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RETIREMENT SAVINGS AND RETIREE'S LIFE ANNUITY: DEFINED BENEFIT SCHEME REINVENTED?

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Abstract

Defined benefit (DB) pensions have long served as a crucial tool for addressing old-age security challenges globally. However, in Nigeria, their relevance diminished after June 2004, reflecting a broader trend where these schemes lost favour due to the financial strains of an aging population. In this context, the discussion has shifted toward retiree life annuities, which provide income contingent upon survival, within defined contribution (DC) pension schemes. Advocates argue that the annuity market could effectively replicate the benefits of traditional DB schemes for retirees who choose this option for income. This study introduces various models grounded in realistic assumptions about accumulated funds and annuity gains/losses for underwriters. It outlines the necessary criteria for retiree life annuities to effectively function as a substitute for DB schemes within the DC framework, thereby enriching the ongoing discourse on pension reform in Nigeria

Keywords: retirement saving, annuity gains/loss, defined benefit, defined contribution.

1. OVERVIEW

As societies evolve, the importance of ensuring financial security in old age cannot be overstated. Defined benefit (DB) pension schemes have emerged as crucial mechanisms in many countries, helping to combat the challenges posed by aging populations and securing a stable income for retirees. However, the landscape of pension systems is not static, and in Nigeria, the narrative took a striking turn in June 2004 when the DB pension system lost its footing, leaving many to ponder the future of retirement security.

For decades, DB pensions flourished, particularly within the public sector, where they were regarded as a foundational pillar of financial assurance for employees in their twilight years. Yet, as the specter of an aging population loomed larger, DB schemes began to falter in popularity across various countries. The financial burden they placed on government budgets became increasingly unsustainable, leading policymakers to question their viability. In Nigeria, the shift was not merely a result of demographic changes but rather a significant failure to allocate sufficient budgetary resources to meet actuarial liabilities (Adeyele & Adelakun, 2010).

One of the core issues contributing to the decline of the DB scheme in Nigeria has been the divergent views among financial professionals regarding the appropriate methods for funding these pensions. Actuaries and economists, experts tasked with assessing and managing pension schemes, often find themselves at odds. Economists argue that pension actuaries should factor in prevailing market conditions—like fluctuating stock prices—when conducting actuarial valuations of pension assets. They believe this insight could paint a more accurate picture of a pension fund's health. Meanwhile, actuaries contend that the methodologies employed by financial economists, which often rely on short-term market predictions, may not align with the long-term nature of pension obligations.

This discord creates a precarious situation. The economists' reliance on daily stock market performance can lead to a misplaced optimism among pension sponsors, encouraging them to underestimate the urgency for adequate funding for future liabilities. In stark contrast, actuaries, with their emphasis on conservative projections, can instill a sense of pessimism regarding the pension's value, often resulting in plans being undervalued and

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creating potential surpluses that could last for years (Adeyele & Adelakun, 2010).

Moreover, systemic issues exacerbate the funding crisis. There have been instances of deliberate inaction where sponsors fail to make the necessary funds available for pension schemes, despite actuarial reports clearly advocating for appropriate financial contributions. This failure to act is a critical factor driving the need for significant reform within Nigeria's pension industry.

The culmination of these challenges led to sweeping changes in June 2004 with the introduction of the Pension Reform Act, which implemented a new defined contribution (DC) scheme designed to alleviate some of the financial strains associated with traditional DB plans. Many employers quickly adopted the DC model, drawn in by its perceived convenience in funding employee pension obligations. Gradually, the once-flourishing DB model became sidelined, particularly among civil servants, excelling in popularity only in certain sectors, such as the military and secret service. The rationales behind this shift included an effort by the government to distribute the financial burdens of pension obligations more equitably.

The DC scheme includes two critical phases: accumulation and payout. It has been positioned as a means to reinvent the benefits traditionally offered by DB plans, particularly for retirees who choose to purchase a retiree life annuity. The retiree life annuity is a modern version of the DB structure, intended to serve a similar purpose within the DC framework. In the classic DB model, retirees enjoyed a pension contingent upon their survival, generally guaranteed for a period of five years. Conversely, under the DC structure, the retiree's life annuity is secured for ten years, with the intention that recipients receive pension income for as long as they live. This arrangement means that contributions from pensioners who pass away after the guaranteed period help sustain payments for those who continue to survive.

The introduction of the life annuity product in Nigeria represents a potential lifeline, positioning it as an alternative safety net for retirees to ensure that they receive stable income throughout their lives. Yet, there are significant concerns that arise when pension incomes and savings fall short of maintaining a retiree's pre-retirement standard of living. Such inadequacies could compel retirees to explore part-time job options in an effort to make ends meet, creating new problems rather than solving existing ones.

In the realm of pension studies, Adeyele et al. (2020) developed a loss recovery model aimed at computing accumulated funds, but the focus was primarily on the recovery of funds not consistently remitted by employers rather than on the complexities of the financial pathways themselves. The present study aims to extend this discourse by linking annual pension withdrawals to annuity gains and losses, creating models that allow for evaluating returns for annuitants based on their survival.

What sets this current exploration apart from earlier works, such as those by Adeyele et al (2024)—which primarily operated under the assumption of a fixed accumulated fund for a single individual—is its comprehensive review of models designed to build accumulated funds over extended periods. The current research computes these funds based both on years of contributions and the age of retirement, with the expectation that annual pensions under the retiree life annuity product will be received contingent upon the pensioner's longevity.

This study will also delve into the associated risks inherent in this system, particularly the uncertainties surrounding life expectancy. The potential reality of not living to the anticipated lifespan, or conversely, outliving one's expected years, underscores the shared risks between annuity underwriters and annuitants. This balance forms the crux of the current investigation, which aspires to contribute meaningfully to ongoing discussions about whether retiree life annuities can effectively be reinvigorated to fulfill the essential roles originally played by defined benefit schemes within the context of defined contribution formats.

To date, however, the capacity of retiree life annuities to supplant DB schemes within the DC model has not been rigorously examined in Nigeria. As such, this study seeks to fill an existing gap, providing insights into the relationship between accumulated funds and annuity gains and losses—a connection that has not been adequately explored in prior research. Identifying and addressing these prevalent challenges in the payout phase of DC pensions is critical. Without dependable models to resolve the existing issues, Nigeria may encounter

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a persistent cycle of pension-related difficulties. Therefore, this study is dedicated to bridging this crucial gap, ultimately aiding retiring employees navigating the DC landscape in making informed, strategic decisions that will significantly impact their future income security.

