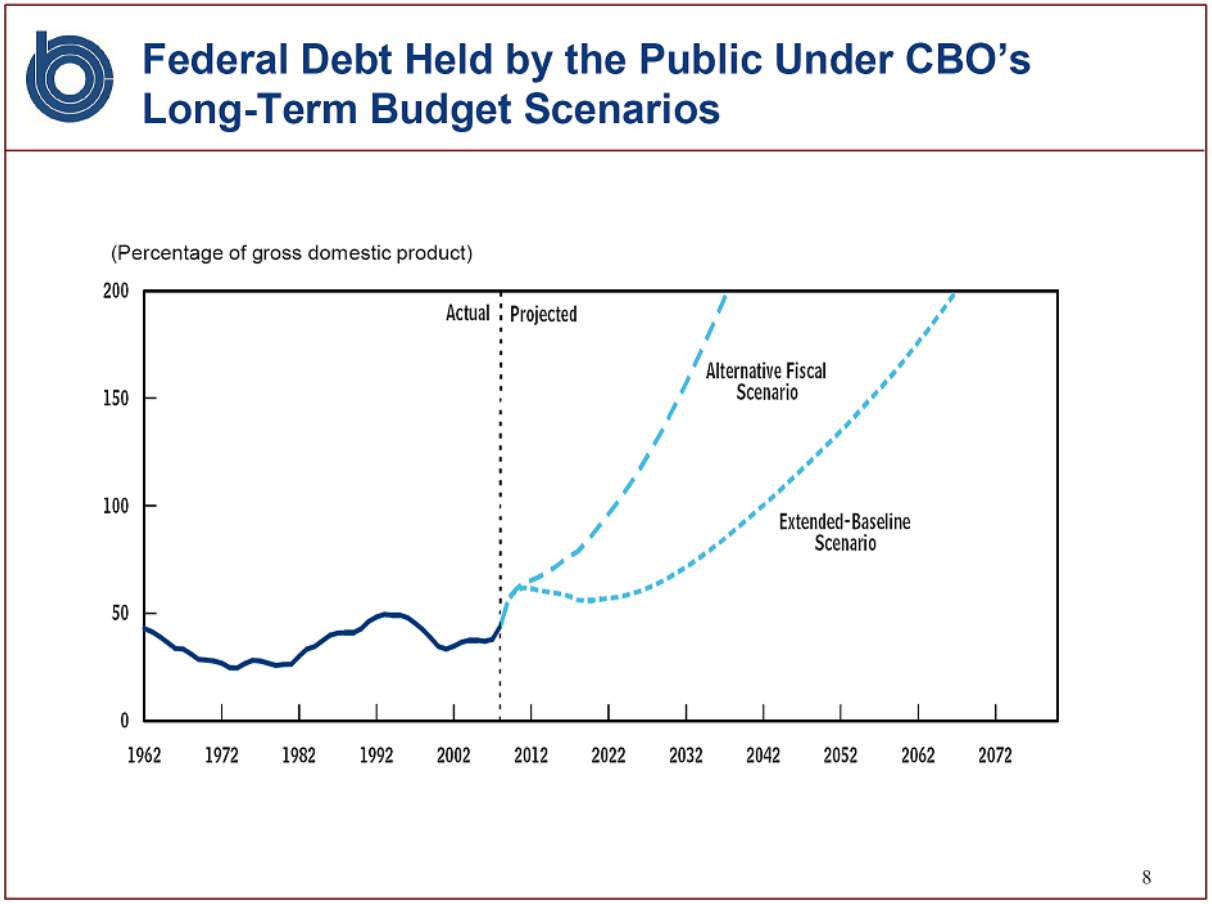
Fiscal / Monetary stimulus

$$\begin{aligned} \frac{M_t + B_t}{P_t} &= E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau. \\ M_t V_t(i_t, \cdot) &= P_t Y_t \end{aligned}$$

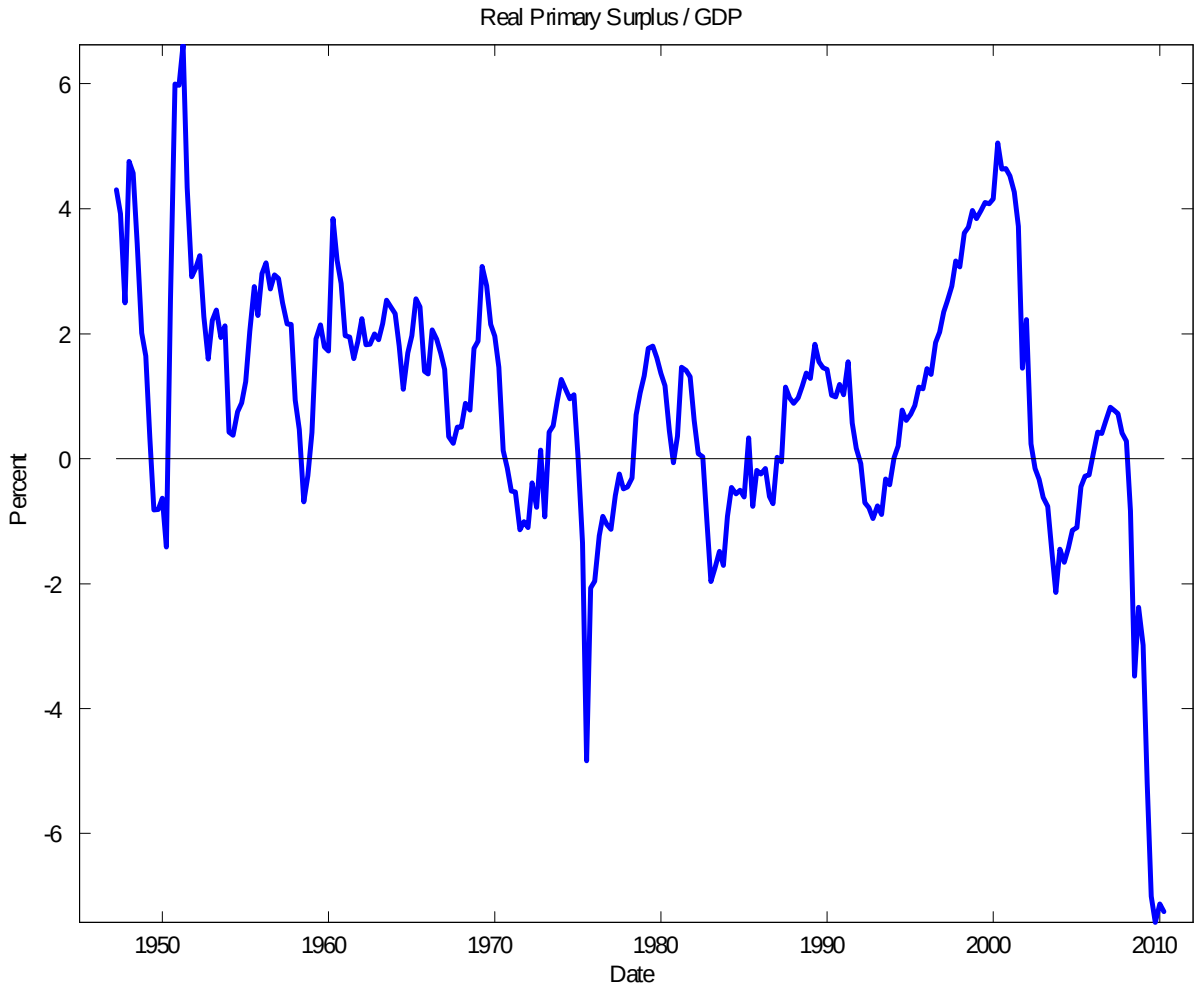
- Helicopters? A *fiscal* operation, a brilliant way to communicate s intentions.
- You can't *inflate* (especially at $i = 0$) without (lack of) fiscal backing, changing long term s expectations (Japan?)
- Fiscal-monetary stimulus is really hard to do.
  1. Bond sales *are set up* to convey $E_t s_{t+\tau}$, raise revenue.
  2. Contrast with a currency reform – $E_t s_{t+\tau}$ is the only difference!
- Commodity standard / CPI futures or TIPS spread?

