

On the Optimality of Financial Repression

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Financial Repression

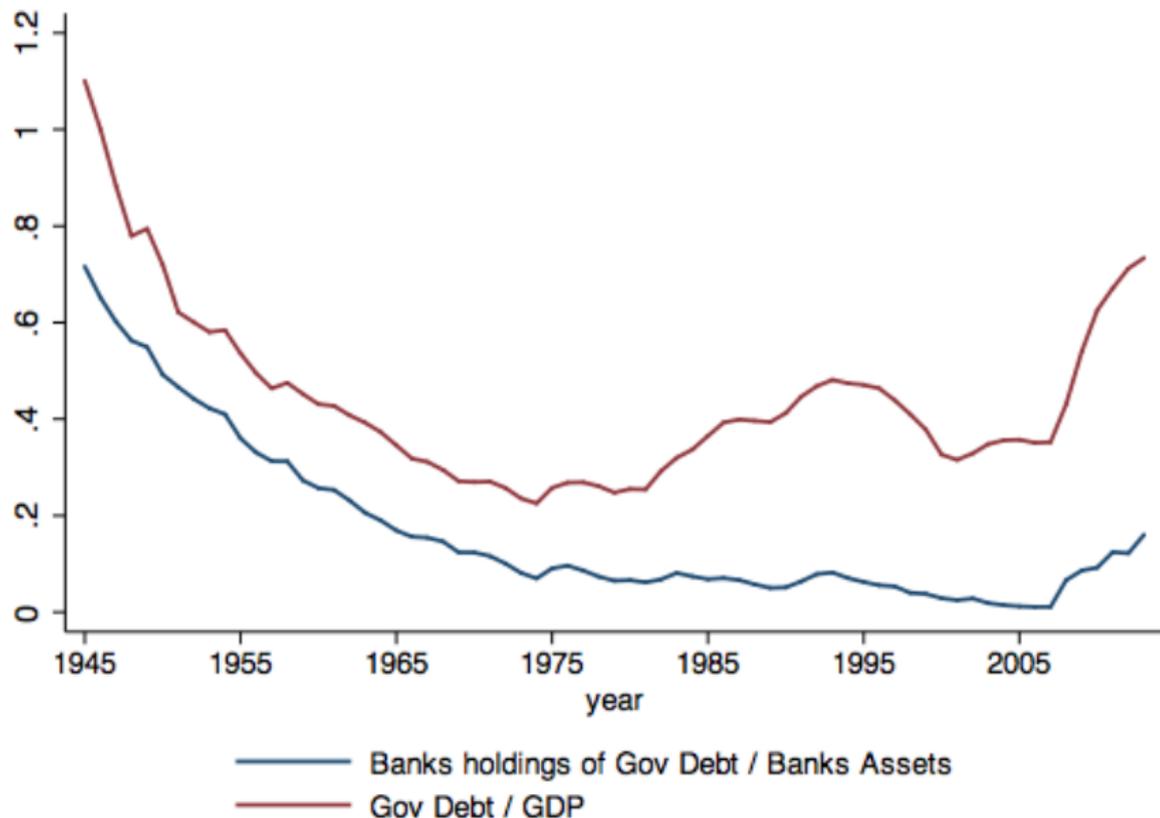
Regulation forcing financial institutions to hold gov't debt

