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IS THE KWAP DEFINED BENEFIT PENSION FUND SUSTAINABLE IN THE LONG RUN?

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ABSTRACT

The Retirement Fund Incorporated (KWAP) manages the civil servant pension fund. It is a statutory body governed by the Ministry of Finance to manage Malaysia's civil employees' pension scheme. In order to examine the fund's long-term sustainability, this study simulates 560 scenarios to examine the required rate of return needed to fund this defined benefit pension based on four parameters, namely contribution rate, years of service, retirement age and life expectancy. Our results show: First, the minimum years of service for pension eligibility should be increased to 20 years. Second, a contribution rate of at least 13 percent per worker to KWAP is needed. Third, there are no significant changes in the required rate of return even though the retirement age is extended from 55 to 60. Fourth, this study shows that the contribution period is more crucial than the post-retirement period for the sustainability of the pension fund. As a policy suggestion, there is a need for the authority to set a minimum funding ratio for the KWAP pension fund to ensure its long-term sustainability.

Keywords: Civil service, pension fund, Malaysia, investment performance, internal rate of return, scenario analysis, simulation.

JEL Classification: C32, G11, H55, H75, J32.

INTRODUCTION

Overview of Malaysia's Pension Scheme

A pension scheme intends to give retirees and their surviving family members financial security in the event of retirement, death, or permanent disability. According to Holzmann and Hinz (2005), the importance of pension systems to a country's economic stability and the security of its elderly population has gained widespread acknowledgement during the past ten years. The World Bank (2008) created the five-pillar model, which describes the variety of design elements and provides a five-pillar model scheme to classify the various methods of funding the retirement system. The five-pillar framework of The World Bank (2008), is as illustrated below:

a) Zero Pillar (Non-Contributory): *"Basic" or "Social Pension" at the very least provides social aid, social protection for the elderly, and poverty protection*
b) First Pillar (Mandatory): *Public pension plan, publicly managed, defined benefit, or nationally defined contributions. The goal is to prevent seniors from poverty and to stabilise their consumption.*
c) Second Pillar (Mandatory): *Typically refers to the individual savings account.*
d) Third Pillar (Voluntary): *Occupational or private pension programs, financed defined contribution or entirely or partially funded defined benefit.*
e) Fourth Pillar (Non-financial): *Access to formal social programmes, other informal social supports (such as family), and other private financial and non-financial resources.*

Regardless of the pillars, country-specific constraints necessitate executing a basic and carefully sequenced approach that will significantly narrow the range of viable possibilities. Each country must decide the specifics of its pension system, including any potential reforms. In Malaysia, the pension structure is composed of three main

retirement schemes. The following are the primary pension plans as described by Malaysia's pension providers:

Defined Contribution by Employee Provident Fund

The Employee Provident Fund (EPF) runs and manages the Defined Contribution (DC) for non-pensionable civil officers and employees of the private sector. Under the DC retirement scheme, employees and employers regularly contribute, for example monthly payments to the retirement fund.

Defined Benefit by Retirement Fund Incorporated

The Malaysian Government offers the Defined Benefit (DB) pension programme for eligible civil personnel who meet the requirements. This civil service pension programme is a specific pension programme for public sector workers. The scheme is a Government-sponsored retirement plan that provides benefits to employees such as monthly pensions and medical benefits. The Malaysia Pension Department calculates the benefits using a specified formula.

The plan guarantees life and adjusted pay outs to account for inflation, or the rising cost of living. The Malaysia Pension Department administers the Defined Benefit plan under the Ministry of Finance (MOF). Meanwhile, the Retirement Fund Incorporated (KWAP) serves as the appointed agent of the Federal Government for pension fund collection and management (Law, 2007). This scheme also extends its benefit to the dependents of a deceased pensioner. This benefit is given to the dependents of a retiree who has passed away after retirement, or while s/he is still working for the Government. The pensionable officers are entitled to a service pension (a monthly payment), a service gratuity (a one-time payment), and financial rewards in place of leave (JPA, 2021).

Historical Development of Malaysia Civil Servant Pension

Historically, the Royal Suffian Commission for Public Services Officers endorsed the pension benefit implementation in 1968. Gratuity award (and derivative gratuity for the widow and children of a deceased officer) is acknowledged as the additional benefit on top of the pension/derivative pension. A derivative pension is given for 12.5 years from the retirement or death of a serving officer. After

that, the Royal Harun Commission approved the pension benefit implementation for the personnel of statutory bodies and local authorities in May 1969. In January 1974, cash award in place of leave (GCR) was introduced at the rate of 1/30 last drawn salary for each day of leaves not utilised. In January 1976, the Government agreed to provide a pension for the child of a deceased officer till the age of 21, or upon completing or ceasing to receive the first-degree education at a higher learning institution, whichever applies as long the child is unmarried.

In October 1982, the Government agreed to exempt any gratuity from the income tax. In January 2009, the minimum pension received was increased from RM280 to RM720 per month. Even the derivative pension shall be paid 100 percent to the dependents. In April 1991, the period of service to qualify an employee for pensionable status was reduced from 10 to 3 years. In January 2004, the Government agreed to grant a derivative pension to the mother or father of an officer if s/he dies without leaving a spouse or children eligible for the derivative pension.

Defined-Benefit Plan and its Sustainability

In the Defined-Benefit (DB) plan, the annuity provider must pay a specified annuity to the retirees. Benefit amounts are guaranteed regardless of whether the retiree's DB plan is underfunded. In other words, the benefit to be paid becomes the employer's obligation, irrespective of its financial condition or capacity.

Hence, the financial sustainability of the DB plan scheme refers to the annuity provider's capacity to fulfil the short-term and long-term commitments in paying pensions. The short-term commitment refers to the ability to finance the current debt to pay current pensioners by considering the current assets and liabilities. Long-term obligations, also known as implicit debt, refer to the ability to finance future pension that considers future expenditures and revenues (Barr & Diamond, 2009; Holzmann et al., 2004).

Despite the rising pension costs, the Federal Constitution of Malaysia safeguards the pension system and guarantees solvency (the assets must equal liabilities) (Lee, 1997). When the pension deficit becomes too large and persists, the pension scheme becomes unsustainable, requiring the reviewing and changing of pension parameters to

ensure sustainability. Hence, Barr and Diamond (2009) argue that any pension expenditure shall be compatible with one country's ability to finance retirees' consumption, investment return from the pension assets, and the fund manager's ability to raise revenues.

The revenues must be sufficient to cover the liabilities and to ensure financial sustainability in the long run. The ability to finance future expenditures will depend on the fund contribution, the interest earned on the assets, and the pension promises to the current and future retirees (Barr & Diamond, 2006). A pension deficit means the contribution collection and returns do not match the payments to pensions.

When a pension deficit occurs, the pension scheme becomes financially unsustainable. It thus, creates a pension debt that the Government needs to finance through its revenue or by raising taxes. Some governments have responded to underfunded pensions with a wave of pension reforms that seek to limit benefits for current employees and alter the benefit structure for future employees.

Since the KWAP has operated for more than 12 years, the total fund size has gradually increased. In 2007, the total fund was recorded at RM47.42 billion, and the fund was the highest, amounting to RM141 billion in 2017 before declining to RM137 billion in 2018. In 2018, the Malaysian Financial Reporting Standards (MFRS) 9 was fully adopted, replacing the existing MFRS 139 (KWAP, 2018).

In general, each retiree will receive two types of payment. The first is the monthly pension payment, and the second is the one-off gratuity upon retirement. Table 1 shows the annual growth rate of 7.6 percent and 14.5 percent for pension and gratuity payments over the last 20 years. Table 1 also shows an annual 8 percent increase in the Federal Government's financial obligation to pension and gratuity payments.

