

Looking behind the financial cycle: the neglected role of demographics

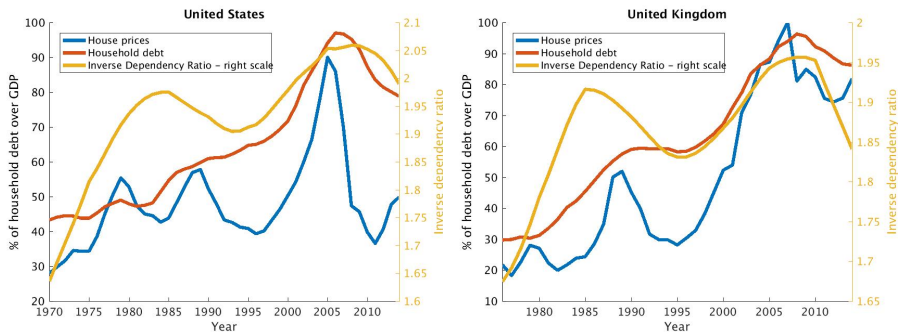
Alessandro Ferrari

5th Annual conference
Secular Stagnation and Financial Cycles
28th September 2017

Disclaimer

The views expressed in this article are solely the responsibility of the author and should not be interpreted as reflecting the views of the Eurosystem or the Banca d'Italia.

Inverse dependency ratio, household debt and housing prices



Source: BIS, IMF, WB

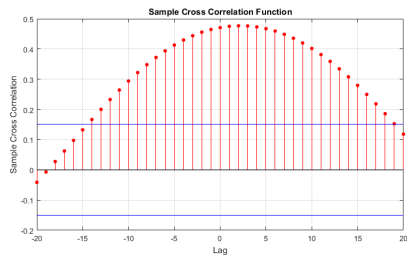
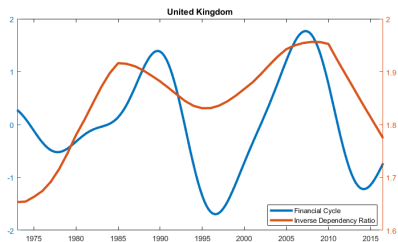
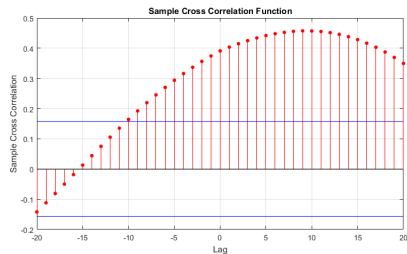
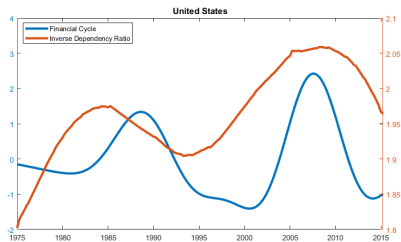
Correlogram US

Correlogram UK

Motivation

- Household debt and housing price cycles are correlated with dependency ratio (Nishimura, 2011 & 2013)
 - Housing prices are driven by population dimension and demographic structure (Saita et al. (2013))
 - Correlation between private debt, mortgages and housing (land) prices (Piazzesi and Schneider, 2016; Knoll et al., 2017)
- Fertility in the 20th century has been characterized by booms and busts (Geanakoplos, 2004; Jones and Schoonbrodt, 2016) Figure

Financial and "demographic cycle"



Source: author's elaboration of Borio et al. (2012)

This paper

Research question

Can the demographic cycle explain the financial cycle?

- Construct an OLG model with debt, housing and exogenous demographic shocks
- Study the effect of a transitory baby-boom on agents choices of consumption and savings
- Effects on the income life-cycle and relative-dimension of supply and demand of the credit market trigger financial cycle: credit-to-GDP and house prices co-moves with inverse dependency ratio

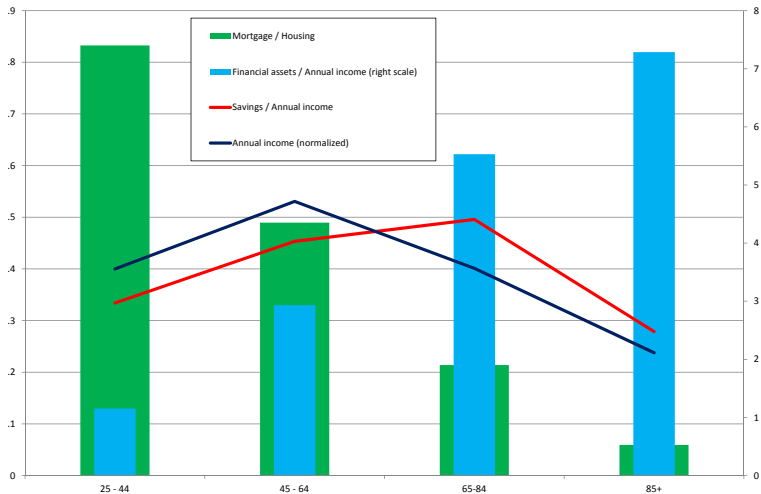
Related literature

- The role of demographic structure on financial markets: Favero et al. (2015), Carvalho et al. (2016), Gagnon et al. (2016)
- Debt super-cycle: Rogoff (2015), Borio (2017)
- This paper studies the role of demographics factors on the financial cycle

From macro to micro: stylized facts on households life-cycle

- Households face a life-cycle profile of income: they are more productive and earn more in later stages of lives
- Income profile and tastes determine a life-cycle profile also for savings and wealth
- A change in population structure affects the demand and the supply of credit and housing (non-durable good): keeping individual preferences unchanged in general equilibrium has an effect on prices.

