Asset Allocation and Performance of Malaysian Civil Service Pension Fund

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ABSTRACT

Managing pension assets for defined benefit plans is a dynamic optimisation process between the strategic allocation and the future liabilities obligations. A pension fund's optimal asset and liability structure will eventually determine the pension fund's performance. This study examines the Civil Service Pension Fund, or Malaysia Incorporated Retirement Fund (KWAP). Using the data from 2007 to 2018, our results show: First, KWAP has invested in five main asset classes. Its asset allocation strategy shows an increased risk tolerance with greater weight in equities. Second, real estate is the most performing asset class that contributes the highest ROI, followed by equities. Third, the investment performance of KWAP has deteriorated since 2007 as measured by Sharpe Ratio and M-squared. Fourth, the KWAP is still conservative based on the efficient frontier. It invests mainly in domestic fixed income and local equities. As a policy implication, the KWAP should diversify into an international portfolio as recommended by Capital Market Line.

Keywords: Pension Funds; Pension Scheme; Malaysia; Investment Performance; Asset Allocation

JEL: C32; G11; H55; H75; J32

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1.0 INTRODUCTION

The Malaysian government acknowledges that pension payments have become a substantial financial burden. Pension payments are expected to reach around RM47 billion in 2030 compared to RM28 billion in 2022, a 67% increase within eight years (Daim & Yunus, 2021).

The worsened scenario is when a recent court of Appeals ruled that the amended Pensions Adjustment Act, which came into effect in January 2013, was unconstitutional (FMT, 2022). This recent court decision saddled the government with a vast pensions problem that could cost billions of Ringgit Malaysia backdated claims (Parkaran, 2022).

The problem arose when the government in 2013 made a salary revision providing a higher pension plus a 2% annual increment for those who retired after the amendment. However, those who retired before 2013 continued to receive a pension based on their old salary plus a 2% annual rise. The amended act violated Article 147 of the Federal Constitution, as any new pension scheme cannot be less favourable than the old (Anbalagan, 2022).

Regardless of the pending court cases, the Malaysian government still has to bear a high pension obligation. The Malaysian government is fine-tuning a new civil service retirement scheme to ensure that it optimises government spending in the long term and, at the same time, ensures that the welfare of civil servants is always protected.

Hence, the Malaysian government is more pressured to manage its pension fund to meet higher obligations in the future. In the case of defined benefit plans for Malaysian civil servants, the goal of the investment function is to generate the highest possible returns consistent with the future liabilities requirement. Furthermore, managing the assets for pension funds is crucial since it reflects the pension fund's performance in the near and long term.

1.1 Retirement Fund (Incorporated) (KWAP)

Parliament of Malaysia enacted the Retirement Fund Act 2007 (Act 662) in March 2007 to establish a new statutory body named Retirement Fund (Incorporated). The act replaces the abolished Pensions Trust Fund Act of 1991 (Act 454), designed to help the federal government meet its pension obligations. This retirement fund (Incorporated), known as "Kumpulan Wang Persaraan (Diperbadankan)" (KWAP), was launched as a capital start-up of RM500 million. (KWAP, 2007)

KWAP is a statutory body governed by the Ministry of Finance that manages the pension scheme for Malaysia's public employees. KWAP is a fund manager for the Malaysia public pension fund for financing the government's future liability and responsibility for administering and paying pensions to public-sector retirees.

As Government-Linked Investment Companies (GLIC), KWAP is one of the three central bodies that manage Malaysia's pension scheme other than EPF and LTAT. In 2015, KWAP took over the Post-Pension Services Division of the Public Services Department (PSD). It manages the payment of pensions, gratuity, and other benefits granted under the merged fund (KWAP, 2017).

With the incorporation of KWAP, all of the Pensions Trust Fund's authorities, functions, activities, assets, and liabilities were transferred to KWAP. The mission of KWAP is to manage the retirement fund (the Fund) created under Section 3 of the Retirement Fund Act 2007 (Act 662) to maximise returns through benchmarking, a dynamic investment framework, and

prudent risk management. The Fund shall assist the Federal Government in financing its pension liability.

Since KWAP has operated for 12 years, the total fund size at cost has increased. In 2007, the total fund at cost was recorded at RM47.42 billion, reaching the highest fund, RM141 billion in 2017, before it went down to RM137 billion in 2018. In 2018, the full adoption of the Malaysian Financial Reporting Standards (MFRS) 9, which replaces the existing MFRS 139, occurred in the year under review (KWAP, 2018).

Table 1: Snapshot of KWAP Performance 2007-2018

Year/Element (20XX)	07	08	09	10	11	12	13	14	15	16	17	18
Fund Size (RM Billion)	48	52	62	71	79	89	100	109	118	125	141	137
Gross Investment Income (RM Billion)	3.4	2.9	3.2	4.6	4.6	5.8	6.7	6.5	6.4	6.4	9.0	7.1
Net Income (RM Billion)	3.7	0.6	5.7	4.9	4.3	5.7	6.6	4.8	4.4	4.8	8.8	1.2
Gross ROI (%)	9.2	5.9	5.6	7.1	6.3	6.8	7.1	6.2	5.4	5.4	5.8	4.1
Net ROI (%)	9.8	1.1	10	7.3	5.8	6.8	7.0	4.6	3.3	4.0	7.0	0.8

Source: KWAP Financial Report

Table 1 shows that the gross income of KWAP rose to a record of 9.03 billion ringgit ($2.32 billion) in 2017 on the back of a 5.77% return on investment. The total fund size expanded to 140.8 billion ringgit from 125 billion ringgit a year earlier.

KWAP has full responsibility for investing and managing the respective fund. Any KWAP's new investments must follow policies set by the Investment Panel and approved by the board. These include a strategic asset allocation, which needs to be reviewed periodically to assure optimal returns from relatively low-risk investments.

The Investment Policy and Guidelines is a document that governs KWAP's investment activities. However, the status and performance of KWAP's assets are reported monthly to the Investment Panel and the Board. As a sole fund manager for the government, assessing KWAP's performance and strategies is essential to ensure the government's financial sustainability in paying the pension and future obligations.

