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Impact of persistent bad returns and volatility on retirement outcomes

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ABSTRACT

We examine wealth outcomes and risk of ruin faced by retirees due to persistent bad returns and high volatility in equity markets occurring at different stages of their retirement. Our results show poor equity returns persisting over long periods can put retirement security to serious risk but volatile market conditions actually have the opposite impact. The timing of such persistent bad returns and volatility (early or late stages of retirement) is critical and has differing effects on retirement outcomes. The results are robust to varying portfolio allocations to equities although the precise impacts are different.

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1. Introduction

Retirees are often advised to adopt a 'safety first' approach to ensure their nest eggs are able to provide a steady source of income over their lifetime. However, a general consensus has emerged that holding some equities in the retired investor's portfolio is essential to generate adequate income to fund a comfortable retirement and minimise the risk of outliving their assets. For example, [Bengen \(1994; 1997\)](#) recommends a portfolio allocation of 50% to 75% to equities to allow for a sustainable retirement. Others like [Cooley, Hubbard, and Walz \(1999\)](#) find that a portfolio with 75% allocated in stocks and the rest allocated in corporate bonds can sustain 4–5% inflation adjusted annual withdrawals. More recent studies like [Bewley et al. \(2007\)](#) suggests that, due to ever increasing life expectancy, sustaining over longer periods in retirement makes the case for allocating to equities stronger for investors till they get to the late stages of retirement.

Holding equities in retirement can benefit the retiree's portfolio by harvesting the equity premium historically observed over long horizons. Indeed, [Cooley et al. \(2003\)](#) suggest that most retirees allocate between 25% and 75% of their retirement portfolio to equities. Yet this allocation strategy carries significant risk of depletion of retirement savings in the event of

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downturns and extreme events in the equity markets. Bengen (1994) suggests that retirees who face significant market downturns early into their retirement bear a higher risk of exhausting their portfolio over their lifetime. In a recent study, Chatterjee et al. (2011) confirm that the recent market downturns during 2000–2002 and 2008 had adversely impacted the retirement portfolio for individuals retiring around that time.

The first decade of the twenty-first century has proved to be the worst decade for equity investors with US and several other international markets reporting negative returns (Dimson et al., 2011) and there is widespread concern that equity premium in the future may be disappointing. Similarly, market volatility has spiked on several occasions in the last decade driving fear among market participants and resulting in large capital losses. Volatility in equity markets rose sharply during the financial crisis in 2008 accompanied by a crash that resulted in severe losses to investors within a span of few months. While this spike in volatility was short-lived, there have been instances in history of equity markets, like the Great Depression (1929–1939), when high levels of volatility persisted for a very long period (Schwert, 2011).

Our paper focusses on wealth outcomes and risk of ruin faced by retirees in the event of prolonged periods of bad returns and high volatility in equity markets. Both poor equity returns and high volatility can have varying impact on wealth and sustenance depending on the allocation of the retirement portfolio to equities and other assets. We separately assess the impact of bad returns and high volatility as it is quite plausible that equity markets remain depressed for a sustained period of time without volatility being particularly high. Similarly, persistent periods of high volatility in equity markets may not necessarily be accompanied by bad returns.¹

The potential of significant loss in the nest egg at a time when the retiree has little recourse to recoup from adverse investment outcomes through labour market participation can be a serious threat to her sustenance. Since the question of whether to hold equities in retirement portfolio (and if so, how much equities to hold) is important, a range of portfolios with varying allocation to equities is used in our study. Second, we consider the impact of timing of bad returns and market volatility on the retirement outcomes by modelling wealth outcomes and risk of ruin under alternative stylised scenarios that capture the emergence of bad returns or high volatility at different stages of retirement.

2. Data and methodology

We examine the wealth impact of poor returns and high volatility on a retiree who has 30 years to survive after retirement.² We assume an initial wealth balance of \$1000 of which 4% is withdrawn in the first year to meet consumption needs.³ Thereafter, we assume this withdrawal amount to increase by 3% every year to account for future inflation. We compare the impact of these severe market conditions on the retirement sustainability under four different portfolio strategies that have varying allocation of retiree's wealth to equities, bonds and bills. These include (i) a conservative portfolio which invests in bonds and bills in equal proportion; (ii) a balanced portfolio which invests 50% in equities and the rest equally among bonds and bills; (iii) a growth portfolio which invests 70% of wealth in equities and the remaining equally among bonds and bills; (iv) a lifecycle portfolio which is initially invested 50% in equities (and the rest in bonds and bills) but linearly switches allocation entirely to bonds and bills over the retiree's lifetime.⁴

We randomly resample monthly returns from the distribution of returns of US equities, bonds, and bills between January 1928 and January 2014 (Global Financial Database) to construct simulated 30-year portfolio return paths. We use a stationary block bootstrap method developed by Politis and Romano (1994) to resample from the time series of historical returns. Instead of selecting an optimal block size, which has been shown to be suboptimal (see Politis and White, 2004), this methodology employs a block size that is a geometrically-distributed random variable. Politis and Romano (1994) show that with random blocks, the resulting time series is less sensitive to block size misspecification when compared to competing methods. This bootstrap method also maintains the cross-correlation between asset class returns, while dynamic serial correlation in the data is preserved within the blocks. The returns are then applied on the initial wealth of the retiree to derive the terminal wealth after 30 years while providing for an annual withdrawal of 4% of initial wealth each year for meeting consumption needs. The process is repeated 10,000 times to generate a simulated distribution of terminal wealth.

To understand the impact of timing of poor equity returns on the retirement nest egg, we also model three alternative scenarios by drawing from the worst simulated returns paths as derived above. These 'conditional' scenarios are as follows.

Scenario 1: Here equity returns are extremely poor in the first 10 years after retirement but random thereafter. To model this scenario, for the first 10 year period following retirement, we randomly resample from the worst 1% equity return paths and combine them with randomly drawn returns from the historical distribution of returns for the next 20 years.

¹ Historically, US equities have shown more extreme positive returns than extreme negative returns. Hence, high volatility in many periods may be driven by the former rather than latter.

² According to the US National Center for Health Statistics as reported by Kochanek, Murphy, Xu, and Arias (2014), the median life expectation is around 86 years whilst a tenth of the population at 65 years will grow to age 96. This requires a retiree who wants to be 90 percent certain that her retirement savings last as long as she lives to plan for her consumption and investment for up to 31 years. With the 30-year investment horizon, we adequately cater for the 10th percentile of retirees who will live beyond age 95.

³ The 4 per cent 'golden rule' as a sustainable withdrawal rate is proposed by many including Bengen (1994).

⁴ The preponderance of lifecycle funds within retirement plans in US would suggest that allocation to equities should be higher in the initial years of retirement compared to the later years. However, some recent studies question this conventional wisdom (see, for example, Arnott, Sherrerd, and Wu (2013), Estrada (2014)).

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