Stylized facts on life-cycle profiles (US 2013)

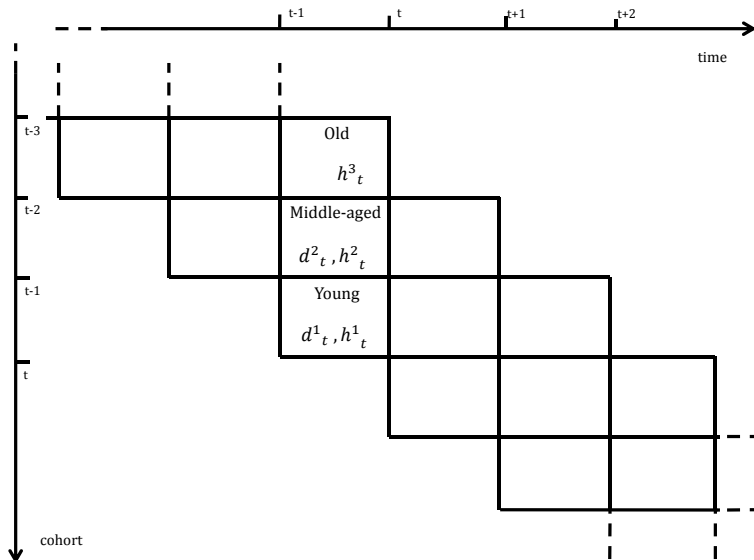


Source: SCF, CE Italy

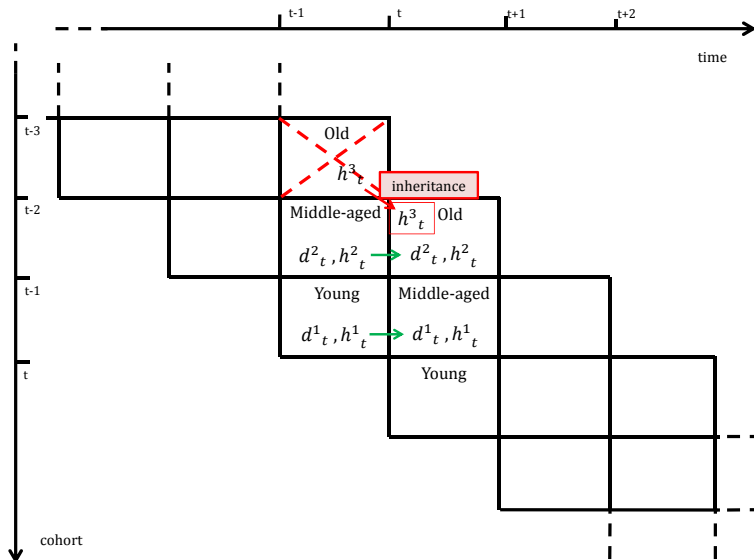
The Model

- OLG: agents live three periods and then die with certainty
- In the first two periods supply labor and earn labor income
- In any period they consume housing and consumption good
- Housing is in fixed supply
- The first and the second cohort participates to financial markets
- Solution: third order perturbation

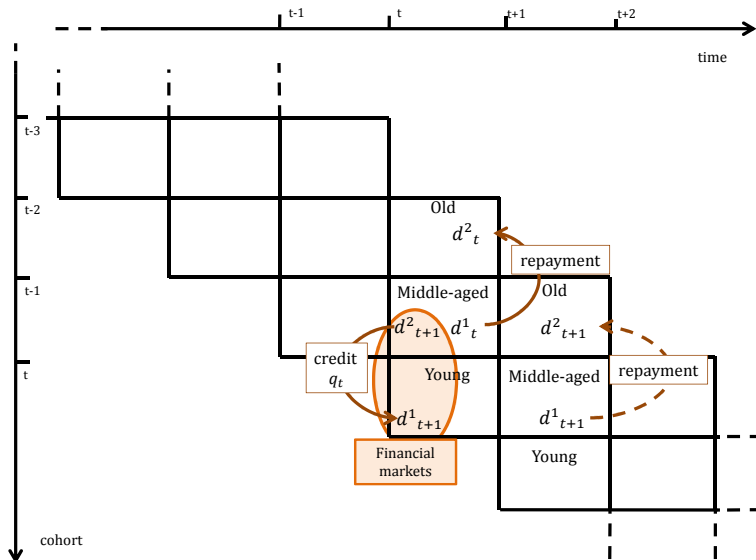
[More on preferences](#)

