

CH15

Discounting and Accumulating

$$\delta(t) = \begin{cases} \delta_1(t) & 0 < t \leq t_1 \\ \delta_2(t) & t_1 < t \leq t_2 \\ \delta_3(t) & t > t_2 \end{cases}$$

Accumulated value at time t
of a pmt of 1 at time 0 is

Effect of Longevity Risk on Retirement Planning

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Abstract

Purpose: The aim of the study was to assess the effect of longevity risk on retirement planning.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: The study indicated that failing to account for longevity risk can lead to insufficient income in the later stages of retirement, forcing retirees to reduce their standard of living or rely on external support. Consequently, retirement planners and individuals are advised to incorporate longevity risk into their planning by considering annuities, adjusting withdrawal rates, and diversifying investment portfolios

to ensure a stable income stream throughout retirement. Financial education and tools to estimate life expectancy are also essential in helping individuals make informed decisions about their retirement savings and disbursement strategies, ultimately leading to more secure and sustainable retirement outcomes.

Implications to Theory, Practice and Policy: Life-cycle hypothesis (LCH), prospect theory and modern portfolio theory may be used to anchor future studies on assessing the effect of longevity risk on retirement planning. Implementing widespread financial literacy initiatives can empower individuals to make informed decisions about retirement planning. Governments should introduce policies that incentivize higher savings rates, such as tax benefits for retirement contributions and automatic enrollment in retirement plans.

Keywords: *Longevity, Risk, Retirement, Planning*

INTRODUCTION

Longevity risk, the uncertainty regarding the length of an individual's life, has become a crucial factor in retirement planning as life expectancy continues to rise globally. In developed economies, such as the USA and the UK, retirement planning outcomes are shaped by various factors including required savings and retirement age. In the USA, the average required savings for a comfortable retirement is estimated to be around \$1 million, with the average retirement age being 62 years (Vanguard, 2018). In the UK, individuals are expected to save approximately £260,000 to maintain a moderate standard of living in retirement, with the average retirement age standing at 65 years (Pensions and Lifetime Savings Association, 2019). Trends indicate a gradual increase in retirement age and savings requirements due to longer life expectancy and rising living costs (OECD, 2020). Effective retirement planning in these countries also emphasizes the importance of diversified investment portfolios and proactive financial management strategies (Merton, 2018).

In Japan, the retirement planning landscape reveals different dynamics. Japanese retirees are generally expected to have savings of around ¥20 million to ensure financial security, with the average retirement age being 60 years (Ministry of Health, Labour and Welfare, 2019). The trend towards increasing required savings and later retirement age reflects similar concerns about longevity and economic stability as seen in other developed economies (Nishi, 2020). Moreover, Japan's unique demographic challenges, such as a rapidly aging population and low birth rates, intensify the need for robust retirement planning measures (OECD, 2020). These examples highlight the critical role of comprehensive retirement strategies in addressing the financial needs of aging populations in developed countries (Merton, 2018).

In Germany, retirement planning is heavily influenced by the state pension system, which requires individuals to save substantially to maintain their pre-retirement standard of living. The average required savings for a comfortable retirement is estimated to be around €300,000, with the average retirement age being 67 years (Börsch-Supan, 2018). Trends show that Germans are increasingly participating in private pension plans and investments to supplement their state pensions due to concerns over the sustainability of the public pension system (OECD, 2020). Additionally, the shift towards later retirement ages is influenced by demographic changes, including an aging population and lower birth rates (Schnabel, 2019). This emphasizes the importance of early and diversified retirement planning to ensure financial security in old age (Börsch-Supan, 2018).

In Canada, the average individual aims to save approximately CAD 756,000 for retirement, with the average retirement age around 64 years (Statistics Canada, 2020). Canadian retirement planning trends reflect a strong reliance on a combination of public pensions, employer-sponsored plans, and personal savings (Morissette & Ostrovsky, 2021). The aging population and increasing life expectancy have led to heightened awareness about the need for sufficient retirement savings (OECD, 2020). Canadians are also encouraged to maximize their contributions to Registered Retirement Savings Plans (RRSPs) and Tax-Free Savings Accounts (TFSA) to ensure a comfortable retirement (Morissette & Ostrovsky, 2021). These measures are crucial in addressing the financial challenges posed by longer retirement periods (Statistics Canada, 2020).

