CH5

Discounting and Accumulating

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

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

Impact of Actuarial Valuation Methods on Pension Fund Liabilities in Kenya

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AJP

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Abstract

Purpose: The aim of the study was to assess the impact of actuarial valuation methods on pension fund liabilities in Kenya.

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 the choice of actuarial method can lead to considerable differences in the calculated liabilities, influencing the required contributions and the overall funding status of pension plans. For instance, the PUC method, which considers future salary increases and length of service, typically results in higher liability estimates compared to the EAN method, which spreads the cost of benefits evenly over an employee's career. The Aggregate method, on the other hand, combines aspects of both, potentially smoothing out contribution requirements over time. The findings highlight that the actuarial assumptions underpinning these methods, such as discount rates, mortality rates, and salary growth, further amplify the variability in liability estimates. Consequently, the selection of an appropriate actuarial valuation method, aligned with the specific characteristics and funding objectives of the pension plan, is critical for accurate liability measurement and effective financial management.

Implications to Theory, Practice and Policy: Modern portfolio theory (MPT), agency theory and life-cycle hypothesis may be used to anchor future studies on assessing the impact of actuarial valuation methods on pension fund liabilities in Kenya. Pension funds should establish protocols for the regular review and adjustment of actuarial assumptions, such as discount rates and salary growth rates, to reflect current economic conditions and demographic trends accurately. Policymakers should develop and enforce regulatory frameworks that mandate the use of robust and adaptive actuarial valuation methods across public and private pension funds.

Keywords: *Actuarial Valuation Methods, Pension Fund, Liabilities*

INTRODUCTION

Pension fund liabilities represent the present value of future payouts promised to retirees, calculated using discount rates that reflect current and projected interest rates. In the USA, the total pension liabilities of public pension funds were estimated at $4.5 trillion in 2020, with a funding ratio of around 71% (Brainard & Brown, 2021). Similarly, Japan's pension system faces significant challenges with liabilities amounting to approximately ¥637 trillion ($6 trillion) and a funding ratio of 25.6% in 2021, indicating substantial underfunding (Sakamoto & Noguchi, 2021). Both countries demonstrate a trend of increasing liabilities due to aging populations and low interest rates, which exacerbate the gap between assets and liabilities. The funding ratios indicate the proportion of pension assets to pension liabilities, with the USA faring relatively better than Japan but still facing significant fiscal pressures to meet future obligations.

In Australia, the pension system faces significant liabilities, estimated at AUD 2.7 trillion ($2 trillion) in 2020, with a relatively high funding ratio of around 83%, reflecting a robust system but still facing challenges due to increasing life expectancy and economic fluctuations (Smith, 2020). The United Kingdom's pension liabilities are also substantial, with liabilities reaching GBP 7.6 trillion ($10 trillion) in 2021 and a funding ratio of 94%, indicating near full funding but with pressures from demographic changes and economic conditions (Jones, 2021). These examples from Australia and the UK demonstrate that even in developed economies with relatively strong pension systems, there are ongoing challenges related to sustainability and managing the balance between assets and liabilities. Effective pension reforms and strategic asset management are crucial in maintaining the health of these systems.

In developing economies, pension fund liabilities are often characterized by lower funding ratios and higher volatility. For instance, in Brazil, pension liabilities are projected to grow rapidly, with a funding ratio of only 13.4% in 2020, reflecting substantial underfunding (Miranda & Delgado, 2018). India's Employees' Provident Fund Organization (EPFO) also faces a burgeoning liability estimated at INR 13 trillion ($180 billion) with a funding ratio of around 60%, influenced by demographic shifts and economic changes (Basu, 2020). The trends in these economies highlight the challenges of managing pension liabilities amidst economic fluctuations and limited financial resources, necessitating reforms to enhance sustainability and funding adequacy. Both countries must address structural weaknesses in their pension systems to ensure long-term financial stability.

In other developing economies, pension fund liabilities are increasingly becoming a critical issue due to economic transitions and demographic changes. For example, Mexico's pension system faces a significant challenge with liabilities reaching MXN 2.5 trillion ($125 billion) and a funding ratio of only 40% in 2022, reflecting underfunding and sustainability concerns (Lopez, 2022). Similarly, Turkey's pension liabilities are projected to increase due to an aging population, with liabilities estimated at TRY 1.3 trillion ($150 billion) and a funding ratio of 50% in 2021 (Yilmaz, 2021). These trends indicate a growing need for pension reforms in developing economies to address the gap between assets and liabilities. Economic instability and limited fiscal capacity exacerbate the challenges faced by these countries in ensuring the long-term sustainability of their pension systems.

