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## SAFE Finance Blog

### Fundamental factors push down interest rate levels

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09/09/2019

Alexander Ludwig: Central banks are held responsible for the continuous low-interest rate environment. However, there are many indications that the demographic trend is lowering natural interest rate



Between economists, a major discussion has flared up again: Is the current low-interest rate environment being caused by central banks? Or are there fundamental factors that are pushing down the natural interest rate which the European Central Bank (ECB) and other central banks base their monetary policy decisions on? In my view, there are several arguments in favor of the second proposition.

For more than 15 years, I have been working with various co-authors on quantitative macroeconomic models dealing with the efficiency, distribution and welfare effects of demographic change. The origin of these studies lies in works carried out in the 1990s

([https://pdfs.semanticscholar.org/1474/00b910731475e1694d5e73883dd9b0dc585d.pdf?\\_ga=2.134203718.978820409.1566812285-196709981.1566812285](https://pdfs.semanticscholar.org/1474/00b910731475e1694d5e73883dd9b0dc585d.pdf?_ga=2.134203718.978820409.1566812285-196709981.1566812285)), long before the terms “saving glut hypothesis” and “secular stagnation” were established or gained popularity, although the second concept actually goes back to Alvin Hansen in the 1930s. However, they pick up exactly the mechanisms behind these catchwords.

An important aspect of this work (in addition to the central welfare question) is to make a statement about the course of the marginal product or the return on capital. The interest in returns on capital at that time came from the fact that economists wanted to evaluate whether fundamental pension reforms would pay off, since not only pay-as-you-go pension systems but also capital markets are susceptible to demographic change. In addition, an increase in savings through stronger capital coverage in old-age provision would further lower returns.

### **The relationship between capital and labor**

How can we imagine the links between returns on capital? A metaphor is helpful. Although it neglects numerous mechanisms, the core of the whole becomes understandable. Imagine a company that produces tables. It employs workers to screw in the table legs. In production, it uses the capital stock (machinery and buildings) and people. Let us now assume that from one day to the next there are only half as many workers left because of demographic change. Let us now go one step further and assume the extreme case: There are no more workers. Then, the production collapses and also the return of the invested capital goes towards zero or becomes negative, if one considers that capital loses value over time (depreciation).

The picture neglects many factors, including the fact that demographic change is not a sudden event and that the company can compensate for a shortage of manpower in production with machines. These and many other aspects need to be taken into account in a quantitative analysis of the macroeconomic impact of demographic change.

I will briefly summarize some important points of this work from the past 15 years (Börsch-Supan et al. 2003a (<https://onlinelibrary.wiley.com/doi/pdf/10.1111/1468-0475.00077>); Börsch-Supan et al. 2006 (<https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1468-0335.2006.00526.x>); Börsch-Supan et al. 2014 ([https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2663952](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2663952)); Krueger and Ludwig 2007 (<https://www.sciencedirect.com/science/article/pii/S0304393206002455>); Ludwig and Vogel 2010 ([https://econpapers.repec.org/article/sprjopoec/v\\_3a23\\_3ay\\_3a2010\\_3ai\\_3a2\\_3ap\\_3a703-735.htm](https://econpapers.repec.org/article/sprjopoec/v_3a23_3ay_3a2010_3ai_3a2_3ap_3a703-735.htm)); Ludwig and Reiter 2010 (<https://www.aeaweb.org/articles?id=10.1257/pol.2.4.83>); Ludwig et al 2012 (<https://www.sciencedirect.com/science/article/pii/S1094202511000275>); Vogel et al. 2017 (<https://www.cambridge.org/core/journals/journal-of-pension-economics-and-finance/article/div-classtitleaging-and-pension-reform-extending-the-retirement-age-and-human-capital-formation-a-hreffns01-ref-typefnadiv/A6FCF2DF5F117FA0F6A650A716168AA7>)): As our metaphor suggests, a central question is the relation between capital and labor, and here the question of both factors' elasticity of substitution becomes relevant. Under conventional assumptions, long-term returns on capital decrease by between 0.8 and 1 percentage point between 2005 and 2035, taking into account international diversification and endogeneity of labor.

As studies by numerous authors have also shown, for example, the increase in the retirement age, migration of young workers, investment in human capital and labor-saving technological progress have a dampening effect. The latter aspect is not included in my own quoted work but is formally similar to the

human capital mechanism mentioned above. This was shown by Heer and Irmen (2014) (<https://www.sciencedirect.com/science/article/pii/S016518891400150X>) and the thesis was recently revisited by Acemoglu and Restrepo (2017) (<https://www.nber.org/papers/w23077>).

These adjustments run counter to the strong complementarity relationship between capital and labor outlined in our metaphor, which I doubt, though, for medium- to long-term issues like these. However, it is important to stress that the adjustment mechanisms have a dampening effect at best.

Recently, economists have tried to use these macroeconomic models to make statements about risk-free interest rates, i.e. natural interest rates. In past years, the interest of central bankers in these models has increased; but these studies suffer precisely from the fact that attempts are being made to depict a risk-free return in a deterministic production economy (for example, Gagnon et al. 2018 (<http://econweb.umd.edu/~davis/eventpapers/GagnonNormal.pdf>)). However, this is inconsistent because macroeconomic production is exposed to risks, which the macroeconomic return must reflect in a corresponding premium. With natural interest rates, though, one has a risk-free interest rate in mind. The two objects – natural return and total return on productive capital – are of course closely related, as Larry Summers argues. In my view, however, if this is to be approached in a model-consistent manner, models with portfolio selection and endogenous risk-free and risky returns are needed. However, these macroeconomic models are technically very complex.

### The role of demography

Already in 2003, we solved this in Börsch-Supan et al. (2003b) using an approximation. We concluded that the risk-free interest rate fell even more sharply in the period from 2005 to 2035, namely by around 1.5 percentage points, due to higher demand from older people for relatively risk-free investments. The approximation at the time was that, although we modeled the bond market consistently, we took the course of capital productivity from a deterministic model and thus neglected a feedback mechanism. However, those who are familiar with such studies will quickly notice that this approximation is not too rough. My most recent work on this question confirms this assumption (Geppert et al. 2016 ([https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2841555](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2841555))).

This supports the assumption that demography is a fundamental economic mechanism that pushes natural interest against zero. It is also important to stress that this work can describe the long-term trend of risk-free real interest rates since the 1980s. However, I am not in a position to judge conclusively whether the natural interest rate will actually fall close to zero in an environment with an economic situation as we have observed in Europe and other countries since the financial and economic crisis of 2007 (which is not reflected in the models aimed at demographic development). However, it seems plausible to me, and some econometric studies suggest this, e.g. the discussion in Papetti (2019) (<https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2258~32d1cdba97.en.pdf?4f6ffdb6d7097f59312a49e5b868f336>). It is also true that in such a situation negative interest rates are necessary to stimulate the economy.

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