In developing economies, such as India and Brazil, retirement planning outcomes are characterized by significant variability in required savings and retirement age. In India, the average individual is expected to accumulate savings equivalent to 20 times their annual salary by retirement, with the average retirement age being around 60 years (National Institute of Public Finance and Policy,

2020). In Brazil, required retirement savings are often lower due to the country's pension system, but the average retirement age is similar at 62 years (Instituto Brasileiro de Geografia e Estatística, 2019). Trends show a growing awareness of the need for personal savings alongside government pensions, driven by economic volatility and demographic shifts (World Bank, 2021). Developing economies also face challenges such as informal employment and limited access to financial planning resources, which impact retirement outcomes (Sinha, 2019).

In Mexico, the average required savings for retirement is relatively lower compared to developed countries, with individuals typically needing around MXN 2 million, and the average retirement age being 65 years (CONSAR, 2019). Trends indicate a significant reliance on the mandatory individual account system, introduced in the 1990s, which mandates contributions to individual retirement accounts (OECD, 2020). However, issues such as low contribution rates and informal employment challenge the effectiveness of this system in ensuring adequate retirement income (Aguila et al., 2019). Increasing financial literacy and expanding pension coverage are vital for improving retirement outcomes in Mexico (OECD, 2020).

In Indonesia, retirement planning faces unique challenges due to the large informal sector and limited pension coverage. The average required savings for retirement is estimated to be around IDR 1 billion, with the average retirement age at 58 years (World Bank, 2019). Trends show that Indonesians primarily rely on personal savings and family support for retirement, as formal pension systems are less prevalent (OECD, 2020). Efforts to enhance financial inclusion and develop comprehensive pension schemes are essential to address the retirement planning needs in Indonesia (World Bank, 2019). Additionally, increasing public awareness about the importance of retirement savings can significantly impact future financial security (OECD, 2020).

In Tanzania, retirement planning is influenced by a mix of mandatory pension schemes and informal savings. The average required savings for retirement is estimated to be around TZS 200 million, with the average retirement age being 60 years (NSSF, 2019). Trends indicate a reliance on the National Social Security Fund (NSSF) and other statutory schemes to provide retirement benefits, although coverage is limited to formal sector workers (World Bank, 2020). Informal workers often lack access to pension schemes, necessitating personal savings and family support (OECD, 2020). Enhancing pension coverage and financial literacy are key to improving retirement outcomes in Tanzania (NSSF, 2019).

In Zambia, the required savings for a comfortable retirement are typically calculated based on a percentage of annual income, with the average retirement age at 55 years (NAPSA, 2020). Trends reveal that the majority of Zambians rely on the National Pension Scheme Authority (NAPSA) for retirement benefits, but the system faces challenges such as inadequate funding and low coverage (World Bank, 2020). Efforts to diversify retirement savings options and improve the sustainability of pension systems are crucial for enhancing financial security in retirement (OECD, 2020). Promoting financial inclusion and developing private pension schemes can significantly impact retirement planning in Zambia (NAPSA, 2020).

In countries like South Africa and Kenya, retirement planning is increasingly important as economic and social changes influence retirement outcomes. In South Africa, the recommended savings target is around ZAR 5 million for a comfortable retirement, with the average retirement age being 60 years (Association for Savings and Investment South Africa, 2020). In Kenya, the required savings are lower, but the average retirement age is similarly pegged at 60 years

(Retirement Benefits Authority, 2019). Economic disparities and inconsistent pension coverage pose significant challenges to effective retirement planning in these regions (World Bank, 2021). Efforts to improve financial literacy and access to retirement savings plans are essential to enhance retirement security in developing economies (Sinha, 2019).

In Kenya and Uganda, retirement planning faces distinct hurdles. In Kenya, the average recommended savings for retirement is around KES 10 million, with the retirement age set at 60 years (Retirement Benefits Authority, 2019). In Uganda, individuals are encouraged to save 15-20% of their income each year, with a similar retirement age (Uganda Retirement Benefits Regulatory Authority, 2020). Sub-Saharan economies often struggle with informal employment and inadequate pension systems, making personal savings crucial for retirement security (African Development Bank, 2020). Efforts to enhance financial inclusion and retirement planning education are vital to improving outcomes in these regions (Adeola, 2020).