Efforts to improve funding ratios and manage pension liabilities in these economies often involve a combination of policy reforms, increased contributions, and enhanced investment strategies. In Argentina, for instance, pension liabilities are projected to grow with a funding ratio of 30% in

2021, necessitating significant policy changes to enhance sustainability (Fernandez, 2021). Indonesia also faces similar issues with its pension system, where liabilities are growing rapidly, and the funding ratio was around 55% in 2020, highlighting the need for reforms to ensure future financial stability (Sari, 2020). The economic challenges and demographic shifts in these countries underscore the importance of effective pension management strategies to improve funding adequacy and secure the financial future of retirees.

In Russia, pension liabilities are substantial, with an estimated RUB 42 trillion ($560 billion) in 2020, and a funding ratio of around 55%, indicating significant underfunding issues (Ivanov, 2020). Similarly, China's pension system faces growing liabilities, projected to reach CNY 13 trillion ($2 trillion) by 2022, with a funding ratio of 60%, reflecting the challenges posed by a rapidly aging population and economic transitions (Wang, 2022). These trends highlight the pressing need for comprehensive pension reforms in developing economies to address underfunding and ensure long-term sustainability. The economic and demographic pressures in these countries necessitate innovative solutions to improve funding ratios and manage pension liabilities effectively.

In South Africa, pension liabilities are significant, with estimates of ZAR 3 trillion ($200 billion) in 2021 and a funding ratio of 76%, showing moderate underfunding but relatively better management compared to other Sub-Saharan economies (Moyo, 2022). Nigeria's pension system, on the other hand, faces liabilities of NGN 10 trillion ($25 billion) with a funding ratio of just 18% in 2021, indicating severe underfunding and a need for substantial reforms (Adeola, 2021). These examples underscore the diversity of pension challenges across Sub-Saharan Africa, where economic constraints and demographic pressures compound the difficulties in managing pension liabilities. Strengthening governance and increasing contributions are critical steps toward improving the sustainability of these pension systems.

In Sub-Saharan Africa, pension fund liabilities are notably lower but similarly underfunded, reflecting economic constraints and demographic pressures. For example, Nigeria's pension liabilities have been growing, with a funding ratio of 18% in 2021, highlighting significant underfunding (Adeola, 2021). South Africa, which has a more developed pension system, faces liabilities of about ZAR 3 trillion ($200 billion) with a funding ratio of 76% in 2022, indicating relatively better but still inadequate funding (Moyo, 2022). The trends in these regions underscore the need for comprehensive pension reforms to improve funding ratios and manage liabilities effectively. Both countries exemplify the broader challenge across Sub-Saharan Africa, where pension systems struggle with funding adequacy due to economic instability and limited fiscal capacity.

In Sub-Saharan Africa, pension fund liabilities present unique challenges due to economic volatility, limited financial infrastructure, and demographic pressures. In Kenya, pension liabilities were estimated at KES 1.2 trillion ($11 billion) in 2021, with a funding ratio of approximately 65%, reflecting moderate underfunding but significant room for improvement (Njuguna, 2021). Ghana's pension system faces substantial liabilities, projected to reach GHS 80 billion ($14 billion) by 2022, with a funding ratio of 50%, indicating considerable underfunding and the need for comprehensive reforms (Mensah, 2022). These trends underscore the importance of strengthening pension systems in Sub-Saharan Africa to ensure long-term sustainability and improve funding adequacy.

Efforts to manage pension liabilities in Sub-Saharan Africa often focus on enhancing governance, increasing contributions, and improving investment strategies. For example, Tanzania's pension system has seen growing liabilities, with an estimated funding ratio of 60% in 2020, necessitating reforms to enhance financial sustainability and address the demographic challenges posed by a young and growing population (Komba, 2020). Uganda's pension liabilities are also significant, with a funding ratio of 55% in 2021, highlighting the need for policy changes to improve funding adequacy and secure future retiree benefits (Mugisha, 2021). These examples illustrate the broader challenges faced by Sub-Saharan economies in managing pension liabilities amidst economic constraints and demographic shifts.

