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Investment Policy Strategies in Risk and Liquidity Management for Dual-Account Old-Age Security Schemes

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ARTICLE INFO	ABSTRACT
	This study formulates an optimal investment policy for the Dual-Account Old-Age Security (JHT) scheme managed by BPJS Ketenagakerjaan amid increasing liquidity pressures caused by early withdrawals. Since regulatory changes have shifted JHT from a long-term retirement savings instrument toward a short-term liquidity facility, the program faces heightened asset–liability mismatch risks that threaten its sustainability. To address this challenge, the study integrates Asset Liability Management (ALM) and Modern Portfolio Theory (MPT) to design feasible investment allocation scenarios, which are subsequently evaluated using the Analytical Hierarchy Process (AHP). Primary data were obtained from pairwise comparison questionnaires completed by ten internal experts of BPJS Ketenagakerjaan with extensive experience in investment, risk management, actuarial analysis, and program policy. Five criteria were assessed: liquidity, asset–liability balance, portfolio risk, asset diversification, and returns. The results show that asset–liability balance (0.25) and liquidity (0.24) are the most dominant criteria in determining investment policy priorities. Among the evaluated alternatives, the 70:30 allocation between the Main Account and the Supplementary Account emerges as the optimal strategy, with a global weight of 0.67. This configuration provides adequate liquidity buffers to manage short-term claims while preserving long-term fund growth and portfolio efficiency. The findings confirm that an integrated ALM–MPT framework, supported by expert-based AHP prioritization, is essential to ensure the sustainability and resilience of the JHT Dual-Account scheme in the post-P2SK policy environment.

INTRODUCTION

The old-age program forms part of the social protection system that maintains income continuity when individuals enter unproductive periods. Barr and Diamond (2006) explain that the pension system functions to smooth consumption—maintaining stable consumption patterns from employment to retirement—while Holzmann et al. (2008) emphasize its role in preventing poverty and ensuring welfare in old age. Social protection theory finds relevance in Indonesia through the implementation of the Old Age Security Program (JHT), as mandated in Law Number 24 of 2011 concerning the Social Security Administration Agency (Arianto, 2023; Ihwanto et al., 2024; Khairani et al., 2025; Wijayanti & Jannah, 2019).

In Indonesia, the Old Age Security Program (JHT) aims to provide cash benefits when participants reach retirement age, experience permanent total disability, or die. Initially, disbursement provisions were regulated through Government Regulation No. 46/2015, which required a waiting period of five years and one month. However, regulatory changes via

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Government Regulation No. 60/2015 and *Permenaker* No. 19/2015 introduced flexibility for participants who resign, are laid off, or leave Indonesia permanently—even after just one month of inactivity. This flexibility, though intended to accommodate employment dynamics, has encouraged massive early disbursements, shifting *JHT*'s function from long-term retirement savings to short-term liquidity instruments and weakening the principle of consumption smoothing (Pal, 2016; Rani et al., 2024).

Internal data from *BPJS Ketenagakerjaan* (2020–2024) show that *JHT* claims are dominated by participants aged 20–30 years due to resignations, with 1.77 million cases in 2024—far exceeding pension claims of 134,600. This pattern reflects a tendency toward early withdrawals that transform *JHT* from old-age savings into a short-term liquidity source, reducing accumulated investment capacity and program sustainability (Alsubaie, 2025; Bedard et al., 2020; Joubert, 2019).

Early withdrawals shorten and volatilize the structure of obligations. This asset-liability mismatch heightens the need for liquidity buffers and risks forced asset sales in unfavorable market conditions, depressing yields and weakening compound investment growth (Bhansali, 2021; Guzel, 2021; Keating et al., 2016; Marozva, 2017). Early withdrawals also truncate the accumulation period for contributions and investment returns, limiting the fund's long-term benefit capacity. Empirical evidence indicates that rising early withdrawals lowered the Fund Adequacy Ratio (*RKD*) to 99.3% in June 2022, with the JHT replacement rate reaching only 15.54%—far below the ILO standard of 40% and lower than Vietnam (60%) and Thailand (45%) (Saragih et al., 2023).