Beginning of period t 

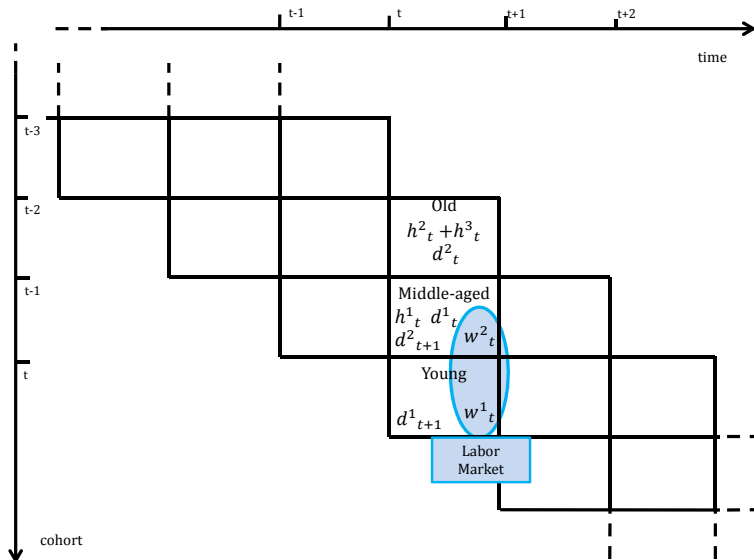
State variables



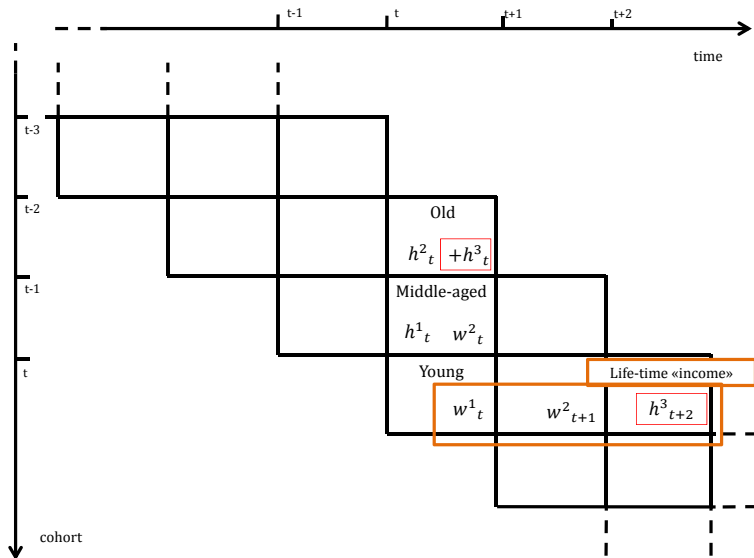
Financial markets



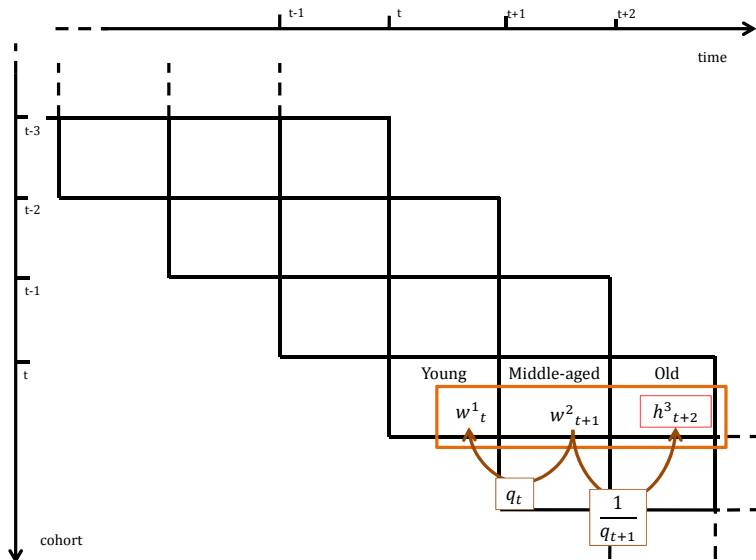
Labor market



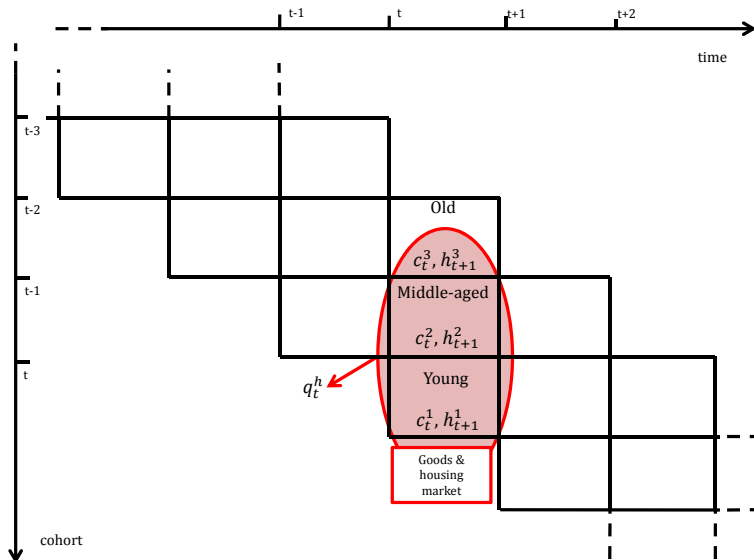
Life-time "income"



The role of financial markets



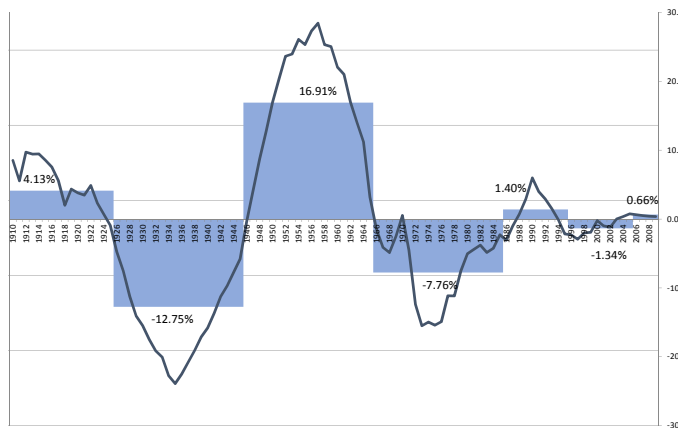
Housing and goods market



Calibration: crucial elements

- Agents get the highest level of labor income when they are middle-aged, i.e. $w^1 < w^2$ (consistent with empirical data)
- The discount factors are calibrated to match life-cycle profile of consumption and savings ($\beta_1 > \beta_2$)
