

Welfare-Enhancing Distributional Effects of Central Bank Asset Purchases

Andreas Schabert
University of Cologne

November, 2017

I INTRODUCTION

II THE MODEL

III WELFARE ENHANCING ASSET PURCHASES

IV STATE CONTINGENCY

V CONCLUSION

Central bank asset purchases

- Should central banks (CBs) intervene in secondary markets for private debt securities?
 - Large scale purchases of debt securities were added into the CB instrument set
 - Several studies report gains of unconventional policies in times of financial stress

- Recent experiences with asset purchases suggest measurable *asset price effects*
 - Asset purchase reduced yields on long-term treasuries (De Fiore et al., 2016)
 - MBS purchases reduced yields and mortgage rates (Hancock and Passmore, 2014)

Redistributive effects of asset purchases

- Is there a useful role for asset purchases (AP) even in *tranquil times* and off the ZLB?
 - Even if they are non-neutral, they might be equivalent to conventional policies
- This paper
 - AP drive a *wedge* between the effective rates for lenders and borrowers
 - Not possible by conventional instruments (interest rates or inflation target)
 - They can induce a redistribution of funds from lenders to borrowers

Welfare enhancing role of asset purchases

- CB purchases of assets distort market prices and might raise or lower efficiency
 - Even if borrowers are constrained, redistribution can reduce social welfare
- Novel insights
 - Financial constraint induces constrained inefficiency due to externalities
 - AP can serve as a *Pigouvian subsidy* and enhance welfare even further
 - State contingent asset purchases should be *countercyclical*

The framework

- Endowment economy with idiosyncratic shocks and limited contract enforcement
 - *Positive* feedback loop between collateral demand, prices, and borrowing capacity
- Fiat money as a medium of exchange
 - Fully backed by eligible assets (treasuries or *collateralized debt*)
 - Conventional monetary policy is neutral

Related literature

- Beneficial *unconventional* monetary policies under stressed financial markets
 - Curdia and Woodford (2011), Gertler and Karadi (2011), Chen et al. (2012), Del Negro et al. (2016), Woodford (2016) and others

- Redistributive effects of *conventional* monetary policy
 - Akyol (2004), Berentsen et al., (2005), Algan and Ragot (2010), Lippi et al. (2015), Auclert (2016), Garriga et al. (2016) and others

- Constrained inefficiency under *pecuniary externalities* and financial constraints
 - Lorenzoni (2008), Bianchi (2011), Stein (2012), Bianchi and Mendoza (2017), Jeanne and Korinek (2016), Davila and Korinek (2017) and others

I INTRODUCTION

II THE MODEL

III WELFARE ENHANCING ASSET PURCHASES

IV STATE CONTINGENCY

V CONCLUSION

Overview

- Households face idiosyncratic shocks, hold treasuries, money, and durables (housing)
 - They rely on fiat money for purchases of non-durables
 - They can get money from the CB against eligible assets (treasuries)
- A household with a relatively high valuation of non-durables
 - can borrow intraperiod from other households against collateral (durables)
- Central bank buys treasuries and can further purchase collateralized debt
 - Treasury issues short-term debt in an ad-hoc way

Timing

Beginning of the period

- Aggregate shocks are realized
- Money is supplied against treasuries
- Idiosyncratic preference shocks are realized
- Loans are originated and might be purchased by the central bank
- Household members purchase goods with fiat money
- Loans are repaid, repos are settled, and assets are traded

End of the period

Households I/III

- Infinitely lived households $i \in [0, 1]$ with identical initial wealth and endowment
 - Utility depends on consumption $c_{i,t}$ and housing $h_{i,t}$

$$u_{i,t} = u(\epsilon_i, c_{i,t}, h_{i,t})$$

- i.i.d. preference shocks $\epsilon_i \in \{\epsilon_b, \epsilon_l\}$ with equal probabilities and $\epsilon_l < \epsilon_b$
- They can get money $I_{i,t}$ against eligible assets discounted with the policy rate R_t^m

$$I_{i,t} \leq \kappa_t^B \cdot B_{i,t-1} / R_t^m$$

where $B_{i,t-1}$ denotes treasuries and κ_t^B the fraction of purchased treasuries.

Households II/III

- Agents drawing ϵ_b borrow, $-L_{i,t} > 0$, at the loan rate R_t^L against collateral

$$-L_{i,t} \leq z_t P_t q_t h_{i,t},$$

where $z_t \in (0, 1)$ is a liquidation value, q_t the housing price, and P_t the price level.

- CB might offer purchases of a fraction κ_t of secured loans $L_{l,t} = -L_{b,t}$

$$I_{l,t}^L \leq \kappa_t \cdot L_{l,t} / R_t^m.$$

Lenders are willing to sell secured loans for above market prices $R_t^m \leq R_t^L$

- Households rely on money for purchases of consumption goods (for b and l)

$$P_t c_{i,t} \leq I_{i,t} + I_{i,t}^L + M_{i,t-1}^H - L_{i,t} / R_t^L.$$

Households III/III

- Households maximize welfare taking all constraints into account
 - Borrowers' loan demand satisfies (with the collateral constraint multiplier $\zeta_{i,t}$)

$$\frac{1}{R_t^L} = \beta \frac{E_t \left[u'(\epsilon_i, c_{i,t+1}) / \pi_{t+1} \right]}{u'(\epsilon_i, c_{i,t})} + \frac{\zeta_{i,t}}{u'(\epsilon_i, c_{i,t})}$$

- Lenders' loan supply satisfies

$$\frac{1}{R_t^L} = \frac{1 - \kappa_t}{1 - \kappa_t R_t^L / R_t^m} \cdot \beta \frac{E_t \left[u'(\epsilon_i, c_{i,t+1}) / \pi_{t+1} \right]}{u'(\epsilon_i, c_{i,t})}$$

- The wedge $\frac{1 - \kappa_t}{1 - \kappa_t R_t^L / R_t^m}$ exceeds one for $R_t^m < R_t^L$ and a positive fraction $\kappa_t > 0$
 - It increases with a larger fraction κ_t and a larger price discount R_t^L / R_t^m .