Table 1

Pension Payment by the Malaysian Government from 2001-2020

Component	Pension Payment	Gratuity Payment	Total Benefit Paid
Average Annual Growth Rate 2001-2020	7.60%	14.51%	8.03%

Note. Sourced from the Economic Unit Report 2001–2020, Prime Minister 's Department.

Besides the government pension scheme, two other prominent pension schemes in Malaysia are the Employee Provident Fund (EPF) and the Armed Forces Fund Board (LTAT). The EPF manages a defined pension scheme contribution for private-sector employees. At the same time, the LTAT oversees compulsory and voluntary pension contributions for non-pensionable and pensionable armed forces specific to industries. However, this study does not discuss these pension schemes under the EPF and LTAT. The private retirement scheme and the basic state scheme are also not discussed.

Currently, the public employee pension is funded by the State and Federal governments' annual contribution to the KWAP. There is an ongoing issue that the pension cost has increased over many years. The retirement cost in the 2019 Federal Budget stood at 27.06 billion of the operating expenditure (OPEX)[2]. What is the ideal contribution rate from the government agency the KWAP? In addition, what is the required return from the investment undertaken by the Federal Government to ensure the sustainability of the pension fund in the long term? These questions remain unaddressed in the literature. This next part of the paper is organised as follows. Section 2 highlights the relevant literature, followed by the data collection and methodology in Section 3. Section 4 discusses the results, while the last section concludes this study.

LITERATURE REVIEW

Investment Policy

The nature of pension funds is to decide on the best investment policy and implement those policies. Any risk taken is a cost to the fund management. Ambachtsheer (1994) has explained two implementation choices. One is to take the lowest-risk-cost path with due diligence and prudence. In contrast, another takes the additional bundle of risks and costs, expecting the economic payoff (additional fund return) to justify the additional cost and risk assumed. As such, pension fund management involves creating one of these two relationships conceptually over time as follows:

$$\textit{Policy Return} = f\,(\textit{Policy Risk} - \textit{Cost}) \textbf{ or}$$
$$\textit{Policy Return} + \textit{Additional Return} = f\,(\textit{Policy Risk} - \textit{Cost}, \textit{Additional Risk})$$

The idea of investment choices is to maximise return. However, a pension fund cannot just maximise its returns using the traditional method. Chernoff (2003) has explained that one way to manage a pension fund is by matching pension assets against pension liabilities. Besides providing pension liabilities to the pensioners, Rudolf and Ziemba (2004) have argued that pension fund sponsors have the secondary goal of achieving an "earning spread" to reduce future liabilities.

For example, the Malaysia pension funds have been studied by Jidwin et al. (2012) regarding its fund selection, performance, and perception survey. The results revealed that members' experiences of investment performances and risk-taking were mixed. It is challenging for pension fund managers to fulfil a guaranteed minimum return to the contributors as they have to consider the performance return and risk perception aspects.

Funding Pension

There are two prominent employer-sponsored retirement plans; defined benefit (DB) and defined contribution (DC). The DB plan is the pension benefit in which the Malaysian government guarantees pension benefits to the employee upon retirement based on the employee's final salary scale. Hence, the Malaysian government faces an increasing financial burden regarding the total amount of pensions and gratuities payable. The Government is responsible for the pension obligations of civil officials' pensions and gratuities. According to economic reports, Malaysia's expenditure on pensions and gratuities has been rising yearly (MOF, 2019). According to Barr and Diamond (2009), any pension expenditure must be in line with the nation's capacity to pay for retirees' consumption, the investment returns from the pension assets, and the fund manager's capacity to generate income in the future.

For the DB plan, the Government as the annuity provider, must pay a specified annuity to the retirees. The benefit amounts are guaranteed regardless whether the retiree's plan is underfunded. The benefit amounts are the employer's obligation, irrespective of its financial condition or capacity.

Funding pension plans means putting aside financial assets dedicated to fulfilling the promised payments in the future. The amount of

money that pension and annuity providers should allocate each year is determined by how much expenses are allocated by actuaries each year. Hence, establishing and maintaining a high level of assets relative to liabilities require fiscal discipline and many years of planning.

Martell et al. (2013) demonstrate a reciprocal relationship between the public pension fund and states' finances. Thus, any government's financial health is inextricably linked to the funding status of its DB-sponsored plans and other post-employment benefit programmes.

The funding ratio is associated with the three characteristics of the plan; the time the programme is commenced, plan size, and the generosity of benefits. When the plan has started, older plans tend to have promised benefits over a more extended period without setting aside funds to fulfil the promises, which would lead to the significant unfunded liability. Therefore, the older the plan, the lower the expected funded ratio.

Two funding issues have been raised: first, the stock market's collapse reduces the equity value held by the state and local plans, thus undermining the funded status of all stated and local plans. Second, many baby boomers are about to retire, which means that benefits are slated to increase sharply (Munnell et al., 2011).

One of the key concerns is how long the state and local plans can keep up with their promises. In other words, are the plans going to run out of cash? If so, when would it happen? Indeed, a retirement plan's assets-to-liabilities ratio illustrates how many years the plan can keep paying benefits in the event of no other investment returns, no additional contribution, and no growth in the scheme benefits. Sponsors of the plan shall continue to contribute, notwithstanding the basic ratio, to reflect the changes over time. As the baby boomers retire, there is an expectation that the plan will generate returns on assets and that the benefit payout will increase.

Asset Allocation

An asset class is a group of assets with similar investment characteristics, and subject to the same regulations. Each asset class shall carry risk factors such as equity market risk, interest rates, inflation, or currency risk. Thus, portfolio weighting for an asset class

helps manage the portfolio's risk exposure. Asset allocation influences the return to the retirement fund.

An optimal asset allocation is when the pension plan sponsor does the portfolio weighting dynamically. Strategic Asset Allocation (SAA) is the highest decision-making level in the investment process. Hence, Alestalo and Puttonen (2006) have discussed the pension fund portfolio management in two steps.

The first is when the sponsoring company identifies steps on how to invest in broad asset classes, known as strategic asset allocation, which heavily affects a pension fund's performance. The asset classes include, but are not limited to fixed income, equity, money market instruments, real estate, private equity, or even commodities.

The second is asset allocation implementation via internal or external fund managers. The role of fund managers is critical in selecting the right investment strategies or security processes. The sponsor shall consider the fund manager with a higher information ratio, indicating additional spread or alpha over additional unit risk.

The literature has highlighted two extreme views on optimal asset allocation. From one perspective, bonds are the sole option to align assets with liabilities. At the same time, another view advises that the assets should have equity exposure. The potential asset classes include fixed income, equity, money market, and alternative investments such as real estate, private equity, and commodities. Traditionally, equity and fixed income are the main asset classes for pension funds, whereas alternative investments are growing in demand.

For example, the OECD (2020) report shows that OECD pension funds are primarily invested in equities and fixed-income asset classes. A total of 16 of the 36 OECD countries have more than 75 percent of their pension portfolios in equities and bonds. However, Papke (1991) found that the asset allocation of the US private pension funds in terms of fixed income and equities depends on the type of employers. Single-employer plans tend to have about 60 percent fixed-income and 20 percent equity securities. The smaller single employers invest 50 percent and 20 percent in fixed-income and equity securities. They found that the equity allocation increased its share from 48 percent in 1991 to 57 percent in 2001. Blake et al. (1999) found that 300

UK pension funds have a higher equity allocation than fixed-income securities. However, this study concentrates on pension performance rather than asset allocation.