Calibrated profiles of consumption, housing and debt
- The cross-elasticity of substitution between housing and consumption is less than 1 (0.50 in line with Borri and Reichlin (2016))

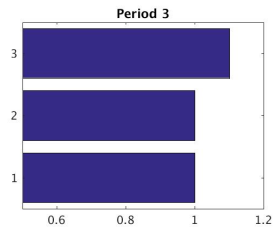
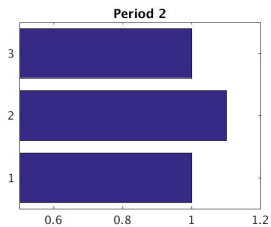
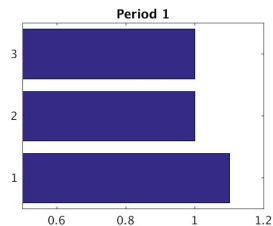
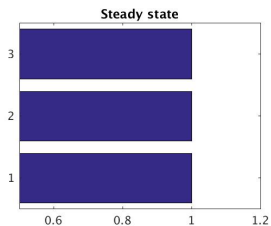
Demographic booms and busts



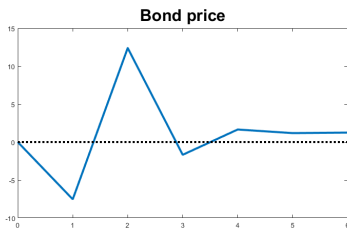
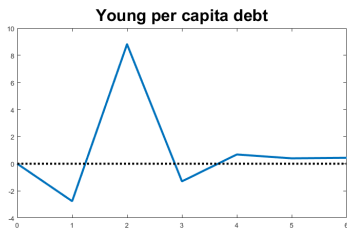
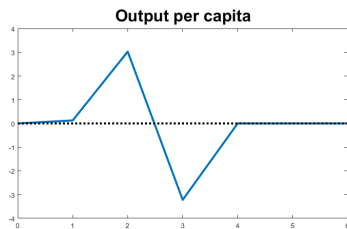
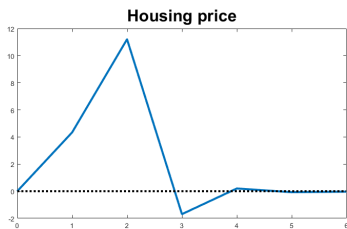
Detrended fertility rate adjusted for child mortality