Inflation and fiscal limits?

$$\frac{\text{Money} + \text{Gov't Debt}}{\text{Price level}} = \text{Expected discounted surpluses}$$



Real primary surplus / GDP again



Inflation and the fiscal limit

- When and how will debt lead to inflation?

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau.$$

- Fiscal limit novelties
  1. Debt/GDP is no guarantee
  2. "The Government will monetize debt, and then we'll get inflation." P does not wait for seigniorage (all)
  3. R can change too!
  4. Flight happens quickly, unpredictably, without warning signs for the Fed. (Rollover, "speculators?")
  5. Credit guarantees and the dynamic Laffer limit...

Credit guarantees and nominal commitments

- Credit guarantees + looming bailouts mean
  1. Defaults/state bailouts may give big shocks to s (sovereign?)
  2. Guarantees, pensions, etc are "nominal debt"
  3. Temptation to inflate is larger

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=t}^{\infty} \frac{\Lambda_\tau}{\Lambda_t} s_\tau(P_\tau);\ s'(P) > 0$$

  4. Size of inflation is smaller.
- Note. US debt is "small". Even $P = \infty$ is not enough!

Dynamic Laffer curve

1. Static Laffer curve

$$\frac{\partial \log(\tau Y)}{\partial \log \tau} = 1 + \frac{\partial \log Y}{\partial \log \tau} < 1 \quad (< 0?)$$

   If $\tau = 0.30$ to $\tau = 0.35$ lowers Y by 15%, at the limit.

2. Dynamic – if taxes lower growth it's much worse –

$$\begin{aligned} PV &= \int e^{-r\tau} \left(\tau Y_0 e^{gt}\right) dt = \frac{\tau Y_0}{r-g} \\ \frac{\partial \log PV}{\partial \log \tau} &= 1 + \frac{\partial \log Y_0}{\partial \log \tau} + \frac{1}{(r-g)} \frac{\partial g}{\partial \log \tau} \end{aligned}$$

   - $r - g = 0.02$;if $\tau = 30\%$ to $\tau = 35\%$ lowers growth by 0.3%, we're at the limit.

$$\log(0.35/0.30) = 0.15;\ 0.02 \times 0.15 = 0.003$$

   - *Slow Growth* is the big danger

What will fiscal inflation look like?

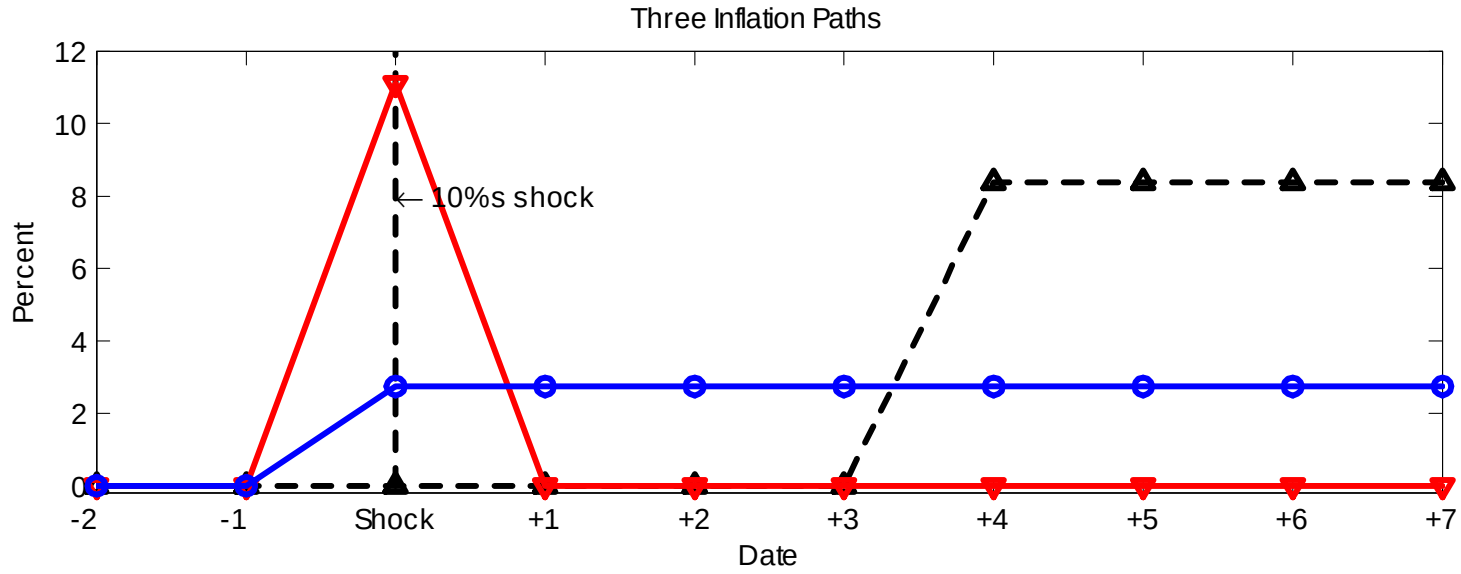
- Long term debt affects dynamics a lot – no price level jump. Bond prices
- Government (Fed) can affect the *timing* of inflation with bond sales.
- Selling more of outstanding long term debt devalues that debt as a claim to eventual surpluses, postpones inflation. And vice versa (QEII 2008/2010).
- Outstanding debt gives the "budget constraint" for inflation tradeoffs.