METHODOLOGY

This study has adopted a few assumptions from the Malaysian Public Service Department Post-Service Division to project the retirement fund. The goal is to produce a retirement fund cash flow for pensioners of Malaysia's civil service under a few scenarios. The objective is to estimate the required return needed to sustain the retirement fund for Malaysia's civil servants.

Monthly Pension Payment

First, one needs to understand the type of pension benefits offered by the Malaysian Government. The civil servant who is eligible for a pension in Malaysia is the one who retires or is asked to retire from government service, and s/he is eligible for the pension benefits (JPA, 2021). For a typically defined benefit pension plan, the Malaysian Government pledges a monthly pension payment according to the employee's final salary and years of service using a specific formula as follows:

$$\textbf{\textit{Pension Payment (Monthly)}} = \frac{\mathbf{1}}{\mathbf{600}} \times \textbf{\textit{Last Drawn Salary}} \times \textbf{\textit{Service Months}}$$

The formula, however, is limited to a pension of three-fifths of the last basic salary (after 30 years or 360 months of the recognised service period). In other words, the maximum number of months recognised is limited to 360 months (30 years of service). A pensionable officer who has worked for more than 30 years is not eligible for additional months of service in the pension calculation.

Service Gratuity Payment

The formula is as follows:

$$\textbf{\textit{Gratuity Payment}} = \textbf{\textit{Last Drawn Salary}} \times \textbf{\textit{Months of Reckonbable Service}} \times 7.5\%$$

This one lump sum payment by the Malaysian Government to the retirees is in appreciation for their services to the Government.

Cash Award in Place of Leaves

The Malaysian government provides for the Cash Award in place of Leave (GCR) for public service officers. The GCR is an official recognition of unused leave due to service necessity, and is accumulated following the terms under the pension regulations. This benefit is also known as a "Golden Handshake" for Malaysian civil servants. The provision for Cash Award in place of the Accumulated Leave came into effect on 1 January 1974 under Service Circular No. 1/1974 and is granted to public service personnel who will retire on or after 1 January 1974 (JPA, 2021). The formula is as follows:

$$\begin{aligned} \textbf{\textit{Cash Award}} &= \frac{\mathbf{1}}{\mathbf{30}} \times (\textbf{\textit{Last Drawn Salary}} + \textbf{\textit{Fixed Allowances}}) \\ &\times \textbf{\textit{Number of Leave Gratuity Payment}} \\ &= \textbf{\textit{Last Drawn Salary}} \times \textbf{\textit{months of reckonable service}} \times \mathbf{7.5\%} \end{aligned}$$

As of August 2020, the maximum number of claimable days is up to 180 days. However, the Malaysian Government can scrutinise and amend any mistakes in the officer leave record when approving the claim.

Scenario Analysis

Scenario analysis is one of the methods to assess portfolio value changes in response to certain conditions. The idea is to study how scenarios such as, unfortunate events and worst-case scenarios (tail risk) influence the portfolio value. Hence, scenario analysis is proposed using the pension formula to find the required return for the civil service pension fund under a few scenarios and assumptions.

This study estimates the average investment return throughout the defined benefits period to cover future obligations under various scenarios. Figure 1 shows how the required returns are generated using different assumptions and constraints. This study has made assumptions about the input of the variables. Table 2 summarises the input range for four variables in generating the scenario-based analysis.

Table 2

Input Range for the Variables Used in the Required Return Simulation

Variable	Unit	Description	Range
Contribution Rate (ContRate)	Percentage	Defined benefit contribution by the Malaysian Government based on salary per month	3-15%
Average Year of Service (Length)	Years	Length of service in government sector	10, 20, 30 and 40 years
Retirement Age (RetiAge)	Years	Compulsory retirement age	55, 56,58, and 60 years old
Life Expectancy (LifeExp)	Years	The average period a person may expect to live	75, 80, 85, 90 and 95 years old

The rationale for the scenario-based assumptions are as follows:

i. Inflation Assumption

The inflation assumption is that every pensioner is eligible for the 2 percent monthly annuity increment for each year (JPA, 2021)

ii. Salary Increment

The Malaysian government has provided a salary increment of 3 percent for each year, starting from 2013 (JPA, 2021).

iii. Mortality Rate

This study ignores the table of mortality probability that projects how long civil servants will live after retirement. Life expectancy shall be considered one of the possibilities when calculating future liabilities

iv. Optional Retirement Age

Malaysia's pension scheme offers an optional retirement age for those who have fulfilled the criteria. A civil servant with a pension who has reached the age of 40 and has a recognised period of service of no less than ten years may apply for optional retirement, whereby the application must go through the Head of the Department where the member serves. However, this

study may ignore the matter of optional retirement in the calculation.

v. Leave Claim

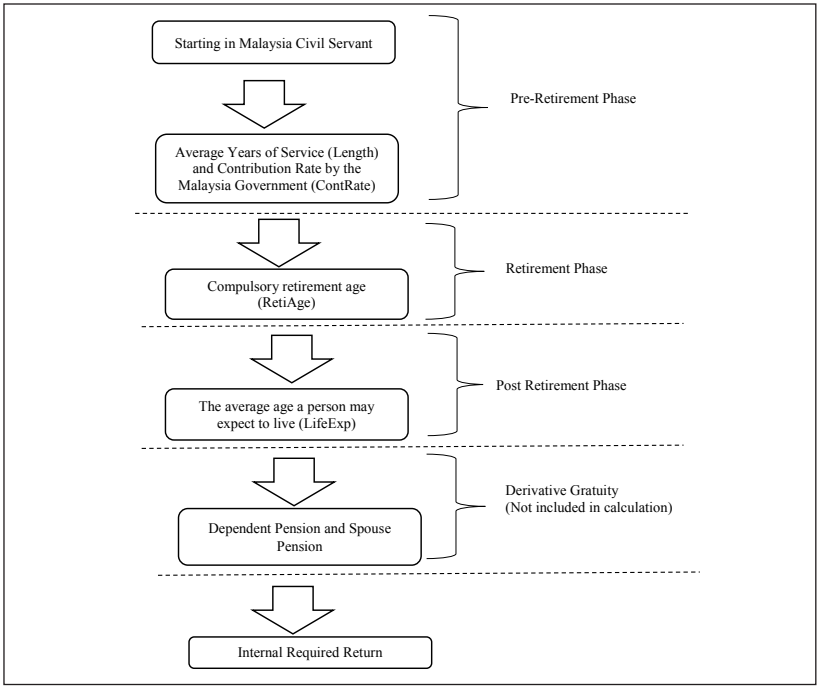
This study assumes that civil servants can claim a maximum leave of 180 days.

vi. Dependent Pension and Spouse Pension

The pension scheme in Malaysia also extends pension benefits to the deceased officer's dependants who passed away while still in the service or upon retirement. The extension benefit is known as a derivative gratuity or derivative pension. However, this study may ignore the matter of derivative gratuity in the retirement fund calculation.

Figure 1

Workflow of the Scenario Analysis



Note. Based on Authors' own sketch

Internal Rate of Return

This study defines the required return via the internal rate of return (IRR). The IRR is a financial analysis metric to estimate a potential investment's profitability. In a discounted cash flow analysis, the IRR is a discount rate that makes all cash flows' net present value (NPV) equal zero. The IRR relies on the same formula as the NPV does. One has to keep in mind that the IRR is not the actual dollar value of the project. It is the annual return that makes the NPV equal to zero. The IRR is calculated using the same concept as the NPV, except it sets the NPV as equal to zero. The IRR is ideal for capital budgeting analysis and to understand and compare the potential annual rate of return over time as in Equation 1:

$$NPV = \sum_{t=1}^{T} \frac{C_t}{(1 + IRR)^t} \quad (1)$$

To find the right amount of return and liabilities, the NPV must be equal to zero. While Equation 2:

$$0 = \sum_{t=1}^{T} \frac{C_t}{(1 + IRR)^t} \quad (2)$$

Where C_t denotes the cash flow at that time, t.