Creating and balancing the pension portfolio entails managing asset allocation for each asset class. After all, it is one of the most important aspects of determining portfolio returns. Choosing the right asset mix of stocks, bonds, cash, and real estate for the portfolio is a fluid process. As a result, the asset mix should always represent the investment objectives. This study intends to examine KWAP's asset allocation as part of its investment strategy. Does KWAP's asset allocation strategy yield the best return after all?

This remaining part of the paper is organised as follows. Section 2 reviews the literature, followed by the data and methodology. Section four discusses the result and the last section concludes our study.

2.0 LITERATURE REVIEW

2.1 Life Cycle Theory

The life-cycle saving model is the cornerstone of modern economic policy analysis. Many types of research have applied the framework to study that covers economic growth, business cycles, social insurance, trade and tax policies, and many others (Auerbach & Kotlikoff, 1987;

Diamond, 1965; Hubbard et al., 1995; Lucas et al., 1990). However, Laitner & Silverman (2005) explained that the model's ability to match data and answer economic questions depends on its parameter values, especially the intertemporal elasticity of substitution for consumption.

In a life-cycle labour supply model, the individual plans for a long-term plan for work and consumption that maximises satisfaction or well-being over the expected time interval. A life cycle utility function can be written as:

$$U = U\ (X, L, X_2, L_2, \ldots\ldots X_N, L_N, \rho, Z)$$

Where N represents the remaining lifespan, U depends on consumption (X) and Leisure (L) at the interval period where the individual enjoyed each period. While the ρ is an individual's rate of time preference, which denotes the extent to which an individual prefers consumption and leisure now instead of in the future. Moreover, Z is a vector of relevant personal characteristics that affect preferences such as age, health, and marital status. Someone with a high rate of time preference ($\rho = 1$) values the immediate enjoyment of a unit of consumption or leisure much more highly than their perspective enjoyment at a future date.

Current and future consumption can be financed through various income sources, such as earnings, savings, pensions, social security benefits, and other public and private transfers. The individual's objective is to plan a sequence of consumption and work activity from now (which is t=0) through period N that maximises a life-cycle budget constraint of the form:

$$\sum_{t=0}^{N}(1+r)^{-t}P_tX_t\ \leq\ A_O + \sum_{t=0}^{N}(1+r)^{-t}\left[w_t(T-\ L_t) + \ TR_t - \ TX_t + PENS_t + \ SS_t\right]$$

Where: A_0 indicates assets held at the beginning of the first period, transfer payments (TR), taxes (TX), pension income (PENS), and social security benefits (SS). The idea behind this equation is that the lifetime budget constraint says that the present value of remaining lifetime consumption cannot exceed the current value of all anticipated net income (all the income and earnings minus taxes). Hence, to understand the utility-maximising desired amount of Ht in each period is given by the solution to this problem and can be generally stated as:

$$H = T - L_t(P_1..P_N, w_1..w_n, A_0, TR_1..TR_N, TX_1.TX_N, PENS_1.PENS_N, SS_1.SS_N, r, \rho, Z)$$

As presented thus far, the model implicitly assumes that the future is always known with certainty. In reality, all planning occurs in an uncertain environment that requires considerable personal forecasting skills. In formulating long-range plans, individuals confront uncertainties such as their life expectancy, future health status, and the security of various future income sources. Finally, economic research attempts to verify the theoretically predicted nature of the determinants of retirement and, where possible, to measure the effects of the various retirement influences.

Driffill (1980) finds that the individual with the larger inheritance (A0) consumes less at each point in his life than the smaller one, other things being equal. The result implies that the larger one's inheritance, the smaller would be one's legacy. Thus, the ordering of families by wealth would be reversed each generation, resulting in an extraordinary amount of social mobility.

Hence, this theory describes people's spending and saving habits over a lifetime. However, in terms of investing, the life-cycle investing theory assumes that human capital is less risky than financial wealth for young people. The theory suggests that human capital is somewhat like a bond. Younger investors would afford to take a risk and invest a more significant proportion of their financial wealth in stocks or risky assets.

2.2 Asset and Liability Management in Pension Funds

Managing pension funds is not straight forward as it is. The pension fund around the globe sometimes is more significant than some countries GDP. Preliminary data by the OECD (2020) report shows the total pension fund assets up to USD 30 trillion held by seven OECD countries: are – the United Kingdom, the United States of America, Australia, Netherlands, Canada, Japan, and Switzerland.

A pension fund cannot just maximise its returns using the traditional efficient method. Chernoff (2003) explained that one way to manage a pension fund is by matching pension assets against pension liabilities. However, besides providing pension liabilities to the pensioners, Ito (1995) argues that pension fund sponsors have a secondary goal to achieve an "earning spread" to reduce the future liabilities requirement.

For example, the Malaysia pension funds have been previously studied by (Jidwin et al., 2012) in a fund selection, performance, and perception survey. The study results reveal that members' experiences of investment performances were mixed. As a pension fund manager, meeting a guaranteed minimum return to the contributors is challenging.

2.3 The Choice between Asset Classes

An asset class is a group of assets with similar investment characteristics. Each asset class will carry various risk factors, such as equity market risk, interest rates, inflation, or currency risk. Thus controlling, asset class weights control the portfolio's risk exposures.

The literature suggested that a debate on optimal asset allocation has two extreme views. According to one viewpoint, bonds are the sole option to align assets with liabilities. At the same time, another perspective advises that the assets must have equity exposure. A pension fund's main potential asset classes are presented in this section, including fixed income, equity, money market, and investing in alternative investments such as real estate, private equity, and commodities. Traditionally, equity and fixed income are the main asset classes in pension funds, whereas alternative investment is growing in demand.

For example, OECD (2020) report shows that OECD pension funds were primarily invested in equities and fixed-income asset classes. 16 of 36 OECD countries held more than 75% of their pension portfolios in equities and bonds. However, Papke (1991) finds the asset allocation of US private pension funds where the percentage holds fixed income and equities different by the type of employer. Single-employer plans tend to have about 60% in fixed income securities while another 20% in equity securities. The smaller single employers invest 50% and 20%, respectively. They found that equity allocation increased its share from 48% in 1991 to 57% in 2001. Differently, (Blake et al., 1999) found that 300 UK pension funds have a high percentage allocation to equities than fixed-income securities. However, this study concentrates on pension performance rather than asset allocation.