By thoroughly examining the intersection of retiree life annuities and the defined contribution framework, this research aspires to illuminate new avenues for enhancing the effectiveness and sustainability of Nigeria's pension system, ensuring that retirees can secure a dignified, satisfying retirement

2. LITERATURE REVIEW

The transition from Defined Benefit (DB) pension plans to Defined Contribution (DC) retirement savings accounts marks a pivotal shift in the landscape of retirement funding. This change inherently transfers a substantial portion of the risks associated with the pension system from employers to employees. Under the DB framework, employers assume the responsibility for funding the entire pension, guaranteeing a specified monthly income upon retirement. In contrast, with the DC paradigm, employees bear the dual responsibility of determining how much to contribute to their retirement funds and deciding how to allocate these contributions across various investment assets during the accumulation phase. Not only must they manage their investments wisely, but they must also navigate the complexities of converting their accumulated funds into a reliable source of income during the decumulation phase, which includes options like life annuities.

A life annuity represents a lasting income stream purchased from life insurance companies by individuals participating in Defined Contribution plans. While pensions provide a steady income for eligible employees funded by their employers, life annuities aim to fulfill a similar purpose by offering retirees financial security in their later years (St. John, 2003). Both instruments are designed to safeguard the financial well-being of retired individuals who have permanently exited the workforce. However, in Nigeria, life annuities lack a historical precedent and remain relatively unknown to many retirees, which contrasts sharply with the well-established annuity markets found in developed nations like the United States and the United Kingdom. These countries boast a robust tradition of wealth accumulation for retirement, fostering a more comprehensive understanding and acceptance of life annuities as a viable retirement income source.

The theoretical underpinnings of annuitization date back over five decades, notably illustrated by Yaari's (1964) pioneering work. He effectively demonstrated how uncertainty surrounding lifespan could be integrated into a standard life-cycle consumption model. Yaari contended that a rational consumer without any desire to leave a bequest would logically utilize all available wealth to purchase actuarially fair life annuities rather than invest in traditional bonds. Building on this foundational idea, later research by Brown, Davidoff, and Diamond (2003) expanded upon Yaari's findings, revealing that in environments characterized by complete markets, the benefits of full annuitization hold true across a broader array of circumstances than previously comprehended.

Yet, as Brown (2004) later argued, the empirical reality starkly contrasts with the theoretical expectations of annuitization. He pointed out that actuarial unfairness and longevity risk are not the sole contributors to the observed consumption uncertainty that stymies the growth of annuity markets. His findings indicate that the significant divide between theoretical propositions and real-world practices remains a primary reason for individuals' reluctance to purchase life annuities. A chief contributor to this disconnect is the bequest motive, reflecting a desire to pass wealth onto one's heirs (Brown, 2004).

St. John (2003) highlights several societal benefits derived from the widespread adoption of annuities. One noteworthy advantage is the alleviation of social pressure on average workers to provide financial support for their families; this obligation can be effectively fulfilled by life annuity underwriters. Furthermore, annuities facilitate better intergenerational wealth sharing, a feat that would be unattainable through phased withdrawals by individuals. Additionally, a collective risk-sharing dynamic emerges among annuitants, as the funds contributed by those who pass away sooner than expected can subsidize the pensions of those who live beyond their predicted lifespans (Gordon, 2002; Watt & Reddell, 1997).

Given the inherent uncertainties tied to life expectancy and the absence of standardized annuity tables to price these products, this study aims to explore the potential benefits of opting for a retiree life annuity as a source of retirement income.

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Economic theory proposes that individuals can enhance their overall welfare by participating in risk-sharing arrangements associated with uncertainties around lifespan and the detrimental effects of unintentional declines in living standards. Under specific conditions—such as possessing complete markets, a variety of actuarially fair annuities with zero transaction costs, and a lack of bequest motives—risk-averse individuals with uncertain longevity are likely to opt for annuitization of their entire wealth. Horneff et al. (2006) further elucidate that the optimal age for purchasing an annuity varies. Younger individuals and those with lower levels of risk aversion might prefer to retain their assets outside annuities, while older individuals and those more averse to risk derive tangible benefits from converting their wealth into annuities.

Despite the theoretical advantages of annuities, the market for private annuities remains relatively small, both in developed and developing nations, particularly in the context of Defined Contribution pension systems. The persistent annuity puzzle arises from the paradox that, despite the apparent benefits, the annuity market continues to dwindle. Scholars and policymakers have raised concerns regarding this phenomenon, questioning why individuals fail to capitalize on potentially advantageous annuity opportunities.

Behavioral research suggests that certain psychological and situational factors significantly dampen consumers' interest in annuities. Many individuals express discomfort at relinquishing substantial portions of their accumulated pension funds to annuity providers, only to receive relatively modest monthly payments in return. Because of this perception, even when annuities are priced at actuarially fair rates, numerous individuals still choose lump-sum payouts instead. This mindset fundamentally frames annuities as a gamble rather than a safeguard against the risks associated with longevity.

Several factors contribute to the stagnant development or, in some cases, decline of annuity markets across various countries. These include tax treatment, the perceived money's worth ratio, adverse selection, inflation, and mortality risks (St. John, 2003; Mitchell & McCarthy, 2002), all of which serve to diminish the overall value of annuity products in the eyes of potential buyers. The slow pace of annuity market development has been a focal point for many scholars. They contend that annuity pricing in the market often fails to reflect actuarial fairness, resulting in inflated costs that discourage participation. This pricing structure is frequently plagued by loading factors—such as profits, overheads, and premiums influenced by insurance mortality rates rather than the general population (Knox, 2000; Brown, Mitchell, Poterba, & Warshawsky, 2001). These additional charges significantly erode the value of the eventual pension income available to retirees. For instance, St. John (2003) reveals that annuity products typically cost about twice the present value of a single premium, representing a stark disadvantage for potential annuitants.

Two fundamental failures in the annuity markets—adverse selection and moral hazard—further complicate matters. Adverse selection occurs when those with above-average life expectancies disproportionately purchase life annuities, while those with below-average expectancies favor alternatives like phased withdrawal programs. This imbalance can undermine the profitability of insurance companies, as evidenced by the absence of underwriting in annuity purchases, contrasting with the life insurance domain, where underwriting practices are common (Adeyele, 2015; Adeyele & Imouokhome, 2014). Without proper measures in place, insurance companies face significant challenges when pricing annuities based solely on the average mortality rates of the general population, as individuals with increased longevity are naturally drawn to such products.

The consequences of adverse selection lead to elevated premium costs for given annuities, creating broader welfare losses for households. The general consensus posits that annuitants tend to possess superior longevity profiles compared to the general populace, prompting insurance providers to create their own annuitant mortality tables to guide pricing, rather than relying on broader population data (St. John, 2003; Knox, 2000; Brown, Mitchell, Poterba, & Warshawsky, 2001).

Gender-based discrimination in pricing further complicates the landscape, as female retirees often face higher premiums due to their longer life expectancy compared to male counterparts (Campbell & Munnell, 2002). This practice may not be permitted in some jurisdictions. In Nigeria, however, asymmetrical information surrounding pricing

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practices presents additional challenges, as the opaque strategies employed by life annuity underwriters can substantially diminish the money's worth ratio of contributed funds used for annuity purchases.