Large-scale early withdrawals also generate liquidity and solvency pressures, reducing investment value through asset sales in unfavorable markets and reinforcing asset-liability mismatch indications (Bakroh, 2020). The high frequency of early withdrawals leaves *BPJS Ketenagakerjaan* facing a dilemma between short-term obligations and long-term sustainability (Bedard et al., 2020; Fathurrahman, 2020; Khairat, 2023; Rahayu, 2022). According to the *BPJS Ketenagakerjaan* Annual Report (2024), the JHT portfolio remains dominated by debt securities (74.97%) and deposits (12.72%), reflecting a long-term investment orientation amid rising liquidity risk. Thus, applying Asset Liability Management principles—as recommended by Holzmann and Hinz (2005)—is essential to align benefit cash flows with asset cash flows, set risk and liquidity limits between accounts, and maintain proportionate liquidity buffers so short-term needs do not undermine long-term fund sustainability.

In response, the government issued Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector (P2SK), introducing the JHT Dual Account concept: separating funds into a Main Account for retirement and an Additional Account for urgent needs. Similar models operate in Malaysia via the EPF (75:15:10 proportions) and in Singapore via the CPF (three functional accounts) (Chia & Tsui, 2019; EPF, 2024). Malaysia and Singapore serve as benchmarks due to their defined-contribution pension systems' similarities and geographical proximity, representing Southeast Asian best practices.

JHT Dual Account must balance fund liquidity and sustainability. The Asset Liability Management approach aligns assets and liabilities, while Modern Portfolio Theory (MPT) ensures portfolio efficiency through risk-return diversification. To identify optimal strategies amid interacting criteria, the Analytical Hierarchy Process (AHP) method applies (Saaty,

1980). This research matters because no prior study has integratively combined ALM, MPT, and AHP in the Indonesian JHT Dual Account investment policy context.

METHOD

This research employed an exploratory-descriptive design with a mixed-methods approach, combining qualitative methods to explore expert preferences and quantitative methods to develop comprehensive *JHT Dual Akaun* investment policy strategies. The design centered on a case study of *BPJS Ketenagakerjaan* as the managing institution for the Old Age Security Program (*JHT*).

Qualitative and quantitative data were integrated via an embedded design, with interview data enriching and interpreting AHP quantitative results, particularly experts' preferences for investment criteria. The theoretical framework drew on Asset Liability Management (ALM) and Modern Portfolio Theory (MPT) to formulate strategy criteria. Data collection occurred from February to August 2025 at *BPJS Ketenagakerjaan* Headquarters in Jakarta, the hub for national *JHT* policy and investment management.

Primary data consisted of AHP questionnaires completed by 10 purposively selected internal experts from *BPJS Ketenagakerjaan*. Respondent selection prioritized quality and consistency over sample size (Saaty, 1980), focusing on those with at least 10 years of experience in *JHT* fund management, investment, risk management, or actuarial work, and involvement in policy formulation or evaluation across relevant units. Supporting interviews clarified paired-comparison rationales, explored criteria preferences, and examined fund allocation scenarios between Main and Additional Accounts.

Secondary data came from official sources, including Law Number 4 of 2023 on the Development and Strengthening of the Financial Sector (*P2SK*), *BPJS Ketenagakerjaan* annual reports, OJK and Ministry of Finance publications, and *JHT* claims and portfolio data for 2020–2024. Comparative insights drew from academic literature and international practices, such as Singapore's Central Provident Fund (CPF) and Malaysia's Employees Provident Fund (EPF). Validity was ensured through credible, up-to-date sources.