Live births

A transitory "baby boom": population pyramids



"Baby boom" responses of main variables

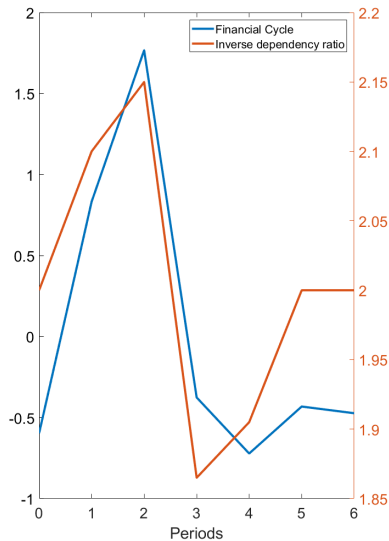
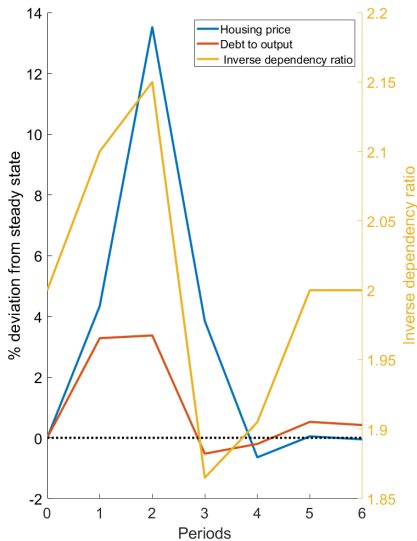


All variables

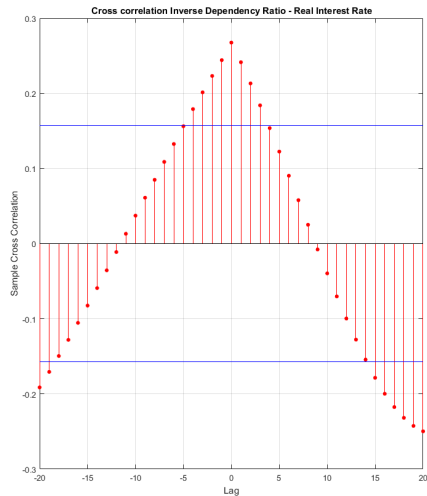
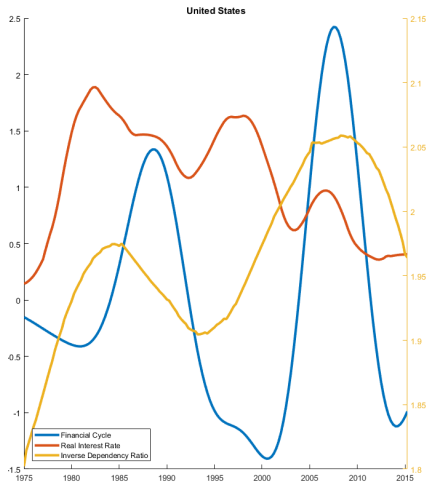
Main mechanism

- Co-movement between housing and demographics determined by complementarity between consumption and housing goods
- Baby boomers enters the model:
 - Negative wealth effect on the first cohort, positive wealth effect on second and third cohort [Figure](#)
 - Reduces consumption smoothing desire of the young [Figure](#), reduces saving needs of the middle aged
 - Together with different relative size the second effect prevails and the interest rate rise (+ "sort of" no-arbitrage with housing)
- Baby boomers become middle aged: increase in credit supply and negative expectations on house prices leads to a decrease in the interest rate, the newborn are richer and takes more credit
 - The debt-to-GDP increases while the interest rate decreases \implies demographic cycle (not financial cycle)

Aggregate variables and financial cycle



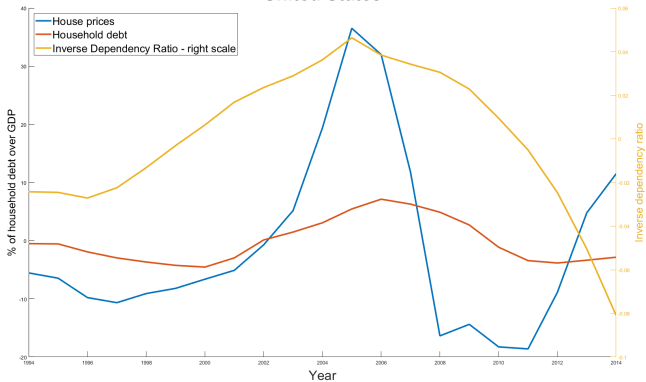
The effect on interest rate - US



Conclusions

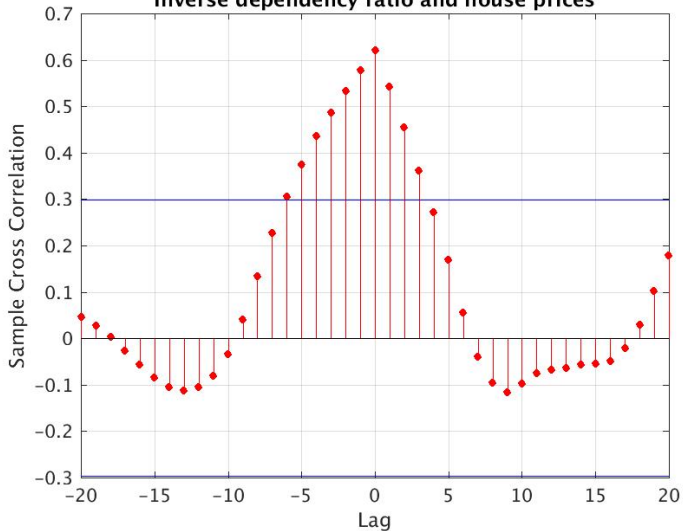
- In a OLG model with individual life-cycle and housing a demographic shock determines the financial cycle
- Medium frequency cycle that will revert in the near future
- Financial cycle vs secular stagnation:
 - "Financial cycle" is related to structural factors but...
 - Structural factors are cyclical (at the medium frequencies)!
- Future research agenda:
 - OLG as in Gertler (1999): higher frequency \implies empirical estimation
 - Rational bubbles triggered from demographic shocks?