With a mortality experience in Nigeria still below 54 years, Mojekwu and Adeyele (2010) highlight an average life expectancy of 63 years at retirement, suggesting that individuals tend to live over a decade post-retirement. The solvency of annuity providers may become tenuous if retirees who opt into life annuities exceed projected longevity. Any adjustments made by underwriters to account for potential increases in life expectancy could inadvertently render their offerings less appealing to prospective customers, further threatening their financial stability. James and Vittas (2000) propose that pooling longevity risks among different companies represents a viable strategy to mitigate adverse selection challenges faced by underwriters.

When providers attain assumed real rates of returns, they may be better positioned to implement inflation adjustments for annual pension withdrawals, thereby assuring long-term financial sustainability. St. John (2003) notes that while private annuity markets in certain countries do offer indexed annuities, they often involve high costs. In countries where governments offer inflation-indexed long bonds, annuities can be indexed accordingly, but this arrangement transfers the burden of uncertainty to the government itself. New Zealand's life offices, for instance, tend to provide only nominal annuities (Knox, 2000), leaving uncertainty about the nature of products available in Nigeria, where the annuity market remains in its nascent stages. The absence of inflation-indexed options could inflate annuity costs, ultimately hindering their attractiveness as potential retirement income solutions (Reichling & Smetters, 2015).

The desire to leave a bequest, known as the bequest motive, often influences individuals' hesitance to purchase annuities. The satisfaction derived from preserving wealth for future generations may result in a reluctance to annuitize. Anticipation of high future medical expenses—especially long-term care costs—further complicates the situation in the absence of social or private insurance (Wallister, 2000). Additionally, key factors underpinning the development of annuity markets encompass increased literacy regarding these products, greater educational outreach, considerations of actuarial fairness, improvements in transparency, and enhanced inflation protections (Adeyele & Imouokhome, 2014).

Complexities and a lack of transparency can lead to inflated costs for consumers, impeding their ability to conduct price and product comparisons, dampening competition, and suppressing even the sales of simpler, lower-margin products like fixed income annuities. Addressing the issue of adverse selection may necessitate implementing a legal framework to make annuities mandatory for all retirees, while still allowing for risk differentiation based on factors like gender.

In countries like Chile and Nigeria, the annuity market operates on a voluntary basis. However, in Chile, the government actively subsidizes the annuity market, while in Nigeria, there is a ten-year guarantee associated with annuity products. The annuitization of accumulated pension funds is deemed crucial for several reasons, including the avoidance of moral hazard effects, which can arise when individuals are incentivized to deplete their assets quickly and subsequently rely on an annuity provider for financial support. Other concerns resulting from voluntary annuity markets include adverse selection, a lack of financial literacy, and a discernible trend away from life annuities in private pension schemes (Warshawsky, 2001).

To address the shortcomings inherent in voluntary annuity markets, mandatory annuitization of individual accounts has been proposed as an essential corrective measure. However, alternative policy approaches might emphasize previously mentioned aspects such as tax incentives, education, and advisory services (Brown, Mitchell, Poterba, & Warshawsky, 2001; Mitchell & McCarthy, 2002). Nevertheless, it is imperative to regulate the actions of annuity underwriters to mitigate moral hazard issues, as neglecting to do so could lead to significant market failures (Adeyele et al., 2020).

In understanding these multifaceted dynamics, it becomes evident that the journey towards establishing a viable and sustainable annuity market requires a concerted effort from policymakers, researchers, and financial institutions. By addressing the challenges surrounding annuitization and fostering environments conducive to pension security, societies can work towards ensuring that retirees receive the financial support they rightfully deserve in

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their golden years.

3. MODELS AND DATA SOURCE

Models: The models utilized for the accumulation phase of Defined Contribution plans in this study were developed in recent research conducted by Adeyele et al. (2020) and Adeyele, Maiturare and Ogunbenle (2024). Below is a summarized version of these models as presented by the authors, detailing the accumulated funds:

$$AF_n = a_{(f,m)} \sum_{t=1}^{m} AF_{i,s_{(i,t)}} (1+f_r)^{n-\sum_{i=1}^{m} s_{(i,t)}} \quad \text{.... (1)}$$

$$a_{(f,m)} = \left[\left(1 + \frac{f_r{}^m}{m} \right)^m - 1 \right] / [\, f_r{}^m / m \,] = convertabl \;\; e \; monthly \quad (2)$$

n = total number of years in service;

$i = 1$ *to m grade levels throughout years in service*

$s_{(i,t)}$ = number of years spent at ith grade levels,

$\sum_{i=1}^{m} s_{(i,t)} = s_{(1,t)} + s_{(2,t)} + s_{(3,t)} + s_{(3,t)},,,+s_{(i,t)}$ represent total number of years served in grade level 1, 2,,*ith*. Thus, $n - \sum_{i=1}^{m} s_{(i,t)}$ represents the remaining years in service. That is, the difference between numbers of years individual is expected to serve and total past years of service. The purpose of these models is to enable readers and other researchers understand the basis of accumulated funds computations which are used for annuity market analysis. Adeyele et al (2024) determined annual pension withdrawals using the following formula:

$$A_W^{Pen} = A_F^P (1 - \mathrm{T_d^r}) / \sum_{\mathrm{k-1}}^{\infty} \mathrm{v^k}_{\mathrm{k}} \mathrm{p_x} \quad \text{...(3)}$$

This formula was derived by considering the accumulated funds of DC. The modified version of formula (3) by considering formula (1) is given in the later work by as follows:

$$A_W^{Pen} = \frac{a_{(f,m)} \sum_{t=1}^{m} APF_{i,s_{(i,t)}} (1+f_r)^{n-\sum_{i=1}^{m} s_{(i,t)}}}{\sum_{\mathrm{t=1}}^{\mathrm{w-x-1}} \frac{{}_{\mathrm{t}}\mathrm{P_x}}{(1+f_T)^{\mathrm{t}}}} \quad \text{... (4)}$$

The results of Model (4) can be utilized to analyze potential gains or losses by employing "if, then" assumptions regarding the survival of annuitants. Given the projected lifespan of 90 for all employees, it is anticipated that each annuitant may live for a maximum of 20 additional years, which is why many retirees opt for a life annuity to safeguard against longevity risk. The mathematical formulation of this payment system is expressed as follows:

$$TP\ (i,x,n) = \left[\frac{a_{(f,m)} \sum_{t=1}^{m} APF_{i,s_{(i,t)}} (1+f_r)^{n-\sum_{i=1}^{m} s_{(i,t)}}}{\sum_{\mathrm{t=1}}^{\mathrm{w-x-1}} \frac{{}_{\mathrm{t}}\mathrm{P_x}}{(1+f_T)^{\mathrm{t}}}} \right] \times n \quad \text{.(5)}$$

where $TP\ (i,x,n) = Total\ \ payments$ at "i" intrest rate at age x for n years

The annuity gains/losses is the difference between (1) and (5). At the point where (1) is greater than (5), annuity underwriters make more gains from the annuitants. This is situation where annuitants do not live up to expected 10 years guaranteed by law. However, if (1) < (5)i.e. $AF_n < TP\ (i,x,n)$ annuity underwriters make losses while the annuitants make gains as they continue to live beyond the guaranteed period. These two scenarios can be represented as follows:

$$Annuity \;\; gains \;\; / losses \;\; = AF_n(1) - TP\,(5) \times n \text{...} (6)$$

where n is the number years lived during annuity period by the annuitants. This may be more than the guaranteed period and it is not uncommon for one to live up to twenty years or more after retirement.

