Debt, Deleveraging, and the liquidity trap:

A Fisher-Minsky-Koo approach

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What causes big contractions?

$$Y_t = A_t K_t^{1-\gamma} L_t^{\gamma}$$

Want a story of incomplete factor utilitization.

1. Financial frictions that trigger large change in "intertemporal prices"

2. Price frictions that make this hard to accommodate.

Old stories

- Hicks: IS equation shocks
- In modern literature it has been shocks to "preferences", e.g. Krugman (1998), Eggertsson and Woodford (2003), Christiano, Eichenbaum and Rebelo (2010).
- Can think of this paper as putting more structure on these "exogenous shocks"
- More direct modeling of the origin, and analysis of its implications.

The origin of the crisis

- There is “too much debt”.
- “Minsky moment”
- But one persons debt, is another persons asset.
- Can only matter if wealth distribution matter.
- Need a model with heterogeneity to make sense of this.
- Will do this in the ***<u>most simple</u>*** way possible.

This paper

- Borrowing and lending in a stripped down model DSGE model.
- Borrowing constraint of the same form as Bewley-Ayagari-Hugget etc.
- Explore an exogenous reduction in the debt limit.
  - Natural story for the crisis (temporary negative natural rate of interest)
  - Can't accommodate this due to the zero bound
  - Fisher debt-deflation. Redistribution effect .
  - Paradox of thrift and toil [Eggertsson (2010)]
  - → Fisher effect doing lots of work here, backward bending aggregate demand.
  - Spending and tax multipliers
  - Going to look a bit like a very old fashion Keynesian model.

(a flaw or a feature?)

Structure

1. Endowment economy with flexible prices, natural rate of interest
2. Nominal price determination, Fisher effect and endogenous natural rate of interest
3. Endogenous production, staggered pricing
4. Paradox of thrift, toil and flexibility
5. Monetary and fiscal policy
6. Extension: Dynamic model with Calvo pricing

Simple endowment economy

$$E_0 \sum_{t=0}^{\infty} \beta(i)^t \log C_t(i) \text{ with } i = s \text{ or b}$$

$$D_t(i) = (1 + r_{t-1}) D_{t-1}(i) - \frac{1}{2} Y + C_t(i)$$

$$(1 + r_t) D_t(i) \leq D^{high} > 0$$

$$\beta(s) = \beta$$

Equilibrium in simple model: Steady state

Borrower will borrow up to borrowing limit → $$C^b = \frac{1}{2}Y - \frac{r}{1+r}D^{high}$$

Saver consumes endowment plus interest income → $$C^s = \frac{1}{2}Y + \frac{r}{1+r}D^{high}$$

Saver satisfies Consumption Euler → $$\frac{1}{C_t^s} = (1+r_t)\beta E_t \frac{1}{C_{t+1}^s}$$

Stead state interest will satisfy the savers discount factor → $$r = \frac{1-\beta}{\beta}$$

Experiment: “Deleveraging” shock

- Debt limit presumably reflect “safe” lending taking into account unintended default by some “moral hazard” consideration
- Minsky Moment→ Unexpected reduction in this limit.
- Need to deleverage: Unexpected exogenous drop in the debt limit the borrower <u>*must*</u> satisfy

$$D^{high} \longrightarrow D^{low}$$

What happens? Debtor

- Split in "short run" and "long run".

$$C_L^b = \frac{1}{2}Y - (1-\beta)D^{low}$$

$$C_S^b = \frac{1}{2}Y + \frac{D^{low}}{1+r_S} - D^{high}$$

Number of ***important*** issues regarding the "deleveraging" process are swept under the rug.
Key robust thing we're after
→***Leveraged players need to cut down their spending in SR***
How does saver react and the real interest rate?

Saver

$$C_L^s = (1 + r_S)\beta C_S^s$$

$$1 + r_S = \frac{\frac{1}{2}Y + D^{low}}{\beta\frac{1}{2}Y + \beta D^{high}}$$

Can be less than 1 if $\beta D^{high} - D^{low}$ is big enough

Condition for a nasty little liquidity trap

Negative natural rate of interest

- What going on?
- Borrowers spending collapses due to deleveraging
- In order to get the savers to make up for the spending need the real interest rate to decline.
- The decline may be large enough for the real interest rate to be *temporarily negative*
- Is this a problem?