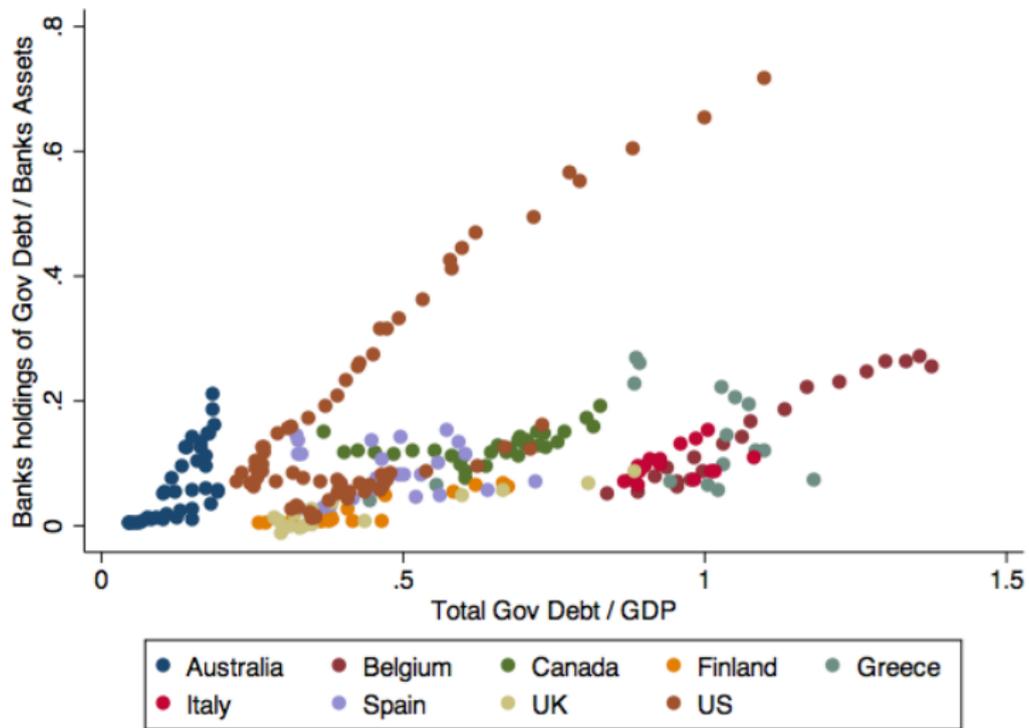
- ▶ Regulation could be explicit or implicit
- ▶ We model regulation as a portfolio restriction
- ▶ We take a **public finance approach** rather than a safety and soundness approach

Financial Repression in Practice

- ▶ Prior to 1860s US states required local banks to hold state debt (Calomiris and Haber (2013))
- ▶ After WWII gov't practiced financial repression to reduce burden of government debt (Reinhart and Sbrancia (2011))
- ▶ Privatization pension system in Latin America: Pension funds required to hold certain fraction of government debt
- ▶ After financial crisis financial repression may be on the way back (Reinhart (2012))
- ▶ During financial crisis Southern European banks increased holdings of national gov't debt (Broner et al (2014))

US Debt and Banks Holdings





$$\frac{\text{Banks holdings of Gov Debt}}{\text{Banks assets}} = \alpha_i + \frac{.44}{(.03)} \frac{\text{Total Gov Debt}}{\text{GDP}} + \varepsilon_{it}$$

Our Reading of Historical Evidence

- ▶ Long history of financial repression
- ▶ Financial repression more likely when government debt high or governments want to issue a lot of debt

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Our model suggests

- ▶ History puzzling if governments can commit
- ▶ Not so puzzling if they cannot

Basic Idea of the Model

- ▶ Collateral constraint model
- ▶ Because of collateral constraints, capital + bonds held by banks constrained by net worth

With Commitment

- ▶ **Crowding out costs** of repression
 - ▶ Given net worth, if banks hold government debt, they must finance less investment
 - ▶ Government debt in banks crowds out investment
- ▶ Taxing bank assets strictly better than distorting portfolio choices
- ▶ With commitment financial repression is a bad idea

Without Commitment

- ▶ **Crowding out costs** of repression same
- ▶ Repression now has **tax smoothing benefits**
 - ▶ Repression allows more debt to be sold by reducing likelihood of future default
 - ▶ Future governments less likely to default because doing so reduces net worth and so reduces investment
- ▶ Repression optimal if tax smoothing benefits outweigh crowding out costs
- ▶ Without commitment repression may be a good idea

Model of Financial Frictions and Financial Repression

Model Overview

- ▶ Representative family of bankers and workers
- ▶ Banks are collateral constrained
- ▶ Gov't finances spending with distorting taxes and debt
 - ▶ State $s_t \sim p(\cdot|s_{t-1})$, government spending $G(s_t)$
- ▶ Gov't can choose minimum fraction of assets that banks must hold in the form of gov't debt

Representative Family of Bankers and Workers

- ▶ Family has bankers and workers
- ▶ All investment done by banks
 - ▶ Households hold deposits at banks
- ▶ Bankers face collateral constraints
 - ▶ Limits deposits relative to bank assets
- ▶ Type of family members switches randomly
 - ▶ Prevents bankers from accumulating too much net worth
 - ▶ Ensures collateral constraint always binding

Representative Family of Bankers and Workers

- ▶ Fraction $1 - \sigma$ of workers become new bankers
 - ▶ Continue as banker with probability σ
 - ▶ Switch to be worker with probability $1 - \sigma$
- ▶ New bankers endowed with random initial net worth with mean \bar{n}