The IRR indicates the annualised rate of return for a given investment, no matter how far into the future, and the projected future cash flow. In this study, the IRR is the annual growth rate that an investment is likely to generate to ensure the fund can pay the liabilities in the future.

Regression

Besides the scenario analysis, this study attempts to model and investigate the factors influencing the retirement fund required to return in Malaysia using the ordinary least square (OLS) over 560 scenarios. A scenario simulation is designed to examine the retirement plan rate of return to fund sufficient pension liabilities in the future.

This study intends to determine the rate of return the Malaysian government should maintain to sustain the pension fund in the long run. Accordingly, the formula used is as follows:

$$\boldsymbol{Required\ Return(IRR)} = \boldsymbol{f}\ (\boldsymbol{ContRate, LifeExp, Length, RetiAge})$$

Where

ContRate denotes the contribution rate when the Malaysian government puts aside a fund for the retirement fund;
LifeExp represents life expectancy for the post-retirement period;
Length means the years of service of a civil servant; and
RetiAge indicates the retirement age.

Hypothesis:

As has been pointed out earlier, this study aims to investigate the impact of the independent variables on the required rate of return (RRR) of the Malaysian pension fund investment. Overall, the contribution rate, length of service, and retirement age shall negatively affect the required rate of return needed by the fund. However, a higher life expectancy shall lead to a higher required rate of return. The hypotheses of this study are as follows:

H_1: Contribution Rate is negatively associated with the required rate of return.
H_2: Life Expectancy is positively associated with the required rate of return.
H_3: Length of Service is negatively associated with the required rate of return.
H_4: Retirement Age is negatively associated with the required rate of return.

When the contribution rate, length of service, and retirement age increase, the required return generated from the KWAP pension fund will be lower. Hence, these three variables are expected to be negatively associated with the required rate of return (H_1, H_3, and H_4). On the other hand, the longer the retiree's life expectancy, the required rate of return generated by the KWAP pension fund will be higher (H_2).

FINDINGS AND RESULTS

Scenario Analysis Findings

The findings of the RRR are as summarised in Table 3, indicating the descriptive statistics based on the simulation of the 560 scenarios.

The simulation shows the required rate of return that the Malaysian pension fund needs to achieve based on the parameters set up in this study.

Table 3

Descriptive Statistics of Simulation-Based on 560 Scenarios

	Required Return
Mean	0.2967
Standard Error	0.0065
Median	0.2437
Mode	0.5146
Standard Deviation	0.1536
Sample Variance	0.0236
Kurtosis	0.0158
Skewness	1.0825
Range	0.5562
Minimum	0.1365
Maximum	0.6928
Sum	166.15
Count	560

The maximum required return is 69.28 percent of the investment return for the 560 scenarios. The policy required the highest required return when the contribution rate was 3 percent, the length of services was ten years regardless of the retirement age and life expectancy. However, it is possible to generate as low as 13.75 percent of the required return to ensure the sustainability of the retirement plan. This level can be achieved by a contribution rate of 15 percent and at least 40 years in public service.

Out of the 560 scenarios, the mean of the required return was 29.67 percent, with a standard error of 0.65 percent. Based on the kurtosis and skewness, the actual return distribution was not expected since the mean, median, and mode values differed. This distribution has skewed to the left as the mode exceeded the median and mean. Table 4, Table 5, Table 6, and Table 8 show the 560 scenarios that used different investment returns.

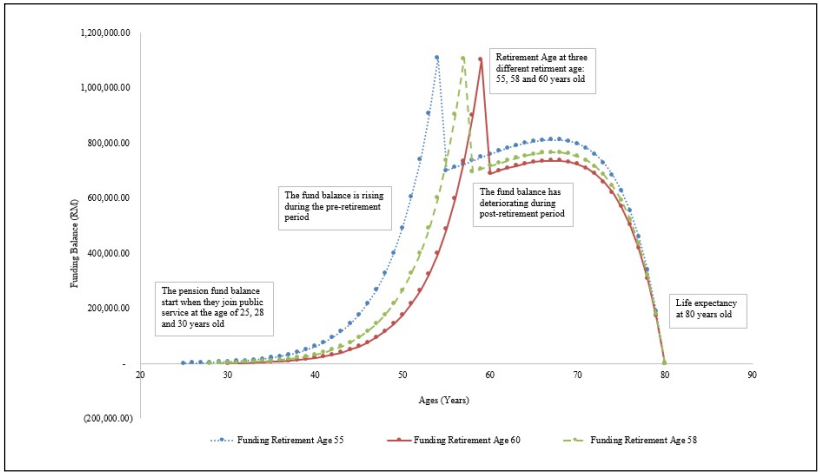
Table 4

Required RRR at the Retirement Age of 55 Years

Length of Services (Years)	Life Expectancy (Years)	Contribution Rate						
		3%	5%	7%	9%	10%	13%	15%
10	75	69.2781%	60.7906%	55.3933%	51.4602%	49.8361%	45.8557%	43.7234%
	80	69.2782%	60.7909%	55.3940%	51.4614%	49.8376%	45.8583%	43.7269%
	85	69.2782%	60.7910%	55.3941%	51.4615%	49.8378%	45.8587%	43.7275%
	90	69.2782%	60.7910%	55.3941%	51.4615%	48.6328%	45.8588%	43.7277%
	95	69.2782%	60.7910%	54.7119%	51.4616%	49.8378%	45.7418%	43.7277%
20	75	35.0688%	31.5430%	29.2600%	27.5747%	26.8732%	25.1392%	24.2010%
	80	35.0760%	31.5552%	29.2773%	27.5972%	26.8982%	25.1719%	24.2388%
	85	35.0778%	31.5586%	29.2826%	27.6045%	26.9066%	25.1835%	24.2528%
	90	35.0782%	31.5596%	29.2842%	27.6068%	26.9094%	25.1877%	24.2579%
	95	35.0783%	31.5599%	29.2847%	27.6076%	26.9103%	25.1891%	24.2599%
30	75	24.5514%	22.3557%	20.9222%	19.8574%	19.4124%	18.3075%	17.7067%
	80	24.5761%	22.3906%	20.9658%	19.9089%	19.4676%	18.3731%	17.7788%
	85	24.5852%	22.4044%	20.9840%	19.9313%	19.4920%	18.4034%	17.8128%
	90	24.5885%	22.4099%	20.9917%	19.9412%	19.5030%	18.4176%	17.8291%
	95	24.5897%	22.4121%	20.9950%	19.9455%	19.5079%	18.4242%	17.8369%
40	75	18.8884%	17.2773%	16.2190%	15.4293%	15.0983%	14.2738%	13.8239%
	80	18.9287%	17.3294%	16.2808%	15.4996%	15.1724%	14.3585%	13.9149%
	85	18.9470%	17.3547%	16.3120%	15.5360%	15.2113%	14.4043%	13.9649%
	90	18.9554%	17.3670%	16.3278%	15.5551%	15.2320%	14.4294%	13.9928%
	95	18.9592%	17.3731%	16.3360%	15.5652%	15.2430%	14.4433%	14.0085%

Figure 2

Retirement Fund Balance According to Retirement Age



Constant Parameters: Life Expectancy − 80 Years; Contribution Rate − 5%; and Length of Service − 30 Years