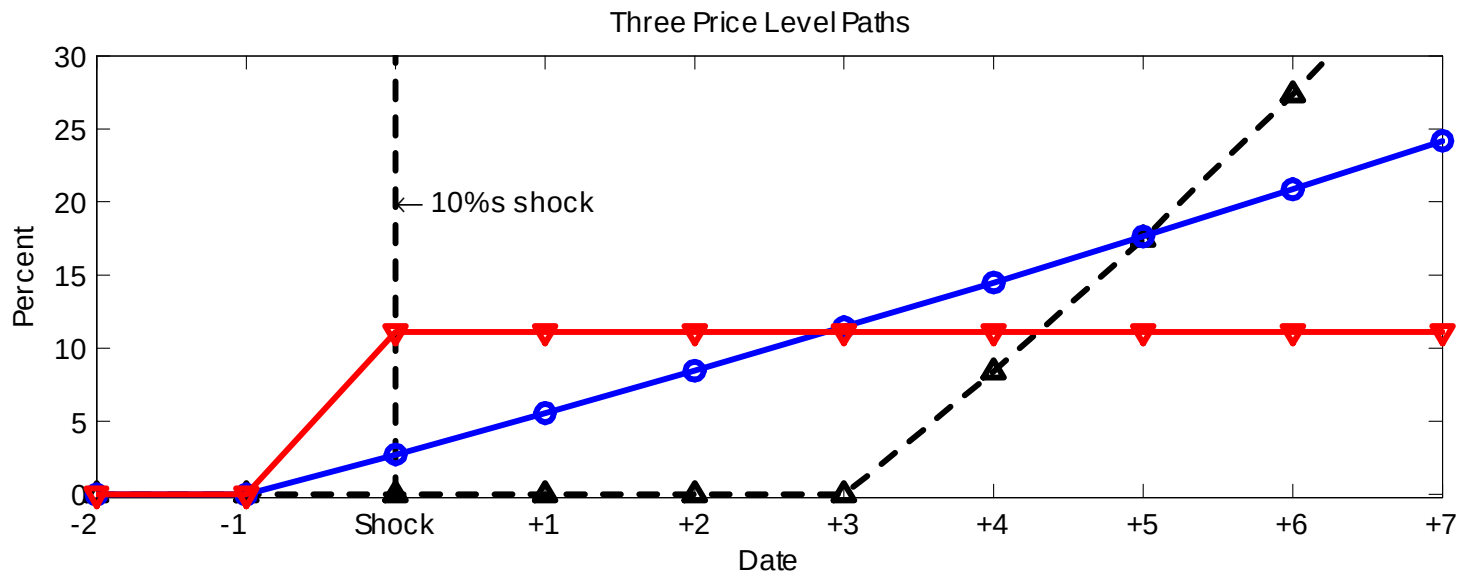
$$\frac{\int_{j=0}^{\infty} Q_t^{(j)} B_t^{(j)} dj}{P_t} = \int_{j=0}^{\infty} E_t \left(\frac{1}{P_{t+j}} \right) e^{-rj} B_t^{(j)} dj = E_t \int_{\tau=0}^{\infty} e^{-r\tau} s_{t+\tau} d\tau$$