Monetary policy

- The central bank sets the price of money in terms of eligible assets $R_t^m \geq 1$
 - decides how many assets are purchased $\kappa_t \in [0, 1]$ and $\kappa_t^B \in (0, 1]$
 - supplies money outright and temporarily, $M_t^R = \Omega_t M_t^H$,
 - and transfers its interest earnings leading to the balance sheet $B_t^c = M_t^H$.
- CB can control both prices and money supply under money rationing (Schabert, 2015)

$$R_t^m < R_t^L$$

Government

- The government issues bonds and has access to lump-sum taxes/transfers τ_t
 - Supply of short-term government bonds is specified in an ad-hoc way ($\Gamma > \beta$):

$$B_t^T = \Gamma B_{t-1}^T$$

- This policy does not support the implementation of first best, which satisfies

$$u_c(\epsilon_b, c_{b,t}^*) = u_c(\epsilon_l, c_{l,t}^*), \text{ and } h_{b,t}^* = h_{l,t}^*.$$

I INTRODUCTION

II THE MODEL

III WELFARE ENHANCING ASSET PURCHASES

IV STATE CONTINGENCY

V CONCLUSION

Simplifying assumptions

- Assumptions

1. Instantaneous utility of households satisfies

$$u(\epsilon_i, c_{i,t}, h_{i,t}) = \epsilon_i(\delta c_{i,t} - (1/2)c_{i,t}^2) + (\gamma h_{i,t} - (1/2)h_{i,t}^2),$$

where $\partial u / \partial c_{i,t} = u'(c_{i,t}) > 0$ and $\partial u / \partial h_{i,t} = u'(h_{i,t}) > 0$.

2. Agents will hold money equal to the amount of planned nominal consumption expenditures even when the multiplier on the cash-in-advance constraint equals zero.
3. The ratio $(\epsilon_b - \epsilon_l)/z$ is sufficiently large such that the borrowing constraint is binding for all agents drawing ϵ_b .

Aggregation

- Under Assumptions 1-3, a competitive equilibrium in terms of a representative borrower and a representative lender under a conventional monetary policy regime is a set of sequences $\{c_{b,t}, c_{l,t}, h_{b,t}, q_t, \pi_t\}_{t=0}^{\infty}$ satisfying

$$\begin{aligned}
 u_{c_{l,t}} &= \beta E_t \left[0.5(u_{c_{l,t+1}} + u_{c_{b,t+1}}) \cdot \left\{ R_t^L / \pi_{t+1} \right\} \right], \\
 \left\{ R_t^L / q_t \right\} \cdot (2h_{b,t} - h) / z &= u_{c_{b,t}} - \beta E_t \left[0.5(u_{c_{l,t+1}} + u_{c_{b,t+1}}) \cdot \left\{ R_t^L / \pi_{t+1} \right\} \right], \\
 u_{c_{l,t}} \left\{ q_t / R_t^L \right\} &= u_{h_l} + \beta E_t \left[u_{c_{l,t+1}} \cdot \left\{ q_{t+1} / R_{t+1}^L \right\} \right], \\
 c_{b,t} - c_{l,t} &= zh_{b,t} \cdot \left\{ q_t / R_t^L \right\}, \\
 y_t &= c_{b,t} + c_{l,t},
 \end{aligned}$$

and $R_t^L = R_t^m$, for $\{y_t\}_{t=0}^{\infty}$ and a sequence $\{R_t^m \geq 1\}_{t=0}^{\infty}$ set by the central bank.

Neutrality of conventional monetary policy

- Under a binding borrowing constraint consumption and housing satisfies

$$\zeta_{b,t} = [u_{c_b,t} - u_{c_l,t}] / R_t^L = (2h_{b,t} - h) / (zqt) > 0, \quad (1)$$

Corollary 2 *Under a conventional monetary policy regime, changes in the monetary policy rate do not affect the equilibrium allocation, while the housing price and the inflation rate increase with the nominal interest rate.*

A pecuniary externality

- When there is no aggregate risk, the relative price of collateral q/R^L satisfies

$$\frac{q}{R^L} = \frac{u_{h_l}(h - h_b)}{(1 - \beta)u_{c_l}(y - c_b)}$$

- The relative price is increasing (decreasing) in borrowers' housing (consumption).
- A Pigouvian tax/subsidy on debt issuance can address the externality $\frac{R_t^L/\pi_{t+1}}{1 - \tau_t^L}$

Proposition 1 *The implementation of a constrained efficient allocation of the representative agents economy without aggregate risk requires a subsidy on borrowing, $\tau^L < 0$, if but not only if $z/(1 - \beta) \geq 1$. Compared to the laissez-faire case ($\tau^L = 0$), the Pigouvian subsidy raises borrowers' consumption and housing as well as the real interest rate R^L/π , which is associated with a decline in lenders' consumption and housing.*

Equilibrium under asset purchases

- A competitive equilibrium without aggregate risk and a price discount $s = R^L/R^m > 1$ is a set $\{c_b, c_l, h_b\}$ satisfying $y = c_l + c_b$,

$$\left[\frac{1 - \kappa}{1 - \kappa s} \right] u_{c_b} = u_{c_l} \left(1 + \frac{1 - \beta u_{h_l} - u_{h_b}}{z u_{h_l}} \right),$$

$$c_b - c_l = h_b \frac{z u_{h_l}}{1 - \beta u_{c_l}} \cdot \left[\frac{(1 - \kappa)(2 - \kappa s)}{(1 - \kappa s)} \right],$$

- The corresponding set $\{c_l, c_b, h_b\}$ under the optimal Pigouvian subsidy $\tilde{\tau}^L$ satisfies

$$\left[1 - \tilde{\tau}^L \right] u_{c_b} = u_{c_l} \left(1 + \frac{1 - \beta u_{h_l} - u_{h_b}}{z u_{h_l}} \right),$$

$$c_b - c_l = h_b \frac{z u_{h_l}}{1 - \beta u_{c_l}} \cdot [2],$$

and $y = c_l + c_b$.