2. Adding the price level (fix it in the long run)

$$\frac{P_S}{P^*} = \frac{\frac{1}{2}Y + D^{low}}{\beta \frac{1}{2}Y + \beta D^{high}} < 1$$

We have actual ***deflation*** when negative natural rate of interest

Fisher effect

- Suppose debt ceiling real, but debt contracted in nominal terms. Then deleveraging increasing in deflation (Fisher effect)

$$\frac{B^{high}}{P_S} - \frac{D^{low}}{1+r_S}$$

What is important is the difference in the actual price level from the expected one

- And natural rate of interest is now endogenous

$$1+r_S = \frac{\frac{1}{2}Y + D^{low}}{\beta\frac{1}{2}Y + \beta\frac{B^{high}}{P_S}}$$

3. Endogenous output

$$E_0 \sum_{t=0}^{\infty} \beta(i)^t [u^i(C_t(i)) - v^i(h_t(i))] \text{ with } i = s \text{ or b}$$

$$C_t \equiv \left[\int_0^1 c_t(i)^{\frac{\theta-1}{\theta}} di \right]^{\frac{\theta}{\theta-1}} \qquad P_t \equiv \left[\int_0^1 p_t(j)^{1-\theta} dj \right]^{\frac{1}{1-\theta}}$$

Fraction χ_s is savers and fraction 1- χ_s is borrowers

$$C_t = \chi_s C_t^s + (1 - \chi_s) C_t^b$$

Assume that a fraction 1- λ lambda set prices one period in advance and λ flexible. We log-linearize the model

Two main new element

1. Now the borrower can deleverage by also working more

$$\hat{W}_t = \omega \hat{h}_t^i + \sigma^{-1} \hat{C}_t^i \text{ where i=b or s}$$

2. Output is endogenous

$$\pi_t = \kappa \hat{Y}_t + E_{t-1} \pi_t$$

Model

$$\pi_t = \kappa \hat{Y}_t + E_{t-1}\pi_t \longrightarrow \pi_S = \kappa \hat{Y}_S$$

$$i_t = \max(0, r_t^n + \phi_\pi \pi_t)$$

$$\hat{C}_S^s = \hat{C}_L^s - \sigma(i_S - \pi_L - \bar{r})$$

$$\hat{C}_t^s = E_t \hat{C}_{t+1}^s - \sigma(i_t - E_t \pi_{t+1} - \bar{r})$$

$$C_t = \chi_s C_t^s + (1 - \chi_s) C_t^b$$

What's remaining is specifying the constraint person

Again lets do short and long run . Long run prices flexible and back at steady state

$$\hat{C}_S^b = \hat{I}_S^b - \hat{D} + \gamma_D \pi_S - \gamma_D \beta(i_S - \pi_L - \bar{r})$$