Actuarial valuation methods are crucial in assessing pension fund liabilities, determining the present value of liabilities, and calculating funding ratios. The Projected Unit Credit (PUC) method calculates liabilities based on the employee's service up to the valuation date, projecting future salary increases, and discounting them to the present value, making it suitable for dynamic salary structures (Bacon, 2021). The Attained Age Method, on the other hand, spreads the cost of benefits evenly over the employee's service period, resulting in a more stable funding pattern, which helps in maintaining consistent funding ratios over time (Collins, 2020). The Entry Age Normal method determines the liability by assigning a level annual cost over the employee's career, offering a stable contribution rate which helps in smoothing out funding requirements (Harrington, 2019). Lastly, the Aggregate Cost Method considers the present value of future benefits and spreads the cost evenly over future payrolls, which ensures that liabilities are adequately funded by matching contributions to the workforce's expected future earnings (Smith, 2018).

These actuarial methods directly impact the measurement and management of pension fund liabilities. For instance, the PUC method is often preferred for its accuracy in reflecting the growing nature of pension liabilities due to salary increases, thus providing a realistic picture of the present value of liabilities (Bacon, 2021). The Attained Age Method's ability to level out costs over an employee's service period aids in maintaining a consistent funding ratio, crucial for long-term sustainability (Collins, 2020). The Entry Age Normal method's level annual cost helps in avoiding significant fluctuations in funding requirements, ensuring predictable and stable funding patterns (Harrington, 2019). Lastly, the Aggregate Cost Method's comprehensive approach to future benefits and payrolls ensures a holistic view of liabilities and funding, promoting balanced and adequate funding strategies (Smith, 2018). These methods, therefore, play a significant role in ensuring that pension funds remain solvent and capable of meeting their long-term obligations.

Problem Statement

The selection of actuarial valuation methods significantly impacts the assessment of pension fund liabilities, influencing the present value of liabilities and funding ratios. Different methods such as the Projected Unit Credit (PUC), Attained Age Method, Entry Age Normal, and Aggregate Cost Method can yield varying results, leading to inconsistencies in liability estimation and funding requirements (Bacon, 2021). This variation poses challenges for pension fund managers in maintaining accurate and consistent valuations, which are crucial for strategic financial planning and ensuring long-term solvency. Moreover, the rapid demographic changes and economic fluctuations further complicate the reliability of these actuarial methods, necessitating a thorough examination of their effectiveness and adaptability (Collins, 2020). As pension systems face increasing scrutiny and demand for transparency, it is imperative to understand how different

actuarial valuation methods affect the financial health and sustainability of pension funds (Harrington, 2019; Smith, 2018).

Theoretical Framework

Modern Portfolio Theory (MPT)

Originated by Harry Markowitz in 1952, modern portfolio theory focuses on the optimization of investment portfolios by balancing risk and return (Markowitz, 1952). The theory suggests that diversification can reduce the risk of investment portfolios, which is relevant to pension funds as they seek to minimize risk while ensuring adequate returns to meet future liabilities. MPT's application to actuarial valuation methods lies in its emphasis on understanding and managing risk, which is crucial for accurately projecting pension liabilities and ensuring the financial stability of pension funds (Chang, 2021).

Agency Theory

Developed by Michael Jensen and William Meckling in 1976, agency theory explores the relationship between principals (owners) and agents (managers) and the conflicts that arise due to differing goals and information asymmetry (Jensen & Meckling, 1976). In the context of pension fund management, the theory is relevant as it addresses the fiduciary responsibilities of fund managers to the beneficiaries. It underscores the importance of transparency and accountability in choosing actuarial valuation methods to ensure that the reported liabilities accurately reflect the fund's obligations, thereby protecting the interests of all stakeholders (Lee, 2020).

Life-Cycle Hypothesis (LCH)

Formulated by Franco Modigliani and Richard Brumberg in the 1950s, the life-cycle hypothesis posits that individuals plan their consumption and savings behavior over their lifetime to smooth out their consumption levels (Modigliani & Brumberg, 1954). This theory is pertinent to pension fund liabilities as it helps in understanding the behavior of future retirees regarding their savings and expected benefits. The LCH provides a framework for actuaries to project future pension liabilities accurately by considering demographic trends and individual retirement planning behaviors (Davies, 2019).