Inflation scenario with long-term debt

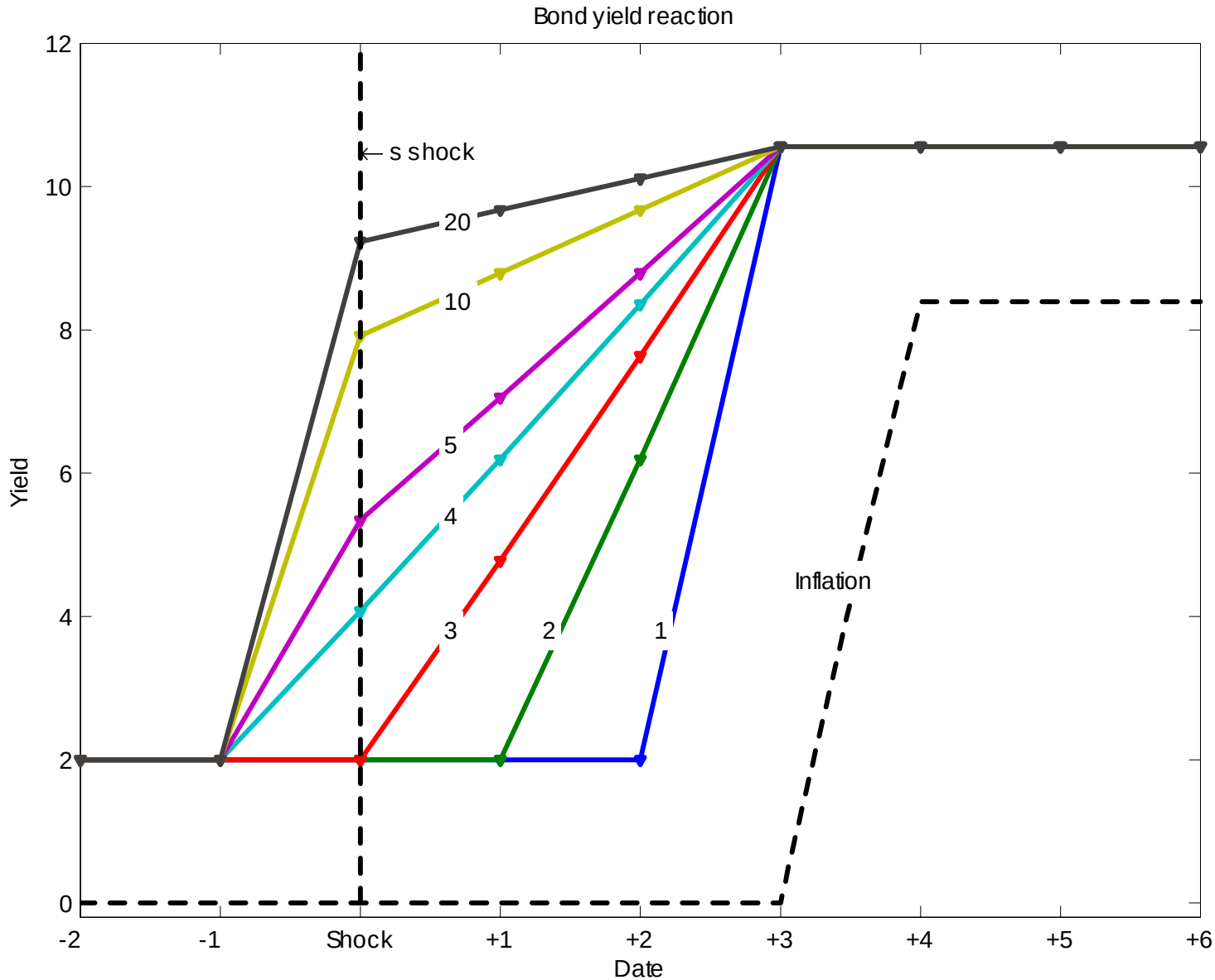
- What if
$$\Delta S_t \equiv (E_t - E_{t-\Delta}) \int_{\tau=0}^{\infty} e^{-r\tau} s_{t+\tau} d\tau.$$
- Price level jump?
$$\frac{B_t}{P_t} (E_t - E_{t-\Delta}) \left(\frac{1}{P_t} \right) = \Delta S_t$$
- Paths with delayed inflation, obey
$$\int_{j=0}^{\infty} dj \; e^{-rj} B_t^{(j)} (E_t - E_{t-\Delta}) \left(\frac{1}{P_{t+j}} \right) = \Delta S_t$$
- Use US Federal debt, 10% S shock,.....

Possible reactions to a 10% PV shock in 2009 ("Fiscal Arithmetic")