In Sub-Saharan Africa, retirement planning outcomes vary widely due to economic conditions and social security systems. In Nigeria, individuals typically aim to save 15-20% of their income annually, with the average retirement age being around 60 years (National Pension Commission, 2019). In Ghana, the required savings for retirement are often calculated as a multiple of annual earnings, with the average retirement age similarly at 60 years (Social Security and National Insurance Trust, 2019). Trends indicate an increasing reliance on personal savings and informal support systems due to limited pension coverage (African Development Bank, 2020). Economic instability and high inflation rates pose additional challenges to securing sufficient retirement savings in these regions (Adeola, 2020).

Longevity risk factors significantly influence retirement planning outcomes, primarily through changes in mortality rates, life expectancy trends, healthcare advancements, and lifestyle changes. Mortality rates have been declining globally, resulting in longer life spans and thus requiring individuals to save more for an extended retirement period (OECD, 2020). Increasing life expectancy trends mean retirees will need sufficient savings to cover a longer duration, which impacts the amount they need to save throughout their working years (United Nations, 2019). Healthcare advancements contribute to improved longevity but also lead to higher healthcare costs in retirement, necessitating greater financial preparation (Bloom et al., 2019). Lifestyle changes, such as healthier living and delayed retirement, also play a crucial role in extending life expectancy, further influencing the required savings and retirement age (Börsch-Supan, 2018).

The relationship between these longevity risk factors and retirement planning outcomes is evident. For example, declining mortality rates and increasing life expectancy trends result in a higher required savings to ensure financial security over a longer retirement period (OECD, 2020). Healthcare advancements, while improving quality of life, increase the financial burden on retirees due to higher medical expenses, thus impacting the amount of savings needed (Bloom et al., 2019). Additionally, healthier lifestyles and delayed retirement can improve life expectancy, which necessitates adjustments in retirement planning, such as increasing the retirement age to maintain financial stability (Börsch-Supan, 2018). Understanding these factors is crucial for effective retirement planning, ensuring that individuals are adequately prepared for a longer and potentially costlier retirement (United Nations, 2019).

Problem Statement

The increasing life expectancy and declining mortality rates present a significant challenge for retirement planning, as individuals are now required to sustain themselves financially for longer periods post-retirement. This longevity risk has profound implications for the adequacy of retirement savings, the sustainability of pension systems, and the overall financial security of retirees. Despite advancements in healthcare and healthier lifestyles contributing to longer life spans, the financial preparedness of individuals has not kept pace, leading to potential shortfalls in retirement income and increased vulnerability to poverty in old age (OECD, 2020). Furthermore, the rising healthcare costs associated with longer life expectancy exacerbate the financial strain on retirees, necessitating higher savings and more comprehensive retirement planning strategies (Bloom, Canning, & Fink, 2019). Therefore, it is crucial to address the effects of longevity risk on retirement planning to ensure that individuals can maintain a satisfactory standard of living throughout their extended retirement years (United Nations, 2019).

Theoretical Framework

Life-Cycle Hypothesis (LCH)

The Life-Cycle Hypothesis, developed by Franco Modigliani and Richard Brumberg in the 1950s, posits that individuals plan their consumption and savings behavior over their lifetime to smooth out their consumption. According to this theory, people save during their working years to fund their retirement, aiming for a stable consumption level throughout their life (Deaton, 2018). The LCH is highly relevant to the study of longevity risk and retirement planning because it directly addresses how individuals allocate resources in anticipation of their retirement and how extended life expectancy can affect these plans.

Prospect Theory

Prospect Theory, introduced by Daniel Kahneman and Amos Tversky in 1979, describes how people make decisions involving risk and uncertainty, emphasizing that people value gains and losses differently, leading to irrational financial behaviors. This theory is pertinent to longevity risk and retirement planning as it explains why individuals might under-save for retirement or fail to invest adequately due to biases such as loss aversion and myopic risk perception (Kahneman, 2018). Understanding these behavioral factors can help in designing better retirement planning tools and policies that account for these biases.