IS equation

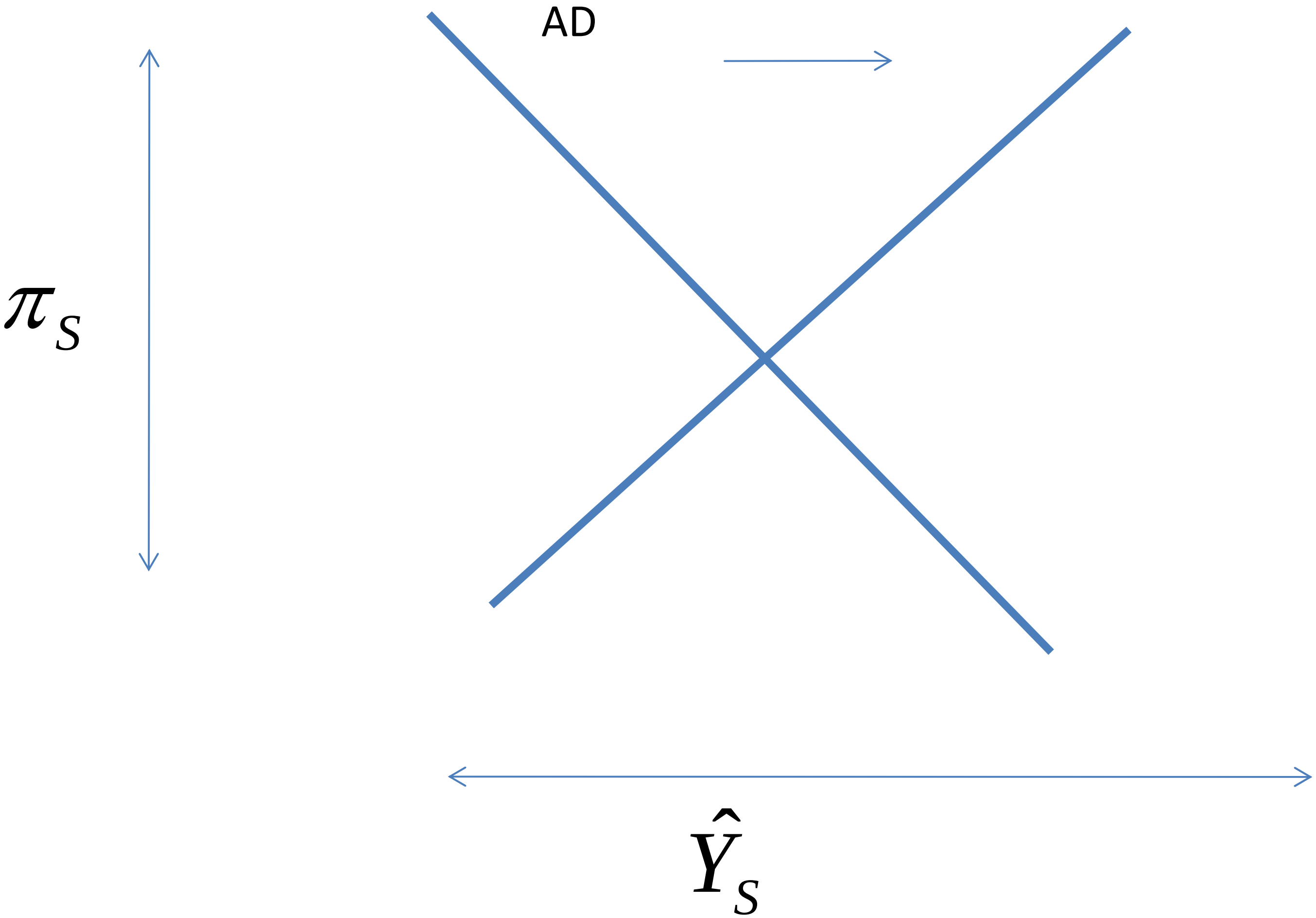
$$\hat{Y}_S = -\frac{\chi_s(\omega^{-1}+\sigma)+\chi_b\gamma_D\beta}{1-\mu\chi_b}(i_S - r_S^n)$$

$$r_S^n \equiv \bar{r} - \frac{\chi_b}{\chi_s(\sigma+\omega^{-1})+\chi_b\gamma_D\beta}\hat{D}$$

$$+\frac{\chi_b\gamma_D}{\chi_s(\sigma+\omega^{-1})+\chi_b\gamma_D\beta}\pi_S$$

$$\hat{Y}_S = \frac{\chi_s(\sigma^{-1}+\omega)+\chi_b\gamma_D\beta}{1-\mu\chi_b}\bar{r} - \frac{\chi_b\gamma_D\beta}{1-\chi_b\mu}(\hat{i}_S - r_S^n) + \frac{\chi_b\gamma_D}{1-\chi_b\mu}\pi_S$$

$$i_t = \max(0, r_t^n + \phi_\pi \pi_t)$$



$$\hat{Y}_S = \frac{\chi_s(\omega^{-1}+\sigma)+\chi_b\gamma_D\beta}{1-\chi_b\mu}\bar{r} - \frac{\chi_b}{1-\chi_b\mu}\hat{D} + \frac{\chi_b\gamma_D}{1-\chi_b\mu}\pi_S$$