Welfare enhancing asset purchases

- The instruments κ and s can be set to replicate the optimal subsidy $\tilde{\tau}^L$.

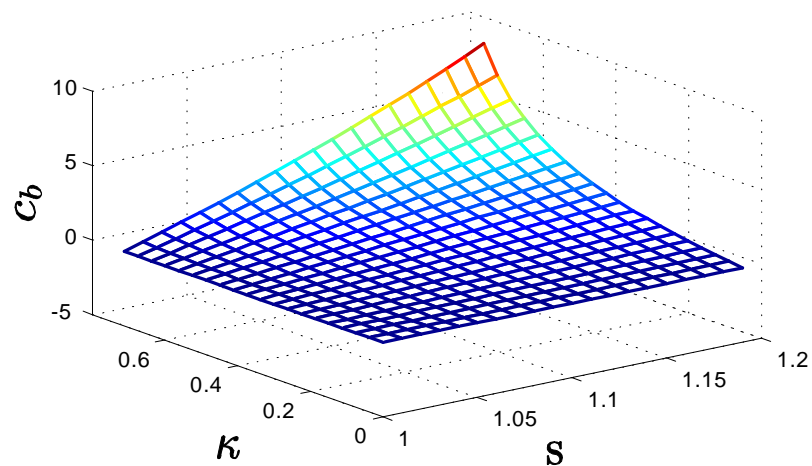
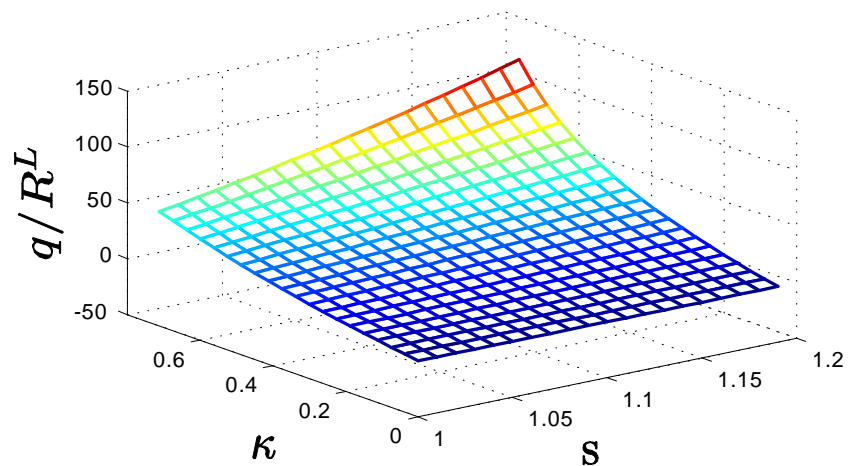
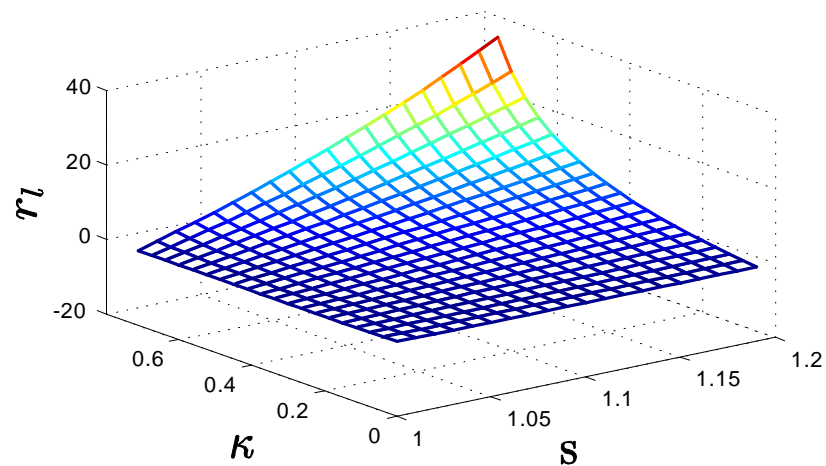
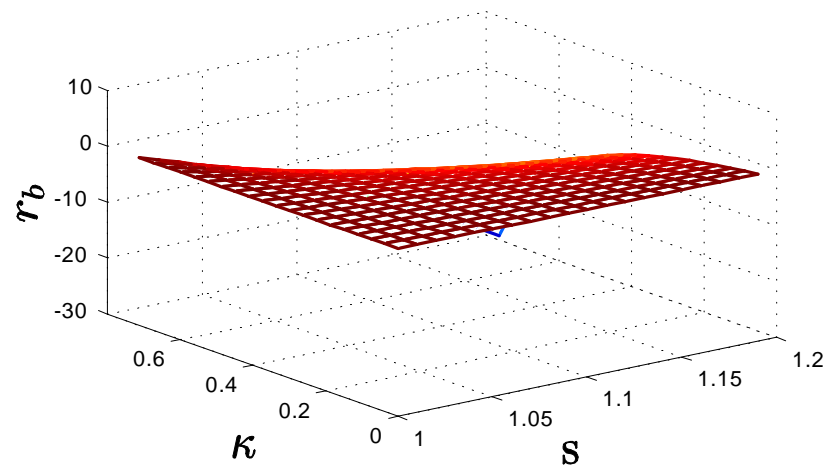
Proposition 2 *Suppose that money supply is rationed and $z \geq 1 - \beta$. Then, the constrained efficient allocation under the Pigouvian subsidy can be implemented by the central bank via asset purchases.*

- For $\frac{(1-\kappa)(2-\kappa s)}{(1-\kappa s)} > 2$, welfare dominating allocations can even be implemented.