Household Problem

$$\max_{\{C_t, L_t, B_{Ht+1}, D_{t+1}\}} \sum_{t=0}^{\infty} \sum_{s^t} p(s^t | s_0) \beta^t U(C(s^t), L(s^t))$$

subject to

$$\begin{aligned} C(s^t) + \sum_{s^{t+1}} [q_B(s^{t+1}) B_H(s^{t+1}) + q_D(s^{t+1}) D_t(s^{t+1})] &\leq \\ &\leq (1 - \tau_l(s^t)) w(s^t) L(s^t) + D(s^t) + \delta(s^t) B_H(s^t) + X(s^t) - (1 - \sigma) \bar{n} \end{aligned}$$

$$B_{Ht+1} \geq 0$$

B_{Ht} = gov't debt held by hh, D_t = deposits, X_t = dividends,

$\delta_t = 0$ denotes default

Household Problem

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Implies return on deposits greater than return on gov't debt

Bankers' Constraints

- ▶ Budget constraint

$$x(s^t) + (1 + \tau_k(s^t))k(s^t) + \sum_{s_{t+1}} [q_B(s^{t+1})b_B(s^{t+1}) - q_D(s^{t+1})d(s^{t+1})] \leq n(s^t)$$

where net worth is $n(s^t) = R(s^t)k(s^{t-1}) + \delta(s^t)b_B(s^t) - d(s^t)$,
 x_t = dividends, b_{Bt} = gov't debt held by banks, d_t = deposits

- ▶ Portfolio constraint

$$b_B(s^{t+1}) \geq \phi(s^{t+1}) (R(s^{t+1})k(s^t) + b_B(s^{t+1}))$$

- ▶ Collateral constraint

$$d(s^{t+1}) \leq \gamma [R(s^{t+1})k(s^t) + \delta(s^{t+1})b_B(s^{t+1})]$$

Deriving the Collateral Constraint

- ▶ Banker can abscond with fraction $1 - \gamma$ of banks assets
- ▶ After absconding can pretend to be new banker with initial net worth given by fraction $1 - \gamma$ of banks assets
- ▶ Let v_{t+1} denotes value of assets with bank
- ▶ Any contract with no absconding must satisfy

$$v_{t+1} \cdot (R_{t+1}k_{t+1} + \delta_t b_{Bt+1} - d_{t+1}) \geq v_{t+1} \cdot (1 - \gamma)(R_{t+1}k_{t+1} + \delta_{t+1} b_{Bt+1})$$

- ▶ Yields collateral constraint above

Newborn Bankers Problem

$$\max \sum_{s=t}^{\infty} Q_{s,t} \sigma^{s-t} [\sigma x_s + (1 - \sigma)n_s]$$

subject to portfolio constraints and

$$x_t + (1 + \tau_{kt})k_{t+1} + q_{Bt+1} \cdot b_{Bt+1} - q_{Dt+1} \cdot d_{t+1} \leq n_t$$

$$d_{t+1} \leq \gamma [R_{t+1}k_{t+1} + \delta_{t+1}b_{Bt+1}]$$

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$$d_{t+1} \leq \gamma [R_{t+1}k_{t+1} + \delta_{t+1}b_{Bt+1}]$$

Capital can earn higher return than deposits

$$\frac{R_{t+1}}{1 + \tau_{kt}} \geq \frac{1}{q_{Dt+1}} = R_{Dt+1}$$

because binding collateral constraint prevents banks from increasing deposits and investing in capital

Absent Regulation Banks Hold No Debt

- ▶ Have shown

$$\frac{R_{t+1}}{1 + \tau_{kt}} \geq R_{Dt+1} \geq R_{Bt+1}$$

with first inequality strict if collateral constraint binds

- ▶ If collateral constraint binds, absent regulation banks hold no debt
 - ▶ No point in paying R_D for deposits to invest at R_B when deposits can be used to earn $R/(1 + \tau_k)$ on capital

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Absent Regulation Banks Hold No Debt

- ▶ Have abstracted from other motives from holding debt such as liquidity considerations
- ▶ Can incorporate such motives
- ▶ Regulation should be thought of as requiring banks to hold debt above and beyond other motives for holding government debt

Financial Repression Not Optimal with Commitment

Financial Repression Not Optimal with Commitment

Proposition.

