Debt Overhang and Monetary Policy

Costas Azariadis
Washington University and Federal Reserve Bank of St. Louis
James Bullard
Federal Reserve Bank of St. Louis
Aarti Singh
University of Sydney
Jacek Suda
Banque de France

13 May 2013

Any opinions expressed here are those of the authors and do not necessarily reflect those of others on the Federal Open Market Committee, the Federal Reserve System, the Banque de France, or the European Central Bank..

Main Ideas

DEBT AS A PROBLEM IN MACROECONOMICS

- The financial crisis of 2007-2009 is often thought to be related to the "over-indebtedness" of households.
- We study a key reason why households may have "borrowed too much":
  - Households thought their income would be higher than it actually turned out to be.
- We then ask how a powerful central bank that can intervene to influence real interest rates in asset markets may or may not be able to improve on this situation.

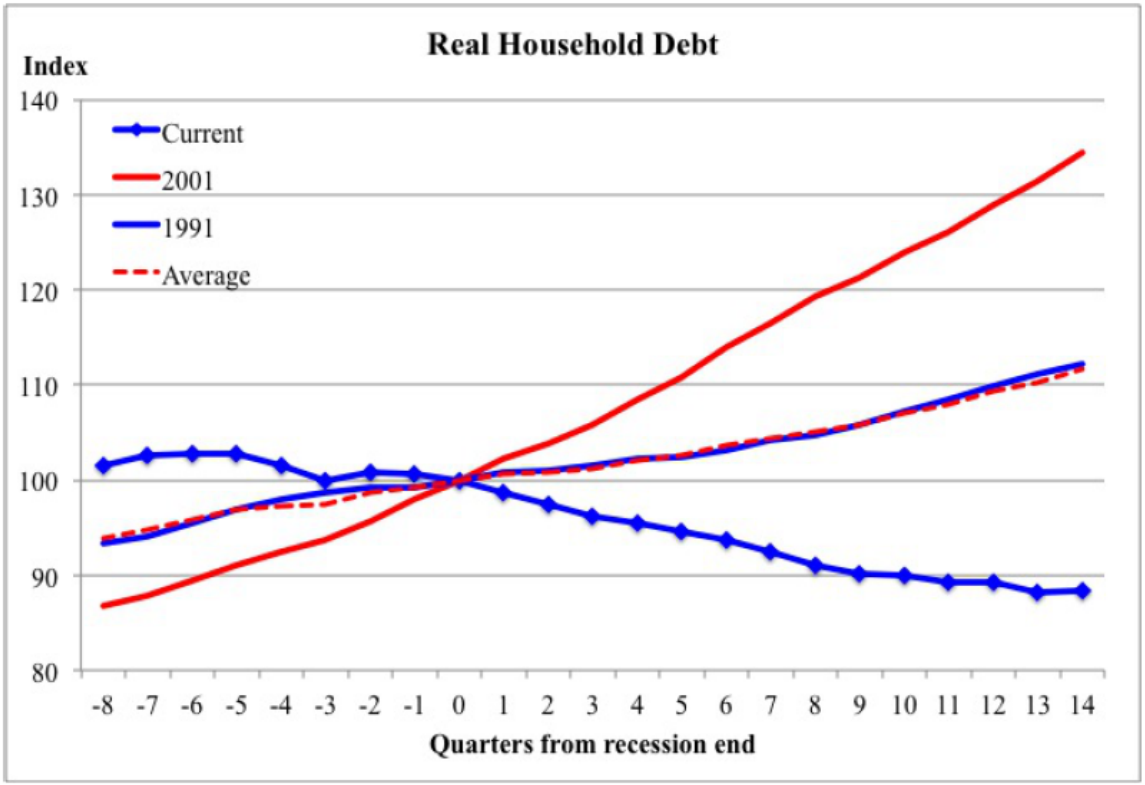


FIGURE: Real household debt levels declined during the 2007-2009 time frame, the diamonds in this Figure. The time scale indicates the quarters before and after the recession. This deleveraging contrasts with previous postwar recessions.