$$\pi_S = \kappa\hat{Y}_S$$

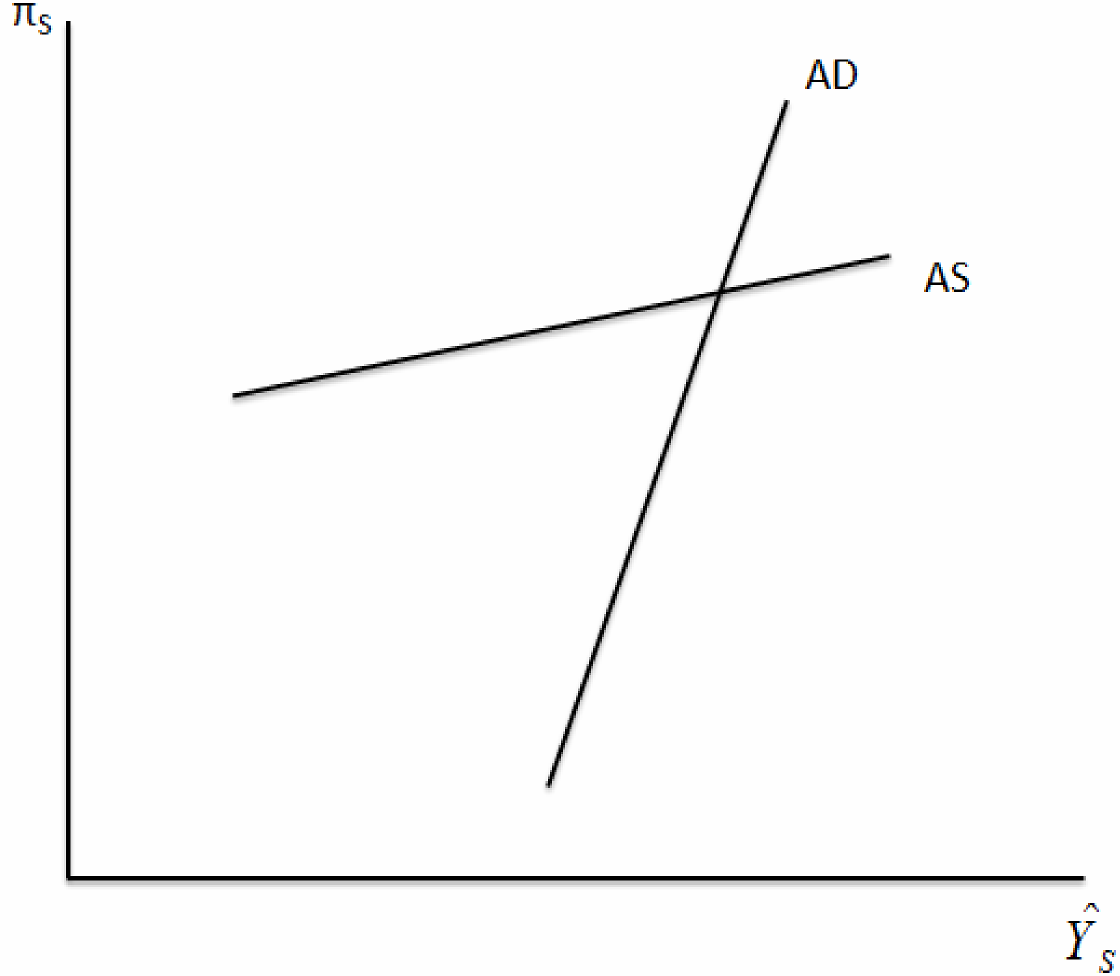


Figure 1 : Topsy-turvy economics

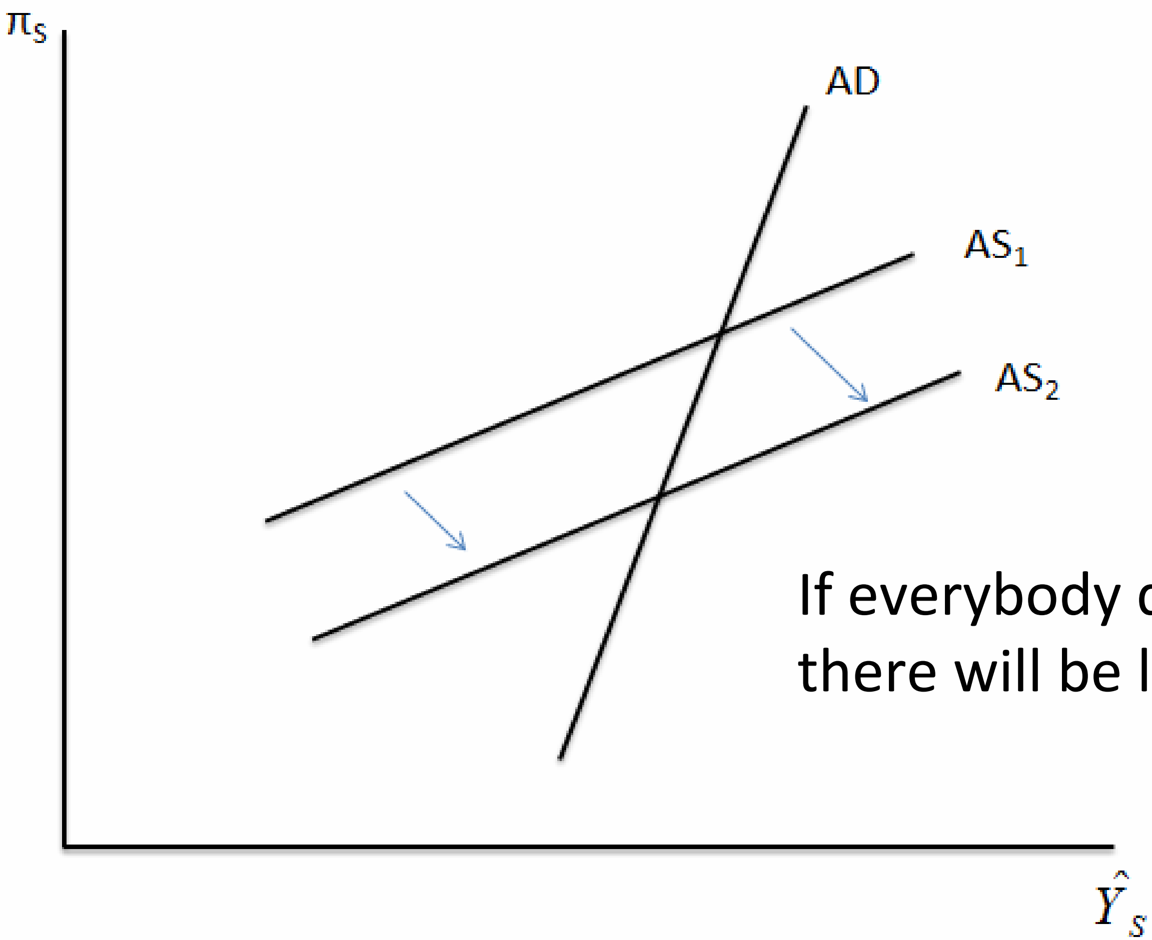


Figure 2: The paradox of toil

If everybody decides to work more, there will be less work in equilibrium!

Intuition?

The converse is true
New Deal?

