



Impact of demographic change on stock prices



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ABSTRACT

Focusing on the relationship between the demographic structure of population and stock prices, we find that stock prices are positively affected by the proportion of population in their prime earning age and negatively affected by the proportion of retirees. The empirical analysis identifies a structural break coinciding with the first wave of baby boomers reaching their prime earning age in the early 1990s. In addition, the results show that both budget deficit and inflation have a negative effect on stock prices.

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1. Introduction

The influence of a changing demographic structure on the price of financial assets has been the subject of a substantial amount of research and discussion. Many researchers have suggested that the dramatic rise in the US stock prices in the 1990s can be partly attributed to the growing demand for financial assets, as the first group of the baby boomers reached the prime earning age in the early 1990s and increased their holdings of financial assets (especially equity shares) to save for retirement. Since most of the baby boomers are still in their prime earning age, there is some concern that equity prices will face a considerable downward pressure when they retire and begin to liquidate equity holdings from their financial portfolio. In fact, the oldest cohorts of the baby boomers have already started to retire. One of the reasons for this concern is that the proportion of population between the ages of 45 and 64 is near its peak, and it is projected to decline over the next two decades.

According to the life cycle hypothesis, individuals invest in housing assets in their 20s and 30s and as they approach retirement age, they allocate more of their savings to financial assets. Hence, there is greater demand for financial assets when an individual reaches the latter earning age prior to retirement, especially between the ages of 45 and 64. The life cycle risk aversion theory states that an individual's relative risk aversion is an increasing function of one's age, which would explain the reallocation of portfolio away from risky equity assets towards less risky fixed income assets as the individual approaches or reaches the retirement age. The corollary to these two hypotheses is that if the proportion of population who are in their pre retirement age is high at any given time, it will have an enhancing effect on the price of relatively risky financial assets, and when they retire and divest their risky equity assets in favor of holding fixed income assets, it will have a depressing effect on the price of equity assets.

The dramatic rise in equity share prices during the 1990s in the United States can be attributed to an unprecedented period of prolonged economic expansion, the growing demand for equity assets by baby boomers saving for their retirement, relatively low rates of inflation, and a steady decline in budget deficits (which culminated in a few years of budget surpluses). The possible negative effect of the eventual reversal in the demographic structure and the corresponding reallocation in the portfolio of the retirees, on the price of financial assets, has been the subject

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of much research and discussion. This study revisits the possible impact of aging baby boomers on equity prices and also addresses the often mentioned “crisis” connected to their impending retirement. It also incorporates the effect of budget deficits and inflation on the demand for equity assets, along with the effect of income.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature; Section 3 presents a description of the data and the variables used in this study; Section 4 addresses the inherent time series issues pertaining to the macroeconomic variables used in the study, Section 5 constructs a simultaneous equation demand-supply model to illustrate the determinants of equity prices; while Section 6 provides details of the empirical results; and finally, Section 7 provides conclusions.

2. Literature review

Despite the theoretical arguments as to why the price of financial assets should vary with changes in the age structure of the population, the empirical evidence for such corresponding price changes is less conclusive. [Poterba \(2001\)](#) found that the positive correlation between the proportion of population in their prime earning age and the demand for financial assets was reflected in the price dividend ratio of equities. He, however, concludes that this would not result in a price decline in the foreseeable future since the baby boomer retirees would conserve their assets consequent to their bequest motive. In a complementary paper, [Abel \(2001\)](#) argues that Poterba only considered demand related factors to specify the relationship between population structure and the price of capital reflected in stock prices. He argues that when supply factors are also taken into account the results would be different. He concludes that the decline in stock prices would not be moderated when baby boomers retire and proportion of the population in the prime earning (and saving) age declines. His theoretical results were based on a general equilibrium model with a bequest motive and rational expectations. In his model, a baby boom increases stock prices, and stock prices are rationally expected to drop when this cohort retires, even when they continue to hold stocks for their lifetime. Hence, the continued high demand for assets by the retired baby boomers does not moderate the decline in the price of financial assets.

In an attempt to explain the trend in price dividend ratio, [Geanakoplos, Magill, and Quinzi \(2004\)](#) used the proportion of middle-aged people between the ages 40 and 49 to the young population between the ages of 20 and 29, and demonstrated a long-run negative relationship between this proportion and the dividend price ratio (inverse of price dividend ratio used in our study). [Favero, Gozluklu, and Tamoni \(2011\)](#) also found that the ratio of between middle aged population and young population is a significant predictor of long-run price dividend trend. In their empirical analysis, [Lettau and Van Nieuwerburgh \(2008\)](#) were able to identify structural breaks for Dividend Price Ratio in 1991 and also in 1954.