Data collection used three techniques. First, respondents completed pairwise-comparison AHP questionnaires to derive priority weights for five ALM- and MPT-derived criteria—liquidity, asset-liability balance, returns, portfolio risk, and diversification—and three *JHT Dual Akaun* proportion alternatives. Response bias was mitigated via anonymity, neutral framing, Consistency Ratio (CR) ≤ 0.10 checks, and post-questionnaire debriefings. Second, semi-structured interviews probed assessment rationales and strategy preferences. Third, document analysis provided empirical context from *P2SK*, *BPJS Ketenagakerjaan* reports, 2020–2024 claims data, and EPF/CPF references.

Data analysis proceeded in two stages: descriptive analysis of secondary data on *JHT* empirical conditions (e.g., claims trends, fund adequacy ratios, portfolio composition) to identify risk and liquidity patterns; and AHP analysis to prioritize investment strategies systematically. AHP processing used specialized software (e.g., Expert Choice or Super Decisions) or validated spreadsheet models following standard procedures: hierarchical construction (objectives, criteria, alternatives), Saaty scale (1–9) pairwise comparisons, matrix normalization, eigenvector derivation, and consistency testing for reliable, replicable results.

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The next stage is the consistency test, which is carried out by calculating the Consistency Index (CI) and Consistency Ratio (CR), with a CR acceptance limit of ≤ 0.10 as an indicator of the logical consistency of respondents' assessments. As an illustration of the calculation, for a matrix measuring 3×3 with a value λmax = 3.085, it is obtained:

CI = CR= indicates that the assessment results are consistent and can be used to determine strategy priorities. The weight of criteria and alternatives that have been declared consistent is then used to compile a ranking $\frac{\lambda max - n}{n - 1} = \frac{3,085 - 3}{3 - 1} = 0,0425 \frac{CI}{RI} = \frac{0,0425}{0,58} = 0,073 \leq 0,10$ of JHT Dual Account investment policy strategies. To ensure the reproducibility and accuracy of the calculation results, the AHP spreadsheet model is validated through two stages: 1) Theoretical validation, by comparing the results of eigenvector and Consistency Ratio (CR) calculations with examples of standard problems from the books Saaty (1980) and Saaty & Vargas (2012). 2) Empirical validation, by cross-checking the results of the spreadsheet against the professional software Expert Choice v11.5.

Validation of the results of the analysis is the final stage to ensure the methodological integrity and reliability of the priority results of the strategy obtained. All stages of analysis are illustrated.
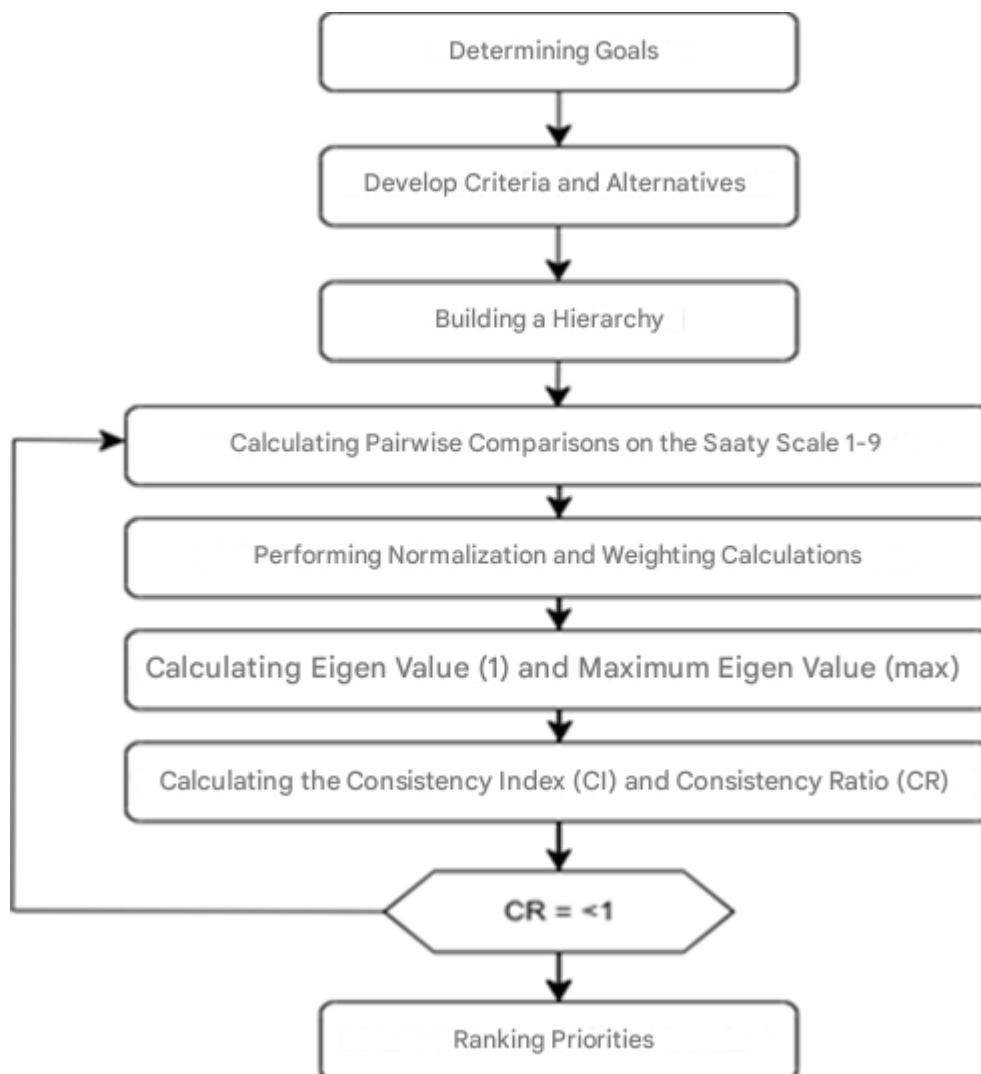