Table 5

Required RRR at the Retirement Age of 56 Years

Length of Services (Years)	Life Expectancy (Years)	Contribution Rate						
		3%	5%	7%	9%	10%	13%	15%
10	75	69.2780%	60.7904%	55.3929%	51.4595%	49.8353%	45.8543%	43.7216%
	80	69.2782%	60.7909%	55.3940%	51.4613%	49.8375%	45.8581%	43.7266%
	85	69.2782%	60.7903%	55.3941%	51.4615%	49.8378%	45.8587%	43.7275%
	90	69.2782%	60.7910%	55.3941%	51.4615%	48.6328%	45.8588%	43.7277%
	95	69.2782%	60.7910%	55.3941%	51.4616%	49.8378%	45.8567%	43.7277%
20	75	35.0656%	31.5380%	29.2532%	27.5663%	26.8640%	25.1275%	24.1877%
	80	35.0752%	31.5538%	29.2753%	27.5945%	26.8952%	25.1677%	24.2340%
	85	35.0776%	31.5583%	29.2820%	27.6036%	26.9055%	25.1820%	24.2510%
	90	35.0781%	31.5595%	29.2840%	27.6065%	26.9090%	25.1871%	24.2573%
	95	35.0783%	31.5598%	29.2846%	27.6075%	26.9102%	25.1890%	24.2596%
30	75	24.5426%	22.3439%	20.9078%	19.8408%	19.3947%	18.2870%	17.6844%
	80	24.5730%	22.3859%	20.9598%	19.9017%	19.4598%	18.3637%	17.7683%
	85	24.5840%	22.4025%	20.9815%	19.9282%	19.4886%	18.3990%	17.8078%
	90	24.5880%	22.4091%	20.9907%	19.9398%	19.5014%	18.4155%	17.8267%
	95	24.5895%	22.4118%	20.9945%	19.9449%	19.5072%	18.4233%	17.8358%
40	75	18.8758%	17.2614%	16.2006%	15.4087%	15.0767%	14.2495%	13.7979%
	80	18.9229%	17.3218%	16.2716%	15.4890%	15.1612%	14.3455%	13.9009%
	85	18.9443%	17.3510%	16.3073%	15.5304%	15.2054%	14.3972%	13.9571%
	90	18.9542%	17.3652%	16.3254%	15.5522%	15.2288%	14.4255%	13.9885%
	95	18.9587%	17.3722%	16.3347%	15.5637%	15.2413%	14.4411%	14.0061%

Retirement Age Factor

Each country has a different pension structure for its retirement age. Malaysia's pension structure defined the pension age as mandatory when one has reached 55 years old. This was the practice for five decades until September 2001 (Moorthy et al., 2012). The mandatory retirement age was raised to 56 in October 2001. In 2021, with a retirement age set at 60 and a life expectancy of 80 years, each pensioner's pay-out had to last for almost 20 years. The mismatch has increased further due to a longer life expectancy, putting pressure on pension providers who risk longer and more uncertain post-retirement periods. Figure 2 shows the retirement fund balance according to the retirement age of 55, 58 and 60. Funding at the retirement age of 55 requires a higher return rate of 22.3905 percent. A higher return is due to sustaining a more extended post-retirement period of 25 years (80 years old minus 55 years at the time of retirement) compared to the retirement age of 58 years (22.3736%) and 60 years (22.3557%).

Table 6

Required RRR at the Retirement Age of 58 Years

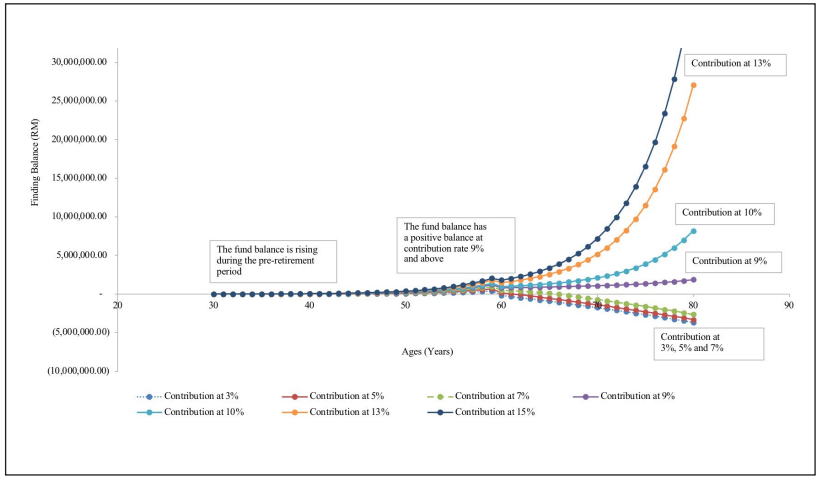
Length of Services (Years)	Life Expectancy (Years)	Contribution Rate						
		3%	5%	7%	9%	10%	13%	15%
10	75	69.2780%	60.7904%	55.3929%	51.4595%	49.8353%	45.8543%	43.7216%
	80	69.2782%	60.7909%	55.3940%	51.4613%	49.8375%	45.8581%	43.7266%
	85	69.2782%	60.7903%	55.3941%	51.4615%	49.8378%	45.8587%	43.7275%
	90	69.2782%	60.7910%	55.3941%	51.4615%	48.6328%	45.8588%	43.7277%
	95	69.2782%	60.7910%	55.3941%	51.4616%	49.8378%	45.8567%	43.7277%
20	75	35.0561%	31.5234%	29.2339%	27.5424%	26.8379%	25.0952%	24.1515%
	80	35.0729%	31.5498%	29.2694%	27.5868%	26.8866%	25.1564%	24.2208%
	85	35.0770%	31.5571%	29.2802%	27.6011%	26.9027%	25.1780%	24.2461%
	90	35.0780%	31.5592%	29.2835%	27.6057%	26.9081%	25.1857%	24.2555%
	95	35.0782%	31.5597%	29.2845%	27.6072%	26.9098%	25.1884%	24.2589%
30	75	24.5187%	22.3125%	20.8702%	19.7978%	19.3492%	18.2347%	17.6280%
	80	24.5643%	22.3736%	20.9442%	19.8832%	19.4399%	18.3400%	17.7422%
	85	24.5808%	22.3976%	20.9750%	19.9201%	19.4797%	18.3880%	17.7954%
	90	24.5869%	22.4072%	20.9879%	19.9362%	19.4975%	18.4104%	17.8208%
	95	24.5891%	22.4110%	20.9934%	19.9434%	19.5054%	18.4209%	17.8329%
40	75	18.8434%	17.2216%	16.1547%	15.3578%	15.0236%	14.1903%	13.7350%
	80	18.9084%	17.3028%	16.2490%	15.4631%	15.1339%	14.3142%	13.8670%
	85	18.9377%	17.3417%	16.2959%	15.5170%	15.1910%	14.3802%	13.9385%
	90	18.9511%	17.3607%	16.3196%	15.5451%	15.2211%	14.4161%	13.9781%
	95	18.9573%	17.3699%	16.3317%	15.5599%	15.2372%	14.4359%	14.0002%

Contribution Rate Factor

The contribution rate is the percentage of the amount needed to be paid into the pension fund. In the Malaysian public service context, the contribution rate refers to how much the Malaysian government puts aside a certain amount of money for an individual's pension fund. Figure 3 shows the retirement fund balance according to the contribution rate throughout the ten. Based on Figure 3, only the 9 percent and 10 percent contribution was sustainable for funding a pensioner that retired at 60 years old and would die at 80 years old. However, the return was considered as too optimistic by having 20 percent of the average rate of return. The result shows that the contribution of 9 percent would be sufficient for the scenario above. At the same time, contributions at 3 percent, 5 percent and 7 percent were insufficient to support 20 years of post-retirement period with an assumption of 20 percent fund return. Hence, the fund balance scenario is as presented.