***Data Source*:** This study draws on data originally collected by Adeyele et al. (2020) from four federal universities located in the North Central geopolitical zone. To enhance the analysis, these data sets were updated in 2021 to assess the impact of the Integrated Personnel and Payroll Information System (IPPIS), introduced in late 2019, on the incidence of pension remittance defaults. For a comprehensive understanding of the methodologies used in the data collection process, please refer to Adeyele et al. (2020).

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4. RESULTS

This section focuses on the presentation and in-depth analysis of accumulated pension funds alongside the annual pension withdrawals based on specified annuity rates. We explore two distinct fund scenarios for comprehensive examination, with contribution periods spanning from 22 to 38 years. Tables 1a and 1b illustrate retirement ages ranging from 54 to 70 years. Additionally, this section delves into the dynamics of annuity gains and losses, highlighting insights for both underwriters and annuitants, all framed within the context of varying returns on annuity rates employed in our pricing analysis.

Table 1a: Accumulated pension funds and equivalent annul withdrawal based on computed annuity rates

(1) Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Accumulated funds not invested	Accumulated funds at 6% per annual pension withdrawal at computed annuity rates:			Accumulated funds not invested per annual pension withdrawal at computed annuity rates:		
				3%	3.50%	4%	3%	3.50%	4%
54	22	19,627,375.06	11,105,706.89	914,066.92	983,508.38	1,055,330.54	517,204.12	556,496.00	597,134.95
55	23	21,653,567.01	11,931,173.37	1,025,149.52	1,101,371.38	1,180,169.82	564,860.13	606,858.58	650,276.73
56	24	23,825,134.08	12,779,795.94	1,147,534.49	1,230,975.99	1,317,197.22	615,537.21	660,295.21	706,544.26
57	25	26,157,418.91	13,658,014.62	1,282,774.11	1,373,922.98	1,468,060.58	669,796.50	717,389.59	766,543.25
58	26	28,660,064.74	14,565,829.61	1,432,297.11	1,531,667.11	1,634,242.19	727,932.61	778,435.16	830,566.62
59	27	31,343,293.04	15,503,240.71	1,597,725.14	1,705,862.35	1,817,424.98	790,278.08	843,765.67	898,947.56
60	28	34,217,938.58	16,470,247.73	1,780,908.91	1,898,387.36	2,019,517.59	857,211.51	913,757.85	972,061.92
61	29	37,295,486.78	17,466,851.06	1,983,959.73	2,111,389.97	2,242,703.52	929,161.46	988,841.74	1,050,340.72
62	30	40,588,111.77	18,493,050.68	2,209,304.87	2,347,331.72	2,489,477.15	1,006,619.55	1,069,508.35	1,134,273.68
63	31	44,108,718.36	19,548,846.78	2,459,731.58	2,609,041.61	2,762,705.36	1,090,145.38	1,156,319.13	1,224,422.42
64	32	47,870,984.89	20,634,238.82	2,738,469.00	2,899,788.53	3,065,699.19	1,180,385.64	1,249,920.58	1,321,434.47
65	33	51,889,411.15	21,749,226.98	3,049,265.45	3,223,365.23	3,402,296.54	1,278,086.70	1,351,059.89	1,426,058.19
66	34	56,148,942.99	22,864,215.14	3,394,658.59	3,582,257.13	3,774,924.42	1,382,327.08	1,458,718.42	1,537,173.80
67	35	60,664,046.74	23,979,203.30	3,779,505.35	3,981,372.07	4,188,534.07	1,493,957.82	1,573,751.43	1,655,638.15
68	36	65,450,056.71	25,094,191.47	4,209,540.16	4,426,494.34	4,648,966.52	1,613,978.84	1,697,161.19	1,782,459.20
69	37	70,523,227.28	26,209,179.63	4,691,574.20	4,924,493.44	5,163,147.65	1,743,571.81	1,830,133.67	1,918,826.88
70	38	75,900,788.09	27,324,167.79	5,233,764.68	5,483,594.40	5,739,354.94	1,884,147.29	1,974,085.61	2,066,159.01

Source: Author's computation.

Table 1a presents the accumulated pension funds of employees who have diligently contributed to their retirement savings accounts for at least 22 years and retired between the ages of 54 and 70. This table distinguishes between two types of retirement savings: accumulated funds, which were invested at a 6% annual rate compounded monthly, and nominal funds, which represent contributions that were never invested. The data reveal a stark reality: employees without Retirement Savings Accounts (RSAs) may struggle to regain the interest difference between these two fund types.

The annual pension withdrawals correlate directly with increasing investment returns, demonstrating a steady rise from 3% to 4%. For instance, an employee who contributed for 28 years could see their accumulated funds reach an impressive N34,217,938.58 when invested consistently, allowing for annual withdrawals of N1,780,908.91, N1,898,387.36, and N2,019,517.59 at return rates of 3%, 3.5%, and 4%, respectively. This indicates that greater returns on annuities lead to higher annual pension

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withdrawals. Conversely, an employee with nominal funds would only receive N857,211.51, N913,757.85, and N972,061.92 under the same return rates.

Given the economic circumstances in the country, even those employees with a comparable accumulated pension of N2,019,517.59 at a 4% return might find it challenging to meet their retirement needs. This difficulty intensifies for those with lesser amounts, particularly those with nominal funds of N16,470,247.73 yielding an annual withdrawal of just N972,061.92. This analysis underscores a crucial reality: pensioners' annual incomes hinge on the funds they have accumulated over time. Longer service translates to greater savings for retirement, provided those funds are invested effectively during the contribution period.

As highlighted in **Table 1a**, delaying retirement until age 70 allows employees to contribute N75,900,788.09 over 38 years, leading to annual pension withdrawals of N5,233,764.68, N5,483,594.40, and N5,739,354.94 at return rates of 3%, 3.5%, and 4%, respectively. In contrast, retirees with nominal funds of N27,324,167.79 would receive significantly lower annual incomes of N1,884,147.29, N1,974,085.61, and N2,066,159.01 under the same conditions.