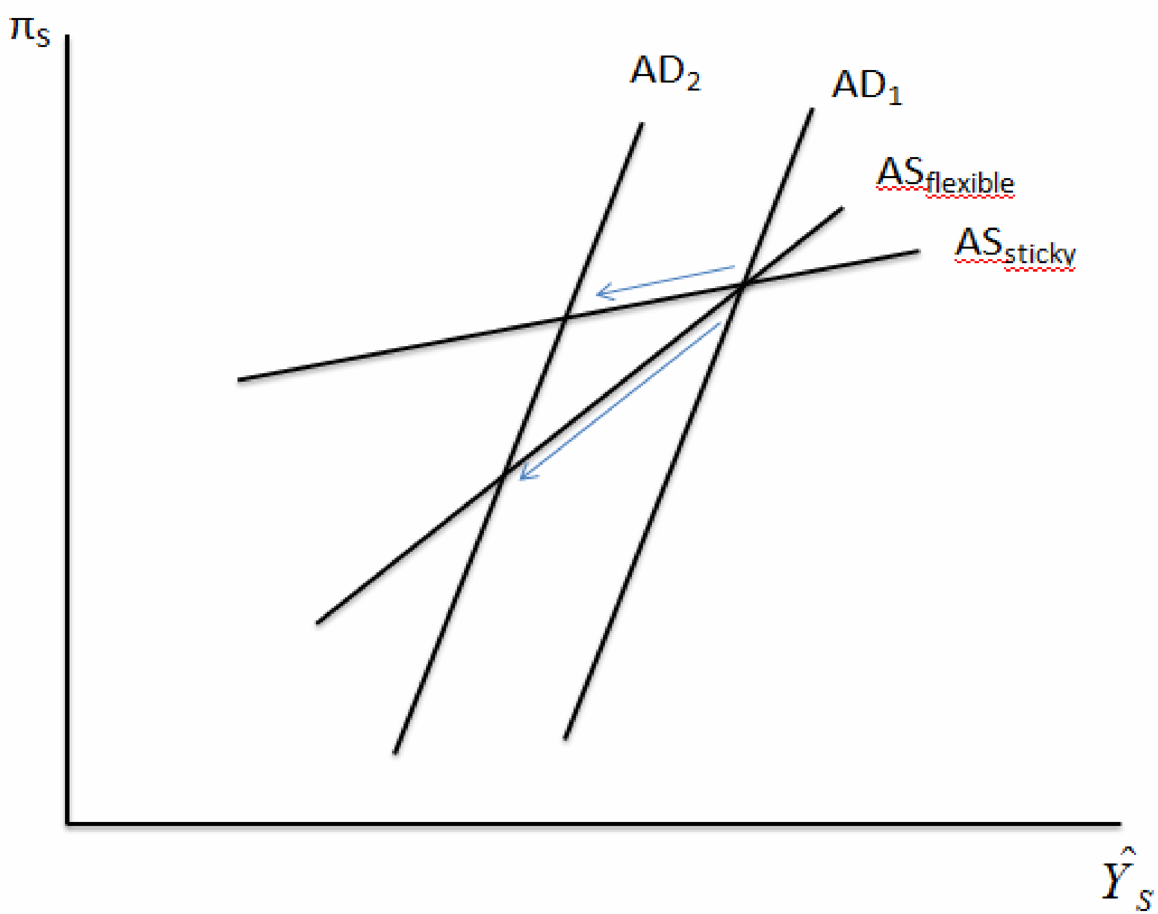


Figure 3: The paradox of flexibility

If prices get more flexible, things get worse!

Monetary and fiscal policy

- Printing money does nothing at zero.
- But! You can do a lot by committing to future inflation (or future low nominal rates)
- Do not study monetary policy here (Krugman (1998), Eggertsson and Woodford (2003) are examples.
- For some reason this seems to be hard in practice
- "The Deflation Bias" (Eggertsson (2006))
- Actually credibility problem may not be that hard here, due to the debt deflation issue

Fiscal policy

- Ricardian equivalence fails here.
- Spending and tax multiplier high

→ Independent of expectation channel documented in Eggertsson (2010) and Christiano, Eichenbaum and Rebelo (2010)

Breakdown of Ricardian Equivalence

$$\hat{C}_S^b = \hat{I}_S^b - \hat{D} + \gamma_D \pi_S - \gamma_D \beta (i_S - \overline{r}) - \hat{T}_S^b$$

$$\pi_S = \kappa \hat{Y}_S - \kappa \varphi \hat{G}_S$$

$$\hat{C}_t = \chi_s \hat{C}_t^s + (1 - \chi_s) \hat{C}_t^b + \hat{G}_t$$

Multipliers can be large and are greater than one

$$\hat{Y}_S = \Gamma - \frac{\chi_b}{1-\chi_b(\mu+\kappa\gamma_D)}\hat{D} - \frac{\chi_b}{1-\chi_b(\mu+\kappa\gamma_D)}\hat{T}_s^{\,b}$$

$$+\frac{1+\omega^{-1}\sigma^{-1}\chi_s-\sigma^{-1}\chi_b-\chi_b\kappa\gamma_D\varphi}{1-\chi_b(\mu+\kappa\gamma_D)}\hat{G}_S$$

Note that this is ignoring the expectation channel!

Too much debt causes the crisis!
You want to pile up more debt?

Well, yes.

Endogenous deleveraging process

- Assumed the consumers deleverage in one go
- More generally the deleveraging will occur due to an increase in spreads (giving the “borrower” incentive to deleverage).
- Now there is interaction between expectation once trapped and demand
- Can get much larger effect if the expectations mechanism is taken into account, and reinforcing our conclusions.

Endogenous deleveraging process

- More importantly perhaps:
- Duration of the trap become endogenous
- The policy can speed up the “adjustment process”.
- Can speed up the “balance sheet cleanup”.