- ▶ The Ramsey outcome can be implemented with no financial repression, that is, $\phi_t = 0$ for all t
- ▶ If the collateral constraint binds for some t then $\phi_t = 0$ and $B_{Bt+1} = 0$ **unique** way to implement Ramsey outcome

Proof Ramsey Can Be Implemented with No Repression

Raising revenue by setting $q_{Bt} > q_{Dt}$ is a **redundant instrument**

- ▶ Forcing bank to hold debt at below market rate is equivalent to forcing them to hold it at market rate and raising the tax on capital

\Rightarrow Wlog can have $q_{Bt+1} = \beta p(s_{t+1}|s_t) \frac{U_{Ct+1}}{U_{Ct}} \delta_{t+1} = q_{Dt+1} \delta_{t+1}$

\Rightarrow Ramsey allocation can be implemented with no repression

Redundancy of $q_B > q_D$

- ▶ Substitute portfolio constraint into budget constraint to get

$$(1 + \tau_{kt})k_{t+1} + q_{Bt+1} \cdot \frac{R_{t+1}\phi_t}{1 - \phi_t}k_{t+1} - q_{Dt+1} \cdot d_{t+1} \leq n_t$$

equivalently can set price of debt to q_D and tax on capital to

$$\hat{\tau}_{kt} = \tau_{kt} + (q_{Bt+1} - q_{Dt+1}) \cdot \frac{R_{t+1}\phi_t}{1 - \phi_t}$$

- ▶ Gov't raises same amount of revenues
- ▶ So can implement outcomes with $q_{Dt+1} = q_{Bt+1}$

Proof When Collateral Constraint Binds Need $\phi = 0$

Aggregate bank budget constraint

$$(1 + \tau_k)K' + q_D \cdot B'_B - q_D \cdot D' = \sigma N + (1 - \sigma)\bar{n}$$

with $N = F_K K + \delta B_B - D$, and the collateral constraint

$$D' = \gamma [F'_K K' + \delta' B'_B],$$

Shift debt from banks to HH by 1 unit and reduce D' by 1 unit

- ▶ Relaxes collateral constraint
- ▶ Reducing B'_B increases K' : Reduces crowding out cost

Financial Repression Is Optimal w/o Commitment

Financial Repression Is Optimal w/o Commitment

First we consider Markov equilibrium

- ▶ Show that if tax smoothing motive strong enough governments practice financial repression
- ▶ Financial repression forces banks to hold debt and induces households to do so

Then consider best sustainable equilibrium

- ▶ Show that in normal times trigger strategies will induce some tax smoothing
- ▶ Show that in crisis times trigger strategies not enough, repression is optimal

Assume non-discriminatory default, results go through w/
discrimination

Overview of Logic Behind Repression

If no repression then banks hold no debt.

Will households?

Overview of Logic Behind Repression

If no repression then banks hold no debt.

Will households? **No**

- ▶ Ex-post defaulting on households has no cost and positive benefits
- ▶ So without repression households do not hold debt either. Must have balanced budget. No tax smoothing

Is a non-balanced budget with repression

- ▶ Feasible? Yes if ex post costs of default large enough
- ▶ Desirable? Yes if tax smoothing gains outweigh crowding out costs

Feasibility of Tax Smoothing with Repression

Aggregate bank budget constraint

$$(1 + \tau_k)K' + q_D \cdot B'_B - q_D \cdot D' = \sigma N + (1 - \sigma)\bar{n}$$

with $N = F_K K + \delta B_B - D$, and the collateral constraint

$$D' = \gamma [F'_K K' + \delta' B'_B],$$

Defaulting on B_B reduces N and implies K' or B'_B must fall

- ▶ Yields investment cost of default
- ▶ Makes it possible for government in previous period to credibly issue debt
- ▶ Makes tax smoothing feasible

Desirability of Tax Smoothing with Repression

Aggregate bank budget constraint

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Forcing banks to hold B'_B reduces K'

- ▶ Costs: Repression crowds out capital
- ▶ Benefits: Repression allows tax smoothing

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Forcing banks to hold B'_B reduces K'

- ▶ Costs: Repression crowds out capital
- ▶ Benefits: Repression allows tax smoothing
- ▶ Repression desirable if tax smoothing benefits outweigh crowding out costs

Simplifying Assumptions

- ▶ $G_t = G_H$ if t even and $G_t = G_L$ if t odd
- ▶ $U(C, L) = C - v(L)$
- ▶ $F(K, L) = \omega_K K + \omega_L L$

Role of Assumptions:

- ▶ On G_t
 - ▶ Makes pattern of debt cyclical
 - ▶ Easy notation (same result for stochastic case)
- ▶ On U and F
 - ▶ Eliminates all the cross-partial terms
 - ▶ Ensures simple expressions for prices