The reason to invest in each class for pension funds is discussed below:

2.3.1 Fixed Income

The main idea behind investing in fixed-income securities is to match assets and liabilities. Theoretically, a fully funded pension fund with a financially stable sponsor such as a government backup should not take an additional risk by investing in equity. According to Blake (2001), regulators encouraged fixed income since the bond yields acted as a reference for actuaries and accountants to calculate pension liability. This feature is why fixed income is one of the securities that can avoid any short-term mismatch between assets and future liabilities. As a result, the asset allocation of pension funds should be more heavily weighted toward bonds.

2.3.2 Equity

Despite what some managers think about fixed income securities as the only way to hedge pension liabilities, Black (1989) finds that stocks or equity securities can be used to achieve higher expected returns in a portfolio. Higher returns will lower expected liabilities costs in the future. Even stocks should be viewed as inflation-protected as stock prices and the expected rate of inflation move in tandem. Similarly, Chun et al. (2000) research that any growing company typically should have more concentration on equity and lower allocation on bonds or real estate due to a higher expected rate of return.

2.3.3 Money Market and Cash Equivalent

Despite the literature suggesting a fixed income and equity exposure, investing in the money market asset class is important. The sponsor has to keep cash in the form of cash equivalent for liquidity requirement purposes. Any short-term debt instruments such as Treasury Bill, Fixed Deposits, and Commercial Paper are part of the Money Market instrument. KWAP does not allow its members to withdraw some savings before retirement age.

2.3.4 Alternative Investment

Real estate is part of the alternative investment asset classes. Malaysian pension funds have traditionally held a lower portion of real estate in their portfolio. Many researchers have found that real estate is great for capital preservation but has a moderate rate of return. Hudson-Wilson et al. (2005) explain that real estate is essential to define benefit pension funds to hedge inflation through benefit payments that happen in real terms.

For example, Chun et al. (2000) found that the real estate allocation in US pension funds is not highly correlated with pensions plan liabilities. The primary role of real estate is to hedge against the risk of inflation.

2.4 Strategy Asset Allocation (SAA) and Tactical Asset Allocation (TAA)

Investment decisions have been made on a broad asset allocation strategy determined by long-term and strategically optimal fund allocation across asset classes. The Strategic Asset Allocation (SAA) is typically based on each asset class's risk and return profile. Varying the potential asset allocations will result in different magnitudes of risk. It is an essential step in the investment process as it determines the majority of the risk of its investments.

An optimal asset allocation is a process when the sponsor is weighting the asset allocation dynamically. The SAA is the highest level of decision-making in the investment process. Hence, (Alestalo & Puttonen, 2006) discusses pension fund portfolio management in two steps.

The first step is where the sponsor company must identify which broad asset classes to invest in, known as strategic asset allocation. These asset classes include but are not limited to fixed income, equity, money market instruments, real estate, private equity, or even commodities. This step will heavily affect the performance of a pension fund.

The second is asset allocation implementation via internal or external fund managers. This step is critical when choosing the right fund managers based on their investment strategies or security selection process. The sponsor should consider a fund manager with a higher information ratio, indicating additional alpha over additional unit risk.

Besides SAA, another decision in the investment process is the Tactical Asset Allocation (TAA), which would allow the fund manager to deviate from the asset allocation as budgeted in the SAA. Tactical Asset Allocation (TAA) entails making short-term deviations from the SAA to profit from mispricing in the capital markets.

After all, the optimal asset allocation for a pension fund depends on many variables. Those factors cover regulation and compliance, the market view for future liability, the sponsor's ability to take the risk, and the funded status. Hence, defining an optimal asset allocation is difficult, given the complexity of those factors.

2.5 Sharpe Ratio and M2 Risk-Adjusted Performance Measurement

Sharpe Ratio is widely used in the financial industry. Fund managers tout their skills and generally point to their Sharpe Ratios as demonstrating skill level. On the other hand, Leah & Franco (1997) suggested using a risk-adjusted performance where it adjusts every portfolio to the level of risk in its unmanaged benchmark and then measures the performance of this risk-equivalent portfolio. The ratio known as the M2 ratio, this performance ratio recognises that the risk of a portfolio can be readily altered and provides the basis for an actual result of risk-adjusted performance.

2.6 Modern Portfolio Theory (MPT)

In 1954, Harry Markowitz published his doctoral thesis, which became the Modern Portfolio Theory (MPT) foundation. The thesis changed the way people viewed risk and showed that in a portfolio context, the risk that is important to the investor is not the total volatility of individual security in the portfolio but rather how the securities correlate with each other in such a way as cancel out some of these risks.

Until Markowitz, investors did not consider the risk of a security in the context of a portfolio. Each security would be gauged on its risks, and securities with higher volatility would be penalised more heavily.

2.7 Efficient Frontier

The global market portfolio can be used as a baseline portfolio for asset allocation. The point contains all risky investable assets, eliminating all diversifiable risks. As a starting point, the

biases of an individual client (or manager) are mitigated. The weights by asset classes can then be lifted to meet the objectives of a given client.

The efficient frontier graph collects optimal portfolios that provide the best-expected return for a given level of risk or the best risk for a given level of expected return. Portfolios below the efficient frontier are suboptimal because they do not deliver adequate returns for their risk level.

For example, Abu Bakar & Rosbi (2018) studied efficient frontier analysis for portfolio investment in the Malaysian stock market, and Tunaru et al. (2006) looked for the Chinese Stock market. Both studies found the efficient frontier application to determine the optimal weight for securities in a portfolio.

The dots represent the risk and return of the different combinations of investment assets. It is possible to draw a curve that defines the outer boundary of these dots. The curve is called the efficient frontier. After all, it represents that the different combinations of efficient portfolios along this line are "efficient" because it gives one the highest return for a given level of risk and the lowest risk for a given level of return.