WHAT WE DO

- Simple, stylized life-cycle model of medium-term movements in real private debt levels, real interest rates, and inflation.
- Aggregate shock: Regime-switching on labor productivity growth.
- When the economy switches to the high growth state, households borrow more and save more.
- When the economy switches back to the low growth state, some households experience "debt overhang."

MAIN FINDINGS

- The period of the "debt overhang" puts heavy pressure on the households that have "borrowed too much."
- These households must either consume less, save less, or default on their debt (we do not allow default).
- A powerful central bank can intervene to keep the real interest rate lower during the period of debt overhang.
- This intervention re-allocates consumption in the economy, generally "punishing savers."

Motivation

MAIN EMPIRICAL IDEAS

- Medium term dynamics in real yields, inflation, and real debt levels.
- 1990s technology boom and the associated increase in labor productivity growth.
  - *Initially heralds a new era in U.S. household income prospects.*
- This event causes some households to borrow more (and others to save more) than they otherwise would in order to smooth life-cycle consumption.
- The increase in labor productivity growth ultimately does not last, causing a significant "debt overhang."

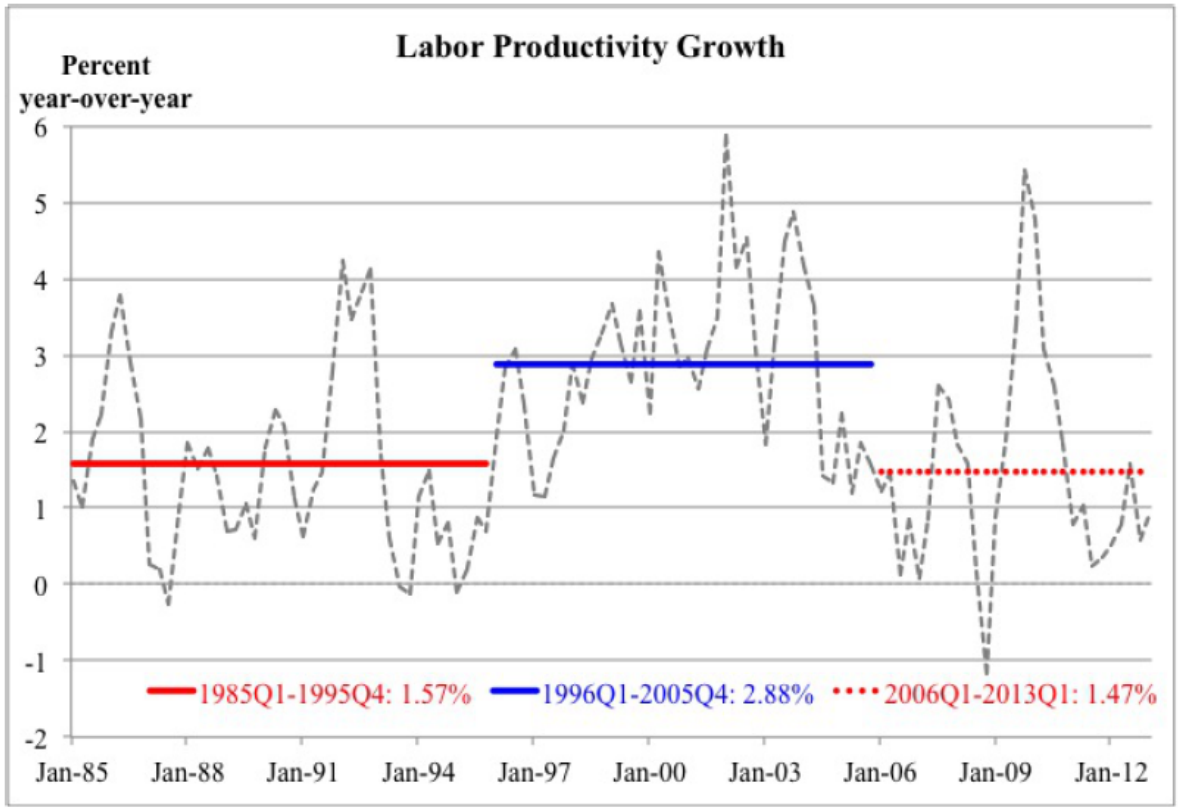


FIGURE: U.S. labor productivity growth from 1985 through 2013Q1. We will view this data as consistent with a regime-switching process with a mean of 1.5 percent in the low regime and 3.0 percent in the high regime.