These findings should resonate deeply with employees, especially those whose employers only remit nominal contributions. Ultimately, the choice between accumulated and nominal funds should not be a point of contention when considering annuity products, as the implications for retirement income are profound.

Table 1b: Accumulated pension funds and equivalent annual withdrawal based on computed annuity rates

(1) Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Accumulated funds not invested	Accumulated funds at 6% per annual pension withdrawal at computed annuity rates:			Accumulated funds not invested per annual pension withdrawal at computed annuity rates:		
				4.50%	5%	5.50%	4.50%	5%	5.50%
54	22	19,627,375.06	11,105,706.89	1,129,405.59	1,205,602.35	1,283,788.16	639,048.65	682,162.86	726,402.54
55	23	21,653,567.01	11,931,173.37	1,261,412.27	1,344,963.77	1,430,684.48	695,041.54	741,078.64	788,310.98
56	24	23,825,134.08	12,779,795.94	1,406,061.41	1,497,426.52	1,591,150.12	754,210.99	803,219.21	853,492.53
57	25	26,157,418.91	13,658,014.62	1,565,046.42	1,664,735.25	1,766,977.69	817,184.10	869,236.31	922,621.88
58	26	28,660,064.74	14,565,829.61	1,739,877.63	1,848,423.47	1,959,728.21	884,253.45	939,419.42	995,987.53
59	27	31,343,293.04	15,503,240.71	1,932,265.19	2,050,232.15	2,171,167.04	955,750.64	1,014,100.29	1,073,917.96
60	28	34,217,938.58	16,470,247.73	2,144,150.39	2,272,130.11	2,403,296.17	1,032,051.89	1,093,652.84	1,156,787.49
61	29	37,295,486.78	17,466,851.06	2,377,747.13	2,516,364.20	2,658,390.22	1,113,586.62	1,178,506.10	1,245,022.12
62	30	40,588,111.77	18,493,050.68	2,635,586.54	2,785,498.52	2,939,050.55	1,200,845.11	1,269,149.10	1,339,111.59
63	31	44,108,718.36	19,548,846.78	2,920,569.48	3,082,473.65	3,248,248.86	1,294,387.31	1,366,142.73	1,439,613.79
64	32	47,870,984.89	20,634,238.82	3,236,050.01	3,410,675.89	3,589,412.16	1,394,862.23	1,470,132.71	1,547,174.93
65	33	51,889,411.15	21,749,226.98	3,585,905.22	3,774,030.62	3,966,504.19	1,503,016.99	1,581,868.95	1,662,543.44
66	34	56,148,942.99	22,864,215.14	3,972,502.76	4,174,835.05	4,381,754.62	1,617,628.99	1,700,020.01	1,784,279.01
67	35	60,664,046.74	23,979,203.30	4,400,840.55	4,618,134.58	4,840,252.54	1,739,558.37	1,825,450.06	1,913,248.55
68	36	65,450,056.71	25,094,191.47	4,876,809.93	5,109,864.47	5,347,974.00	1,869,816.59	1,959,171.98	2,050,465.50
69	37	70,523,227.28	26,209,179.63	5,407,385.30	5,657,059.83	5,912,008.60	2,009,595.11	2,102,383.90	2,197,132.79
70	38	75,900,788.09	27,324,167.79	6,000,916.18	6,268,119.81	6,540,808.80	2,160,320.66	2,256,513.56	2,354,681.18

Source: Author's computation.

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As most public sector employees typically retire at the age of 65, we turn our attention to **Table 1b** and **Table 1c** for an insightful analysis of what these individuals can accumulate after 33 years of dedicated service. In alignment with the findings from **Table 1a**, the data in Tables 1b and 1c clearly demonstrate that higher rates of return on annuities are instrumental in boosting annual pension income.

When we examine the annual pension withdrawals for employees with an accumulated fund of N51,889,411.11 at retirement age, the impact of interest rates becomes abundantly clear. In **Table 1b**, at return rates of 4.5%, 5%, and 5.5%, the annual pension withdrawals amount to N3,585,905.22, N3,774,030.62, and N3,966,504.19, respectively. Meanwhile, **Table 1c** showcases even higher withdrawals at rates of 6%, 6.5%, and 7%, yielding N4,163,156.10, N4,363,810.09, and N4,568,292.85.

These compelling figures illuminate a vital truth: as the rate of returns increases, so too does the annual pension income at retirement, offering substantial rewards for prudent financial planning over a lifelong career.

Table 1b: Accumulated pension funds and equivalent annual withdrawal based on computed annuity rates

(1) Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Accumulated funds not invested	Accumulated funds at 6% per annual pension withdrawal at computed annuity rates:			Accumulated funds not invested per annual pension withdrawal at computed annuity rates:		
				4.50%	5%	5.50%	4.50%	5%	5.50%
54	22	19,627,375.06	11,105,706.89	1,129,405.59	1,205,602.35	1,283,788.16	639,048.65	682,162.86	726,402.54
55	23	21,653,567.01	11,931,173.37	1,261,412.27	1,344,963.77	1,430,684.48	695,041.54	741,078.64	788,310.98
56	24	23,825,134.08	12,779,795.94	1,406,061.41	1,497,426.52	1,591,150.12	754,210.99	803,219.21	853,492.53
57	25	26,157,418.91	13,658,014.62	1,565,046.42	1,664,735.25	1,766,977.69	817,184.10	869,236.31	922,621.88
58	26	28,660,064.74	14,565,829.61	1,739,877.63	1,848,423.47	1,959,728.21	884,253.45	939,419.42	995,987.53
59	27	31,343,293.04	15,503,240.71	1,932,265.19	2,050,232.15	2,171,167.04	955,750.64	1,014,100.29	1,073,917.96
60	28	34,217,938.58	16,470,247.73	2,144,150.39	2,272,130.11	2,403,296.17	1,032,051.89	1,093,652.84	1,156,787.49
61	29	37,295,486.78	17,466,851.06	2,377,747.13	2,516,364.20	2,658,390.22	1,113,586.62	1,178,506.10	1,245,022.12
62	30	40,588,111.77	18,493,050.68	2,635,586.54	2,785,498.52	2,939,050.55	1,200,845.11	1,269,149.10	1,339,111.59
63	31	44,108,718.36	19,548,846.78	2,920,569.48	3,082,473.65	3,248,248.86	1,294,387.31	1,366,142.73	1,439,613.79
64	32	47,870,984.89	20,634,238.82	3,236,050.01	3,410,675.89	3,589,412.16	1,394,862.23	1,470,132.71	1,547,174.93
65	33	51,889,411.15	21,749,226.98	3,585,905.22	3,774,030.62	3,966,504.19	1,503,016.99	1,581,868.95	1,662,543.44
66	34	56,148,942.99	22,864,215.14	3,972,502.76	4,174,835.05	4,381,754.62	1,617,628.99	1,700,020.01	1,784,279.01
67	35	60,664,046.74	23,979,203.30	4,400,840.55	4,618,134.58	4,840,252.54	1,739,558.37	1,825,450.06	1,913,248.55
68	36	65,450,056.71	25,094,191.47	4,876,809.93	5,109,864.47	5,347,974.00	1,869,816.59	1,959,171.98	2,050,465.50
69	37	70,523,227.28	26,209,179.63	5,407,385.30	5,657,059.83	5,912,008.60	2,009,595.11	2,102,383.90	2,197,132.79
70	38	75,900,788.09	27,324,167.79	6,000,916.18	6,268,119.81	6,540,808.80	2,160,320.66	2,256,513.56	2,354,681.18

Source: Author's computation.