Optimality of Financial Repression w/o Commitment

Proposition. If the spread between G_H and G_L is sufficiently large, in any Markov equilibrium the government sells debt in the high state and forces banks to hold part of it

Primal Markov Problem, $S = (K, D, B_B, B_H, G)$

$$V(S) = \max U(C, L) + \beta V(S')$$

s.t. resource constraint, government budget

$$G + \delta(B_B + B_H) = \left(F_L + \frac{U_L}{U_C} \right) L + \tau_k K' + q_D(S') \delta(S') B'$$

aggregate banks budget

$$(1 + \tau_k) K' + q_D(S') \delta(S') B'_B - q_D(S') D' = \sigma (F_K K + \delta B_B - D) + (1 - \sigma) \bar{n}$$

collateral constraint

$$D' = \gamma [R(S') K' + \delta(S') B'_B]$$

and positive rate of return wedge

$$\frac{R(S')}{1 + \tau_k} \geq \frac{1}{q_D(S')}$$

Simplifying Primal Markov Problem

- ▶ Eliminate dependence of q_D and R on S' with linearity and separability
- ▶ Incorporate dependence of future default on future policies by imposing no default constraint
- ▶ Guess and verify simple form for primal Markov problem
- ▶ Let T_K be tax revenues from capital and T_L be tax revenues from labor
- ▶ Let net utility from labor be given by

$$W(T_L) = \omega_L \ell(T_L) - v(\ell(T_L))$$

where $\ell(T_L)$ is optimal labor supply response to T_L

Simplified Primal Markov Problem

In paper we guess and verify value function has form given by

$$V(S) = \omega_K K + A_R R + A_N N + \max \left\{ \overbrace{H(B, G)}^{\text{repay}}, \overbrace{H(0, G) - A_N B_B}^{\text{default}} \right\}$$

where the *tax distortion* function H satisfies

$$H(B, G) = \max_{B'_B, B', T_K, T_L} W(T_L) - \frac{A_N}{\sigma} T_K - A_B B'_B + \beta H(B', G')$$

subject to government budget and no-default constraint

$$A_N B'_B \geq H(0, G') - H(B', G')$$

Note: temporarily suppress rate of return wedge constraint

Tax Distortion Function

$$H(B, G) = \max_{B'_B, B', T_K, T_L} W(T_L) - \frac{A_N}{\sigma} T_K - A_B B'_B + \beta H(B', G')$$

subject to government budget and no-default constraint

$$A_N B'_B \geq H(0, G') - H(B', G')$$

- ▶ $W(T_L)$ measures utility losses from labor tax distortions
- ▶ $\frac{A_N}{\sigma} T_K$ captures reduction in capital accumulation due to capital tax
- ▶ $A_B B'_B$ is crowding out cost of repression

No Default Constraint Implies No-Default Region

- ▶ Tax benefits of future default

$$H(0, G') - H(B', G')$$

Tax benefits increasing and convex function of B'