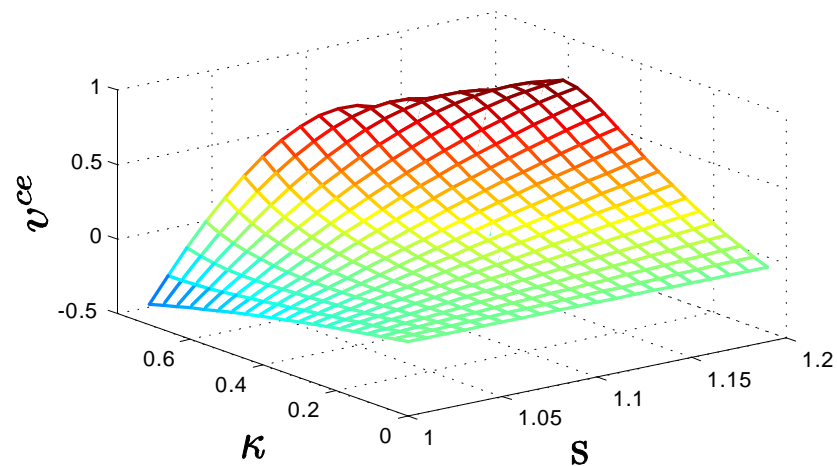
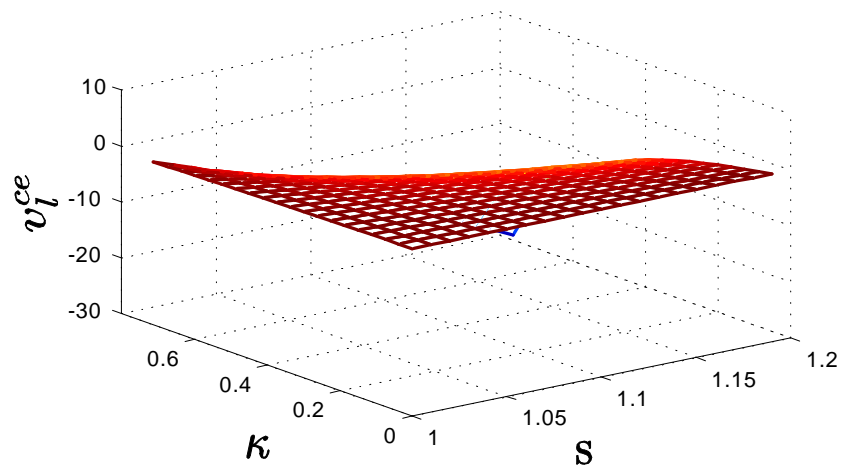
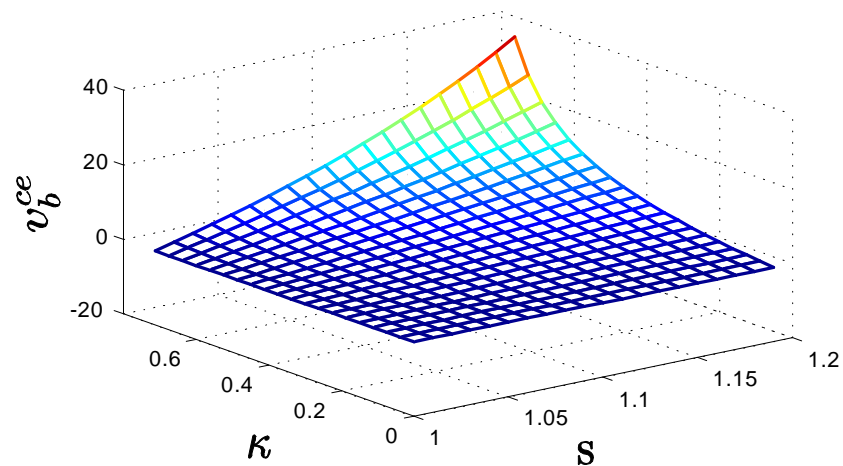
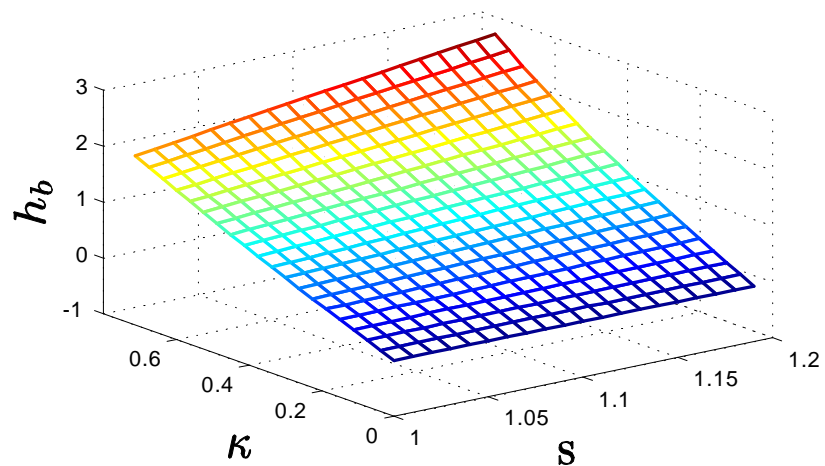
Proposition 3 *Suppose that money supply is rationed and there is no aggregate risk. Then, the first best equilibrium cannot be implemented, while the central bank can implement allocations via asset purchases that welfare-dominate allocations that are implementable under a Pigouvian subsidy.*