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Table c: Accumulated pension funds and equivalent annul withdrawal based on computed annuity rates

Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Accumulated funds not invested	Accumulated funds at 6% per annual pension withdrawal at computed annuity rates:			Accumulated funds not invested per annual pension withdrawal at computed annuity rates:		
				6%	6.50%	7%	6%	6.50%	7%
54	22	19,627,375.06	11,105,706.89	1,363,829.51	1,445,595.83	1,528,955.90	771,692.12	817,957.75	865,125.16
55	23	21,653,567.01	11,931,173.37	1,518,436.11	1,608,079.85	1,699,479.96	836,662.36	886,056.30	936,418.01
56	24	23,825,134.08	12,779,795.94	1,687,086.31	1,785,091.49	1,885,022.14	904,952.67	957,522.62	1,011,125.40
57	25	26,157,418.91	13,658,014.62	1,871,623.64	1,978,522.96	2,087,528.33	977,262.44	1,033,079.59	1,089,996.40
58	26	28,660,064.74	14,565,829.61	2,073,633.71	2,189,987.88	2,308,635.03	1,053,877.43	1,113,011.80	1,173,311.53
59	27	31,343,293.04	15,503,240.71	2,294,910.65	2,421,303.77	2,550,188.28	1,135,124.90	1,197,642.35	1,261,392.12
60	28	34,217,938.58	16,470,247.73	2,537,483.42	2,674,532.23	2,814,276.08	1,221,376.34	1,287,342.55	1,354,605.98
61	29	37,295,486.78	17,466,851.06	2,803,661.80	2,952,007.59	3,103,263.55	1,313,058.15	1,382,533.96	1,453,372.70
62	30	40,588,111.77	18,493,050.68	3,096,072.08	3,256,393.49	3,419,844.09	1,410,654.88	1,483,701.68	1,558,174.24
63	31	44,108,718.36	19,548,846.78	3,417,725.30	3,590,733.86	3,767,100.70	1,514,725.22	1,591,402.08	1,669,567.31
64	32	47,870,984.89	20,634,238.82	3,772,086.57	3,958,527.27	4,148,556.78	1,625,914.64	1,706,277.76	1,788,187.80
65	33	51,889,411.15	21,749,226.98	4,163,156.10	4,363,810.09	4,568,292.85	1,744,969.25	1,829,072.52	1,914,780.61
66	34	56,148,942.99	22,864,215.14	4,593,092.07	4,808,672.30	5,028,316.09	1,870,336.99	1,958,122.67	2,047,563.05
67	35	60,664,046.74	23,979,203.30	5,067,020.93	5,298,271.82	5,533,823.93	2,002,885.26	2,094,293.80	2,187,402.52
68	36	65,450,056.71	25,094,191.47	5,590,968.41	5,838,677.50	6,090,932.73	2,143,631.94	2,238,606.02	2,335,323.14
69	37	70,523,227.28	26,209,179.63	6,172,073.89	6,437,079.54	6,706,859.12	2,293,783.19	2,392,269.62	2,492,530.22
70	38	75,900,788.09	27,324,167.79	6,818,834.53	7,102,027.48	7,390,217.76	2,454,770.02	2,556,719.05	2,660,467.11

Source: Author's computation.

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Table c: Accumulated pension funds and equivalent annul withdrawal based on computed annuity rates

Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Accumulated funds not invested	Accumulated funds at 6% per annual pension withdrawal at computed annuity rates:			Accumulated funds not invested per annual pension withdrawal at computed annuity rates:		
				6%	6.50%	7%	6%	6.50%	7%
54	22	19,627,375.06	11,105,706.89	1,363,829.51	1,445,595.83	1,528,955.90	771,692.12	817,957.75	865,125.16
55	23	21,653,567.01	11,931,173.37	1,518,436.11	1,608,079.85	1,699,479.96	836,662.36	886,056.30	936,418.01
56	24	23,825,134.08	12,779,795.94	1,687,086.31	1,785,091.49	1,885,022.14	904,952.67	957,522.62	1,011,125.40
57	25	26,157,418.91	13,658,014.62	1,871,623.64	1,978,522.96	2,087,528.33	977,262.44	1,033,079.59	1,089,996.40
58	26	28,660,064.74	14,565,829.61	2,073,633.71	2,189,987.88	2,308,635.03	1,053,877.43	1,113,011.80	1,173,311.53
59	27	31,343,293.04	15,503,240.71	2,294,910.65	2,421,303.77	2,550,188.28	1,135,124.90	1,197,642.35	1,261,392.12
60	28	34,217,938.58	16,470,247.73	2,537,483.42	2,674,532.23	2,814,276.08	1,221,376.34	1,287,342.55	1,354,605.98
61	29	37,295,486.78	17,466,851.06	2,803,661.80	2,952,007.59	3,103,263.55	1,313,058.15	1,382,533.96	1,453,372.70
62	30	40,588,111.77	18,493,050.68	3,096,072.08	3,256,393.49	3,419,844.09	1,410,654.88	1,483,701.68	1,558,174.24
63	31	44,108,718.36	19,548,846.78	3,417,725.30	3,590,733.86	3,767,100.70	1,514,725.22	1,591,402.08	1,669,567.31
64	32	47,870,984.89	20,634,238.82	3,772,086.57	3,958,527.27	4,148,556.78	1,625,914.64	1,706,277.76	1,788,187.80
65	33	51,889,411.15	21,749,226.98	4,163,156.10	4,363,810.09	4,568,292.85	1,744,969.25	1,829,072.52	1,914,780.61
66	34	56,148,942.99	22,864,215.14	4,593,092.07	4,808,672.30	5,028,316.09	1,870,336.99	1,958,122.67	2,047,563.05
67	35	60,664,046.74	23,979,203.30	5,067,020.93	5,298,271.82	5,533,823.93	2,002,885.26	2,094,293.80	2,187,402.52
68	36	65,450,056.71	25,094,191.47	5,590,968.41	5,838,677.50	6,090,932.73	2,143,631.94	2,238,606.02	2,335,323.14
69	37	70,523,227.28	26,209,179.63	6,172,073.89	6,437,079.54	6,706,859.12	2,293,783.19	2,392,269.62	2,492,530.22
70	38	75,900,788.09	27,324,167.79	6,818,834.53	7,102,027.48	7,390,217.76	2,454,770.02	2,556,719.05	2,660,467.11

Source: Author's computation.