Figure 3

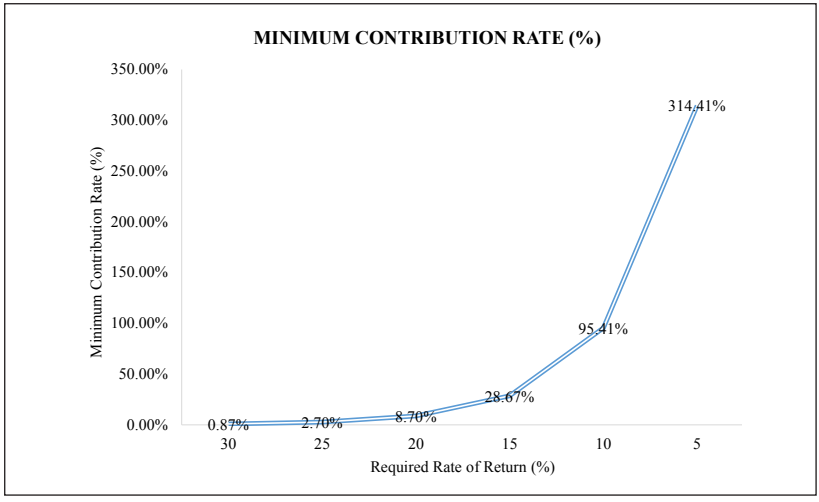
Retirement Fund Balance According to the Contribution Rate



Constant Parameters: Life Expectancy s 80 Years; Retirement Age – is 60 Years; and Length of Service is 30 Years; Fund Rate of Return is 20%

Figure 4

Minimum Contribution Rate vs Required Rate of Return (RRR)



Constant Parameters: Retirement Age – 60 Years; and Length of Service −30 Years; Life Expectancy – 80 years

Table 7

Required RRR at the Retirement Age of 60 Years

Length of Services (Years)	Life Expectancy (Years)	Contribution Rate 3%	5%	7%	9%	10%	13%	15%
10	75	69.2765%	60.7872%	55.3875%	51.4515%	49.8258%	45.8400%	43.7037%
	80	69.2781%	60.7906%	55.3933%	51.4602%	49.8361%	45.8557%	43.7234%
	85	69.2782%	60.7909%	55.3940%	51.4614%	49.8376%	45.8583%	43.7269%
	90	69.2782%	60.2617%	55.3941%	51.4615%	49.8378%	45.8587%	43.7275%
	95	69.2782%	60.7910%	55.3941%	51.4615%	49.8378%	45.8588%	43.7277%
20	75	35.0561%	31.5234%	29.2339%	27.5424%	26.8379%	25.0952%	24.1515%
	80	35.0729%	31.5498%	29.2694%	27.5868%	26.8866%	25.1564%	24.2208%
	85	35.0770%	31.5571%	29.2802%	27.6011%	26.9027%	25.1780%	24.2461%
	90	35.0780%	31.5592%	29.2835%	27.6057%	26.9081%	25.1857%	24.2555%
	95	35.0782%	31.5597%	29.2845%	27.6072%	26.9098%	25.1884%	24.2589%
30	75	24.5187%	22.3125%	20.8702%	19.7978%	19.3492%	18.2347%	17.6280%
	80	24.5643%	22.3736%	20.9442%	19.8832%	19.4399%	18.3400%	17.7422%
	85	24.5808%	22.3976%	20.9750%	19.9201%	19.4797%	18.3880%	17.7954%
	90	24.5869%	22.4072%	20.9879%	19.9362%	19.4975%	18.4104%	17.8208%
	95	24.5891%	22.4110%	20.9934%	19.9434%	19.5054%	18.4209%	17.8329%
40	75	18.7985%	17.1675%	16.0935%	15.2906%	14.9537%	14.1131%	13.6536%
	80	18.8884%	17.2773%	16.2190%	15.4293%	15.0983%	14.2738%	13.8239%
	85	18.9287%	17.3294%	16.2808%	15.4996%	15.1724%	14.3585%	13.9149%
	90	18.9470%	17.3547%	16.3120%	15.5360%	15.2113%	14.4043%	13.9649%
	95	18.9554%	17.3670%	16.3278%	15.5551%	15.2320%	14.4294%	13.9928%

Table 8

Minimum Contribution Rate According to Required Rate of Return

Required Rate of Return (%)	Minimum Contribution Rate (%)
30	0.87%
25	2.70%
20	8.70%
15	28.67%
10	95.41%
5	314.41%

Based on Table 8, assuming a 30 percent rate of return throughout the period, the minimum breakeven to cover this scenario is only 0.87 percent of the contribution rate. In comparison, a 25 percent of return will bring down the required contribution rate to 2.70 percent. The

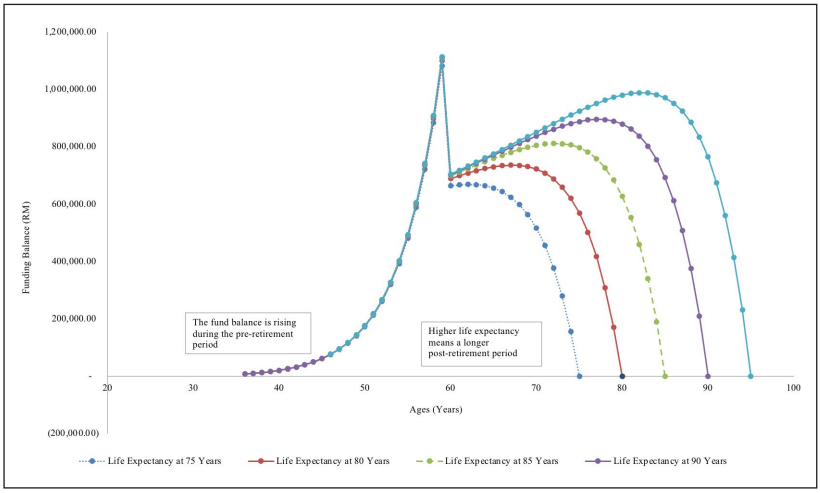
higher RRR will need a higher contribution rate. Table 8 proves that a higher required return is needed to sustain the lower contribution rate. One of the main features of managing a pension fund is that the fund can pool investment risk across individuals and spread risk over a long tenure. Hence, the Malaysian government must balance the contribution rate and the expected investment return by the KWAP. Figure 4 shows how a contribution rate by the Malaysian government has a negative relationship with the required return. Since the Malaysian government pension provides an essential source of income to a civil servant in any contingency, the pension scheme is financially viable. Indeed, it must adequately finance to continue paying the expected benefits as has been stipulated in the pension laws in the future. However, the Malaysian government faces an increasing financial burden regarding the total pensions and gratuities payable.

Life Expectancy Factor

Figure 5 shows the retirement fund balance according to life expectancy. A higher life expectancy requires a higher rate of return on the fund.

Figure 5

Retirement Fund Balance According to Life Expectancy



Constant Parameters: Contribution Rate − 5%; Retirement Age – 60 Years; and Length of Service −30 Years

Table 9 shows that the minimum required rate of return does not increase much in the event that life expectancy increases by five years. However, the Government needs to fund the retirement fund from its pocket higher than the minimum rate. This scenario illustrates the best-case scenario, where each increase in a variable should be supported by a higher contribution rate by the Government.