Portfolios below the efficient frontier are not efficient because one can achieve a more efficient portfolio (with higher return or lower risk) by choosing one that lies on the efficient frontier. Take, for instance, Portfolio A. It is an inefficient portfolio because one can invest in Portfolio B, which gives one a higher return for the same risk, or Portfolio C, which offers a lower risk for the same return. A portfolio that lies above the efficient frontier is not achievable because the efficient frontier already represents the best possible combination of risk and return that the fund manager can achieve.

The investor's objective is to find a portfolio that lies on this efficient frontier because this would be a portfolio that gives one the best risk/return combination. MPT tells one how investors can combine the various asset classes. For example, rather than choose a portfolio that is 100% bonds, MPT shows that one can achieve more efficient portfolios. The investors can achieve higher returns and the same risk by having 50% bonds and 50% equities in the portfolio, or higher returns and lower risk by having 75% and 25% equities.

2.8 Capital Asset Pricing Model (CAPM)

The CAPM, formulated by Sharpe, Lintner, and Mossin, enhances the returns achievable from relying on the efficient frontier. The risk-free asset would be added to the efficient frontier, and the investors can effectively be extended to the efficient frontier. Hence, to make this possible, the investors must be able to invest some portion in a risk-free asset, such as cash deposits, or borrow at the risk-free rate to buy a larger amount of investment assets.

The optimal combination of portfolios with the best risk/return trade-off is no longer the efficient frontier when the investors do this. Instead, a straight line called the Capital Market Line (CML) starts at the risk-free asset return rate and runs tangent to the efficient frontier.

Under the CAPM, the only portfolio the investor should hold in combination with the risk-free asset is the Market Portfolio, which is the portfolio at the tangency between the Capital Market Line (CML) and the efficient frontier.

As defined by CAPM, the Market Portfolio contains all risky assets globally, including bonds, shares, gold and stamps. However, as it is impossible to identify these assets in practice, the Market Portfolio is a widely diversified portfolio of Malaysian and international equities and bonds.

The Capital Market Line (CML) is a straight line that starts at the risk-free asset return and runs tangent to the efficient frontier. The market portfolio (m) is the portfolio that lies in the tangency between the CML and the efficient frontier.

The slope of CML represents the price the market is willing to pay for the risk of the efficient portfolio. It is the additional return that the market requires for each percentage increase in the portfolio risk – standard deviation of returns – and is calculated as below:

$$E(r_n) = r_f + \frac{E(r_m) - r_f}{\sigma_m}\sigma_p$$

In different words:

$$E(r_n) = r_f + \beta_p [E(r_m) - r_f]$$

3.0 METHODOLOGY

This study uses secondary data from KWAP financial reports from 2007 to 2018. The goal is to study its asset allocation precisely and pension fund performance since the organisation was founded.

3.1 Gross Investment (GI) Income per basis point (bps)

Based on an annual KWAP gross investment income from 2007 to 2018, this study computes gross income per 1 bps. A basis point (bps) is a standard measure for interest rates and finance percentage, representing one-hundredth of one percent. The formula for each gross investment income per 1bps for year t is as below:

$$GI\ per\ bps_{t,i} = \frac{Gross\ Investment\ Income_{t,i}}{Percentage\ of\ Asset\ Allocated_{t,i}}$$

The idea is to measure how asset allocation for each 1bps decision impacted the total gross investment income, see which assets also contributed the most for the past eleven years, and see which asset class contributed the most and the least. This calculation is based on the average gross investment income over the average percentage for each institution's asset allocation. However, this calculation may ignore the fund manager's competence and the scenario assumptions (economic cycle).

3.2 Portfolio Performance

Performance measurement for the KWAP portfolio can be measured. However, due to the limited information on the pension providers, only two ratios are commonly used in the performance evaluation able to generate:

First, Sharpe Ratio represents the slope of the Capital Market Line (CML). A higher ratio means a better asset. The formula is defined as the portfolio risk premium dividend by the portfolio risk:

$$Sharpe\ Ratio = \frac{Market\ Risk\ Premium\ (MRP)}{\sigma_P}$$

$$Sharpe\ Ratio = \frac{R_P - R_F}{\sigma_P}$$

The second ratio is the M2 Ratio – An extension of the Sharpe Ratio that provides the investors with the risk-adjusted return to the portfolio by multiplying the Sharpe Ratio with the standard deviation of any benchmark market index and adding a risk-free return. The formula is:

$$M^2 = \left[(Market\ Risk\ Premium\ (MRP))\ x\ \frac{\sigma_m}{\sigma_p}\right] + R_f$$

$$M^2 = \left[\left(R_P - R_f\right)\ x\ \frac{\sigma_m}{\sigma_p}\right] + R_f$$

$$M^2 = [Sharpe\ Ratio\ x\ \sigma_m] + R_f$$

Table 2 shows variables to compute a fund performance ratio, Sharpe Ratio, and M2 Risk Adjusted Performance ratio.

Table 2: The variables for Sharpe Ratio and M2 Ratio

Item	Details	Variables	Source
$\boldsymbol{R_P}$	Return Premium	Represented by Return on Investment (ROI)	KWAP
$\boldsymbol{R_f}$	Risk-Free Rate	Represented by one-year Treasury Bills	Bloomberg
$\boldsymbol{\sigma_P}$	Portfolio Standard Deviation	Represented by Portfolio Volatility	KWAP
$\boldsymbol{\sigma_m}$	Market Standard Deviation	Represented by Volatility of Stock Price Index for Malaysia (KLSE)	FRED Economic Research

The Market Standard Deviation retrieved from (Bank, 2021)

3.3 Efficient Frontier and Capital Market Line (CML)

Using the data from January 2007 to December 2020, this study computes the efficient frontier of the investment based on Markowitz's theory with asset classes listed in Table 3.