THE PRODUCTIVITY BOOM AND PEAK LIFE CYCLE INCOME

- Life cycle income would be about 50 percent higher in the peak earning year for a household living in an economy with 3.0 percent productivity growth versus 1.5 percent.
- Reallocating this income to consumption in the first third and last third of life means more saving and more borrowing in the economy.

THE HOUSEHOLD DEBT-TO-INCOME RATIO

- Mian-Sufi (AER, 2011) report the 1995 U.S. household debt-to-income ratio as 1.15.
- A decade later, in 2005, the ratio was about 1.65.
- This is a 50 percentage point increase.
- The present model is one of *net* indebtedness.
- Net indebtedness probably rose, but not by 50 percentage points because equity markets also rose during this period.
- If the real value of equities doubled, then a rough estimate of the increase in net indebtedness is that it increased 25 percentage points relative to GDP.

REAL INTEREST RATES

- The Fed policy in response to the debt overhang has been to keep real interest rates low.
- The five-year TIPS real yield has recently been about -1.40 percent.
- We will consider central bank policies that keep real yields low during the period of debt overhang.
- In the model, real rates are closely connected to real output growth rates.
  - The current U.S. output growth rate is about 2.0 percent on average, so -1.40 percent real yields are about 340 basis points lower than the benchmark.

Environment

Segmented markets

- Standard 241-period (quarterly) DSGE life cycle endowment economy with segmented markets.
- Households are divided into two types, "participants" and "non-participants".
- There are two assets in the model, *private* debt (consumption loans) and currency.
- Participants can hold either asset, but in the equilibria we study they will not hold currency as it is dominated in rate of return.
- Non-participants can only hold currency.
- All households have log preferences with no discounting.

CREDIT MARKET PARTICIPANTS

- The life-cycle productivity endowment pattern is peaked in middle age.
- Three-period example: $\{\omega_0, \omega_1, \omega_2\} = \{0, 1, 0\}$.
- Participant households will want to borrow in the first period and save in the second period, giving rise to a natural market in private debt.
- We could think of the borrowers as borrowing to buy housing services.
  - Mortgage debt in the U.S. has been on the order of \$10 trillion.
  - Total household debt has been on the order of $\$17 - 18$ trillion.

Non-participants

- Completely precluded from credit markets.
  - Inactive in the first period.
  - Productivity endowment is γ "small" in every other subsequent period 1, 3, 5, ..., 239.
  - These households consume in every other subsequent period 2, 4, 6, ..., 240.
- There is *no life cycle aspect* to productivity or consumption.
- Non-participants work only intermittently and save all income by holding currency.
  - We could think of non-participants as the "unbanked" or nearly unbanked portion of the population.
  - This may be about $15 - 30\%$ in the U.S. today.
  - Another possibility: Dollarized non-U.S. citizens.

Monetary Arrangements

Central bank independence

- The central bank is set up as an "independent" entity.
- We interpret this to mean:
  - The central bank can transact with any actor, including the government, at market prices.
  - The central bank does not give gifts to any actor.
  - The central bank does not consume.

CURRENCY PROVISION

- The central bank can print currency and sell it to non-participant households who value it.
  - This is done to maintain an exogenously-given inflation target.
- The central bank earns real seigiorage revenue in consumption from this activity.
- In normal times this consumption is "loaned" to the government in exchange for government paper paying the same rate of return prevailing in the credit market.
- The government paper is implicitly backed by lump-sum taxes.

GOVERNMENT DEBT AT THE CENTRAL BANK

- The loan is an "arm's length" transaction meant to preserve central bank independence.
- In the following period, the central bank presents more consumption plus the maturing note to the government in exchange for a larger note paying the market rate of interest.
- Government debt piles up at the central bank, but taxes are never levied.
- The government itself does nothing but consume the seigniorage and issue debt back to the central bank.