Numerical results

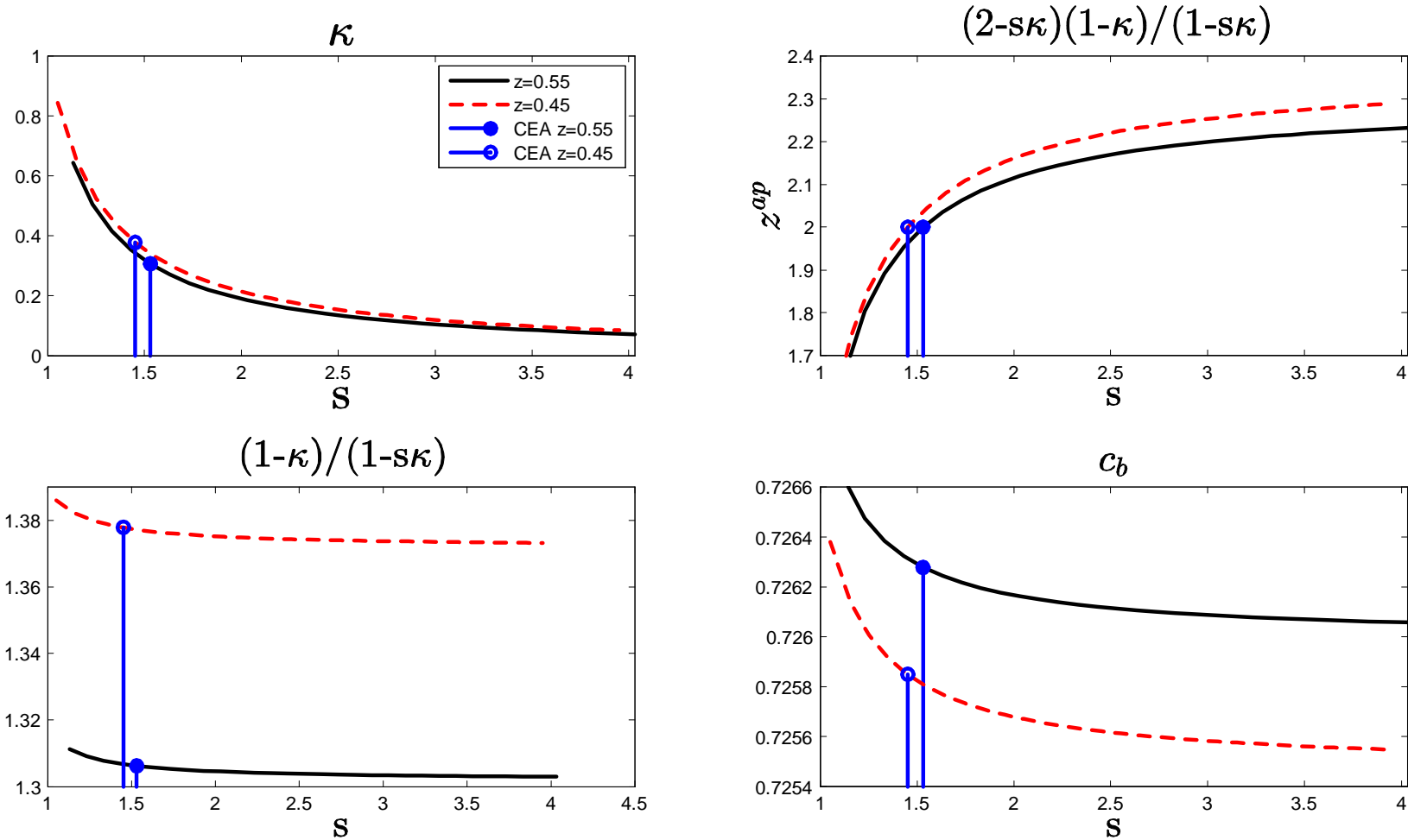
- Numerical version with CRRA preferences
 - End-of-period wealth redistribution to facilitate aggregation
 - Competitive equilibrium solely changes with regard to the marginal utilities
 - All results are qualitatively unchanged
- Parametrization with standard values taken from the literature and three targets
 - MBS yields, installment loans share, cross sectional st.dev. of consumption