Table 9

Minimum Required Rate of Return According to Life Expectancy

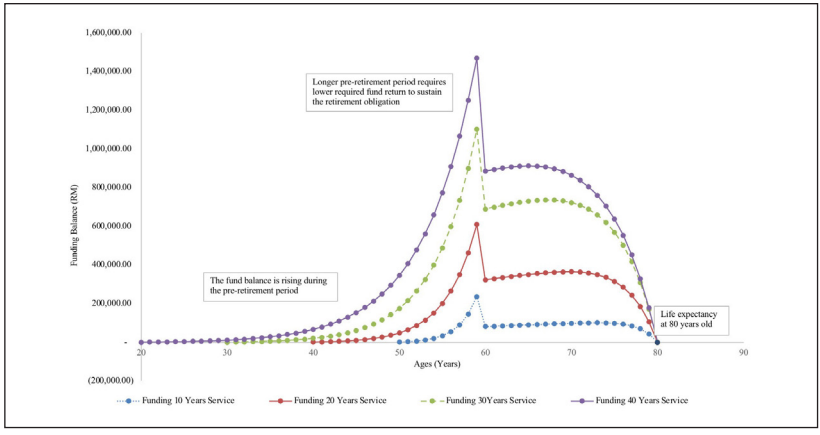
Life Expectancy (Years)	Length of Service / Retired Age (Years)	Contribution Rate (%)	Required Rate of Return (%)
75	30 / 60 Years	5.00	22.27%
80			22.36%
85			22.39%
90			22.40%
95			22.41%

Length of Service Factor

Figure 6 shows that long years of service result in a higher retirement fund balance. A higher fund balance will require a lower minimum return to generate profit in sustaining the plan for an extended period.

Figure 6

Retirement Fund Balance According to the Length of Service



Constant Parameters: Contribution Rate − 5%; Retirement Age − 60; and Life Expectancy − 80 Years

Regression Analysis

Based on the 560 scenarios generated, this study has run a regression analysis to model the required rate of return based on the independent variables.

Table 10

Regression Analysis of the Required Rate of Return

Independent Variable	Model: Required Return (Dependent Variable)			
	(1)	(2)	(3)	(4)
ContRate (-)	-0.9559	-0.9559**	-0.9559**	-0.9559**
	(0.00)	(0.00)	(0.00)	(0.00)
LifeExp (+)	0.0001	-	0.0001	-
	(0.92)	-	(0.92)	-
Length (-)	-0.0121**	-0.0122**	-0.0121	-0.0122**
	(0.00)	(0.00)	(0.00)	(0.00)
RetiAge (-)	0.0001	-0.0000		-
	(0.98)	(0.98)		-
Constant	0.6840**	0.6872**	0.6820**	0.6851**
	(0.00)	(0.00)	(0.00)	(0.00)
Adjusted R-squared	0.8429	0.8432	0.8432	0.8435
F-statistic	751.03	1003.16	1003.18	15007.44
Observations	560	560	560	560

Note. Values in parenthesis are the p-value from the 560 scenarios generated. ** and * denote 1% and 5% levels of significance, respectively

Table 10 shows that Model (4) is adequate to explain the required return of the Malaysian Civil Servant Retirement Fund. About 84 percent variation of the required return can be explained by the contribution rate and length of service. The estimated model is as follows.

$$\boldsymbol{Required\ Return = 0.6851 - 0.9559\ ContRate - 0.0122\ Length}$$

Table 11

Summary of Hypothesis Test

Hypothesis	Independent Variable (Expected sign)	Required Return
H_1	Contribution Rate (-)	Supported
H_2	Life Expectancy (+)	-
H_3	Length of Service (-)	Supported
H_4	Retirement Age (-)	-

As shown in Table 11, H_1 and H_3 have supported the dependent variable, which is the required return of the fund. H_1 has stated that a higher contribution rate from the State and Federal Governments to the KWAP pension fund enables the lower required return to be generated from the fund. H_3 reinforces the idea that there is a need for civil servants to work longer before they can enjoy pension benefits.

Table 13 shows the average RRR needed by the length of service and contribution rate. A future pensioner that works at least 30 and above years would push down the required return for the KWAP. For the final part of this study, a 5-year average gross return on investment (ROI) by the KWAP was used, and the trade-offs between the significant independent variables were computed as follows.

Table 13

Average RRR and Contribution Rate based on Length of Service

Length of Services (Years)	Average Required Rate of Return / Contribution Rate						
	3%	5%	7%	9%	10%	13%	15%
10	69.28%	60.68%	55.39%	51.46%	49.84%	45.85%	43.72%
20	35.07%	31.54%	29.26%	27.58%	26.88%	25.15%	24.21%
30	24.56%	22.37%	20.94%	19.88%	19.43%	18.33%	17.74%
40	18.90%	17.30%	16.25%	15.46%	15.13%	14.32%	13.87%

Table 14 and Table 15 show that the policymakers of the Post-Service Division need to work harder since it is impossible to contribute about 200–300 percent for each pensioner if the pensioners are expected to

live until the age of 80 years old. If someone serves about ten years in the public sector, they are still eligible for the public pension fund. However, the Government needs to contribute about 376 percent of the fund to the monthly payment payable to this pensioner during the person's retirement in the future. The current feature is not feasible since the government revenue is lower than the computation contribution rate. The number is generated based on the five-year average return of the KWAP fund between 2014 and 2018.

Table 14

5-year Average Gross Return on Investment (ROI) by KWAP

Return on Investment (ROI) (%)/Year	2014	2015	2026	2017	2018	Average
Net	4.60	3.30	4.00	7.00	0.80	3.94
Gross	6.20	5.50	5.40	5.80	4.10	5.40

Table 15

Computed Contribution Rate based on Average net and Gross ROI within Five Years: 3.94% (Net ROI) and 5.40% (Gross ROI)

Length of Service (Years)	Life Expectancy / Retired Age (Years)	Contribution Rate (%)	
		Gross ROI	Net ROI
10	80 / 60 Years	375.28%	449.81%
20		326.60%	424.74%
30		286.04%	403.59%
40		202.40%	308.39%

CONCLUSION

Malaysia's rapidly increasing pension costs has raised serious concerns for policymakers and decision-makers. The result shows that the pre-retirement factors, such as the contribution rate and length of service, are more crucial in lowering the required rate of return. However, the post-retirement factors, such as the retirement age and life expectancy, are insignificant in determining the required rate of return.

The work-leisure model theory discusses the labour supply functions with a factor of leisure and wages that explain how long an individual should work in their career lifetime. Based on the theory, people will work if the wages exceed their needs and leisure. This theory also applies to Malaysia's public service labour supply.

The Malaysian government needs to fund the public sector retirement scheme higher than the current contribution rate of 5 percent. The Government has considerable freedom to alter the contribution rate. However, the underlying principles of the amount contribution rate will depend on the surplus or deficit of the pension fund. The accumulated pension assets must be greater than the projected liabilities. Thus, in a sense, the contribution rate can be reduced during the period of surplus. In contrast, the contribution rate can be increased when the fund is in deficit. The flexibility may be restricted due to certain constraints in the fund. As a policy suggestion, the Government should introduce a few measures in the future. First, the Government should reconsider the issue of pension eligibility based on the minimum years of service for a civil servant to be able to participate in the pension scheme. This study recommends that only those with a minimum of 20 years of service be eligible to participate in the pension scheme.

The KWAP pension fund needs a period of 20 years before it is fully vested. The State becomes fully vested when the fund contributed by the State or Federal Government is fully accessible by the pensioner or the beneficiary. Hence, those under 20 years of service should participate in the Employee Provident Fund (EPF).