Figure1. Stages of AHP Analysis

Respondents in this study were internal experts from *BPJS Ketenagakerjaan*, selected via purposive sampling. Selection targeted individuals with extensive experience, strategic positions, and direct involvement in investment management, risk management, actuarial/research, program policies, services, and finance.

Ten respondents participated, each through brief interviews and pairwise comparison questionnaires assessing five strategy criteria (liquidity, asset-liability balance, returns, portfolio risk, and asset diversification) and three alternative fund ratio scenarios between the Main Account and Additional Account.

AHP results determined priorities for JHT Dual Account investment policy strategies, with the highest-weighted alternatives as primary strategies and others as adaptive options. Respondent identities were anonymized as R1–R10 to ensure confidentiality and objectivity.

RESULT AND DISCUSSION

This study involved ten internal experts from *BPJS Ketenagakerjaan* who were selected purposively based on information-rich case criteria, namely individuals with long experience, strategic positions, and direct involvement in the formulation of investment policies and the implementation of the Old Age Security (JHT) program. As many as 70 percent of respondents have worked for more than 20 years and occupied strategic positions at the level of Deputy and Assistant Deputy in the fields of Services, Investment, Finance, Strategic Plan & IT, and Risk Management. The distribution of expertise includes services (40%), actuarial and research (30%), investment (20%), and finance (10%), which reflects a balanced policy perspective in the AHP assessment process. Relatively homogeneous composition of respondents at the senior position level can lead to group polarization, where strategic decisions are easier to consolidate but risk reducing the diversity of perspectives (Baron et al., 2020).

Data collection was carried out in February-August 2025 at the BPJS Employment Headquarters, Jakarta, using the Analytical Hierarchy Process (AHP) questionnaire which contains five investment strategy criteria: liquidity, asset-liability balance, returns, portfolio risk, and asset diversification. All assessment results were tested using Consistency Ratio (CR) and only data with a CR of ≤ 0.10 (Saaty, 1980) were declared valid for analysis.