Modern Portfolio Theory (MPT)

Modern Portfolio Theory, formulated by Harry Markowitz in 1952, focuses on the optimization of an investment portfolio's returns relative to its risk through diversification. This theory is relevant to the study of longevity risk and retirement planning as it provides a framework for managing the investment risk of retirement savings. By applying MPT principles, individuals can better diversify their retirement portfolios to balance potential returns and longevity risk, ensuring more stable and sufficient income streams in retirement (Bodie, 2019).

Empirical Review

Brown (2019) examined the impact of increased life expectancy on retirement savings adequacy. Using a longitudinal survey methodology, the study followed a diverse sample of individuals over several decades to track their savings behavior and retirement outcomes. The findings revealed

that many individuals tend to under-save for retirement, primarily due to underestimating their life expectancy. This miscalculation often results in insufficient funds to maintain their desired standard of living throughout retirement. The study emphasized the importance of realistic life expectancy estimates in retirement planning. Brown recommended policy interventions to encourage higher savings rates, such as increasing awareness about the benefits of long-term savings and providing incentives for individuals to save more. Furthermore, the study suggested that financial advisors should incorporate longevity risk into their planning tools to help clients better prepare for longer retirement periods. The research also highlighted the role of government policies in supporting individuals to save adequately for retirement. Policies that promote automatic enrollment in retirement savings plans and provide tax benefits for retirement contributions were particularly emphasized. Brown concluded that addressing longevity risk is crucial for ensuring financial security in retirement and preventing poverty among the elderly population.

Davidoff (2020) investigated the role of health status in retirement planning through a cross-sectional analysis. The study analyzed data from a national survey of retirees, focusing on the correlation between health status and retirement savings behavior. The findings revealed that individuals in poorer health tend to save less for retirement compared to their healthier counterparts. This is often due to higher immediate healthcare expenses and uncertainty about their longevity. Poor health can also lead to early retirement, further reducing the time available for savings accumulation. Davidoff suggested the need for targeted financial advice and products tailored to those with poor health, such as health savings accounts and long-term care insurance. Additionally, the study recommended that retirement planning should consider health status as a critical factor in determining savings needs and retirement age. Financial planners should encourage clients to adopt healthier lifestyles to potentially extend their working years and improve their financial outlook. The research also called for improved access to healthcare services to mitigate the financial burden on individuals with poor health. By addressing these issues, policymakers and financial advisors can help ensure that even those with health challenges are adequately prepared for retirement.

Hurd and Rohwedder (2019) studied the effect of uncertainty about life expectancy on retirement satisfaction using panel data analysis. The study utilized data from a large-scale survey that tracked individuals' retirement satisfaction and their perceptions of life expectancy over time. The findings indicated that greater uncertainty about life expectancy is associated with lower retirement satisfaction. This uncertainty often leads individuals to either over-save, leading to unnecessarily frugal retirement lifestyles, or under-save, resulting in financial insecurity. Hurd and Rohwedder recommended improving financial literacy to help individuals better estimate their life expectancy and plan their retirement accordingly. The study also suggested that retirement planning tools should incorporate personalized longevity estimates to reduce uncertainty and enhance satisfaction. Financial education programs that teach individuals how to use these tools effectively can further improve retirement outcomes. Additionally, the research highlighted the importance of flexible retirement plans that can adapt to changes in life expectancy and financial needs. By reducing the uncertainty associated with longevity risk, individuals can achieve a more balanced and satisfying retirement.

Clark and Mitchell (2018) analyzed the influence of longevity risk on pension fund management using econometric models. The study examined the investment strategies of pension funds in

response to increasing life expectancies and associated risks. The findings showed that pension funds are increasingly shifting to more conservative investment strategies to mitigate the risks posed by longer life expectancies. This shift often involves reducing exposure to equities and increasing holdings in bonds and other fixed-income securities. Clark and Mitchell advised pension fund managers to adopt more diversified portfolios that balance risk and returns effectively. The study emphasized the importance of incorporating longevity risk into asset allocation decisions to ensure the sustainability of pension funds. Additionally, the research recommended that pension funds consider alternative investments, such as real estate and infrastructure, to enhance diversification and potential returns. The study also called for improved risk management practices, including the use of longevity bonds and other financial instruments designed to hedge longevity risk. By adopting these strategies, pension funds can better manage the financial challenges associated with increasing life expectancies and ensure the long-term security of retirees.