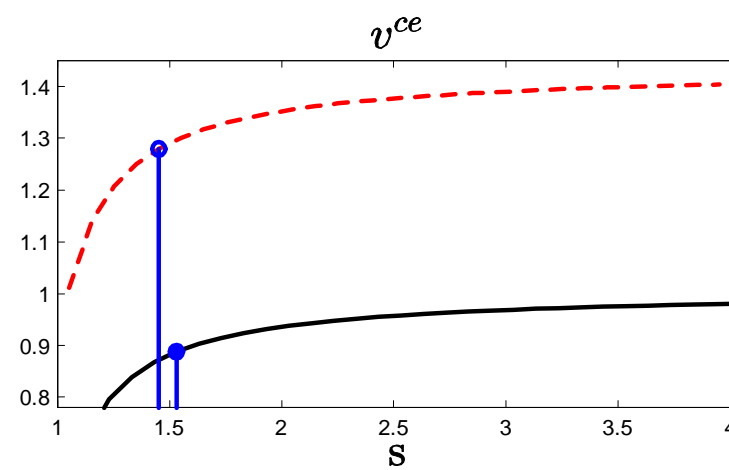
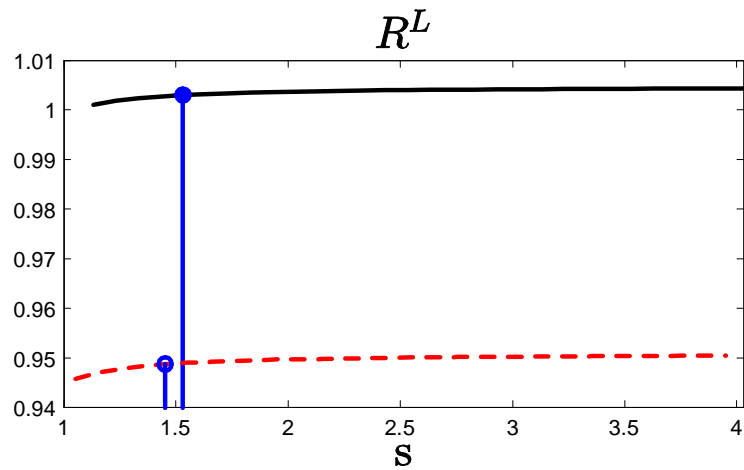
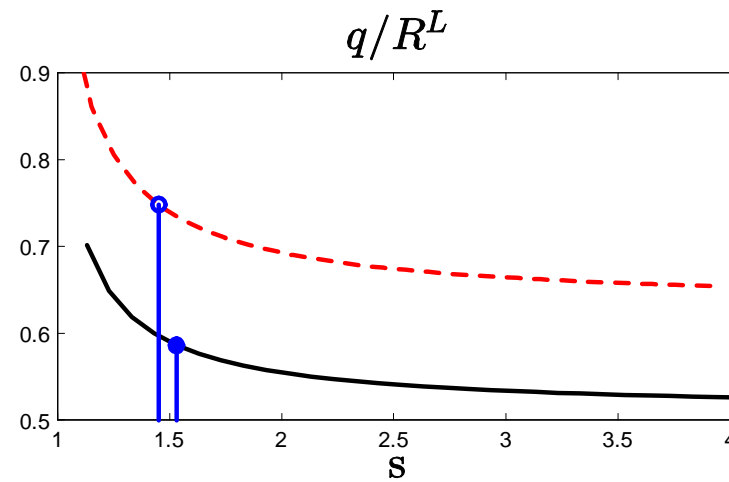
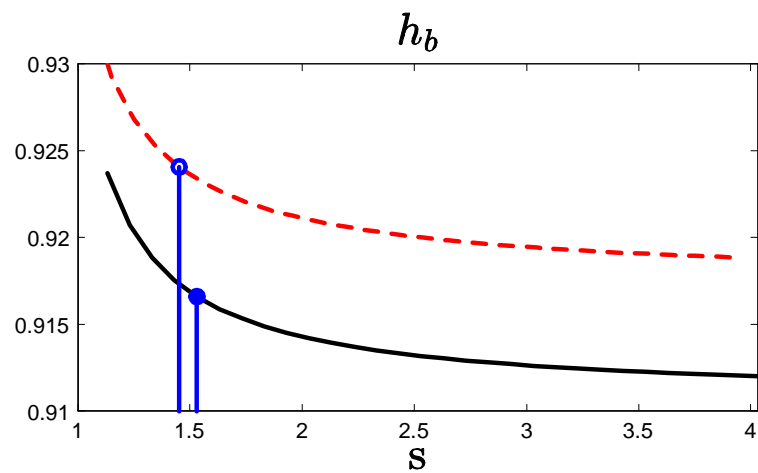
Effects of κ and s for $\pi = 1.07$ (in % deviations from laissez faire values)



Effects of κ and s for $\pi = 1.07$ (in % deviations from laissez faire values)