Interest rates and inflation respond to 10% PV shock

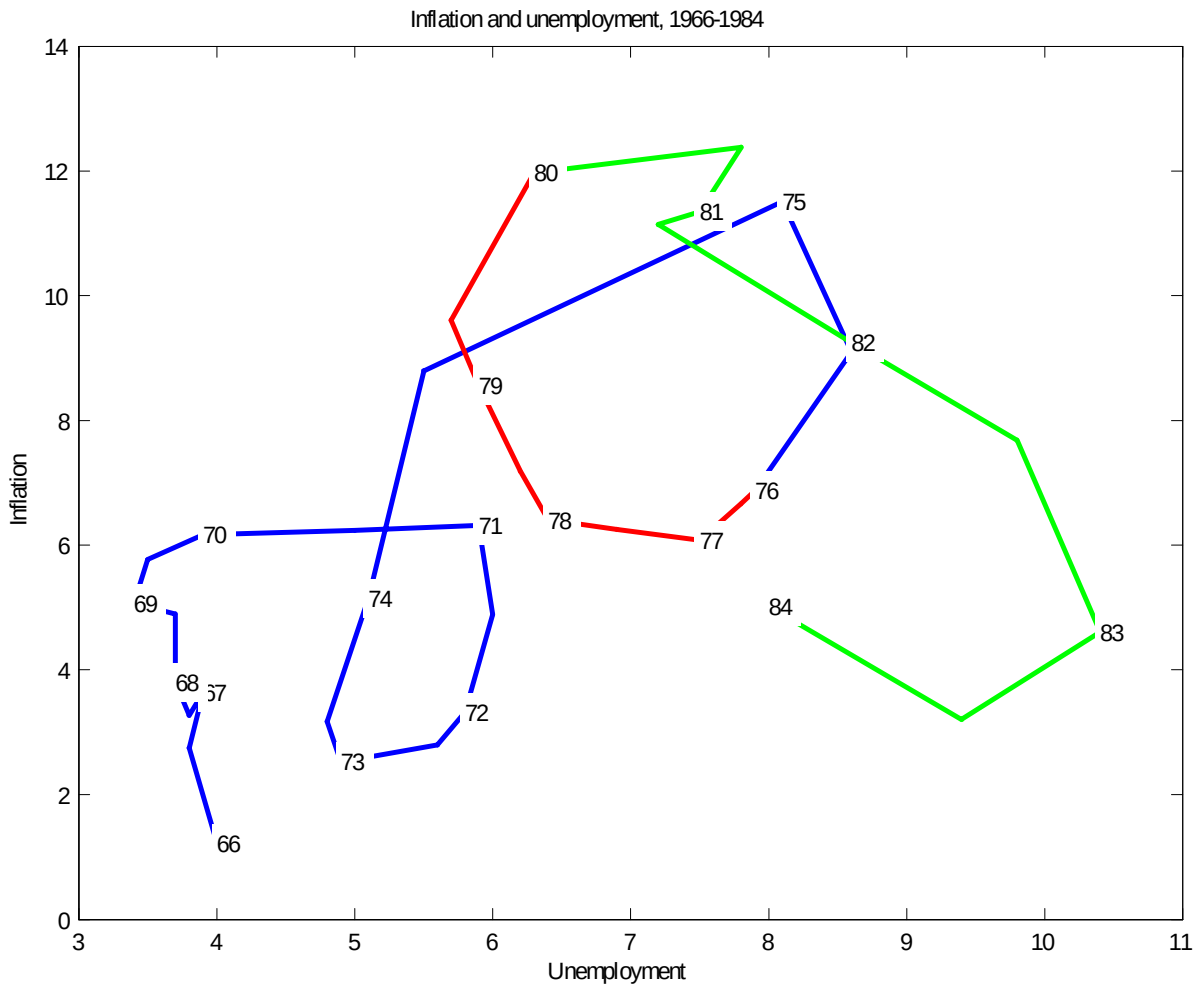


Will fiscal inflation “stimulate,” or “stagflate?”

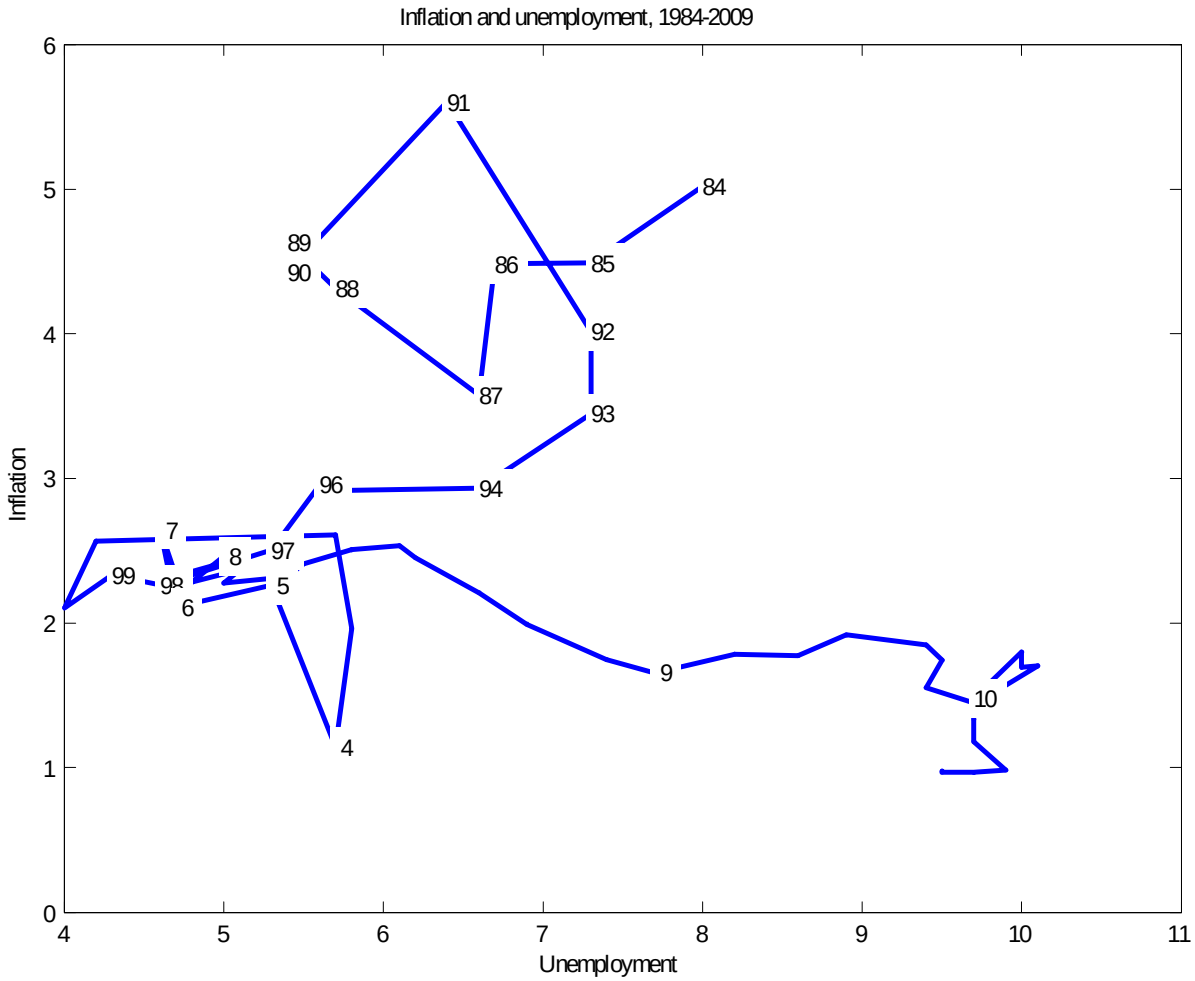
- Many: “a little inflation would be a good thing" (Phillips boom, cancel nominal debts.)
- Many more: (FOMC) Don’t worry, "slack"

> *“With substantial resource slack continuing to restrain cost pressures and longer-term inflation expectations stable, inflation is likely to be subdued for some time.*

- Recall, stagflation is possible! – Phillips curves shift!