- ▶ Investment cost of default

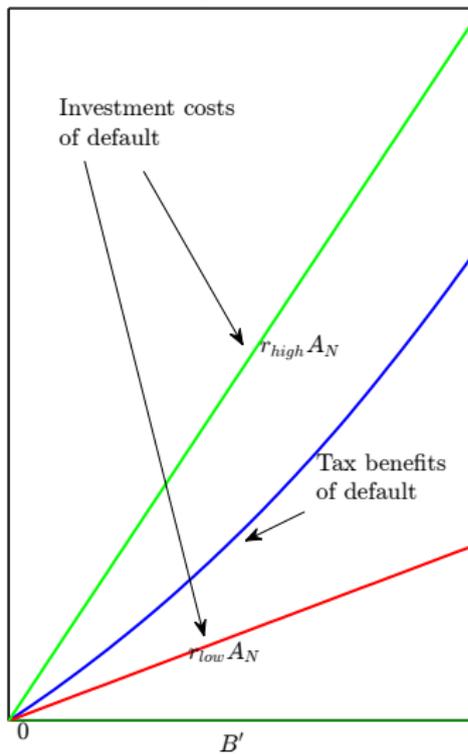
$$A_N B_B$$

- ▶ Let r be

$$r = \frac{B_B}{B}$$

Next plot no-default region

Feasibility of Debt Issue



Tax Smoothing Considerations

- ▶ Tax smoothing benefits of issuing debt

$$W(B + G - \beta B') + \beta H(B', G')$$

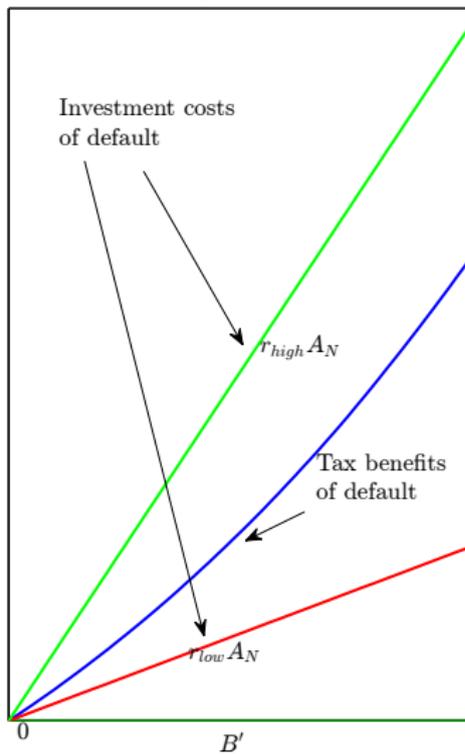
Increase B' reduces taxes today, raises future taxes

- ▶ Crowding out cost of issuing debt

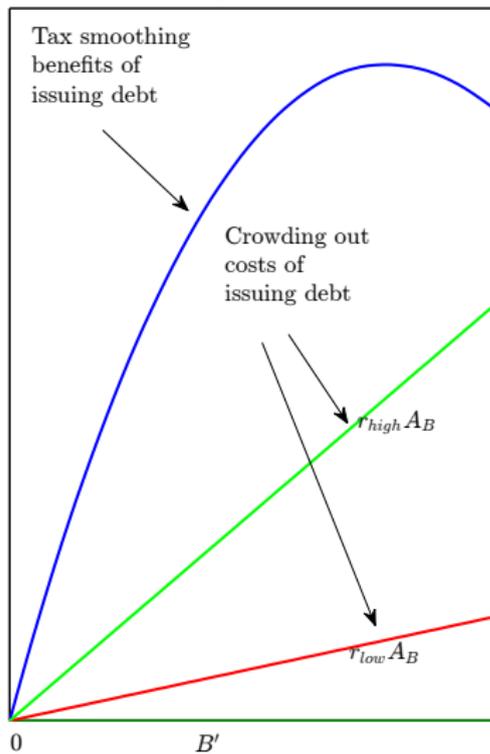
$$A_B B'_B$$

Next plot benefits greater than costs region

Feasibility of Debt Issue



Desirability of Debt Issue



Running Down Debt Slowly Optimal After Big War

Suppose initial debt level high and enough held by banks

Proposition. In a Markov equilibrium debt falls over time as do taxes. Extent of financial repression starts high and falls over time

Contrast with Ramsey: With commitment initial debt never paid off, taxes are constant over time, no repression

Running Down Debt Slowly Optimal After Big War

Ramsey policy

- ▶ Compares cost of raising taxes today to benefit of reducing future taxes
- ▶ Costs and benefits purely from distorting labor supply

Markov policy

- ▶ Must repress to prevent future default
- ▶ Gets additional benefits relative to Ramsey from reducing future taxes by reducing bank held debt
- ▶ So incentive to reduce debt over time stronger in Markov

Front-Loading Distortions Optimal Under Markov

Ramsey: First order condition

$$\beta W'(T_{Lt}) = \beta W'(T_{Lt+1})$$

so taxes constant over time

Markov: If B' strictly positive first order condition

$$\beta W'(T_{Lt}) = \left(\beta + \frac{A_B}{A_N} \right) W'(T_{Lt+1})$$

so taxes must fall over time

Add Standard Reputation Story for Debt

Model no commitment as best sustainable equilibrium

- ▶ Normal times: No repression, trigger supports debt in HH
- ▶ Bad times: Repress to issue extra debt

Best Sustainable Equilibrium

Response to Unanticipated Shock

Temporary change in G in period zero;

For all $t \geq 1$ spending back to cyclical pattern

Proposition. There is a critical value G^* such that if $G_0 \leq G^*$ there is no financial repression and if $G_0 > G^*$ there is financial repression

When G_0 low

- ▶ Sustain desired level of debt with trigger strategies

When G_0 high

- ▶ Trigger strategies alone cannot support enough debt
- ▶ Get better tax smoothing by forcing banks to hold debt