Table 3: The Asset Classes Proxy Variable in Computing Efficient Frontier Graph

Asset Class	Variables	Source
Equity	Represented by Kuala Lumpur Stock Exchange (KLSE)	Bloomberg
Fixed Income	Represented by S&P Malaysia Total Bond Return	Bloomberg
Money Market	A proxy for short-term Ringgit Malaysia money market instrument. Represented by Kuala Lumpur Inter-Bank Offer Rate (KLIBOR). One-month KLIBOR is used.	Bloomberg
Real Estate	Represented by Bursa Malaysia Property Index	Bloomberg
International Stocks	Represented by MSCI World Index. A proxy for all international stocks and exposures.	Bloomberg

Table 3 shows five asset classes to be used in computing efficient frontier. For every asset class, a proxy has determined to see the return for each asset class. The main objective of this exercise is to develop a supported modern portfolio theory. Modern portfolio theory seeks out the set of all portfolios that constitute the efficient frontier. The efficient collection consists of all portfolios between the worldwide minimum variance portfolio and the efficient frontier's maximum return portfolio. The minimum variance portfolio is the portfolio on the efficient frontier with minimal risk; the highest return portfolio may be a portfolio on the efficient frontier with a maximum expected return. Although the utmost return portfolio has the lowest risk on the efficient frontier, no other portfolio within the opportunity set has an equal or greater return but a lower risk.

Based on the efficient frontier, this study aims to determine the optimum weightage of investment in achieving a higher return with minimising the investment risk. The investment risk is minimised using a combination of stocks in Markowitz's theory. Therefore, this study performed statistical diagnostics for asset classes to find the mean, standard deviation, and correlation. These three parameters are implemented in the Markowitz equation to find weightage to reduce portfolio risk in an efficient frontier method.

4.0 RESULTS & DISCUSSION

4.1 KWAP ROI, Asset Allocation, and Gross Investment per 1bps

This study examines the asset allocation pattern from 2007 to 2018 by KWAP.

In the latest financial report (2018), KWAP allocated approximately 46% of its investment asset to fixed income instruments, 40% to equity securities, and 14% to alternative investments such as private equity and real estate. Most of the KWAP's investments are in Malaysia, and international portfolio assets account for approximately 13% of its investment assets.

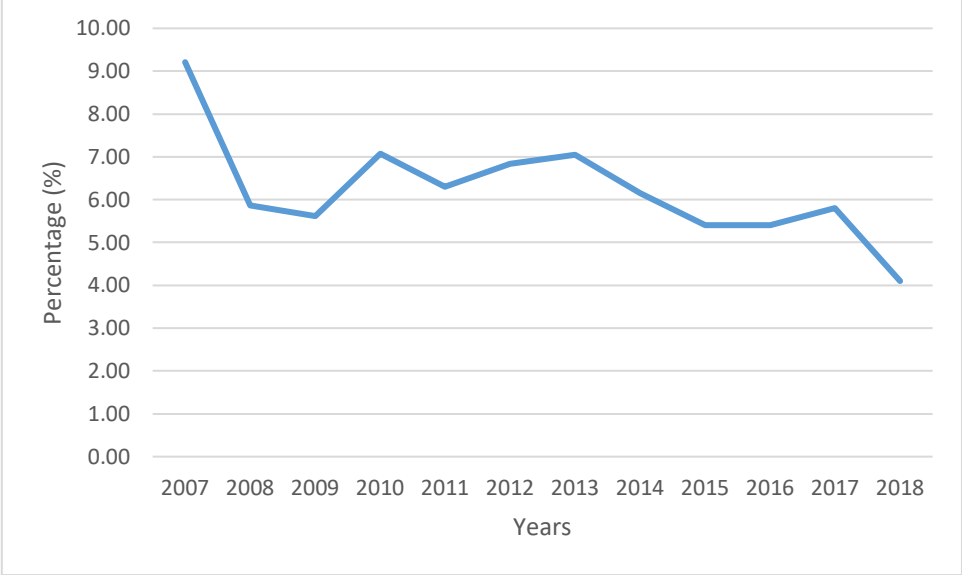


Figure 1: KWAP Return on Investment (ROI) from 2007 to 2018

Figure 3 shows the KWAP ROI from 2007 to 2018. KWAP was initiated in 2007 and had a drop-in return in the second year, about 6%, when recorded at 9% in the first year. The effect of crises can be observed throughout these eleven years from the poor performance of the KWAP fund from 2007 to 2008. The poor performance in the US and UK stock markets in 2008 and 2009 when the subprime and European crises contributed to the low return in these years. Since the US and the UK were Malaysia's top two most preferred international capital markets affected it much, and it may impact our global investors and return.

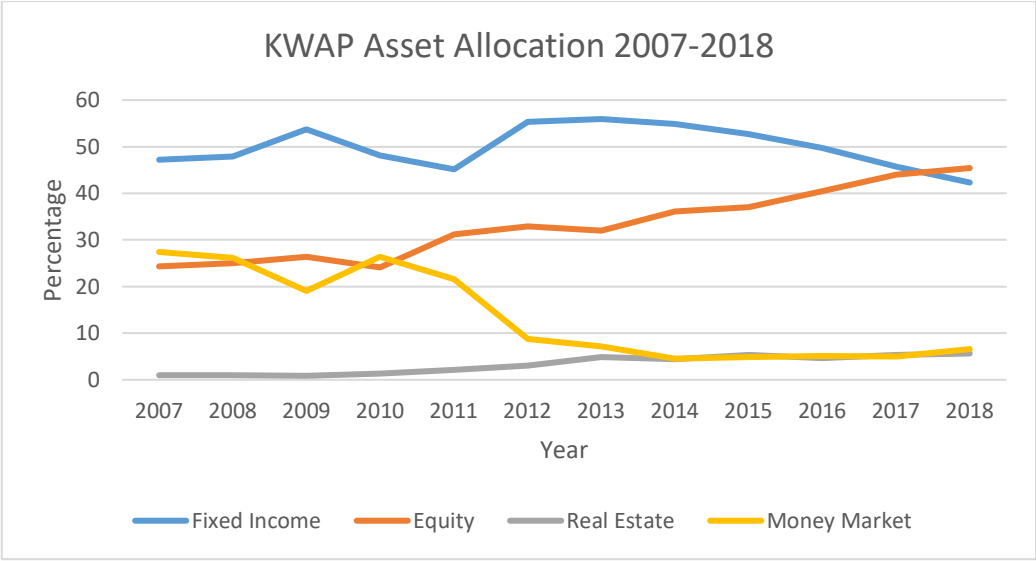


Figure 2: KWAP Asset Allocation from 2007 to 2018

Figure 2 shows that KWAP has invested in four main asset classes since its inception: Equity, Fixed Income, Money Market, and Real Estate. In 2007, KWAP started its asset allocation of about 48% in a fixed income portfolio, 24% in equity, and 27% in money market placement.