[Lim and Weil \(2003\)](#) also predict a decline in asset prices due to demographic shift in population between 2010 and 2030 but they also rule out a massive meltdown in assets prices since they argue that the effect would be relatively small. [Bakshi and Chen \(1994\)](#), [Poterba \(2001\)](#), [Abel \(2001, 2003\)](#), [Jamal and Quayes \(2004\)](#), and [Goyal \(2004\)](#) have all demonstrated a positive correlation between the proportion of population in their prime earning age and the demand for equity assets. Finally, [Bae \(2010\)](#) employed cointegration method and found the proportion of retirees to have a negative effect on stock prices but failed to show that the proportion of population in their prime earning have a positive effect on stock prices.

The standard present value model for asset prices does not recognize that inflation has any effect on real stock prices or real returns. The price of a share is the present value of the stream of dividends to be received in the future from owning the share plus the expected future price. Since inflation will affect the dividend and the price in nominal terms, it would not have any effect on the real prices. In other words, the price–dividend ratio should not be affected by inflation. On the other hand, the Fed Model assumes that an individual’s portfolio consists of bonds and stocks, where these assets are substitutes and hence a change in the rate of inflation can result in a reallocation of an individual’s portfolio.

[Gallagher and Taylor \(2002a,b\)](#) showed that stock prices were negatively correlated to inflation via supply shocks, but did not find any evidence of relationship between stocks prices and inflation due to purely demand shocks. [Rapach \(2002\)](#) studied 16 individual industrialized countries, but did not find any evidence that inflation erodes the long-run real value of stocks. [Feldstein \(1980\)](#) argues that inflation reduces real return from stocks since capital gains tax is levied on nominal returns, which should lead to a decline in stock prices. [Modigliani and Cohn \(1979\)](#) argue that stockholders do not understand the effect of inflation on the value of nominal debt. Although most empirical evidence for industrialized countries show a negative relationship between inflation and stock returns, the same may not be true for emerging economies. [Spyrou \(2001, 2004\)](#) finds mostly positive relationship between stock returns and inflation for a sample of countries drawn from Latin America and Asia, while [Al-Khazali and Pyun \(2004\)](#) find negative relationship in the short-run but positive relationship in a cointegration analysis for the long-run. On the other hand, [Quayes and Jamal \(2008\)](#), [Gallagher and Taylor \(2002a,b\)](#), [Rapach \(2002\)](#), and [Feldstein \(1980\)](#) have shown that inflation can have a negative effect on stock prices in industrialized countries.

The theoretical arguments relating the effect of inflation on stock prices or real return vary from tax argument to value of nominal debt argument. The empirical evidence of the effect of inflation on real stock prices is rather inconclusive. Our model incorporates a demand-supply model and estimates the coefficients from the reduced form.

[Quayes and Jamal \(2010\)](#) investigate the relationship between budget deficits and stock prices, incorporating the effects of inflation and the demographic structure and show that both budget deficits and inflation have a negative effect on stock prices.

Using demand supply model, [Jamal and Quayes \(2004\)](#) showed that the fraction of population in their prime age (between the ages of 45 and 64) has a statistically significant positive effect on equity prices. [Bae \(2010\)](#) used cointegration analysis to assess the effect of the fraction of population in their prime age group without accounting for the interaction between equity price and equity demand in the market. His estimation results show that that the fraction of population in their prime age does not have any statistically significant effect on equity prices but the fraction of retirees has a statistically significant negative effect. Utilizing the demand supply model used by [Jamal and Quayes \(2004\)](#), we analyze the possible effect of (i) the fraction of population in their prime age, (ii) the fraction of population that are retirees, and also (iii) the difference between these two demographic components on equity prices and find that prime age group fraction has a positive effect on equity prices, the fraction of retirees has a negative effect on equity prices, and their difference has a positive effect on equity prices. Using the difference between the fraction of prime age group and retirees captures the change in both groups and as such it is a better explanatory variable in comparison to just prime age group (Jamal & Quayes) or fraction of retirees and prime age group separately (Bae). We also use a vector error correction model to show a stable long run cointegrating relationship between the fraction of population in their prime age and equity prices. Furthermore, we also

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