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Table 2a: Computed annual pension withdrawal and likely gain/loss at different conditions at the given annuity rates

Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Amount payable if retiree live to expected years			Difference in gain		
			3%	3.50%	4%	3%	3.50%	4%
54	22	19,627,375.06	13,711,003.80	14,752,625.63	15,829,958.08	5,916,371.26	4,874,749.43	3,797,416.98
55	23	21,653,567.01	15,377,242.83	16,520,570.64	17,702,547.28	6,276,324.18	5,132,996.37	3,951,019.73
56	24	23,825,134.08	17,213,017.38	18,464,639.86	19,757,958.35	6,612,116.70	5,360,494.22	4,067,175.73
57	25	26,157,418.91	19,241,611.67	20,608,844.70	22,020,908.66	6,915,807.24	5,548,574.21	4,136,510.25
58	26	28,660,064.74	21,484,456.72	22,975,006.58	24,513,632.78	7,175,608.02	5,685,058.16	4,146,431.96
59	27	31,343,293.04	23,965,877.09	25,587,935.24	27,261,374.71	7,377,415.95	5,755,357.80	4,081,918.33
60	28	34,217,938.58	26,713,633.66	28,475,810.40	30,292,763.81	7,504,304.92	5,742,128.18	3,925,174.77
61	29	37,295,486.78	29,759,395.91	31,670,849.48	33,640,552.85	7,536,090.87	5,624,637.30	3,654,933.93
62	30	40,588,111.77	33,139,572.98	35,209,975.76	37,342,157.20	7,448,538.79	5,378,136.01	3,245,954.57
63	31	44,108,718.36	36,895,973.66	39,135,624.15	41,440,580.40	7,212,744.70	4,973,094.21	2,668,137.96
64	32	47,870,984.89	41,077,034.99	43,496,827.89	45,985,487.91	6,793,949.90	4,374,157.00	1,885,496.98
65	33	51,889,411.15	45,738,981.75	48,350,478.46	51,034,448.05	6,150,429.40	3,538,932.69	854,963.10
66	34	56,148,942.99	50,919,878.80	53,733,856.88	56,623,866.23	5,229,064.19	2,415,086.11	-474,923.24
67	35	60,664,046.74	56,692,580.31	59,720,581.00	62,828,010.98	3,971,466.43	943,465.74	-2,163,964.24
68	36	65,450,056.71	63,143,102.42	66,397,415.03	69,734,497.76	2,306,954.29	-947,358.32	-4,284,441.05
69	37	70,523,227.28	70,373,612.98	73,867,401.53	77,447,214.81	149,614.30	-3,344,174.25	-6,923,987.53
70	38	75,900,788.09	78,506,470.17	82,253,916.06	86,090,324.06	-2,605,682.08	-6,353,127.97	-10,189,535.97

Source: Author's computation.

Tables 2a, 2b, and 2c shed light on the potential gains and losses for annuity underwriters based on the longevity of annuitants and the impact of varying rates of return. These tables illustrate how an annuitant's expected lifespan outside of the guaranteed period can significantly affect both their own benefits and the underwriters' profits.

In Table 2b, underwriters can expect to see gains from annuitants aged 54 to 65 years, particularly with return rates ranging from 3% to 4%. However, this dynamic shifts dramatically for those who retire at ages 66 and 67. At a 4% return rate, annuitants are projected to see substantial gains of N474,923.24 and N2,163,964.24 from their accumulated funds of N56,148,942.99 and N60,664,046.74 respectively—resulting in significant losses for underwriters.

The trend continues for annuitants retiring at ages 68 and 69, where they could earn N947,358.32 and N4,284,441.05, based on return rates of 3.5% and 4%. The potential gains at retirement age 70 further amplify, with figures reaching N6,353,127.97 and N10,189,535.97.

These insights reveal the intricate balance between longevity and financial performance in the annuity landscape, emphasizing both opportunities and risks for annuitants and underwriters alike.

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Table 2b Computed annual pension withdrawal and likely gain/loss at different conditions at the given annuity rates

Retirement Age	Years of Contribution	Accumulated funds at 6% p.a	Amount payable if retiree live to expected years			Difference in gain		
			4.50%	5%	5.50%	4.50%	5%	5.50%
54	22	19,627,375.06	16,941,083.86	18,084,035.27	19,256,822.44	2,686,291.20	1,543,339.79	370,552.62
55	23	21,653,567.01	18,921,184.05	20,174,456.55	21,460,267.23	2,732,382.96	1,479,110.46	193,299.78
56	24	23,825,134.08	21,090,921.13	22,461,397.80	23,867,251.82	2,734,212.95	1,363,736.28	-42,117.74
57	25	26,157,418.91	23,475,696.23	24,971,028.69	26,504,665.37	2,681,722.68	1,186,390.22	-347,246.46
58	26	28,660,064.74	26,098,164.52	27,726,352.11	29,395,923.08	2,561,900.22	933,712.63	-735,858.34
59	27	31,343,293.04	28,983,977.92	30,753,482.25	32,567,505.57	2,359,315.12	589,810.79	-1,224,212.53
60	28	34,217,938.58	32,162,255.84	34,081,951.59	36,049,442.52	2,055,682.74	135,986.99	-1,831,503.94
61	29	37,295,486.78	35,666,206.89	37,745,463.03	39,875,853.24	1,629,279.89	-449,976.25	-2,580,366.46
62	30	40,588,111.77	39,533,798.09	41,782,477.83	44,085,758.27	1,054,313.68	-1,194,366.06	-3,497,646.50
63	31	44,108,718.36	43,808,542.23	46,237,104.77	48,723,732.89	300,176.13	-2,128,386.41	-4,615,014.53
64	32	47,870,984.89	48,540,750.16	51,160,138.40	53,841,182.34	-669,765.27	-3,289,153.51	-5,970,197.45
65	33	51,889,411.15	53,788,578.27	56,610,459.27	59,497,562.83	-1,899,167.12	-4,721,048.12	-7,608,151.68
66	34	56,148,942.99	59,587,541.38	62,622,525.71	65,726,319.34	-3,438,598.39	-6,473,582.72	-9,577,376.35
67	35	60,664,046.74	66,012,608.31	69,272,018.69	72,603,788.09	-5,348,561.57	-8,607,971.95	-11,939,741.35
68	36	65,450,056.71	73,152,148.94	76,647,967.00	80,219,609.98	-7,702,092.23	-11,197,910.29	-14,769,553.27
69	37	70,523,227.28	81,110,779.56	84,855,897.50	88,680,128.97	-10,587,552.28	-14,332,670.22	-18,156,901.69
70	38	75,900,788.09	90,013,742.77	94,021,797.09	98,112,132.03	-14,112,954.68	-18,121,009.00	-22,211,343.94

Source: Author's computation.