The fixed income portfolio and money market have been reduced throughout the eleven years, while equity and real estate have gradually increased.

Regarding equity allocation, KWAP has had a rising trend in investing its fund into equity investment since the beginning. Hence, it explained that KWAP had been a substantial shareholder among Malaysia's largest listed companies (KWAP, 2019). The companies include Tenaga Nasional and the top two financial institutions: Malayan Banking (Maybank) and CIMB Group Holdings (CIMB). Any dividend-paying sector, such as banking and telecommunications, is favoured by KWAP.

The Society of Actuaries (SOA) (2011) elaborated that trend of many pension plans continues to invest in equity securities by taking additional risk. However, financial economists would argue that liabilities are bond-like and plan assets would be best invested in high-quality (or risk-free) fixed-income investments.

However, compared to fixed income, the sponsor must realise where the fund will be susceptible to volatility in the equity markets and down-market cycles. Regarding Fixed Income, KWAP has been reduced from 47% of its investment fund in 2007 to 42.31% in 2018. The 10% reduction over eleven years shows that KWAP has increased its risk tolerance since its initiation.

In the early ages of KWAP, higher allocation to the money market asset classes was up to 26% to 27% for the first four years (2007-2010). Since KWAP has less liquidity requirement, the exposure on money market assets should be lower since it generates a lower return than other asset classes.

KWAP's allocation into real estate is also on a rising trend. Over the eleven years, KWAP has increased its weight from 1% to 5.6% in real estate by 2018. According to Hudson-Wilson et al. (2005), real estate has acquired acceptability as a mainstream asset class among institutional investors. High capital flows, high prices, reduced yields, and expansion of the real estate universe into relatively untested property kinds or international markets are all issues with this acceptance.

Table 4: Gross Investment Income for each 1% asset allocation

Years	KWAP Gross Income per 1bps			
	Equity (MYR Billion)	Fixed Income (MYR Billion)	Money Market (MYR Billion)	Real Estate (MYR Billion)
2007	0.10(1)	0.02(3)	0.01(4)	0.06(2)
2008	0.05(1)	0.02(3)	0.02(4)	0.03(2)
2009	0.05(1)	0.03(3)	0.02(4)	0.04(2)
2010	0.10(1)	0.04(3)	0.01(4)	0.04(2)
2011	0.07(1)	0.04(3)	0.02(4)	0.04(2)
2012	0.09(1)	0.04(3)	0.04(4)	0.08(2)
2013	0.07(2)	0.04(3)	0.03(4)	0.36(1)
2014	0.07(2)	0.05(3)	0.04(4)	0.24(1)
2015	0.09(1)	0.05(2)	0.05(3)	0.02(4)

2016	0.07(2)	0.06(3)	0.04(4)	0.10(1)
2017	0.10(2)	0.09(3)	0.03(4)	0.12(1)
2018	0.04(2)	0.11(1)	0.04(4)	0.04(3)
Average	**0.08(2)**	**0.05(3)**	**0.03(4)**	**0.10(1)**

Parentheses: The ranking within the portfolio
Source: Author's computation

This study computes each asset class's average gross investment income over average allocation for eleven years (2007-2018). Table 4 shows the gross investment income for each 1% allocation by asset classes. On average, the real estate asset has demonstrated the most performing asset classes within eleven years, contributing about RM100 million per one percent. This number contributed to high performance for real estate in 2013 and 2014.

Investing in equity is the second-highest asset class contributing to KWAP's gross investment income. On average, Equity investment contributed about RM80 million per one percent allocation. However, income by investing in equities or stocks contributed the highest income for every year except 2013 and 2014. Furthermore, investing in Fixed Income contributed on average RM50 million and Money Market placement of RM30 million per one percent allocation. The recent year of 2018 saw the fixed income contribute the highest incomer per 1bps compared to other asset classes.

4.2 Performance Ratio for KWAP 2009-2018

Table 5: KWAP's performance ratio for 2009 - 2018

Performance Ratio	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Sharpe Ratio	1.33	2.22	0.92	1.34	1.28	1.12	0.90	0.97	1.21	0.47
M-squared	27.50	29.60	11.29	16.91	13.98	12.62	10.73	14.05	12.26	9.16

Source: Author's computation

Table 5 shows that KWAP's performance has been accessed into two different performance ratios from 2009 to 2018 using i) Sharpe Ratio and ii) M-squared Risk-Adjusted Performance. This study uses the Sharpe Ratio to measure portfolio return earned a year above the risk-free rate per unit of risk the plans take. Portfolio volatility is measured by the price fluctuations of an asset or portfolio. The Sharpe ratio of a portfolio determines its risk-adjusted performance. As a result, the higher the Sharpe ratio, the more appealing the risk-adjusted return above the risk-free rate for any given portfolio.

KWAP recorded the highest ratio in 2010, where the ratio was recorded at 2.22 compared to the previous year at 1.33. The number contributed to the highest portfolio return that year, 7.07%, with only 1.9% of volatility.

Based on modern portfolio theory, adding assets to a diversified portfolio with a low correlation can decrease portfolio risk without sacrificing return. Based on this view, the Sharpe ratio has become the most widely used method for calculating risk-adjusted return. Hence, lowering risk

and increasing return should increase the Sharpe Ratio compared to any similar portfolio. A higher diversification level can be interpreted in a high Sharpe ratio.

The Sharpe ratio can also determine if a portfolio's excess returns result from sound investment selections or excessive risk. Although one portfolio or fund can enjoy higher returns than another, it is not considered a good investment unless reflected in a higher Sharpe Ratio.