Poterba (2019) explored the interaction between public pension systems and private savings behavior through regression analysis. The study investigated how variations in public pension generosity affect individuals' private savings decisions. The findings revealed that generous public pensions can reduce the incentive for private savings, potentially leading to inadequate retirement funds. This crowding-out effect is particularly pronounced in countries with well-developed social security systems. Poterba recommended balanced pension reforms that ensure public pensions provide sufficient support without discouraging private savings. The study suggested that policymakers should design pension systems that complement rather than substitute private savings. This can be achieved by implementing policies that encourage voluntary retirement savings, such as tax incentives and matching contributions. Additionally, the research emphasized the importance of financial education programs that teach individuals about the benefits of diversifying their retirement income sources. By promoting a balanced approach to retirement savings, policymakers can help individuals achieve greater financial security in retirement.

Choi (2021) conducted an experimental study on the impact of longevity risk communication on retirement planning decisions. The study involved a series of experiments in which participants received different types of information about longevity risk and retirement planning. The findings demonstrated that clear and effective communication about longevity risks significantly improves retirement planning outcomes. Participants who received detailed information about life expectancy and associated financial risks were more likely to adjust their savings behavior and retirement plans accordingly. Choi recommended enhanced public awareness campaigns to educate individuals about longevity risks and the importance of comprehensive retirement planning. The study suggested that financial institutions and policymakers should collaborate to develop and disseminate educational materials that clearly explain longevity risks. These materials should be accessible and tailored to different audiences to ensure broad understanding and engagement. By improving communication about longevity risks, individuals can make more informed decisions and better prepare for retirement.

Lusardi and Mitchell (2020) investigated the role of financial literacy in managing longevity risk through a survey-based study. The study analyzed data from a national survey that assessed individuals' financial literacy and their retirement planning behavior. The findings showed a significant correlation between high financial literacy and better retirement planning outcomes. Individuals with greater financial knowledge were more likely to understand and prepare for

longevity risks, resulting in more adequate retirement savings and higher retirement satisfaction. Lusardi and Mitchell suggested the implementation of widespread financial education programs to improve financial literacy and enhance retirement planning outcomes. The study emphasized the importance of incorporating financial literacy into school curricula and adult education programs. Additionally, the research recommended that financial institutions offer educational resources and tools to help clients better understand and manage longevity risks. By promoting financial literacy, policymakers and educators can empower individuals to make informed decisions and secure their financial futures.

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

RESULTS

Conceptual Gaps: The studies reviewed highlight significant conceptual gaps in understanding the complex relationship between longevity risk and retirement planning. For instance, Brown (2019) identified the underestimation of life expectancy as a key factor leading to inadequate retirement savings, but the study did not explore the psychological or cognitive biases that cause such misestimations. Additionally, while Davidoff (2020) focused on the role of health status, there is a need for a deeper investigation into how specific health conditions impact retirement planning behaviors and outcomes. Furthermore, Hurd and Rohwedder (2019) noted the effect of uncertainty about life expectancy on retirement satisfaction, yet the underlying mechanisms driving this uncertainty and how different demographic groups experience it remain unexplored. Clark and Mitchell (2018) discussed the shift in pension fund management strategies due to longevity risk, but did not address how these strategies impact individual retirees' decisions and outcomes. Choi's (2021) study on longevity risk communication calls for more research into the most effective methods and channels for delivering this information to diverse populations. Lastly, Lusardi and Mitchell (2020) emphasized financial literacy's role in managing longevity risk but left out the impact of digital financial tools and resources in enhancing this literacy.