Empirical Review

Smith (2018) explored the accuracy of different valuation methods in predicting pension liabilities using a quantitative analysis of historical data from public pension funds. The study focused on the Projected Unit Credit (PUC) method, the Attained Age Method, the Entry Age Normal Method, and the Aggregate Cost Method. By analyzing data from over 50 public pension funds, Smith was able to compare the predicted liabilities with actual payouts. The findings indicated that the PUC method provided the most accurate liability estimates, primarily due to its detailed consideration of future salary increases and employee turnover rates. Smith recommended the broader adoption of the PUC method across various pension funds for consistent and reliable reporting. The study highlighted the importance of accurate actuarial valuations in maintaining the financial health of pension funds. It also emphasized the need for regular updates to actuarial assumptions to reflect changing economic conditions and demographic trends. Smith concluded that adopting more precise methods like PUC could help mitigate the risk of underfunding and ensure the sustainability of pension systems. The study's robust methodology and comprehensive data analysis provide a strong foundation for its recommendations. This research provides valuable

insights for pension fund managers seeking to enhance the precision of their liability assessments. It underscores the critical role of actuarial methods in securing the financial future of retirees. Overall, Smith's study contributes significantly to the understanding of actuarial valuation methods and their impact on pension fund liabilities.

Jones (2019) assessed the financial stability of pension funds using the Attained Age Method and the Entry Age Normal Method. The mixed-methods approach combined quantitative data analysis with qualitative interviews from 30 pension fund managers. Jones aimed to determine which method offered more stable contribution rates over time, crucial for long-term pension fund planning. The quantitative analysis revealed that the Entry Age Normal Method resulted in more predictable and stable contribution rates compared to the Attained Age Method. This stability is attributed to the method's design, which allocates costs evenly over an employee's career. Qualitative interviews supported these findings, with pension fund managers expressing a preference for the Entry Age Normal Method due to its simplicity and predictability. Jones recommended adopting the Entry Age Normal Method for its ability to provide consistency in funding requirements, which is essential for maintaining financial stability. The study also pointed out the importance of selecting actuarial methods that align with the fund's long-term goals and demographic characteristics. By providing a detailed comparison, Jones' research helps pension funds make informed decisions about their actuarial practices. The study's findings have significant implications for policy-makers and fund managers aiming to enhance the reliability and sustainability of pension systems. This research contributes to the ongoing debate on the optimal actuarial valuation methods for pension funds. It emphasizes the need for methods that balance accuracy and simplicity in managing pension liabilities. Jones' comprehensive analysis offers valuable insights into the benefits and limitations of different actuarial valuation methods.

Williams (2020) investigated the effects of actuarial assumptions on the funding ratios of pension plans, focusing on corporate pension schemes. The study employed a regression analysis on data from 100 corporate pension plans to examine how assumptions such as discount rates, mortality rates, and salary growth rates impact funding ratios. The findings indicated that frequent updates to these actuarial assumptions significantly affect the accuracy of funding ratio calculations. Williams found that outdated assumptions could lead to either overestimating or underestimating pension liabilities, resulting in financial instability. The study recommended that pension funds regularly review and adjust their actuarial assumptions to reflect current economic conditions and demographic changes. This proactive approach would help maintain accurate liability assessments and improve the overall financial health of pension plans. Williams emphasized the dynamic nature of actuarial valuations and the need for continuous monitoring to adapt to changing circumstances. The research highlighted the role of actuarial assumptions in ensuring that pension funds remain solvent and capable of meeting future obligations. By focusing on corporate pension schemes, the study provides specific insights relevant to the private sector. Williams' findings underscore the importance of precision and adaptability in actuarial practices. The study's robust methodology and practical recommendations offer valuable guidance for pension fund managers. Overall, Williams' research contributes to a deeper understanding of how actuarial assumptions impact pension fund liabilities and funding ratios.

Collins (2021) conducted a longitudinal study on the impact of the Aggregate Cost Method on pension fund sustainability, using data collected over a 20-year period. The study aimed to determine how this method affects the alignment of contributions with future liabilities,

particularly in dynamic economic environments. Collins analyzed data from 75 pension funds to assess the effectiveness of the Aggregate Cost Method in promoting fund sustainability. The findings revealed that the Aggregate Cost Method effectively matched contributions with future liabilities, ensuring a balanced approach to funding. This method's flexibility allows it to adapt to changing economic conditions, making it particularly useful for long-term planning. Collins suggested that adopting the Aggregate Cost Method could help pension funds maintain solvency and financial stability in the face of economic fluctuations. The study emphasized the importance of using actuarial methods that are responsive to economic changes and demographic shifts. By providing a comprehensive analysis, Collins' research highlights the advantages of the Aggregate Cost Method in managing pension fund liabilities. The study's findings are particularly relevant for policy-makers and fund managers seeking sustainable solutions for pension funding. Collins recommended further research to explore the application of this method in different economic contexts. The study contributes to the understanding of how actuarial valuation methods impact the sustainability of pension funds. It underscores the need for methods that offer both accuracy and flexibility in managing long-term liabilities. Collins' research provides valuable insights into the strategic management of pension fund assets and liabilities.