THE GOVERNMENT BUDGET CONSTRAINT

- The government budget constraint can be written as

$$A^{cb}(t) + G^{b}(t) = R(t-1)\left[A^{cb}(t-1) + G^{b}(t-1)\right] + \frac{H(t) - H(t-1)}{P(t)}. \quad (1)$$

- We let $N(t)$ be the nominal yield on private debt, and $R^{m}(t) = P(t)/P(t+1) = R(t)/N(t)$ be the real yield on money holdings (that is, the gross nominal yield on private debt must be defined as $N(t) \equiv R(t)/R^{m}(t)$).
  - The central bank can be viewed as setting $N(t)$ to target inflation by choice of $H(t)$.
  - In normal times, $A^{cb} = 0$.

Market clearing conditions

- There are two asset markets which must clear, one for private debt and one for currency.
- Equilibrium can be described by a sequence of real returns $R(t)$ and $R^m(t)$ given the state $\lambda(t)$ and the distribution of asset holdings at date $t-1$.
- The distribution of asset holdings must be tracked to calculate the DSGE.
- We impose the zero lower bound $N(t) \geq 1$.

Transactions

- The monetary authority could create some inflation by trading with non-participants but refrain from intervention in the market for private debt.
- We will call this the "laissez-faire" policy.
- The monetary authority could also refuse to roll over government paper and instead demand repayment from the government.
- The monetary authority can then use the repayment to intervene in the market for private debt.
- This will influence the real return on private debt $R(t)$.
- We will call policies in this class "active."

Equilibria

THE LAISSEZ-FAIRE CASE

- The laissez-faire case means that the monetary authority only tries to maintain an inflation target and does not intervene in private credit markets.
- The real return on private debt is determined by aggregate asset demand $A(t) = 0$.
- The real return on currency is determined by the government budget constraint.

The active policy case

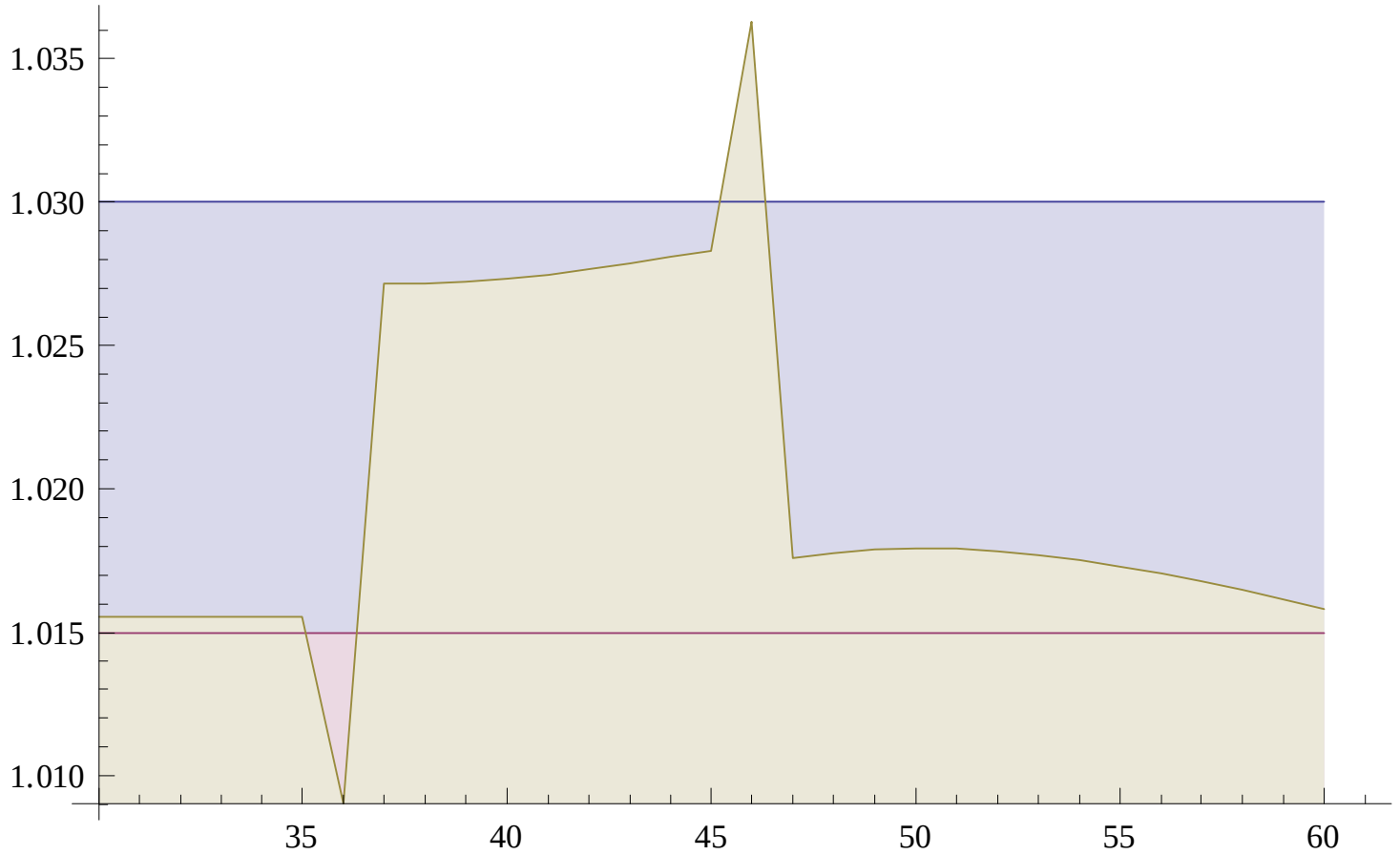
- The active policy case means that the monetary authority also intervenes in the market for private debt.
- The credit market clears when $A^{cb}(t) + A(t) = 0$.
- The government budget constraint determines the real return on currency.