Contextual Gaps: Contextually, there is a notable gap in how different socio-economic and cultural backgrounds influence retirement planning in the face of longevity risk. Brown (2019) primarily focused on a diverse but unspecified sample, lacking detailed analysis of how factors like race, gender, and income levels specifically affect retirement savings behavior. Davidoff (2020) looked at health status but did not contextualize how healthcare accessibility and quality across different regions and socio-economic groups influence retirement planning. Hurd and Rohwedder (2019) examined uncertainty in life expectancy, but there is a need for more context-specific studies that consider regional differences in life expectancy and retirement systems. Clark and Mitchell (2018) emphasized pension fund management strategies without considering the varying regulatory environments across different countries or states. Poterba (2019) highlighted the interaction between public pension systems and private savings, but a comparative analysis of countries with differing public pension schemes was missing. Choi (2021) focused on communication about longevity risk but did not explore how cultural differences impact the

reception and effectiveness of such communication. Lusardi and Mitchell (2020) called for financial education programs without considering the varying levels of existing financial infrastructure and education systems in different regions.

Geographical Gaps: Geographically, the existing research predominantly focuses on developed countries, leaving significant gaps in understanding how longevity risk affects retirement planning in developing and underdeveloped regions. Brown (2019) and Lusardi and Mitchell (2020) largely examined data from developed economies, primarily the United States, without delving into how longevity risk is perceived and managed in countries with less robust financial systems. Davidoff (2020) and Clark and Mitchell (2018) also focused on national surveys and pension fund strategies within developed countries, neglecting the different challenges faced by retirees in developing nations where health and pension systems may be less established. Hurd and Rohwedder (2019) did not address how uncertainty in life expectancy might vary significantly in regions with different mortality rates and healthcare systems. Poterba (2019) concentrated on public pension systems, primarily in Western contexts, without a comparative approach that includes countries with minimal or non-existent public pension provisions. Choi (2021) examined the impact of communication about longevity risk but did not consider how geographical disparities in education and media access might influence the effectiveness of such communication strategies in different parts of the world.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The effect of longevity risk on retirement planning is profound and multifaceted, impacting individuals, financial institutions, and policymakers. As life expectancy continues to rise, the necessity for adequate retirement savings becomes increasingly critical. Individuals must account for longer retirement periods, higher healthcare costs, and potential uncertainties about their lifespan. Studies have consistently shown that underestimating life expectancy can lead to insufficient retirement funds, necessitating improved financial literacy and realistic planning tools. Financial institutions play a crucial role in providing diversified investment options and innovative products to manage longevity risk effectively. Additionally, policymakers must design supportive policies, such as encouraging higher savings rates, offering tax incentives, and promoting automatic enrollment in retirement savings plans. Addressing these challenges through comprehensive and context-sensitive strategies will ensure financial security and enhance the quality of life for retirees, thereby mitigating the adverse effects of longevity risk on retirement planning.

Recommendations

The following are the recommendations based on theory, practice and policy:

Theory

Future research should incorporate insights from behavioral economics to better understand the psychological factors influencing retirement savings behavior. This approach can shed light on cognitive biases, such as over-optimism and myopia, which lead to underestimating life expectancy and inadequate savings. By understanding these biases, theoretical models can be developed to predict and mitigate the impact of these behaviors on retirement planning. The creation of models that integrate health status, mortality rates, and economic variables can provide

a more holistic understanding of longevity risk. These models should account for individual variability in health and lifestyle, thereby offering personalized retirement planning solutions. This comprehensive approach will enhance the accuracy and relevance of theoretical frameworks in retirement studies.

Practice

Implementing widespread financial literacy initiatives can empower individuals to make informed decisions about retirement planning. Educational programs should focus on the importance of realistic life expectancy estimates and the need for adequate savings to cover longer retirement periods. By improving financial literacy, individuals will be better equipped to plan for their retirement effectively. Financial advisors should use advanced tools that incorporate personalized longevity risk assessments. By tailoring advice based on individual health status, lifestyle, and financial circumstances, advisors can help clients prepare more effectively for retirement. Personalized advisory services can significantly improve retirement outcomes by addressing specific risks and needs.

Policy

Governments should introduce policies that incentivize higher savings rates, such as tax benefits for retirement contributions and automatic enrollment in retirement plans. These measures can help individuals accumulate sufficient funds to support longer retirements. Effective policy interventions can significantly enhance retirement savings and financial security.

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