

# Can baby-boomers' retirement *increase* stock prices?

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## Abstract

In a dynamic asset-pricing model with Hyperbolic Absolute Risk Aversion preferences, investors who have Decreasing Relative Risk Aversion have an age dependent component in their optimal asset allocation rule. Unlike conventional models, this component affects equilibrium equity returns due to demographic trends in the same direction suggested by (Poterba, J. M. (2001). Demographic Structure and Asset Returns. *The Review of Economics and Statistics*, 83 (4) 565–584; Poterba, J. M. (2004). *The Impact of Population Aging on Financial Markets*, NBER Working Paper No. 10851). Calibration to US data between 1950 and 2050 reveals that between 1950 and 1970 this effect potentially added 0.15% to the 7.79% post-war long-term return (actual was 8.39%). As boomers joined the labor market (1970–2004) this positive effect turned negative (0.17–0.34%). Ignoring consumption and wealth effects, the model implies that this effect will draw 0.06% annually between 2005 and 2015 but add 0.22% between 2016 and 2050.

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## 1. Introduction

It is well documented that disproportional changes in young, prime-age and old demographic cohorts change the aggregate demand for financial assets, real estate, and consumption. The typical assumption in population economics is that young need to borrow in order to invest, primarily in real estate, prime-age cohorts are the major savers in the economy and the old generation dis-save in order to consume. Overlapping generations (OLG) models, e.g., Constantinides, Donaldson,

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& Mehra (2002), and Constantinides and Duffie (1996), account for aggregate consumption and investment decisions and show that since investors in their old age use their savings for consumption, and since equities are riskier than bonds, retirees will sell equities first, thus drive their prices down and their expected returns up. When Storesletten, Telmer, & Yaron (2001) add idiosyncratic labor risk to the OLG model and allow trade across cohorts, they come to a similar conclusion, though in their calibrated solution equity positions at old age may still be up to 30%. Yet, the literature is still inconclusive about the effect of aggregate demand for savings on expected equilibrium returns. While Siegel (1998) and Campbell (2001) generally agree with the OLG model predictions on different theoretical grounds, Poterba (2001, 2004) took an empirical approach and analyzed the US Surveys of Consumer Finances of 1995 and 2001, respectively. Unlike the theoretical models, he concludes that if demographic variables are at all relevant for equity pricing, the effect should be *positive*. This finding calls for a reexamination of the theoretical reasoning of demographic effects since aggregate demand for savings has far-reaching effects on financial markets, pension funding, social security schemes, etc.

The goal of this paper is to demonstrate a *positive* aging effect on equilibrium equity prices that was not discussed in prior theoretical studies; it stems from an aggregate aging effect of investors with Hyperbolic Absolute Risk Aversion (HARA) utilities and Decreasing Relative Risk Aversion (DRRA) preferences. We show that disproportional changes in the age pyramid and especially changes in the proportion of old-age cohorts might affect equilibrium equity prices through the present value of investors' lifetime subsistence level. This factor serves as a reference level for the investor when determining the optimal exposure to the risky asset, i.e., this is not an actual, observable, consumption parameter.

We demonstrate the above-mentioned effect in a dynamic asset-pricing model where two investor groups with different preferences employ two optimal dynamic asset allocation strategies that enable us to clear the stock market by solving for equilibrium prices endogenously, through trade. This structure allow us to solve for the return generating process endogenously, thus capture demographic effects when equity supply is fixed<sup>1</sup> and the expected return mean-reverts to a stationary long term value (as in Marton 1971, excluding the stochastic element). We refer to the two strategies as “contrarian” and “trend,” for notational simplicity. We demonstrate that the contrarian strategy is optimal for high risk-averse investors with Constant Relative Risk Aversion (CRRA) preferences and the trend strategy is optimal for investors with DRRA preferences under a HARA utility function.<sup>2</sup> The contrarian is derived by solving for the Relative Risk Aversion (RRA) parameter that implies an optimal *sell of units of shares* upon a positive price change, and an optimal *buy of units of shares* when the price declines. Conversely, the trend strategy is optimal for a low risk-averse investor, and it is defined such that the investor *buys units* of shares upon a price increase, and vice-versa. Hence, we clear the demand and supply for shares period after period and reveal a lognormal price process that depends on the age-dependent demand for equities by the low risk-averse investors.

In order to focus our analysis on the age-dependent factor of the trend (DRRA) investors, we assume that aggregate investors' consumption is independent of demographic changes. The age-

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<sup>1</sup> We may assume a fixed supply of equities since we assume that the demand for consumption and the stock of capital assets are constant, thus focus on changes in the age pyramid.

<sup>2</sup> The constant proportion portfolio insurance strategy is a linear asset allocation rule, similar to our trend strategy, has long been proposed for pension funds (e.g., Brennan & Schwartz, 1976, Black & Dewhurst, 1981, Somes & Zurack, 1987, Black & Jones, 1987, 1988, Perold & Sharpe, 1988) to secure their actuarial commitments. In this context, the aggregate floor represents the present value of actuarial commitments.

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