United States

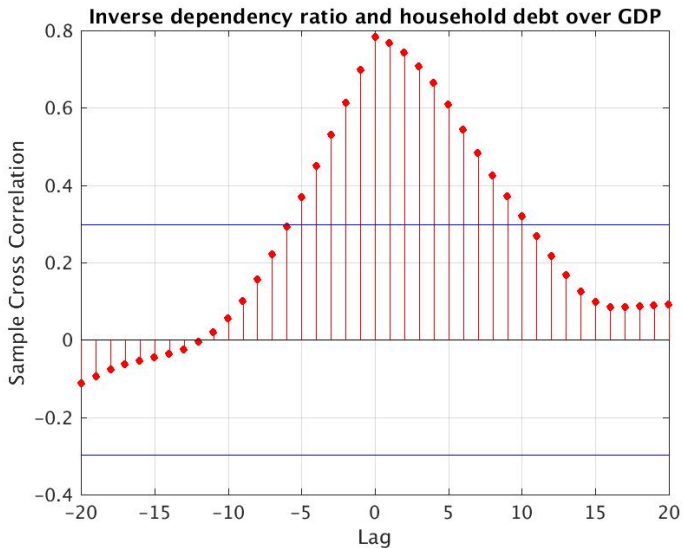


[Back](#)

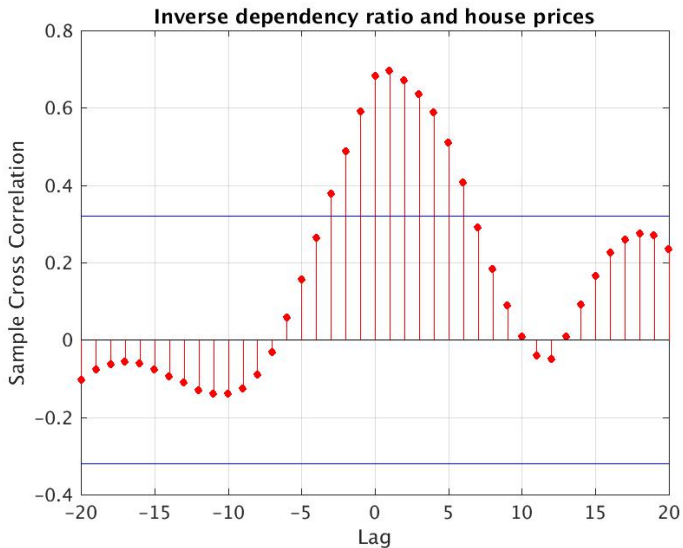
Inverse dependency ratio and house prices



[Back](#)

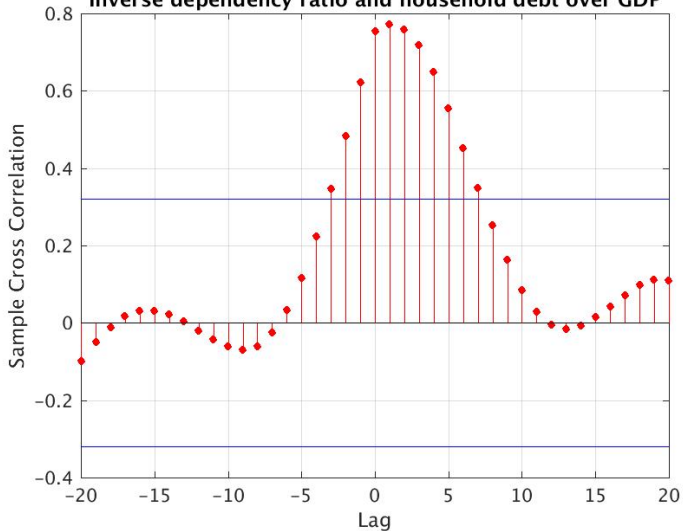


[Back](#)



