Understanding the New Normal: The Role of Demographics

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October, 2017

[1]The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors.

Introduction

- The U.S. recovery from the Great Recession has been characterized by:
  - low real GDP growth;
  - low real interest rates, even for long maturities.
- Observers such as El-Erian (2010) have described this situation as a "new normal" for the U.S. economy.
- This paper assesses the extent to which demographic factors may be contributing to a new normal.

Key take-away points

- Our overlapping-generation (OG) model accounts for a $1\frac{1}{4}$–percentage-point decline in both real GDP growth and the equilibrium real interest rate (r_t^*) since 1980—essentially all of the permanent declines in those variables according to some estimates.

- Transition to the new normal has been unusually rapid over the past decade.

Key take-away points (continued)

- Declines mainly reflect the unfolding of the post-war baby boom.
  - Real GDP growth: A sharp fall in fertility rates in the 1960s eventually led to slower growth in the labor supply.
  - r_t^*: Capital accumulation was boosted ahead of the decelleration in labor supply by the fact that:
    - baby boomers had few dependents;
    - female labor force participation rose in the 1960s and 1970s;
    - longer life expectancy created extra incentives to save.

Related literature

- Effects of aging on interest rates and growth:
  - Kruger and Ludwig (2007), Aksoy, et al. (2015), Carvalho et al. (2016), Eggertsson, et al. (2017), Cooley and Henriksen (2017), and others.
- What we do:
  - Focus on US data going as far back and forward as possible.
  - Isolate the effects of demographics in history.
  - Evaluate the model relative to time-series estimates of trend real rates.

Our OG model

- We calibrate an OG model to a rich set of life-cycle statistics by age and birth cohort:
  - Population composition;
  - Mortality rates;
  - Fertility rates;
  - Labor supply.
- The decision units are:
  - Adults (18+ years old) who are representative of their birth cohort;
  - Representative firms.
- There is no aggregate uncertainty and factor markets are competitive.
- Individuals face uninsurable mortality risk; otherwise have perfect foresight.

Families

An adult of age a who survives the Grim Reaper in period t maximizes

$$\sum_{s=0}^{A-a} \beta^s \Gamma_{a,t,t+s} \left(\frac{\left(C_{a+s,t+s}\right)^{1-\nu}}{1-\nu} + \epsilon \left(n_{a+s,t+s}\right)^{\eta} \frac{\left(C^c_{a+s,t+s}\right)^{1-\nu}}{1-\nu} \right)$$

subject to a sequence of budget constraints such that

$$\begin{aligned} C_{a+s,t+s} + n_{a+s,t+s} C^c_{a+s,t+s} + K_{a+s+1,t+s+1} &= \\ \left(K_{a+s,t+s} + \phi \Xi_{t+s}\right) \left(R^K_{t+s} + 1 - \delta\right) &+ e_{a+s,t+s} W_{t+s}. \end{aligned}$$

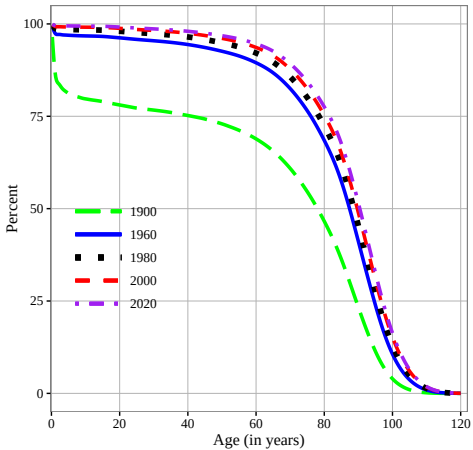
If an adult lives to be 120 years old, she consumes all of her income and dies.

Life-cycle variables to calibrate

- Mortality rates by age and birth cohort,$\Gamma_{a,t,t+1}$.
- Fertility rates by age and birth cohort, $n_{a,t}$.
- Employment rates by age and birth cohort, $e_{a,t}$.
- Initial conditions (population, dependent children, capital) at the start of our sample, 1900.
- We extend simulation out through 2400.