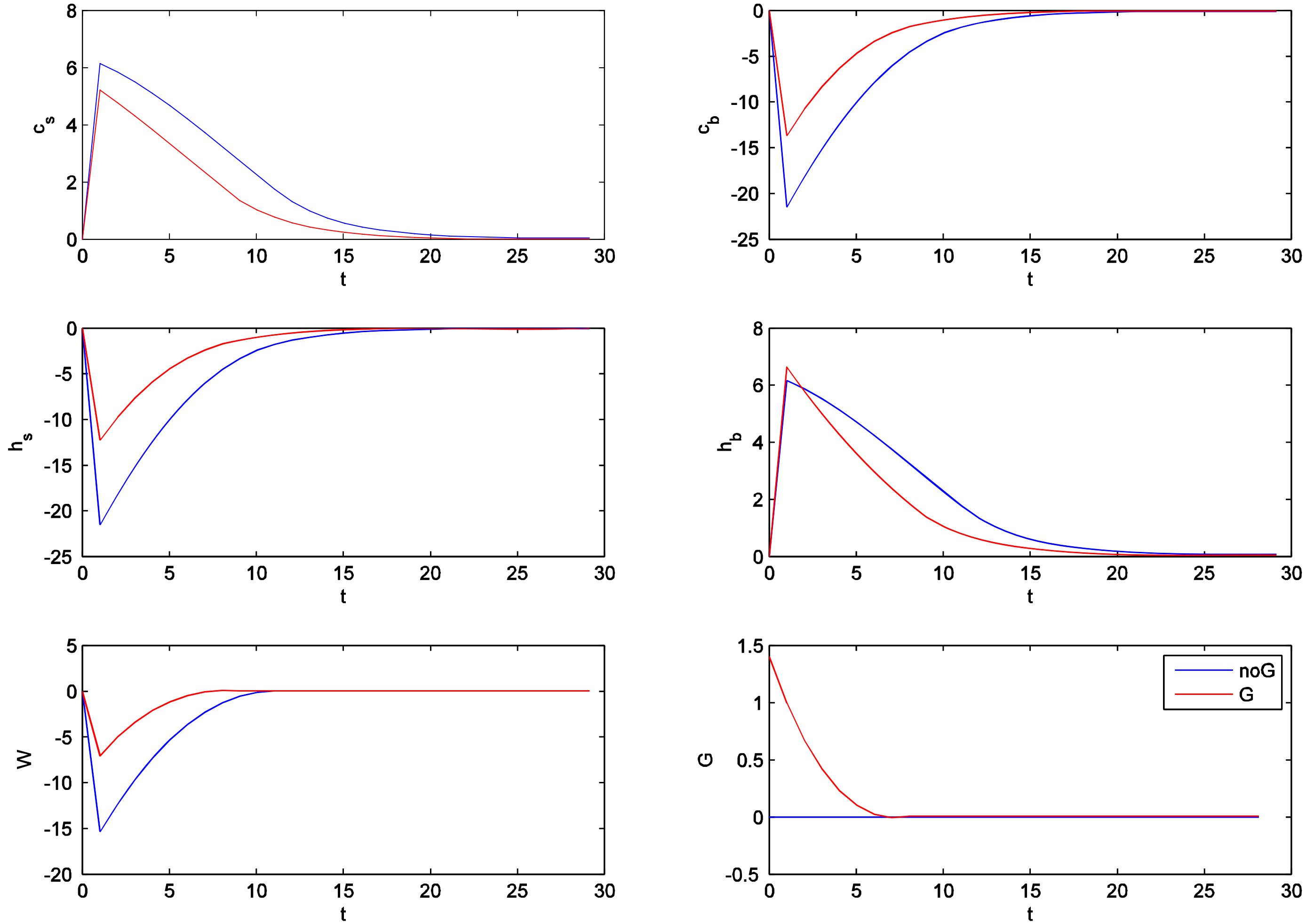
Simple extension of New Keynesian model (in progress)

$$\hat{Y}_t = E_t\hat{Y}_{t+1} - \sigma(i_t^d - E_t\pi_{t+1} - r_t^n)$$

$$\pi_t = \kappa\hat{Y}_t + \beta E_t\pi_{t+1}$$

$$r_t^n = \overline{r} - \chi_b\hat{\omega}_t = \overline{r} - \omega_b\hat{b}_t$$