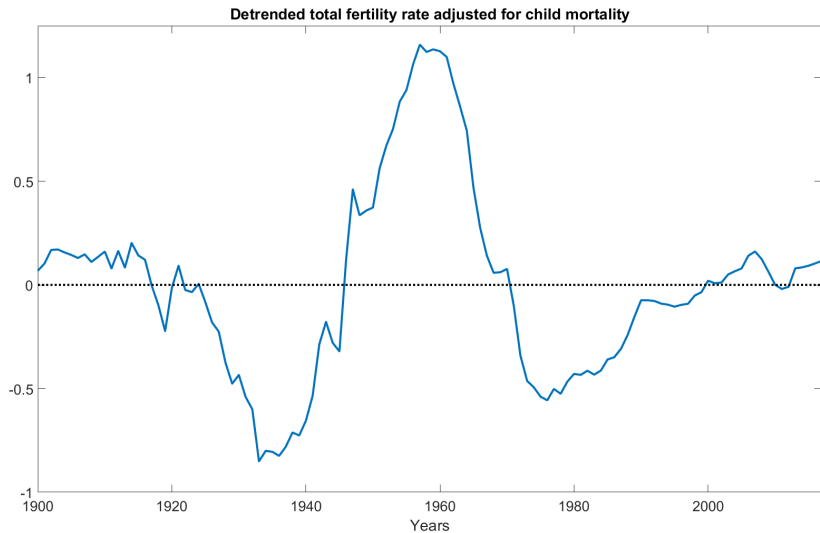
[Back](#)

Inverse dependency ratio and household debt over GDP

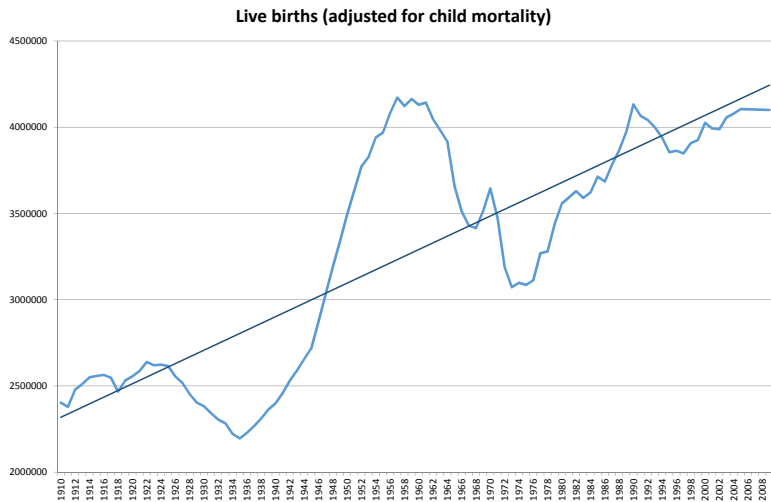


[Back](#)

Demographic medium-frequency cycle

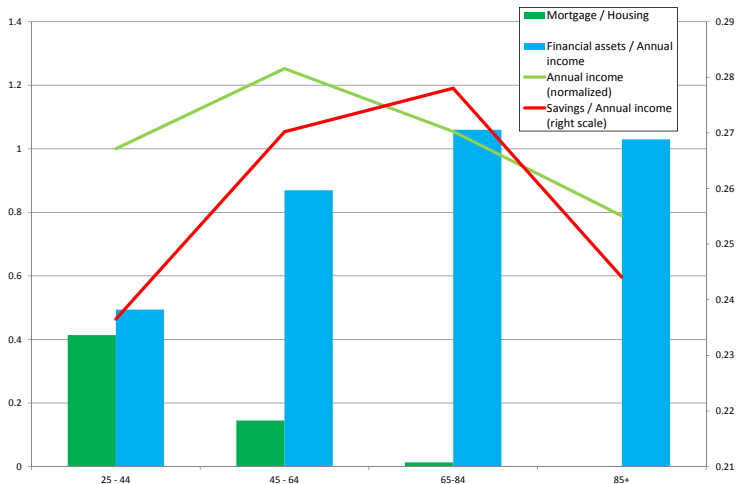


Live births



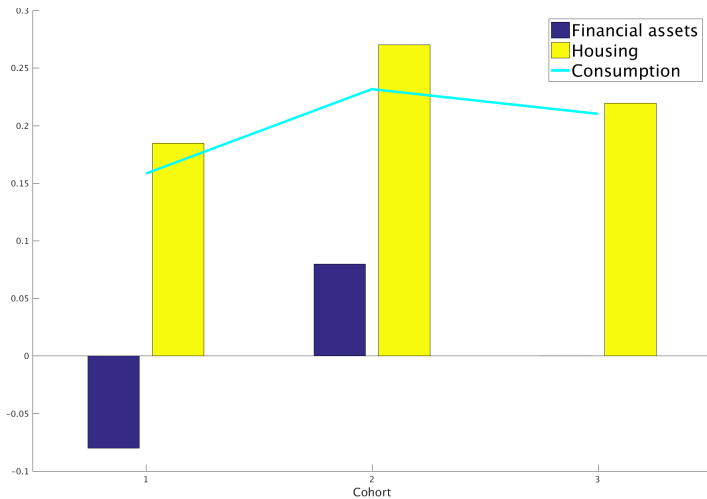
[Back](#)