In Table 2b, we unveil the remarkable annuity gains awaiting public sector retirees who choose to retire at age 65. With interest rates of 4.5%, 5%, and 5.5%, retirees can expect to reap annuity gains of N1,899,167.12, N4,721,048.12, and N7,608,151.68, all exceeding their accumulated funds—these figures indicate significant losses for annuity underwriters.

As retirement age increases, so do the potential rewards. For those retiring at age 70, the gains become even more impressive. With the same interest rates of 4.5%, 5%, and 5.5%, retirees can look N18,121,009.00, and N22,211,343.94, respectively, significantly eclipsing the substantial N75,900,788.09 if annuitants live to and beyond their expected lifespan.

This scenario highlights a captivating interplay in the annuity world: the significant benefits enjoyed by annuitants represent equally substantial losses for underwriters, illustrating the intricate balance of risks and rewards in retirement planning.

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Table 2c: Computed annual pension withdrawal and likely gain/loss at different conditions at the given annuity rates

(1) Retirement Age		Accumulated funds at 6% p.a	Amount payable if retiree live to expected years			Difference in gain		
			6%	6.50%	7%	6%	6.50%	7%
54	22	19,627,375.06	20,457,442.61	21,683,937.52	22,934,338.48	-830,067.55	-2,056,562.46	-3,306,963.42
55	23	21,653,567.01	22,776,541.62	24,121,197.70	25,492,199.39	-1,122,974.61	-2,467,630.69	-3,838,632.38
56	24	23,825,134.08	25,306,294.63	26,776,372.28	28,275,332.04	-1,481,160.55	-2,951,238.20	-4,450,197.96
57	25	26,157,418.91	28,074,354.56	29,677,844.38	31,312,925.01	-1,916,935.65	-3,520,425.47	-5,155,506.10
58	26	28,660,064.74	31,104,505.63	32,849,818.15	34,629,525.42	-2,444,440.89	-4,189,753.41	-5,969,460.68
59	27	31,343,293.04	34,423,659.81	36,319,556.55	38,252,824.16	-3,080,366.77	-4,976,263.51	-6,909,531.12
60	28	34,217,938.58	38,062,251.34	40,117,983.42	42,214,141.21	-3,844,312.76	-5,900,044.84	-7,996,202.63
61	29	37,295,486.78	42,054,926.98	44,280,113.86	46,548,953.18	-4,759,440.20	-6,984,627.08	-9,253,466.40
62	30	40,588,111.77	46,441,081.24	48,845,902.33	51,297,661.32	-5,852,969.47	-8,257,790.56	-10,709,549.55
63	31	44,108,718.36	51,265,879.43	53,861,007.89	56,506,510.45	-7,157,161.07	-9,752,289.53	-12,397,792.09
64	32	47,870,984.89	56,581,298.60	59,377,909.06	62,228,351.67	-8,710,313.71	-11,506,924.17	-14,357,366.78
65	33	51,889,411.15	62,447,341.56	65,457,151.28	68,524,392.73	-10,557,930.41	-13,567,740.13	-16,634,981.58
66	34	56,148,942.99	68,896,381.07	72,130,084.52	75,424,741.29	-12,747,438.08	-15,981,141.53	-19,275,798.30
67	35	60,664,046.74	76,005,314.01	79,474,077.33	83,007,358.88	-15,341,267.27	-18,810,030.59	-22,343,312.14
68	36	65,450,056.71	83,864,526.18	87,580,162.49	91,363,990.91	-18,414,469.47	-22,130,105.78	-25,913,934.20
69	37	70,523,227.28	92,581,108.40	96,556,193.10	100,602,886.82	-22,057,881.12	-26,032,965.82	-30,079,659.54
70	38	75,900,788.09	102,282,517.94	106,530,412.21	110,853,266.40	-26,381,729.85	-30,629,624.12	-34,952,478.31

Source: Author's computation.

Retiring at age 70 with annual returns ranging from 6% to 7% or higher can yield substantial gains for annuitants (refer to Table 2c). According to Table 2c, annuitants stand to benefit significantly if they live for their expected duration of retirement between ages 54 and 70, especially at interest rates of 6%, 6.5%, and 7%. This scenario indicates that underwriters may incur losses when the annual return falls within the 6% to 7% range, as the annuitants do not pass away as anticipated in Table 2c.

5. CONCLUSION AND RECOMMENDATIONS

The public sector's shift away from Defined Benefit (DB) schemes has stemmed from the overwhelming burden of pension liabilities and arrears. In 2004, the government transferred this responsibility to beneficiaries, allowing them the option to pass it on to annuity underwriters. To examine the consequences of this shift, we calculated indigenous annuity rates ranging from 3% to 7% for individuals aged 54 to 70 and evaluated both accumulated and nominal funds to determine annual pension income.

This study delves into the critical relationship between annuity rates and accumulated funds, highlighting the significant disparities in income for annuitants and underwriters based on varying rates of return. Our findings reveal that retirees with nominal funds receive considerably less in annual income compared to those with accumulated funds, largely because the former lack investment returns. As retirement age advances, those with accumulated funds can earn more than double the annual income compared to their counterparts with nominal funds, especially when retirement occurs between ages 60 and 70.

Moreover, we assessed potential gains or losses for individuals with life annuities based on

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expected lifespans post-retirement. The results indicate that life annuity underwriters stand to gain significantly if interest rates remain below 4% at retirement age 65. Conversely, as rates climb to between 6% and 7%, annuitants realize substantial returns if they live to or surpass their expected lifespans. In scenarios with returns between 5% and 6.5%, gains and losses are shared but not concurrently, illustrating the competitive dynamics of the annuity market. However, the study underscores a pressing concern: the current irregular pension remittances within Nigeria's pension scheme present barriers to proper growth and development of the annuity market, potentially deterring beneficiaries from utilizing their accumulated funds for life annuities.

To address these challenges, we advocate for a regulatory framework that ensures transparency in the computation of annuity rates and embedded costs. Such measures will empower the annuity market to effectively fulfill the role of a defined benefit scheme. Furthermore, it is crucial that current employees accumulate sufficient funds and foster their growth through robust Pension Fund Administrator activities. Timely remittance of statutory contributions by both employees and employers is essential to prevent the erosion of funds due to inflation.

Lastly, potential annuitants must strive to secure a fair actuarial value for their accumulated funds when purchasing retiree life annuities. By following these recommendations, we can promote a healthier, more transparent annuity landscape that better serves retirees in Nigeria.

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