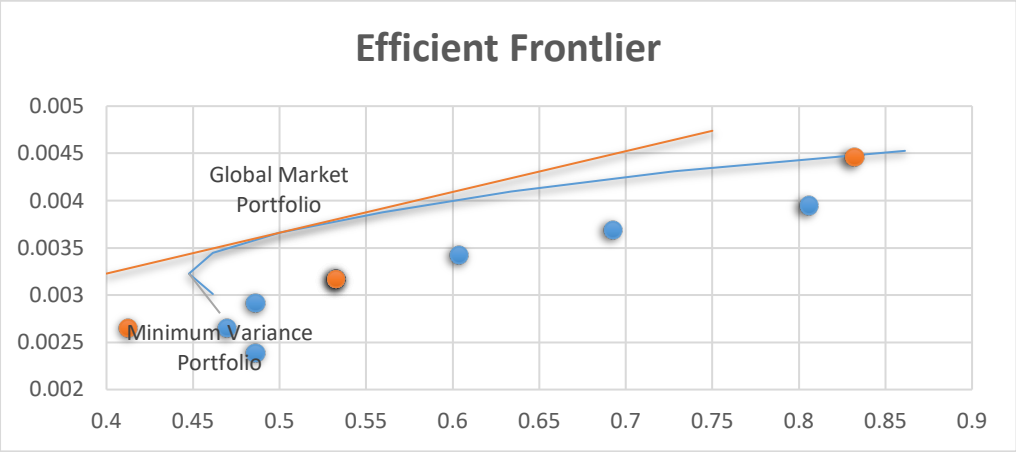
KWAP, in 2011 has aggressively taken a higher risk. The highest risk in 2011 has contributed to a lower Sharpe ratio of 0.92 than the previous year's highest. The Sharpe ratio decreased from 2012 to 2015, increasing risk and reducing the pattern in return. It shows that KWAP has aggressively taken an additional risk that does not contribute to better performance.

Second, this study uses the M2 ratio in evaluating performance. Even the Sharpe Ratio has been interested in assessing the excess return from any risk-free asset over risk. We can interpret the value of the M2 measure as the difference between a portfolio's scaled excess returns compared with the market. It could mean that the M2 estimate indicates how much return a portfolio would have attained if it had the same risk level as the index.

The ratio by KWAP has been decreasing since 2007. The trend shows that the KWAP portfolio performs better early since its returns are better considering its risk. The M2 measure is very diversified and acts as a helping tool in portfolio management. It helps to understand that the given level of risk assumed in a portfolio will incentivise the investor compared to the risk-free rate of return and benchmark portfolio. Therefore, if an investment is considered to have more risk than the benchmark, it might have fewer risk-adjusted performances with few benefits. The M2 measure facilitates the interpretation and helps compare two or more portfolios by the investor.

In conclusion, KWAP's performance has deteriorated for the past ten years. Based on the analysis, KWAP has aggressively taken additional risks without considering any alpha return (above risk-free return) for one unit of risk. Despite the return of investment in a reducing trend, the ratio has contributed to higher market risk.

4.3 Global Market Portfolio and Efficient Frontier



Source: Author's computation

Figure 3: The Capital Market Line (CML) and Efficient Frontier Graph

Figure 3 shows the computer-efficient frontier graph and the Capital Market Line (CML) computed using proxy variables for each asset class. The point between these two graphs is Global Market Portfolio, where the most diversified asset allocation point is in the graph.

The capital allocation line (CAL), also referred to as the capital market line (CML), is a line created on a graph of all possible combinations of risk-free and risky assets. Capital allocation is the allocation of funds between risky and riskless assets. Combining the portfolio with the best return on the efficient frontier with a riskless asset, the foremost excellent range of expected returns is often achieved, allowing any investor to select the combination that best suits them regardless of risk aversion.

Table 6: Correlation Matrix between Asset Classes

Asset Class	Equity	Fixed Income	Money Market	Real Estate	International Stocks
Equity	1.000	0.191	-0.274	0.746	0.607
Fixed Income	0.191	1.000	0.057	0.207	0.122
Money Market	-0.274	0.057	1.000	-0.205	-0.221
Real Estate	0.746	0.207	-0.205	1.000	0.597
International Stocks	0.607	0.122	-0.221	0.597	1.000

Source: Author's computation

Table 6 shows a correlation between asset classes, as expected that fixed income will negatively correlate with equity exposure (0.191). Real Estate and International stock classes have a high correlation with equity classes. When the economy grows, the logic is reflected by higher stock prices, and real estate will boom.

Table 7: Asset Allocation based on Efficient Frontier Graph

Asset Class	Asset Allocation		
	Minimum Variance Portfolio	Global Market Portfolio	High Risk
Equity	19.98%	17.13%	0.00%
Fixed Income	20.03%	24.95%	15.23%
Money Market	20.04%	12.42%	0.00%
Real Estate	19.97%	8.70%	0.00%
International Stocks	19.98%	36.80%	84.77%

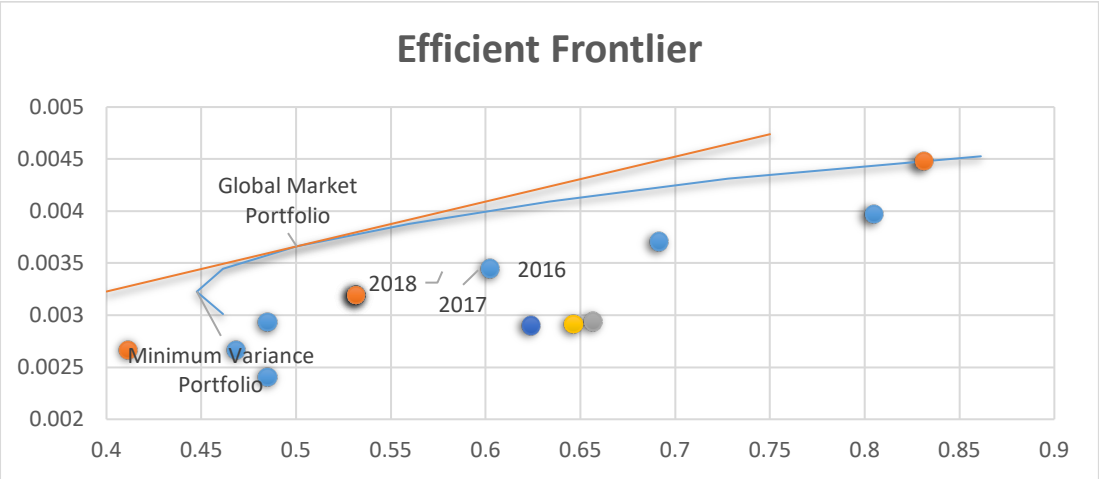
Source: Author's computation

Table 7 shows three asset allocation proposals in different situations. A minimum variance portfolio is where asset allocation has the lowest risk-taking compared to its peer portfolio. A diversified portfolio has less risk as compared to another portfolio. The minimum variance portfolio produces almost 20% for each asset class. These three situations are derived from scenario analysis to produce the weightage for each asset.