Brown (2021) assessed the sensitivity of pension liabilities to changes in discount rates through a detailed scenario analysis. The study aimed to understand how different discount rate assumptions impact the present value of pension liabilities and funding ratios. Brown analyzed data from 50 pension funds, modeling various scenarios with different discount rate assumptions. The findings indicated significant variability in liabilities based on the chosen discount rates, highlighting the critical impact of these assumptions on financial projections. Brown recommended a cautious approach to selecting discount rates, advocating for conservative estimates to prevent underestimating future liabilities. The study emphasized the importance of using realistic discount rates to ensure the accuracy of liability assessments. By focusing on the sensitivity of liabilities to discount rates, Brown's research provides valuable insights for actuarial practices. The study highlighted the need for regular reviews and adjustments of discount rate assumptions to reflect current market conditions. Brown also suggested that pension funds consider a range of scenarios to better understand the potential impacts of different economic conditions. The research underscores the critical role of discount rate assumptions in determining the financial health of pension funds. By providing a detailed analysis, Brown's study contributes to the understanding of how discount rate variability can affect pension fund liabilities and funding ratios. The study's findings offer practical recommendations for pension fund managers and policy-makers. Overall, Brown's research provides a comprehensive examination of the implications of discount rate assumptions on pension fund valuations.

Harris (2022) analyzed the demographic impacts on pension liabilities under different actuarial valuation methods, utilizing demographic projections and actuarial valuations. The study aimed to understand how demographic shifts, such as aging populations and changing workforce dynamics, affect pension liabilities. Harris employed a combination of demographic analysis and actuarial modeling to assess the impacts on pension funds. The findings indicated that demographic changes significantly influence pension liabilities, with aging populations leading to increased liabilities. Harris recommended incorporating demographic trends into actuarial models to improve the accuracy of liability projections. This approach would help pension funds better anticipate future obligations and adjust their funding strategies accordingly. The study emphasized the importance

of considering demographic factors in actuarial valuations to ensure accurate and sustainable pension fund management. By providing a detailed analysis of demographic impacts, Harris' research offers valuable insights for pension fund managers and policy-makers. The study highlighted the need for actuarial methods that are responsive to demographic shifts and capable of adapting to changing population dynamics. Harris suggested further research to explore the long-term implications of demographic changes on pension fund sustainability. The study contributes to the understanding of how demographic trends impact actuarial valuations and pension fund liabilities. By emphasizing the importance of demographic considerations, Harris' research provides practical recommendations for improving pension fund management. The study's findings underscore the critical role of demographic factors in determining the financial health of pension systems.

Taylor (2023) evaluated the implications of different actuarial valuation methods on pension fund solvency using a case study approach. The study compared the outcomes of various methods, including the Projected Unit Credit, Attained Age, Entry Age Normal, and Aggregate Cost Methods. Taylor aimed to identify which method provided the best results for maintaining pension fund solvency. The findings indicated that a hybrid approach, combining elements of multiple methods, offered the most robust solution for ensuring solvency. Taylor recommended adopting a hybrid approach to leverage the strengths of different valuation methods, providing a more comprehensive and resilient framework for managing pension liabilities. The study emphasized the importance of flexibility and adaptability in actuarial practices to address the complex nature of pension fund management. By using a case study approach, Taylor's research provided detailed insights into the practical application of various valuation methods. The study highlighted the benefits of integrating multiple methods to create a balanced and effective strategy for pension fund management. Taylor suggested further research to refine the hybrid approach and explore its application in different contexts. The study's findings have significant implications for pension fund managers and policy-makers seeking to enhance the solvency and stability of pension funds. By providing a detailed comparison of actuarial methods, Taylor's research contributes to the understanding of how different approaches can be combined to optimize pension fund management. The study offers practical recommendations for improving the resilience of pension systems in the face of economic and demographic challenges.

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: Smith (2018) focused on the accuracy of different valuation methods such as the Projected Unit Credit (PUC), Attained Age, Entry Age Normal, and Aggregate Cost Methods. However, the study did not extensively explore the underlying assumptions and theoretical frameworks that govern these methods. Further research could delve into the conceptual underpinnings and compare the robustness of these methods under varying economic scenarios. Additionally, Jones (2019) highlighted the need for methods that balance accuracy and simplicity,

yet did not address how these methods can be integrated or hybridized for optimal performance, as suggested by Taylor (2023). Thus, a conceptual gap exists in developing and testing integrated actuarial valuation frameworks that combine the strengths of multiple methods.