$$\hat{i}_t^d = \hat{i}_t^b + \hat{\omega}_t$$



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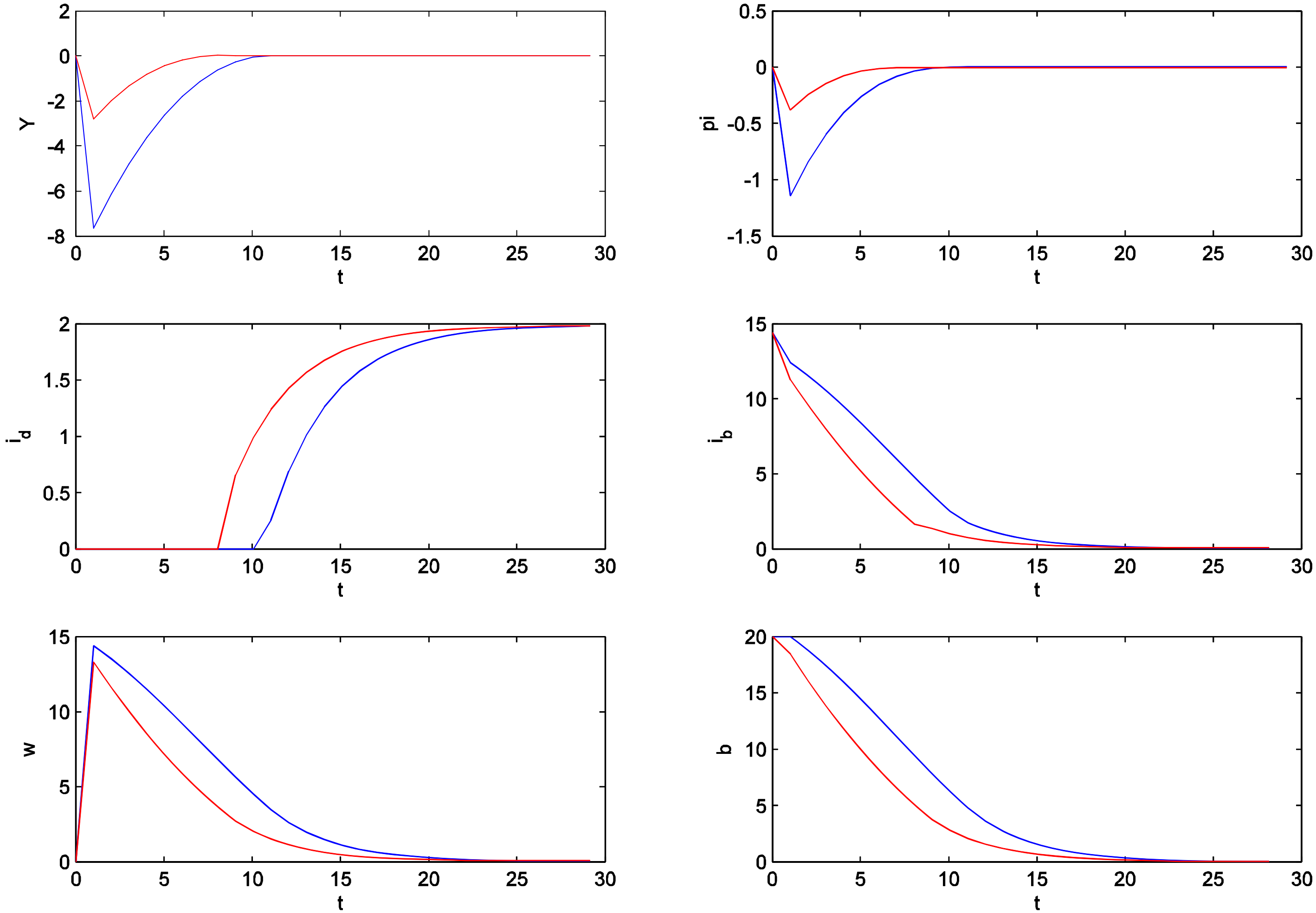
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Summary

- A simple theory of the origin of the Great Depression and the Great Recession (basic mechanism is similar to Hall (2011))
- See a collapse in spending in a certain segments of the population
- For “full employment” somebody else needs to make this up
- The adjustment takes place through a reduction in the real interest rate.
- Can’t happen when zero bound and price rigidities cause drop in both output and prices.

Related

- Del Negro, Eggertsson, Ferrero and Kiyotaki (2010) document a very similar phenomenum in a model where "secondary markets" freeze up.
- There it is the collapse in investment.
- Main point: Combination of financial shock, and nominal rigidities give a good story of what has happen.

Conclusion

- Simple theory of the GD and GR
- Where we are now going: Add more dynamics, and do a “calibrated version”.
- Are relatively close to this, not much more complicated.
- But now expectation become the heart of things.
- Nice thing here, don’t need to rely on expectation to show multipliers and paradoxes.