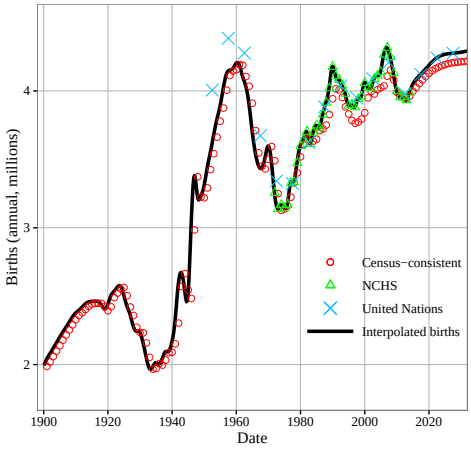
Mortality rates

- Our mortality rates by age and birth cohort are based on Bell and Miller (2005) from U.S. Social Security Administration.
- Their decennial projections run from 1900 to 2100.
- We interpolate across years of age and decennial projections using splines.
- We assume constant mortality rates by age from 2100:Q1 onward.



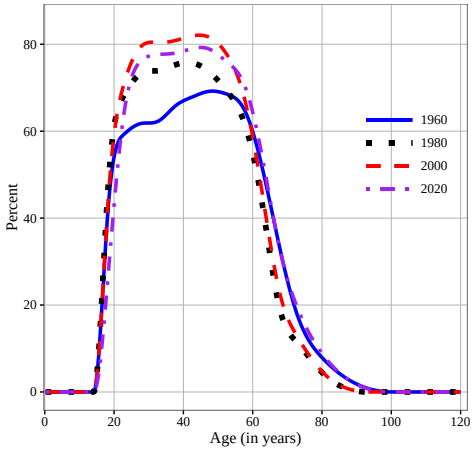
Births

- We obtain birth data from three sources:
  - U.S. Census Bureau;
  - U.S. National Center for Health Statistics;
  - U.N. Wold Population Estimates.
- We interpolate the stitched series with splines.
- Assign births to parents based on distribution of parent age.



Employment rates

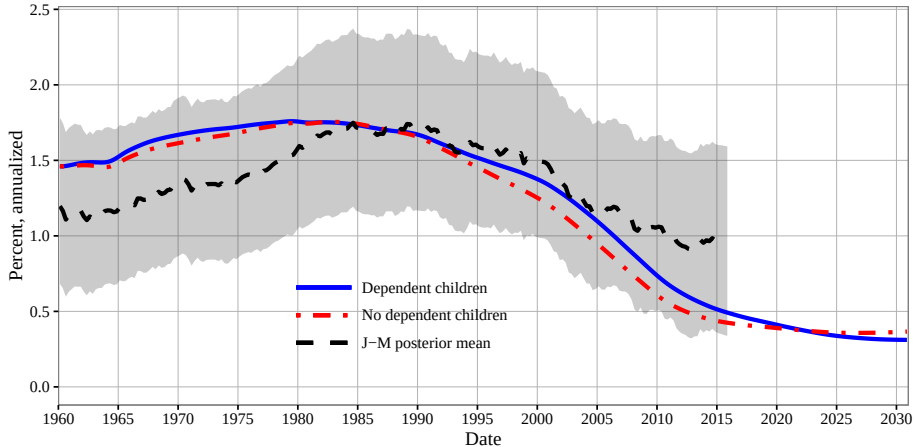
- Data by age and birth cohort from BLS since 1948.
- Forecasts for 2024.
- We H-P filter employment rates to remove recessions.
- We then extrapolate the trend over time and over quarters of age.
- We extend the endpoints of the trend back in history and forward in time.



Dynamic equilibrium: real interest rates

- The model predicts that demographic factors:
  - have lowered r_t^* $1\frac{1}{4}$ percentage points since 1980;
  - caused the largest declines in r_t^* just after 2000;
  - will keep r_t^* low in the coming decades.
- Removing dependent children from the utility function make the decline somewhat more gradual.