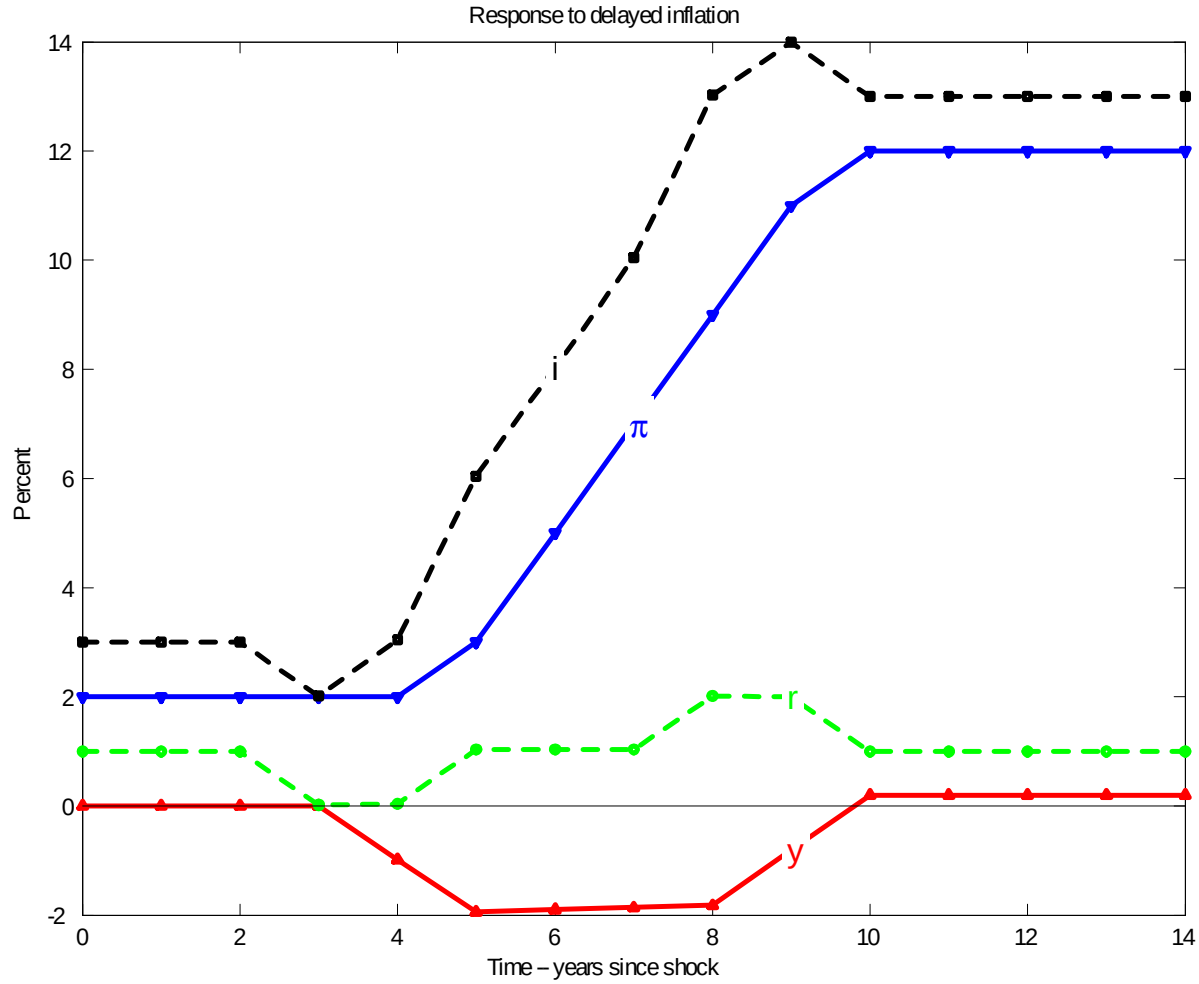
CPI inflation and unemployment, 1966-1984



CPI inflation and unemployment, 1984-2009

Will fiscal inflation "stimulate," or "stagflate?"

- Inflation does not always come with a boom!
  1. 70s.
  2. Fiscal examples: Hyperinflations, currency collapses. Zimbabwe, Argentina.
- Fiscal inflation = "loss of anchoring"? "Expectations" "Phillips shift?"



$$\pi_t = \beta E_t \pi_{t+1} + \gamma y_t; \quad y_t = E_t y_{t+1} - \sigma r_t; \quad i_t = r_t + E_t \pi_{t+1}$$

The End

- The end

Sargent and Wallace

$$JC \quad \frac{B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{\Lambda_{t+\tau}}{\Lambda_t} \left(T_{t+\tau} - G_{t+\tau} + \frac{dM_{t+\tau}}{P_{t+\tau}} \right) d\tau,$$

$$SW \quad b_t = E_t \int_{\tau=0}^{\infty} \frac{\Lambda_{t+\tau}}{\Lambda_t} \left(T_{t+\tau} - G_{t+\tau} + \frac{dM_{t+\tau}}{P_{t+\tau}} \right) d\tau,$$

- SW: $T < G$ means dM/P at some point, and $MV(dP/dt) = PY$ can mean P_t (real debt).
- JC: $T < G$ can mean P_t rise even with no M.

Fiscal stimulus

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau$$

- Can "fiscal policy stimulate aggregate demand?" (Past R)
  1. If expected *future* $s_{t+\tau}$ rises with higher B_t, lower s_t, no.
  2. If expected future s_τ does not rise, yes.
  3. It's ok to have "non-Ricardian" expectations for *nominal* debt.
  4. It does not matter that "spending will come too late."
- Be careful when you read history / estimate multipliers.
- Explains long term debt projections in 2008? "spend it now or else?"
- Of course frictions add channels.

Exit strategy

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau$$

- *Can* the Fed soak up extra cash? Pundits: no. Me: yes.
  1. Open market operations are easy.
  2. Illiquid assets? The Treasury can issue more debt
  3. Pay more interest on reserves
  4. Fiscal limit, no one wants to buy B? *They're already holding M* .
- *Will* the Fed soak up the extra cash? – Trade M for B, raise rates?
- *Will doing so make any difference*? A: Not at the fiscal limit.

Bottom line

$$\frac{M_t + B_t}{P_t} = E_t \int_{\tau=0}^{\infty} \frac{1}{R_{t,t+\tau}} s_{t+\tau} d\tau \quad (1)$$

$$M_t V_t(\cdot) = P_t Y_t \quad (2)$$

$$\pi_t = \beta E_t \pi_{t+1} + \gamma(y_t - \bar{y}) \; ? \quad (3)$$

- (1) is surely at the center of events right now.
- Inflation? No forecast but a scenario
  1. More bailouts, spending, no entitlement resolution.
  2. *Slow growth*, distorting taxes.
  3. $\rightarrow$ Fairly sudden flight from long bonds, dollar, followed by π, stagflation
  4. Fed: "models don't work" "shifting Phillips curve" like the 70s.