The Regime-Switching Economy

THE EXPERIMENT

- Begin the system in the low state for a long time.
- Switch to the high state corresponding to the tech boom.
- Switch to the low state initiating the debt overhang period.
- Compare laissez faire credit market policies to credit market intervention policies.

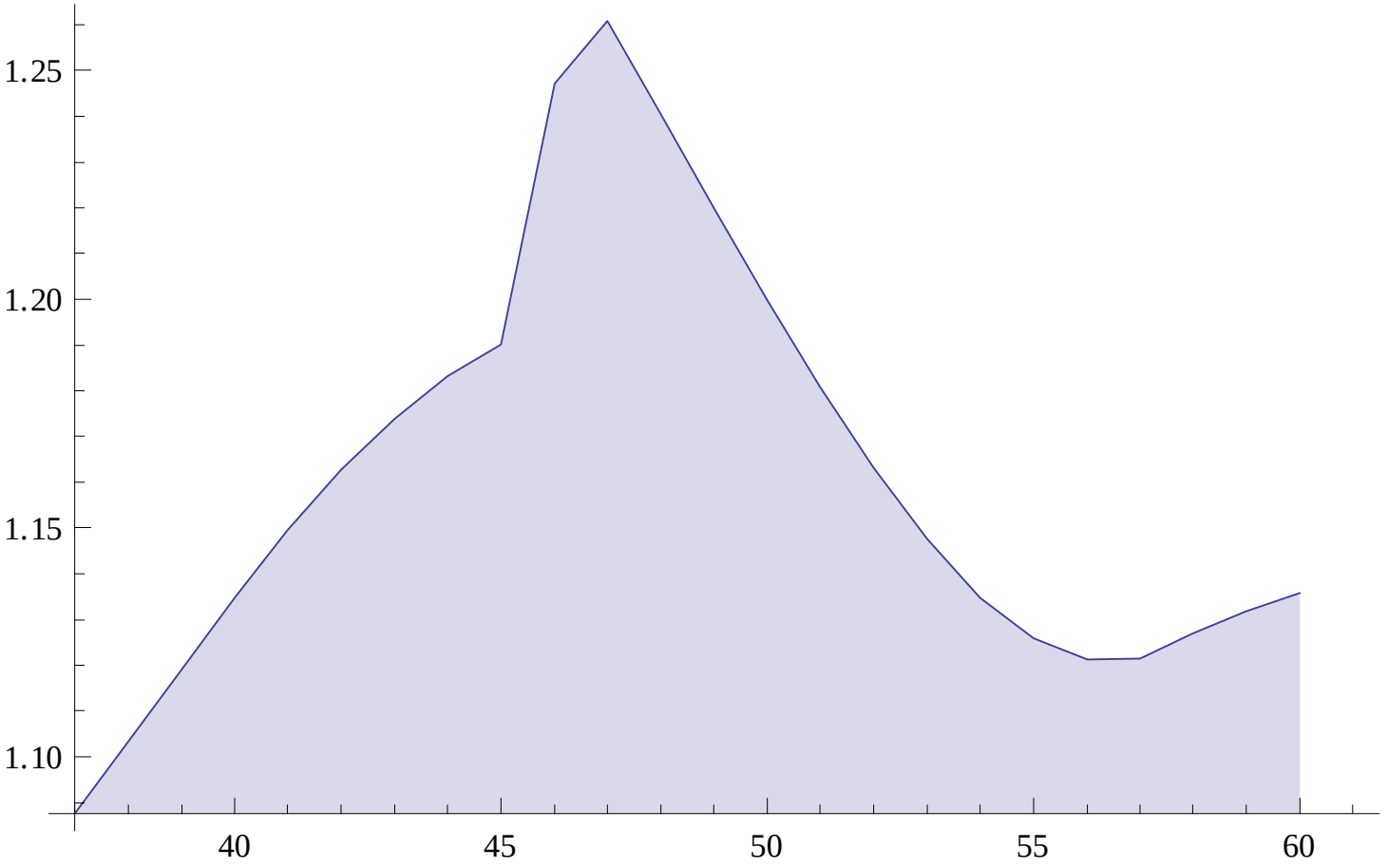
REAL INTEREST RATES UNDER LAISSEZ-FAIRE