According to the analysis carried out in this study, if an officer has only worked for ten years and joined the pension scheme, then the KWAP needs to generate a required return of more than 50 percent to sustain the pension benefits to the officer. On top of that, this study has found that extending the retirement age from 55 to 60 years does not reduce the required return significantly (see Tables 5 and 6). In addition, the length of service or year of contribution is more important than life expectancy in the post-retirement years.

Second, the Government should set a minimum contribution rate even if the economy is in deficit. This study recommends a contribution rate of 13 percent based on the 648 simulated scenarios. The Federal government's current contribution rate of 5 percent to the KWAP is insufficient. Based on the current literature, there is a need for the

Malaysian government to set a minimum funding ratio for the KWAP pension fund for its long-term sustainability.

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ENDNOTES

1 2013 Budget. http://www.jpapencen.gov.my/english/2012budget.html

2 2019 Malaysia Budget. https://www.mof.gov.my/arkibrevenue/2020/section3.pdf

REFERENCES

Alestalo, N., & Puttonen, V. (2006). Asset allocation in Finnish pension funds. *Journal of Pension Economics and Finance*, *5*(1), 27–44. https://doi.org/10.1017/S1474747205002295

Ambachtsheer, K. P. (1994). The economics of pension fund management. *Financial Analysts Journal*, *50*(6), 21–31. https://doi.org/10.2469/faj.v50.n6.21

Barr, N., & Diamond, P. (2006). The economics of pensions. *Oxford Review of Economic Policy*, *22*(1), 15–39. https://doi.org/10.1093/oxrep/grj002

Barr, N., & Diamond, P. (2009). Reforming pensions: Principles, analytical errors and policy directions. *International Social Security Review*, *62*(2), 5–29. https://doi.org/10.1111/j.1468-246X.2009.01327.x

Blake, D., Lehmann, B. N., & Timmermann, A. (1999). Asset allocation dynamics and pension fund performance. *Journal of Business*, *72*(4), 429–461. https://doi.org/10.1086/209623

Chernoff, J. (2003). Asset liability management back with a twist. *Pensions and Investments*. https://www.pionline.com/article/20030721/PRINT/307210719/asset-liability-management-back-with-a-twist

Driffill, E. J. (1980). Life-cycles with terminal retirement. *International Economic Review*, 45–62. Vol. 21, No. 1 (Feb., 1980), pp. 45-62. https://doi.org/10.2307/2526239

Greenhaus, J. H., & Parasuraman, S. (1999). Research on work, family, and gender: Current status and future directions. In G. N. Powell (Ed.), *Handbook of gender and work* (pp. 391–412). Sage Publications. https://doi.org/10.4135/9781452231365.n20

Holzmann, R., Palacios, R., & Zviniene, A. (2004). *Implicit pension debt: Issues, measurement and scope in international perspective*. *0403*, 38. http://documents.worldbank.org/curated/en/947731468762352221/Implicit-pension-debt-issues-measurement-and-scope-in-international-perspective

Jidwin, A. P., Ali, R., & Tuyon, J. (2012). The Malaysian employees provident fund's members' investment scheme: Survey of fund selection, performance and perceptions. *Management*, *1*(9), 31–43.

JPA. (2021). *Malaysia pension scheme*. Bahagian Pasca Perkhidmatan. http://www.jpapencen.gov.my/english/pension_scheme.html

KWAP. (2018). KWAP Annual Report 2018. *KWAP Website*, *86*(3), 64–65. https://www.kwap.gov.my/EN/UsefulInformation/Publication/Annual Reports/KWAP Annual Report 2018.pdf

Lee, K. C. (1997). The Malaysian government pension scheme. Whither is its future direction? *Jurnal Ekonomi Malaysia*, *31*, 87–106.

Munnell, A. H., Aubry, J. P., & Quinby, L. (2011). Public pension funding in practice. *Journal of Pension Economics and Finance*, *10*(2), 247–268. https://doi.org/10.1017/S1474747211000126

OECD. (2020). Pension funds in figures 2020. *Oecd*, *June*, 1–5. https://www.oecd.org/pensions/Pension-Funds-in-Figures-2020.pdf

Papke, L. E. (1991). *The asset allocation of private pension plans*. National Bureau of Economic Research

Rudolf, M., & Ziemba, W. T. (2004). Intertemporal surplus management. *Journal of Economic Dynamics and Control*, *28*(5), 975–990. https://doi.org/10.1016/S0165-1889(03)00058-7

Haworth, J., & Lewis, S. (2005). Work, leisure and well-being. *British Journal of Guidance and Counselling*, *33*(1), 67–79. https://doi.org/10.1080/03069880412331335902

Holzmann, R., Palacios, R., & Zviniene, A. (2004). *Implicit pension debt: Issues, measurement and scope in international perspective*. *0403*, 38. http://documents.worldbank.org/curated/en/947731468762352221/Implicit-pension-debt-issues-measurement-and-scope-in-international-perspective

Jidwin, A. P., Ali, R., & Tuyon, J. (2012). The Malaysian employees provident fund's members' investment scheme: Survey of fund selection, performance and perceptions. *Management*, *1*(9), 31–43.

JPA. (2021). *Malaysia pension scheme*. Bahagian Pasca Perkhidmatan. http://www.jpapencen.gov.my/english/pension_scheme.html

KWAP. (2018). KWAP Annual Report 2018. *KWAP Website*, *86*(3), 64–65. https://www.kwap.gov.my/EN/UsefulInformation/Publication/AnnualReports/KWAPAnnual Report 2018.pdf

Law, M. (2007). *Act 662 retirement fun act 2007*. Malaysia, December.

Lee, K. C. (1997). The Malaysian government pension scheme. Whither is its future direction? *Jurnal Ekonomi Malaysia*, *31*, 87–106.

Leonesio, M. V. (1996). The economics of retirement: A nontechnical guide. *Social Security Bulletin*, *59*(4), 29–50.

Martell, C. R., Kioko, S. N., & Moldogaziev, T. (2013). Impact of unfunded pension obligations on credit quality of state governments. *Public Budgeting and Finance*, *33*(3), 24–54. https://doi.org/10.1111/j.1540-5850.2013.12013.x

Moorthy, M. K., Durai, T., Chelliah, L., Sien, C. S., Leong, L. C., Kai, N. Z., Rhu, W. C., & Teng, W. Y. (2012). A study on the retirement planning behaviour of working individuals in Malaysia. *International Journal of Academic Research in Economics and Management Sciences*, *1*(2), 54.

MOF, M. of F. (2019). *Malaysia 2020 budget speech by YB Tuan Lim Guan Eng*. Parliament Malaysia, October 2019, 1–13.

Munnell, A. H., Aubry, J. P., & Quinby, L. (2011). Public pension funding in practice. *Journal of Pension Economics and Finance*, *10*(2), 247–268. https://doi.org/10.1017/S1474747211000126

OECD. (2020). Pension funds in figures 2020. *Oecd*, *June*, 1–5. https://www.oecd.org/pensions/Pension-Funds-in-Figures-2020.pdf

Papke, L. E. (1991). *The asset allocation of private pension plans*. National Bureau of Economic Research

Rudolf, M., & Ziemba, W. T. (2004). Intertemporal surplus management. *Journal of Economic Dynamics and Control*, *28*(5), 975–990. https://doi.org/10.1016/S0165-1889(03)00058-7

Warr, P. (1987). *Work, unemployment, and mental health.* Oxford University Press.

World Bank (2008). Social protection discussion paper series titles no. title 0824 pension systems and reform conceptual framework by Robert Holzmann, Richard Paul Hinz and Mark Dorfman. https://documents1.worldbank.org/curated/en/716871468156888545/pdf/461750NWP0Box334081B01PUBLIC10SP00824.pdf