Running Down Debt Slowly Optimal After Big War

Suppose initial debt level high and enough held by banks

Proposition. In the best sustainable equilibrium debt falls over time as do taxes. Extent of financial repression starts high and falls over time

Contrast with Ramsey: With commitment initial debt never paid off, taxes are constant over time, no repression

Running Down Debt Slowly Optimal After Big War

Ramsey policy

- ▶ Compares cost of raising taxes today to benefit of reducing future taxes
- ▶ Costs and benefits purely from distorting labor supply

Best sustainable policy (and Markov too)

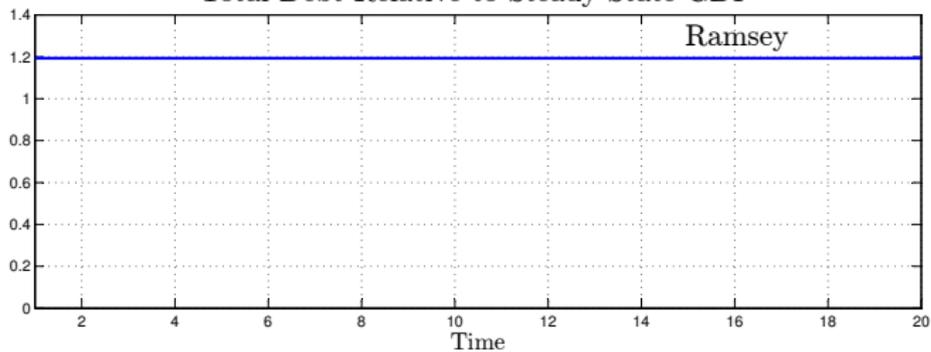
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Numerical Illustration

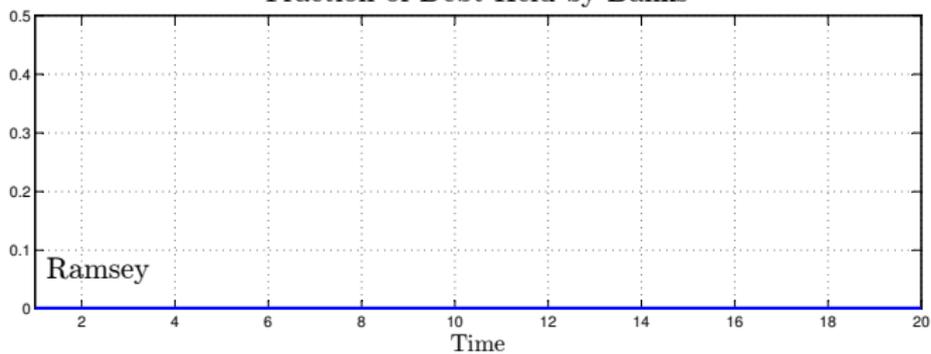
Numerical Illustration in Stochastic Model

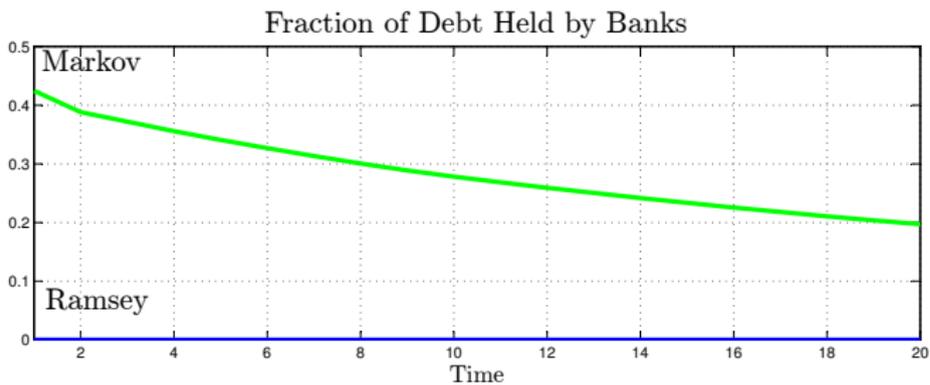
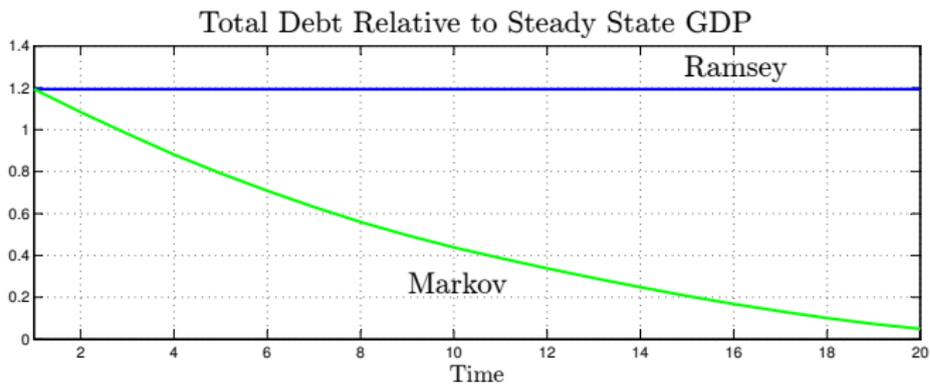
- ▶ $G \in \{G_L, G_H\}$, Markov transition matrix for G
- ▶ Assume peace is more persistent than war
- ▶ Start economy at high B in peace
- ▶ Sample path of always peace