Asset purchases and the constrained efficient allocation for variations in s



Asset purchases and the constrained efficient allocation for variations in s

I INTRODUCTION

II THE MODEL

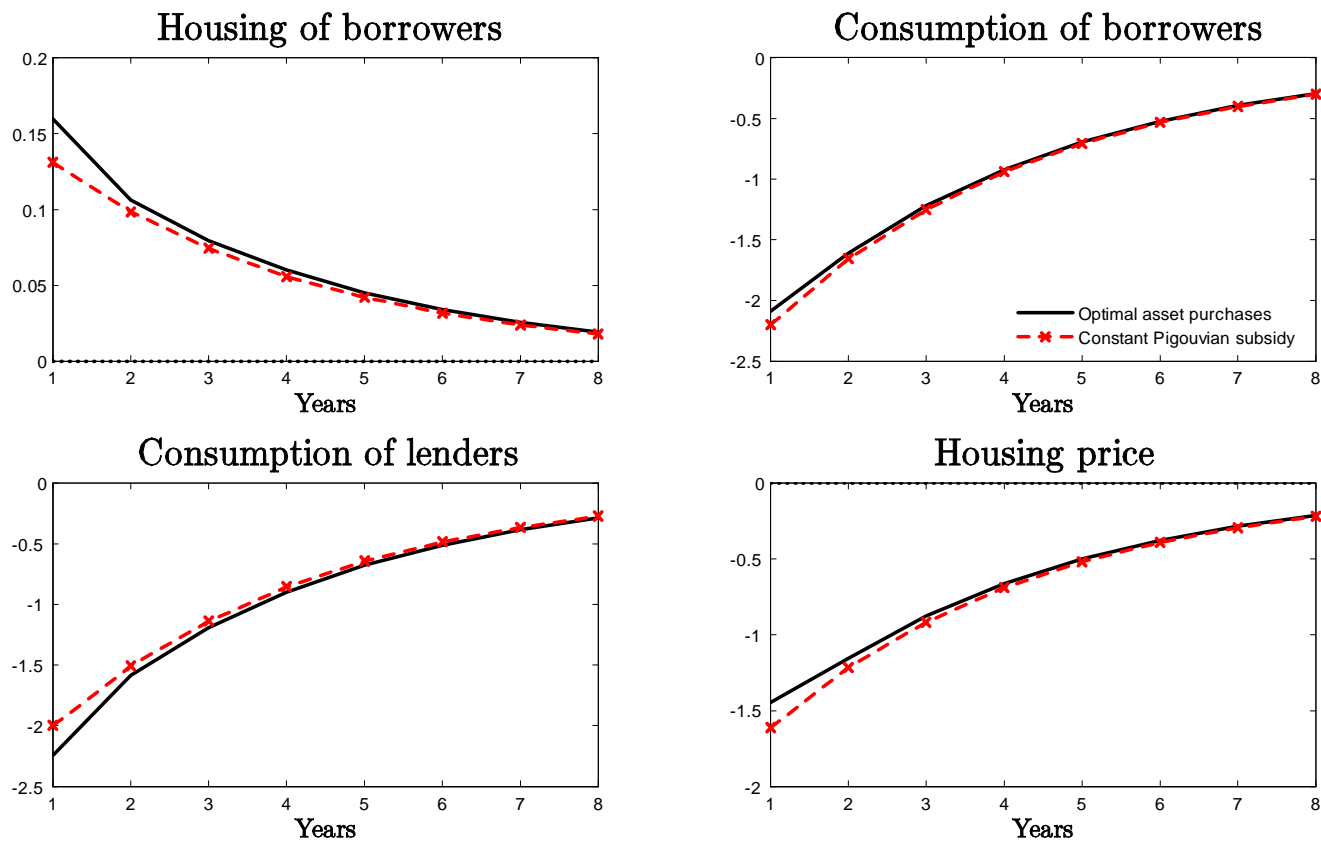
III WELFARE ENHANCING ASSET PURCHASES

IV STATE CONTINGENCY

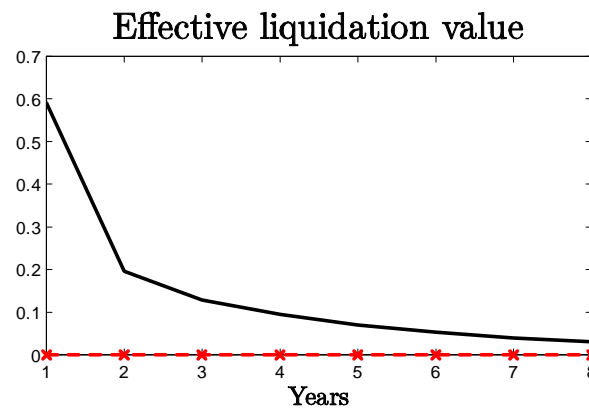
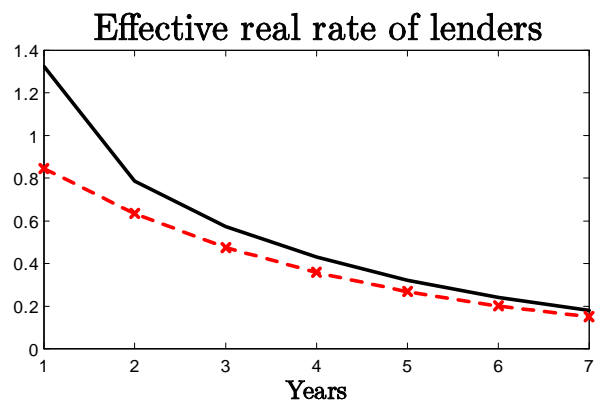
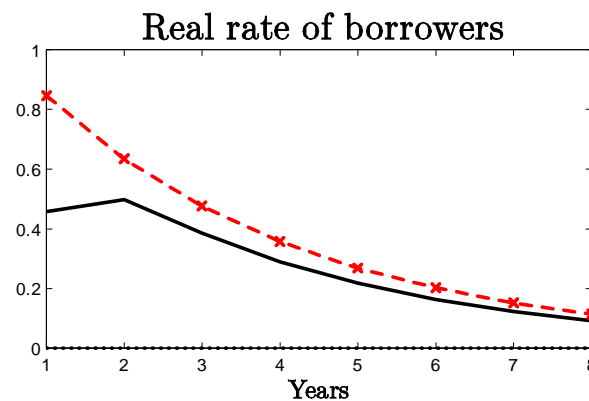
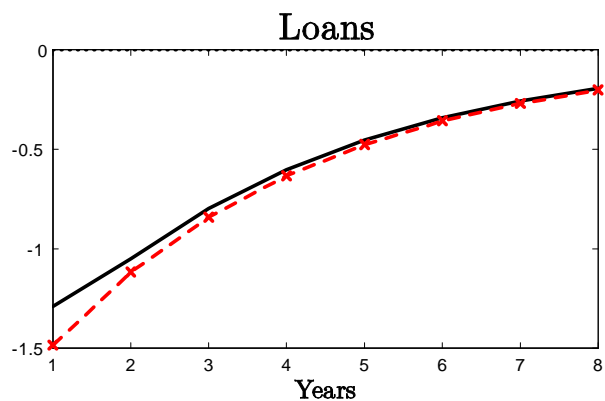
V CONCLUSION

Introducing aggregate risk

- We add a random process for aggregate income (estimated with US data)
- Asset purchases are adjusted in a state contingent way for a fixed s
 - The mean is identical to a constant Pigouvian subsidy
- Borrowing is supported in response to adverse shocks
 - Effective liquidation value $\tilde{z}_t = \frac{z(1-\kappa)(2-\kappa s)}{2(1-\kappa s)}$ is increased
 - Borrowers' real rate is reduced, lenders' real rate is increased
- Corresponding results for stochastic realizations of the liquidation value z_t .