Equilibrium real interest rates

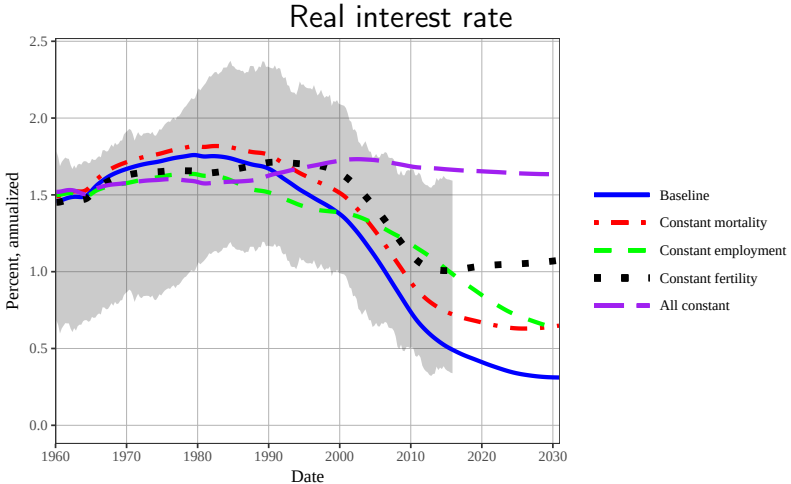


Point estimates and 50-percent uncertainty bands are from Johannsen and Mertens (2015).

Demographic transition since 1960

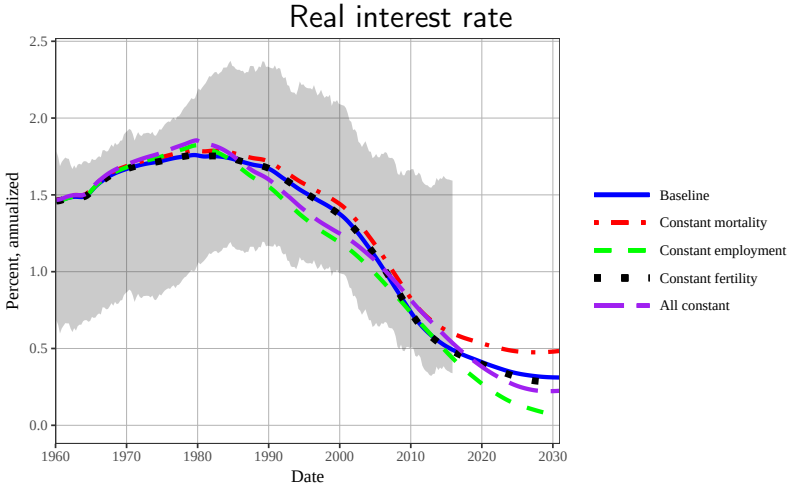
- To parse the repective effects of each demographic factor since 1960, we:
  - Freeze one demographic variable from 1960 onward;
  - Allow others to follow their historical path;
  - Repeate the exercise for 1980.

Demographic transition since 1960



50-percent uncertainty bands from Johannsen and Mertens (2015).

Demographic transition since 1980

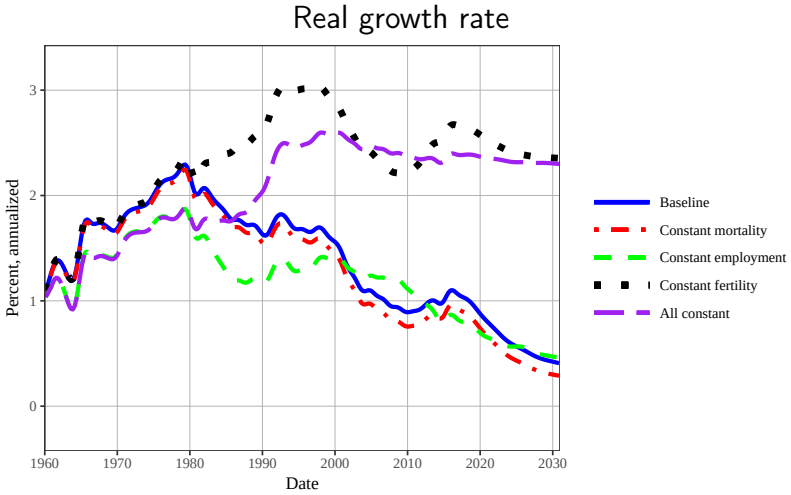


50-percent uncertainty bands from Johannsen and Mertens (2015).