Mechanisms and guides

- **Interest rates, Fed view**

$$\text{Fed} \rightarrow \text{short r} \rightarrow \text{long, other r} \rightarrow \text{"demand"} \rightarrow \text{"gaps"} \rightarrow\rightarrow \text{inflation}$$
$$\text{other shocks} \nearrow \quad \text{expectations} \nearrow$$

- **New Kenyesian**

$$\pi_t \uparrow \implies i_t \uparrow\uparrow \implies \pi_{t+1} \uparrow\uparrow$$

"Coordinate expectations on unique local equilibrium"

- **Money**

$$MV = PY$$

- **Deficits**

$$\frac{\text{Money + Govt Debt}}{\text{Price level}} = \text{Present value [Real primary surpluses]}$$

$$\text{primary surplus} = \text{tax - spending (not interest)}$$

  - Fed: More money, less debt. It is powerless here.
  - Inflation? Be scared, be very scared

Fiscal constraints in NK models – IR functions

- Fiscal constraint

$$\frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j}$$

$$\Longrightarrow \quad (E_{t+1} - E_t) \sum_{j=0}^{\infty} \beta^j s_{t+j} \text{ gives } \pi_{t+1} - E_t \pi_{t+1}$$

- Simplest model

$$\begin{aligned} i_t &= r + E_t \pi_{t+1} \text{ (IS, Fisher, FOC)} \\ i_t &= r + \phi \pi_t + x_t \text{ (Taylor rule)} \\ x_t &= \rho x_{t-1} + \varepsilon_t \end{aligned}$$

- Equilibrium

$$\begin{aligned} E_t \pi_{t+1} &= \phi \pi_t + x_t \\ \pi_{t+1} &= \phi \pi_t + x_t + \delta_{t+1} \end{aligned}$$

- δ_{t+1} must correspond to a fiscal shock

Impulse-response functions with fiscal constraints

- Simplest model

$$\begin{aligned} i_t &= r + E_t \pi_{t+1} \\ i_t &= r + \phi \pi_t + x_t \end{aligned}$$

- Equilibrium

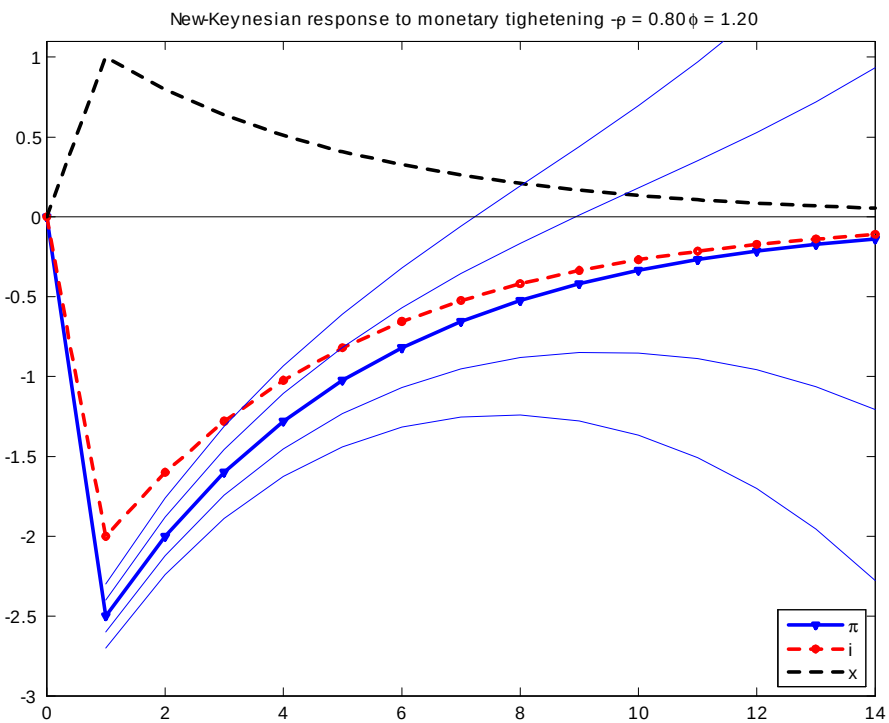
$$\pi_{t+1} = \phi \pi_t + x_t + \delta_{t+1}$$

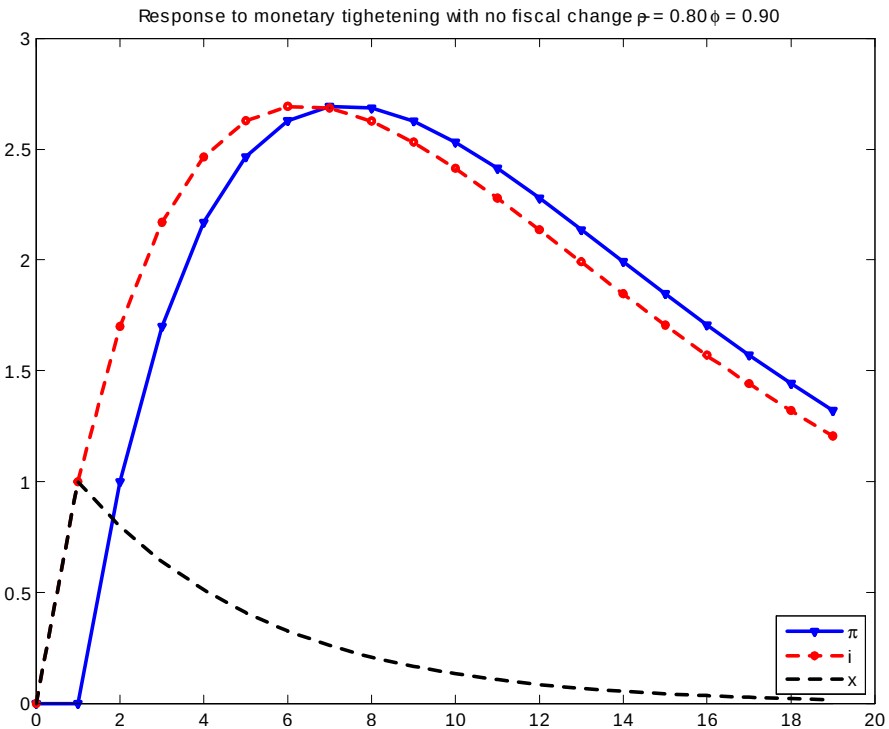
- NK solution (needs $\phi > 1$).

$$\begin{aligned} \pi_t &= -\sum_{j=0}^{\infty} \frac{1}{\phi^{j+1}} E_t x_{t+j} = -\frac{x_t}{\phi - \rho} \Longleftarrow \text{ Inflation jumps} \\ \delta_t &= -\frac{\varepsilon_t}{\phi - \rho} \Longleftarrow \text{ Fed induces fiscal change} \end{aligned}$$

- Fiscally-constrained solution: $\delta_t = 0$ in response to x shock. (Needs $\phi < 1$).