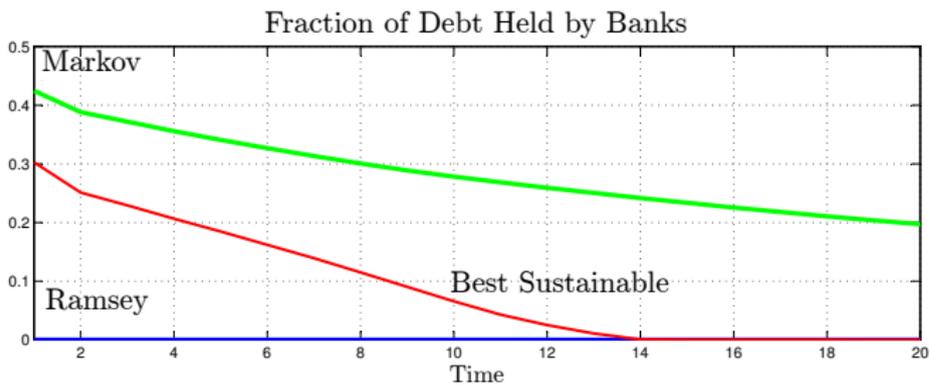
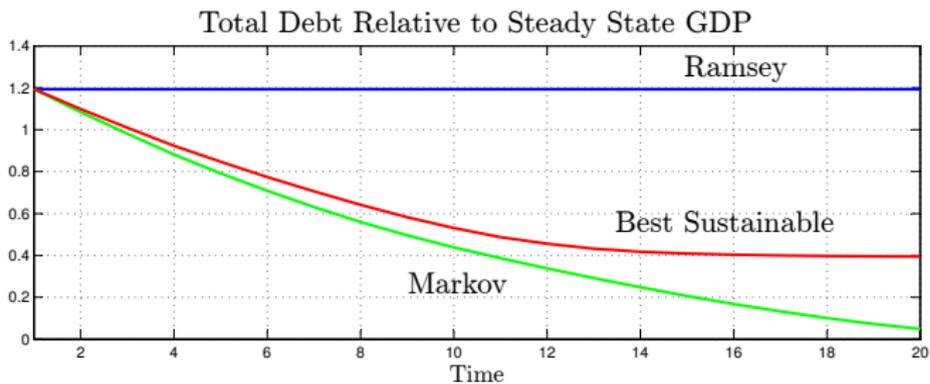
Total Debt Relative to Steady State GDP



Fraction of Debt Held by Banks







Interpretation of High G_0

- ▶ War
- ▶ Privatization of pension system
- ▶ Sudden stop: Foreign lenders ask for repayment

Equilibrium without commitment consistent with

- ▶ Reinhart's readings for US after WWII:
 - ▶ US debt after WWII high, financial repression severe.
As debt fell financial repression became less severe
- ▶ Privatization waves of pension funds in Latin America
- ▶ Argentina in 2001, Russia in 1998

Non-Discriminatory Default Not Crucial for Results

- ▶ So far government default decision non-discriminatory
 - ▶ Banks and households treated the same in event of default
- ▶ If the government can choose different default rates for HH and banks
 - ▶ All our results go through
 - ▶ Government still find it optimal to practice repression
 - ▶ Tax smoothing gains need to be larger relative to the case with no discrimination

Conclusion

- ▶ Financial repression widely practiced
- ▶ Puzzle if governments can commit to future policy
- ▶ Puzzle resolved if governments cannot commit
- ▶ Financial repression only in bad times
- ▶ Policy for, say, European Union: Forcing banks not to hold local debt may be a bad idea