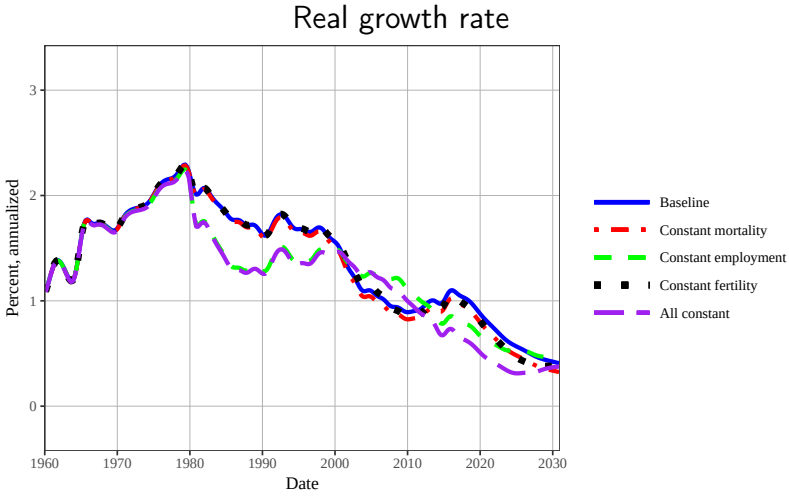
Dynamic equilibrium: real GDP growth

- The model predicts that demographic factors:
  - have lowered growth $1\frac{1}{4}$ percentage points since 1980;
  - GDP growth will remain low in the coming decades;
  - all else equal, adding historical TFP produces level shift in growth rates.

Demographic transition since 1960



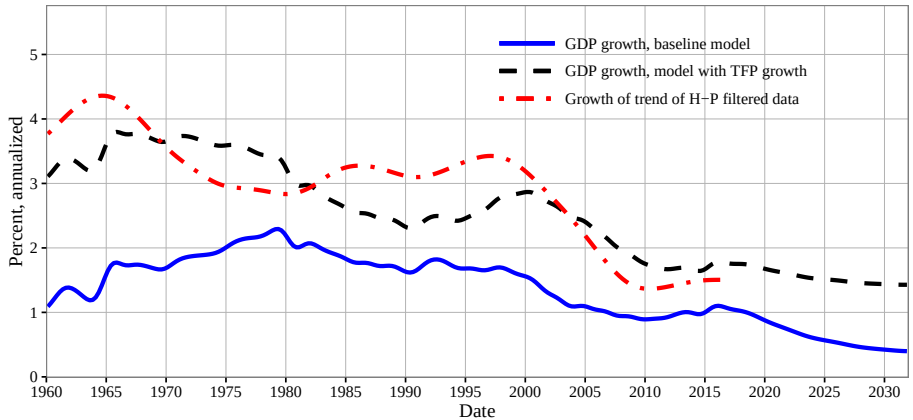
Demographic transition since 1980



Historical TFP growth

- TFP growth rate data from Fernald (2014), starting in 1947.
- Extend data back in time using estimates from Shackleton (2013), 2 percent.
- Extend data forward using estimates from Gordon (2015), 1.1 percent.
- H-P filter the data to remove business cycle.

Equilibrium real GDP growth rates



Summary

- Demographic factors predict that real interest rates and real growth rates should have fallen since 1980.
  - The size of the declines predicted by the model—$1\frac{1}{4}$ percentage points—appears consistent with empirical estimates.
- Demographic factors also predict real interest rates would rise from 1960 to 1980, consistent with some time-series evidence.
- The model predicts a rapid decline in r_t^* due to demographics since 2000.

Investment

- Since the global financial crisis of 2008, investment in the U.S. has been low.
- At the same time, real interest rates on have been low, which might drive money into equities and business investment.
- We analyze what our model predicts for net savings rates.

Net saving rate

- Blue line:benchmark model
  Red line: no dependent children.
- Net saving rates high as baby boom saves for retirement.
- Dip in net saving in 1980s and 1990s when we account for dependent kids.
- Large decline in net saving rate as baby boom retires.