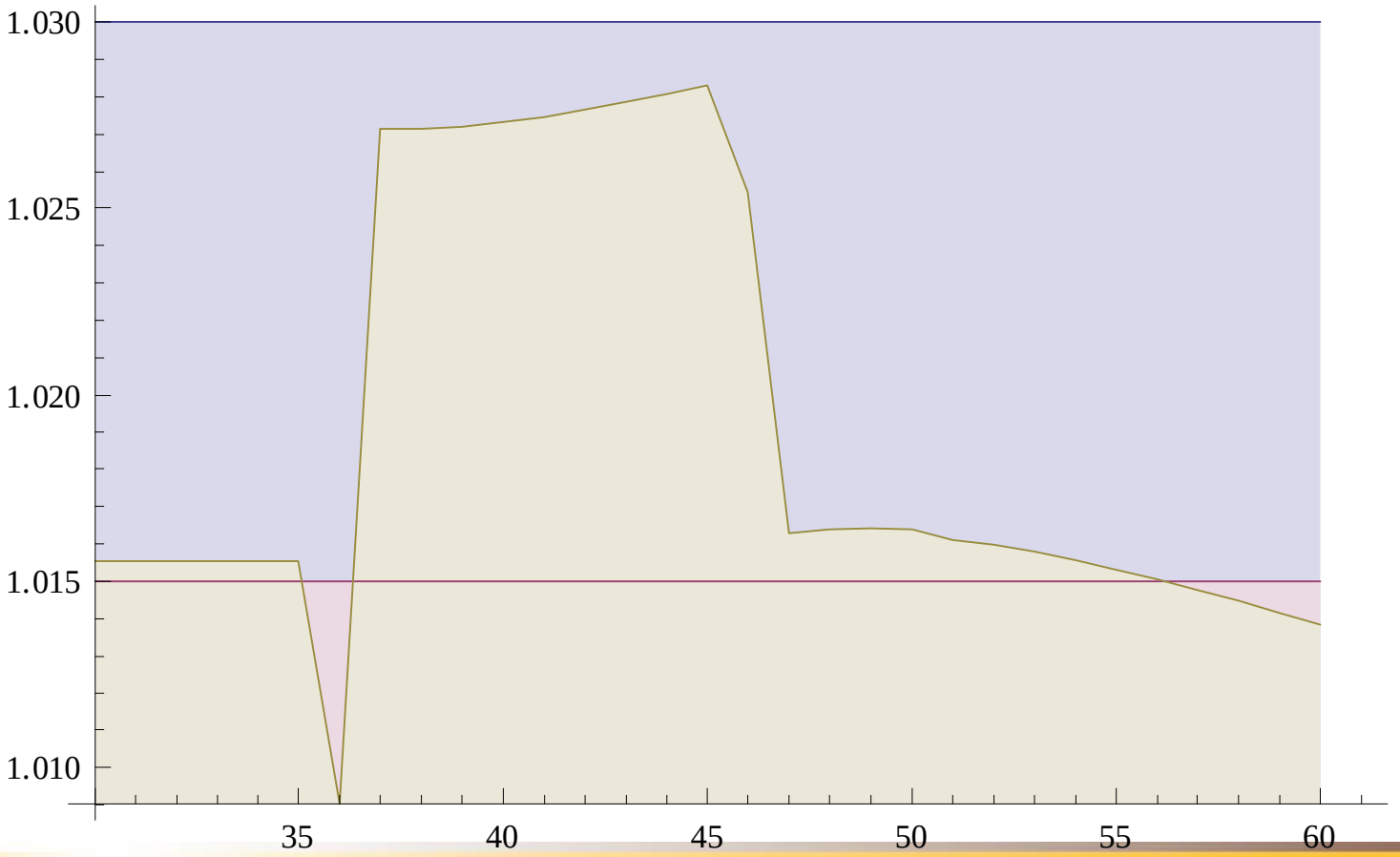
THE INCREASE IN HOUSEHOLD DEBT-GDP

- The initial household debt-GDP ratio is around the 1.15 value reported by Mian and Sufi (2011).
- The trough to peak household debt-GDP ratio can increase by 17 percentage points.
- This may be about the right extent of the increase in net asset holding.
- The households deleverage steadily during the period of debt overhang.