Responses to a negative aggregate endowment shock



Responses to a negative aggregate endowment shock

I INTRODUCTION

II THE MODEL

III WELFARE ENHANCING ASSET PURCHASES

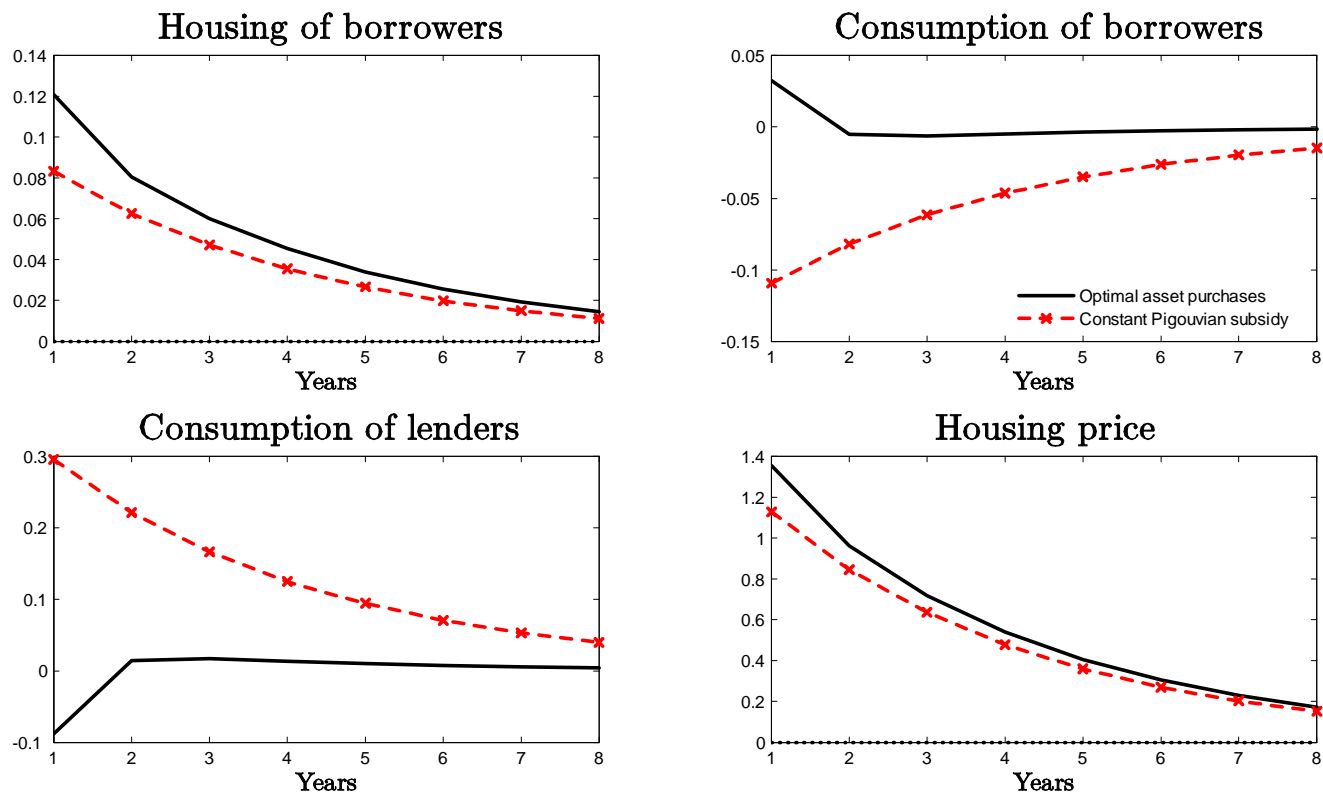
IV STATE CONTINGENCY

V CONCLUSION

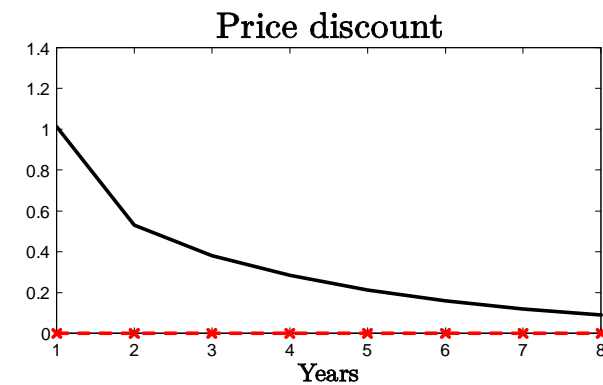
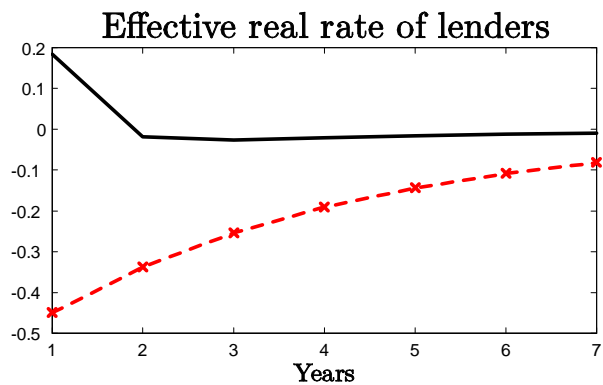
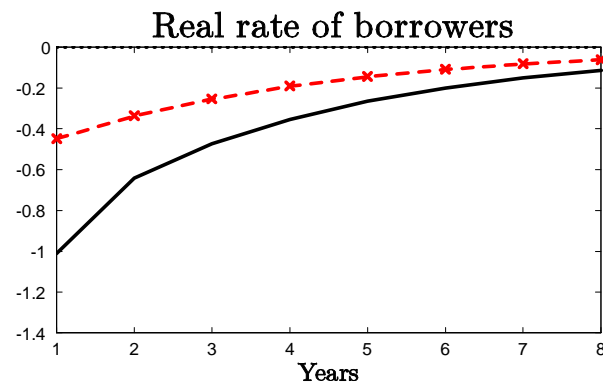
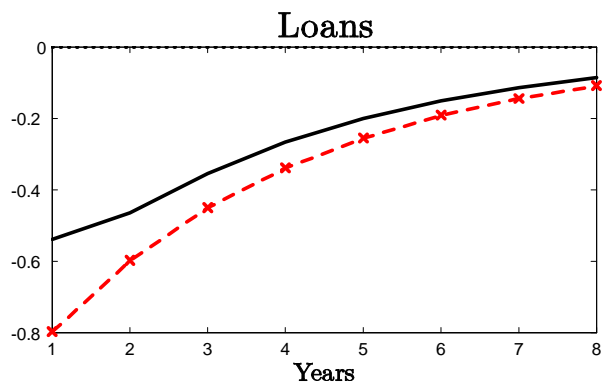
- Asset purchases exert effects distinct from conventional monetary policy
 - Useful role even in non-crisis times
 - Price effects can be used as a Pigouvian subsidy
 - Borrowing can be stimulated even further

- Asset purchases can address inefficiencies from financial frictions
 - Support prudential (ex-ante) policies

ADDITIONAL SLIDES



Responses to a minus one st.dev. liquidation value shock



Responses to a minus one st.dev. liquidation value shock