Stylized facts on life-cycle profiles (Italy 2014)



Source: SHIW [Back](#)

Calibration of income, credit, and housing



[Back](#)

Households' problem

- The intra-period utility of cohort i is given by $u^i(c_t^i, h_{t+1}^i) \equiv U^i(g(c_t, h_{t+1}))$ where:

$$g(h_{t+1}, c_t) = \left[(1 - \omega^h) (c_t)^{\frac{\eta-1}{\eta}} + \omega^h (h_{t+1})^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

And:

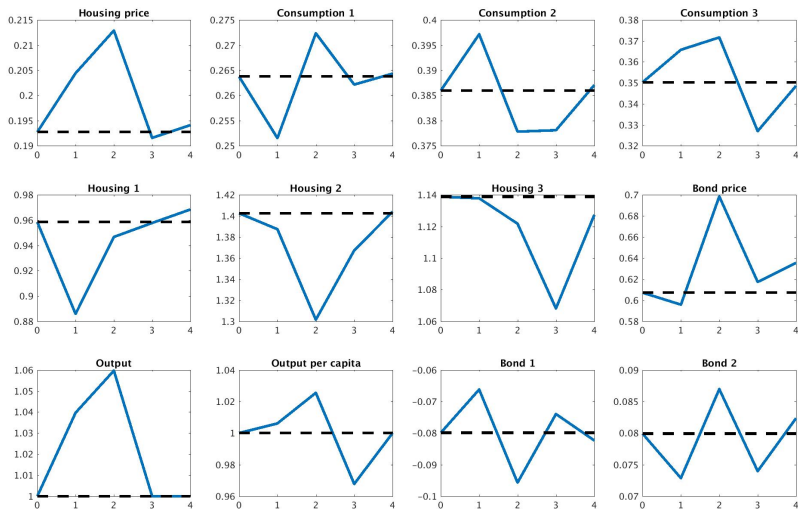
$$U^i(x) = \frac{x^{1-\sigma}}{1-\sigma}$$

- The intra-period budget constraint is:

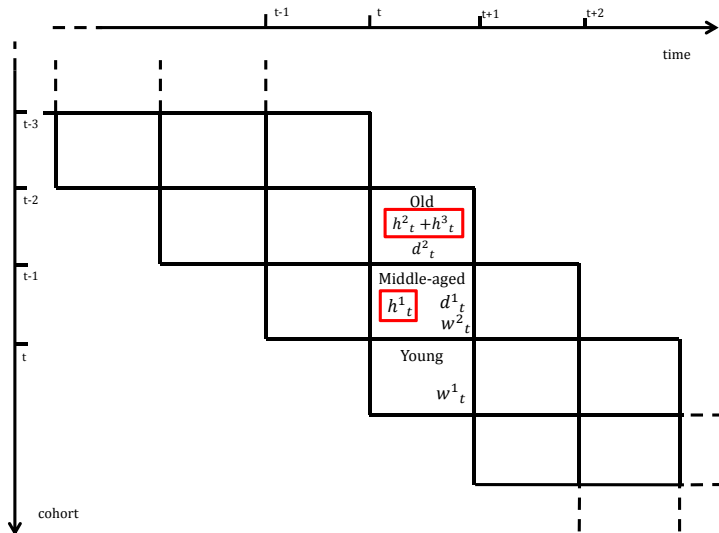
$$c_t^i + q_t^h (h_{t+1}^i - h_t^{i-1}) + q_t^b d_{t+1}^i \leq w_t^i + d_t^{i-1}$$

[Back](#)

Individual responses

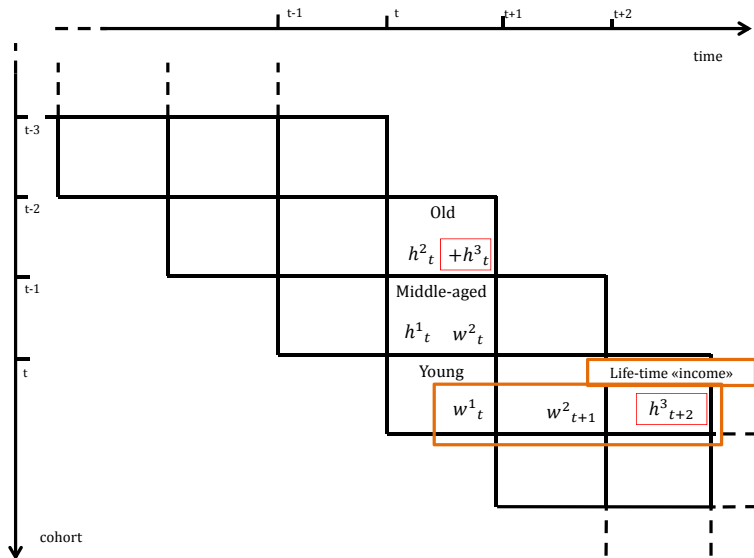


Cohort's wealth



Back

Life-time "income"



The effect on interest rate - UK