THE INCREASE IN HOUSEHOLD DEBT-GDP



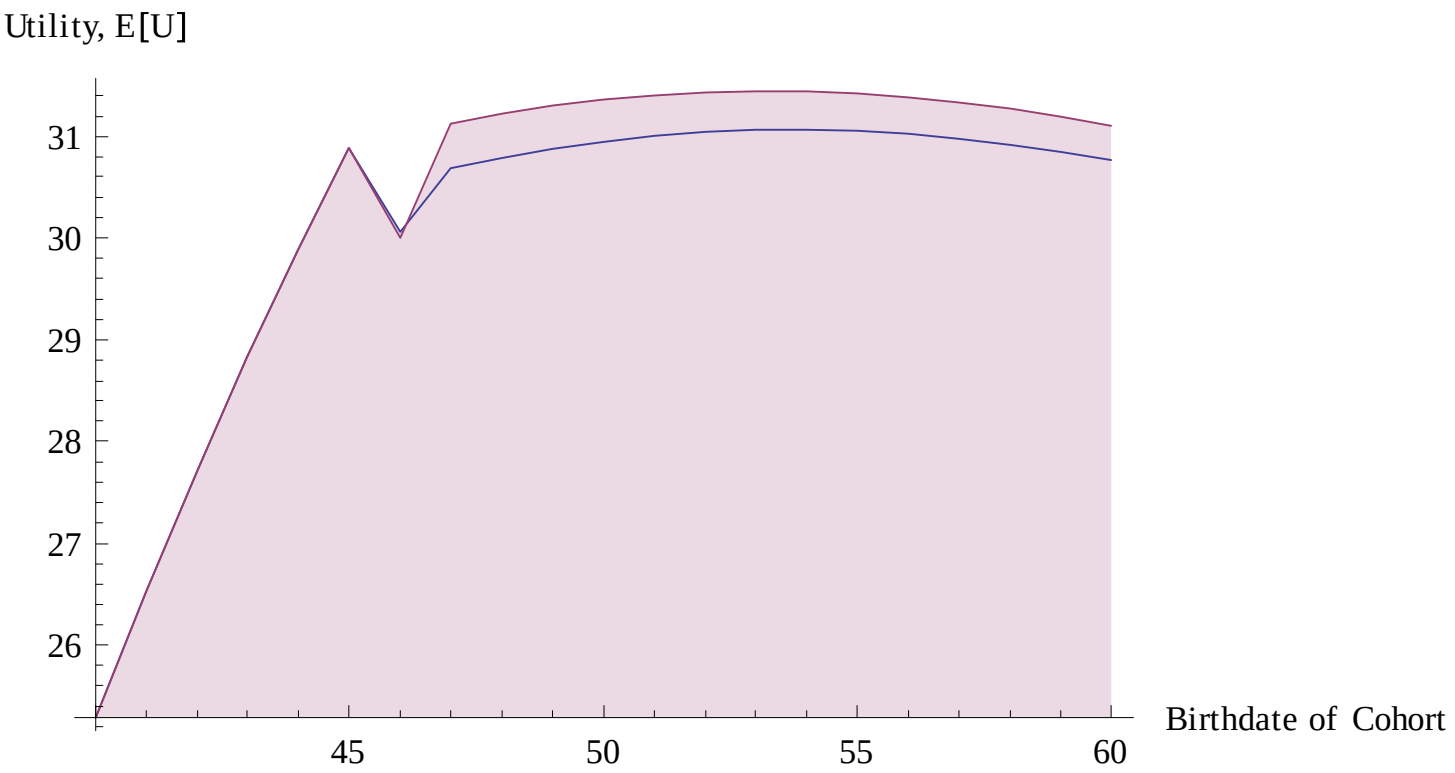
REAL INTEREST RATES IN CREDIT MARKETS WITH ONGOING INTERVENTION



Welfare

- We can ask households if they prefer to live in the economy with the intervention or without.
- Cohorts born earlier: Actual utility under the two policies.
- Cohorts born later: Actual plus expected utility given the low state.
- Normalization: Divide all by a factor 1.0225^t, the average growth rate.
- Result: Laissez faire preferred by all cohorts.
- Intuition: Some are helped when facing lower borrowing interest rates, but all are hurt when facing lower returns on asset holding later in life.

WELFARE COMPARISON—LAISSEZ FAIRE PREFERRED



Conclusion

Possible additions

- Elastic labor supply to get hours movements.
- Government debt held by the public: Makes no difference.

OPTIMAL MONETARY POLICY

- Two frictions:
  - Non-participants need currency provision—and there is an inflation target.
  - Participants do not use state-contingent debt.
- Optimal policy might be able to mitigate both frictions.

RELATED LITERATURE

- A related literature models the financial crisis as a tightening of debt constraints.
- A tightening of debt constraints drives real interest rates lower.
- That also happens in the current model.
- A permanent tightening of debt constraints would create a new steady state with a lower real rate of return on private debt.

Strengths of the model

- This model generates an interesting debt overhang phenomenon.
- The model has a natural role for private debt in smoothing income over the life cycle.
  - This sounds like a demand for mortgage debt.
- A powerful monetary policymaker can intervene in the market for private debt.
- This intervention redistributes income but does not generically improve outcomes.

Concerning QE

- Concerning "Asset Purchase Policies," the paper suggests
  - (1) such an intervention could be contemplated by the central bank,
  - (2) that interventions like this are quasi-fiscal in nature,
  - (3) for such an intervention to be effective, it has to be part of a rule,
  - (4) that an intervention could be of a scale that would have important consequences for the private credit market, and,
  - (5) that the intervention is a very simple process of the central bank stopping its policy of rolling over treasury securities and instead deciding to purchase privately-issued paper.