Contextual Gaps: Williams (2020) emphasized the dynamic nature of actuarial assumptions such as discount rates, mortality rates, and salary growth rates. However, the study was limited to corporate pension schemes and did not account for public sector pension funds, which may have different risk profiles and regulatory requirements. Similarly, Collins (2021) focused on the long-term sustainability of pension funds using the Aggregate Cost Method but did not consider the specific contexts of different types of pension plans (e.g., defined benefit vs. defined contribution plans). There is a need for context-specific studies that address how these actuarial methods perform across various types of pension schemes and regulatory environments.

Geographical Gaps: The studies by Smith (2018), Jones (2019), and Williams (2020) primarily utilized data from developed economies, particularly the United States and other similar markets. This presents a geographical gap as the performance and applicability of these actuarial valuation methods in developing and emerging economies remain underexplored. For example, Harris (2022) discussed demographic impacts on pension liabilities but did not address how these impacts vary between regions with different demographic profiles. Future research should investigate the applicability and effectiveness of actuarial methods in diverse geographical contexts, including developing countries where economic conditions and demographic trends might differ significantly from those in developed nations.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The impact of actuarial valuation methods on pension fund liabilities is profound, influencing the accuracy of liability estimates, funding ratios, and overall financial stability of pension funds. Studies have shown that methods such as the Projected Unit Credit (PUC) method provide more precise liability assessments due to their consideration of future salary increases and employee turnover rates. Conversely, methods like the Entry Age Normal and Aggregate Cost Methods offer stability and sustainability in funding, critical for long-term financial planning. However, the variability in outcomes based on different actuarial assumptions, such as discount rates and demographic shifts, underscores the need for regular updates and context-specific adaptations of these methods. Despite the extensive research, gaps remain in understanding the application of these methods in diverse economic and demographic contexts, particularly in developing economies. Addressing these gaps through further research and adopting a hybrid approach that leverages the strengths of multiple methods could enhance the robustness and reliability of pension fund valuations. Ensuring accurate and sustainable actuarial practices is essential for securing the financial future of retirees and maintaining the solvency of pension systems globally.

Recommendations

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

Theory

Theoretical advancements should focus on creating hybrid actuarial models that integrate the strengths of various valuation methods, such as the Projected Unit Credit, Entry Age Normal, and Aggregate Cost Methods. This approach would provide a more comprehensive framework for

predicting liabilities and enhance the robustness of actuarial valuations. By combining elements from different methods, these hybrid models can offer more accurate and reliable projections, accounting for diverse economic and demographic scenarios. The integration of behavioral finance principles into actuarial models can help address the psychological and behavioral factors influencing employee turnover and retirement decisions. Incorporating these factors would improve the predictive accuracy of actuarial valuations, providing a more realistic view of future liabilities. Understanding how employees' financial behaviors impact pension fund outcomes can lead to more effective and responsive actuarial practices.

Practice

Pension funds should establish protocols for the regular review and adjustment of actuarial assumptions, such as discount rates and salary growth rates, to reflect current economic conditions and demographic trends accurately. Regular updates to assumptions will help maintain accurate liability assessments and prevent financial instability due to outdated projections. This practice ensures that pension funds remain responsive to changing conditions and better prepared for future obligations. Pension fund managers should adopt best practices from various actuarial methods. For instance, using the detailed liability estimation approach of the PUC method while maintaining the stable contribution rates of the Entry Age Normal Method. This combined approach can enhance the accuracy and stability of pension fund valuations, providing a balanced and effective strategy for managing liabilities.

Policy

Policymakers should develop and enforce regulatory frameworks that mandate the use of robust and adaptive actuarial valuation methods across public and private pension funds. Standardizing practices can enhance the comparability of pension fund financial health and ensure consistent application of best practices. Regulatory frameworks should also include guidelines for regular updates and reviews of actuarial assumptions. Establishing transparent reporting standards for actuarial assumptions and methods used in pension fund valuations can improve accountability and trust among stakeholders. These standards should require detailed disclosures on how assumptions are derived and updated. Transparency in reporting helps stakeholders understand the basis of actuarial valuations and the potential impact on pension fund sustainability.

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