This point allocation refers to a diversified portfolio that creates the lowest point of volatility. This point in the efficient graph is suitable for risk-averse investors. The philosophy behind risk-averse investors is to spread the eggs across the baskets. As the share of risky assets in the portfolio grows, so does the risk until the portfolio consists entirely of hazardous assets. The portfolio's risk is the combination of the risk of the assets. Diversification reduces risk by combining assets with varying correlation coefficients among the assets that make up the portfolio. Because all assets are exposed to systemic risk produced by macroeconomic issues that affect almost all assets, most assets have some correlation.

Global Market Portfolio is where asset allocation produces the highest Sharpe ratio and act as a baseline for asset allocation. Global Market Portfolio is weighting tilt towards the International stocks or international exposure. An international market has many transactions, and investors might eliminate a few liquidities and delay risks. The situation has created a better portfolio that offers a higher return in international exposure, given a lower risk. The point contains all risky investable assets and eliminates diversifiable risks by definition.

Furthermore, it is a high-risk point where the plans maximise the return regardless of the risk-taking. More than 80% of the recommended asset class is a tilt toward international stocks. Regardless of risk, the local market would not offer an attractive return compared to global markets. However, a minimal allocation in fixed income is still required to keep the cash flow stream to support the liabilities requirement.



Source: Author's computation

Figure 4: The Capital Market Line (CML) and Efficient Frontier Graph with KWAP Asset Allocation

Figure 4 shows that KWAP asset allocation is outside the efficient frontier line. It means that KWAP has taken additional risks but reported a lower return. The three points have been derived from asset allocation last three years (2016-2018), as stated in Table 8. This recommendation is either for asset allocation increases or decreases derived based on the risk level taken by KWAP.

Table 8: KWAP's Asset Allocation for the past three years. (2016-2018)

Asset Class / Year	Asset Allocation			Recommendation
	2016	2017	2018	
Equity	35.15%	38.09%	38.22%	Decrease
Fixed Income	47.69%	44.17%	40.90%	Decrease
Money Market	5.15%	5.02%	6.63%	Increase
Real Estate	1.46%	1.70%	2.12%	Increase
International Stocks	10.54%	11.02%	12.13%	Increase

Source: Author's computation

KWAP is on the right track since the allocation trend is as per recommendation by the global market KWAP has been adopting the total return approach as a sole and primary performance metric, a more dependable method for retirement income strategies and in mitigating certain risks that are inherent to the investment portfolio, while generating consistent returns (KWAP, 2018)

SOA (2011) finds the private sector-defined benefit system faces a substantial increase in required cash funding. The increase is due to the decline in high-quality corporate bond yields over the past few years. The effects of the equity market decline and subsequent foregone market returns have increased contributions.

Based on the latest three years of KWAP performance, KWAP focuses too much on traditional asset classes invested in Equity and Fixed Income. The equity allocation between these two asset classes has increased while fixed income is decreasing. KWAP's fund feature has a long tenure where it can absorb any losses.

Based on the recommendation, KWAP should reduce fixed income allocation and start having more international exposures or stocks. The money market seems surprisingly a safe asset allocation with the lowest risk exposure. However, it provides a steady return to the funds. Hence, increased allocation in the money market is the answer.

A study by (Michas, 2014) has the potential for better performance in terms of returns and risk if Canadian pension funds can diversify without restriction into international assets. It has also demonstrated that portfolio diversification in foreign securities can achieve substantial risk reduction advantages.

5.0 PENSION ASSET ALLOCATION

The size of the portfolio affects allocation strategies. A small portfolio may lack the resources or qualifications to implement any complex strategy. However, KWAP is considered one of the significant pension funds and can implement complex strategies such as private equity and infrastructure. More extended tenure has increased pension funds' ability to invest in this asset.

KWAP should align the investment strategies with the ratio of average active participants to the average pensioner. Suppose there is a higher percentage of active participants. In that case,

the plan can bear an additional risk since the plan has a longer tenure with more contributions than benefits. A higher proportion of retired lives (lower workforce age) pushes the funds to a higher liquidity requirement. Life Cycles Models Theory has discussed this strategy, where young investors would afford to take a risk and invest a more significant proportion of their financial wealth in stocks or risky assets.

SAA is not fixed but must continually be reviewed and updated as the client and longer-term market expectations change. Given the global outlook, pension providers must constantly check their strategic asset allocation by seizing any opportunities that could help their fund grow bigger without compromising the risk appetite.

6.0 CONCLUSION

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. KWAP, one of Malaysia's primary pension providers, has strategies for managing an optimal asset allocation to maximise the return.

Within 13 years, from 2007 to 2020, KWAP managed to have a positive ROI throughout these years. However, the results have shown that KWAP's performance has deteriorated since 2007. This trend is due to the additional risk-taking by KWAP is not reflected by the additional alpha return as measured by the ROI.

The overall risk framework is already in place to minimise potential adverse effects on its performance. KWAP has another big room to invest efficiently using Capital Market Line (CML) and Efficient Frontier as a baseline. The result shows that KWAP should reduce fixed income allocation and start having more international exposures or stocks. The money market seems surprisingly a safe asset allocation with the lowest risk exposure. However, it provides a steady return to the funds. Hence, increased allocation in the money market is the answer. The strategy will sustain this organisation to meet its future commitment.

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