Response to m policy shock





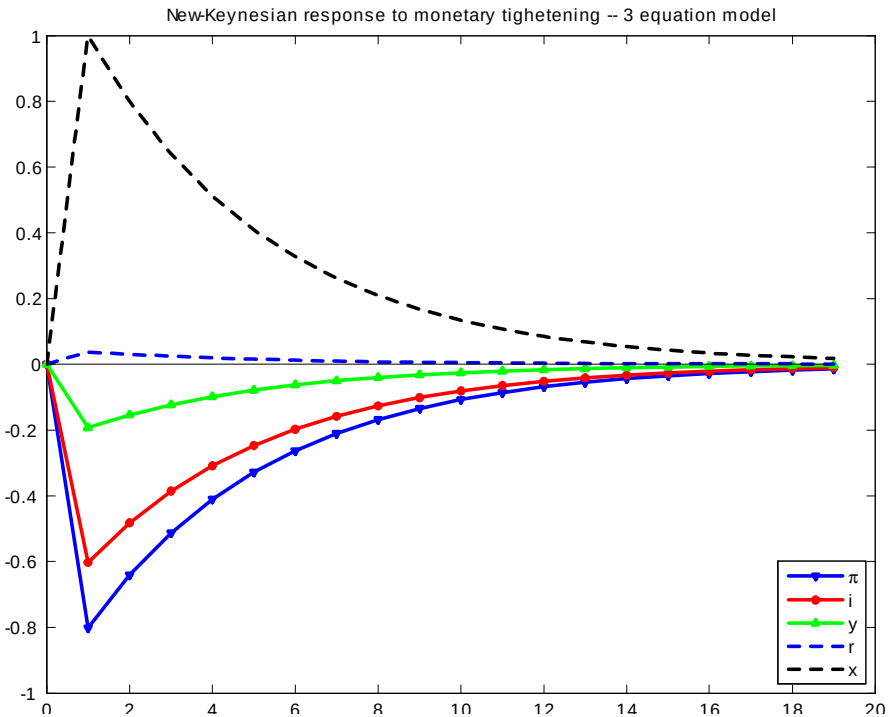
3-Equation model with fiscal constraints

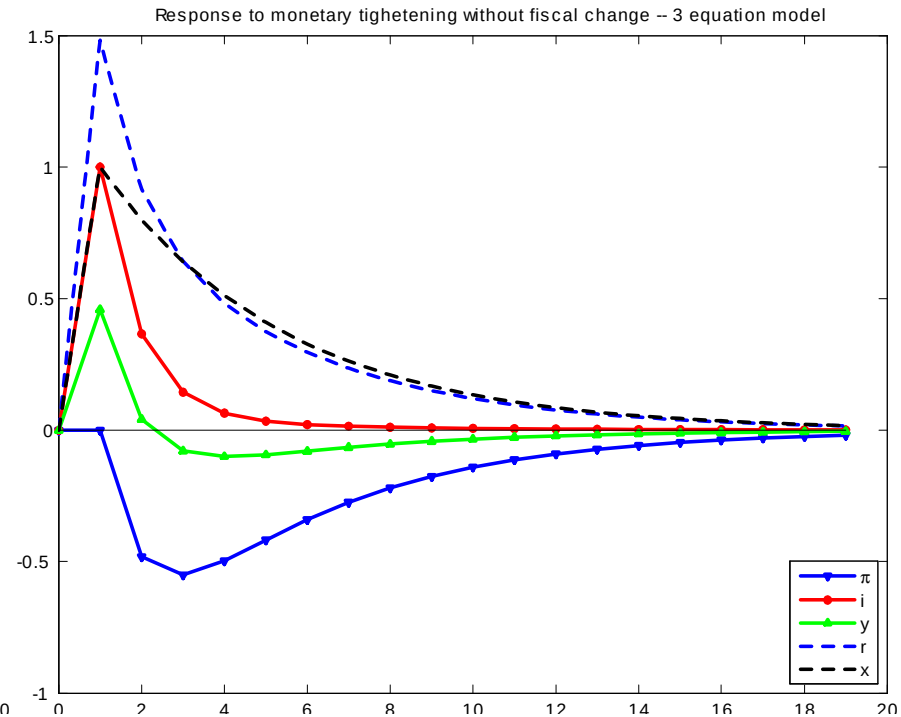
- Model

$$\begin{aligned} y_t &= E_t y_{t+1} - \sigma r_t + x_{dt} \\ i_t &= r_t + E_t \pi_{t+1} \\ \pi_t &= \beta E_t \pi_{t+1} + \gamma y_t + x_{\pi t} \\ i_t &= \phi_\pi \pi_t + x_{it} \end{aligned}$$

- NK solution: $\phi > 1$, solve forward, π jumps in response to an x_i shock
- Fiscal solution: $\phi < 1$, calculate the response to an x_i shock with no contemporaneous shock to π.

3 Equation model with fiscal constraints – response to m policy shock





Fiscal foundations for the Euro (again)

$$\frac{B_{t-1} + M_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j}$$

1. Does it apply, and how? A: Yes, ECB transforms sovereign debt + some credit guarantees.
2. The choice: Common fiscal policy, Default, or "Government equity."
3. Livres vs. ecus, a 300 year old idea.