Table 1. Research Respondents

Response	Job Level	Long Time Working	Field	Relevance of Expertise to Investment Analysis/ALM
R1	Deputy	>20 years old	Service	Understand participant claim patterns and benefit withdrawal behaviors that affect the program's liquidity needs.
R2	Deputy	>20 years old	Service	Manage claims data systems and digital channels that support real-time JHT cash flow estimation.
R3	Deputy	>20 years old	Service	Review the policies of the JHT program, including P2SK regulations and benchmarking the EPF–CPF model in the context of Dual Accounts.
R4	Deputy	>20 years old	Social Security Actuarial and Research	Prepare liability projections and solvency analysis as the basis for the implementation of ALM.

R5	Deputy	>20 years old	Risk Management	Directs investment risk management policies and oversight of portfolio risk profiles.
R6	Deputy	11–15 years	Investment	Analyze portfolio performance and diversification according to the risk–return trade-off principle.
R7	Assistant Deputy	>20 years old	Social Security Actuarial and Research	Conduct benefit valuation and sensitivity analysis of financial assumptions for asset balance liabilities.
R8	Assistant Deputy	>20 years old	Social Security Actuarial and Research	Supporting the calculation of the duration of liabilities and the solvency analysis of funds.
R9	Assistant Deputy	>20 years old	Investment	Engage in asset allocation planning and evaluation of investment portfolio performance.
R10	Assistant Deputy	11–15 years	Service	Review the policies of the JHT program, including P2SK regulations and benchmarking the EPF–CPF model in the context of Dual Accounts.

Source: Processed 2025

Account Characteristics in the Dual Account JHT Scheme

The results of interviews with two internal experts from *BPJS Ketenagakerjaan* who have benchmarked the Malaysian Employee Provident Fund (EPF) as well as a study of Law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector (P2SK) show that the separation of JHT Dual Accounts is a key policy to balance the sustainability of long-term benefits and liquidity resilience. The distinction between the characteristics of the Main Account and the Supplementary Account reflects the application of the theory of mental accounting (Thaler, 1985) and the behavioral life-cycle hypothesis (Shefrin & Thaler, 1988), where the separation of accounts is used to direct the behavior of participants in distinguishing short-term and long-term financial goals. The Main Account functions as a commitment account that helps participants withstand short-term consumption impulses and maintain the discipline of saving until retirement age, while the Additional Account acts as a liquidity account that provides flexibility to deal with urgent needs such as education, health, or termination of employment. Thus, the design of the Dual Account is not only administrative, but also a behavioral instrument to overcome self-control problems and liquidity constraints for participants, including informal sector workers.

Behavioral and Governance Aspects in Dual Accounts

The Main Account is conceptually managed to guarantee old-age benefits through medium- to long-term investments in medium- to low-risk instruments such as Government Securities (SBN), investment-grade corporate bonds, strategic equity, and infrastructure projects that support long-term value growth. In contrast, the Additional Account is directed to maintain the availability of liquid funds through placement in low-risk and easy-to-liquidate instruments such as money market instruments and short-term SBN, to be able to respond to the need for more frequent disbursements without disrupting long-term investment stability.

In this context, automatic threshold-based rules between the Main Account and the Additional Account can be considered as a policy design option to maintain a balance of risk and liquidity, rather than as a mechanism that has been in place in the current regulations.

However, the implementation of automatic rebalancing faces governance and regulatory challenges, including the risk of violating the prudential principle if asset composition adjustments are made aggressively to trigger forced selling, increase transaction costs, or cause duration mismatch). The principles of prudence recommended in long-term fund management practices emphasize the importance of matching asset maturity and liabilities, conservative management of liquidity risk, and the need for strong justification for any changes in investment strategy.

As a mitigation measure, the design of the automatic rebalancing mechanism in the context of this research is proposed to be implemented in stages by utilizing cash inflows of contributions and maturity of assets, thereby minimizing the need for forced sale of strategic assets. Adjustments to the composition between the Main Account and the Additional Account should be made using conservative limits, such as a certain maximum portion of the total funds that can be transferred between accounts per year, which is determined based on the results of the Asset Liability Management (ALM) analysis, liquidity stress testing, as well as the approval of the Investment Committee and regulatory supervision. Thus, liquidity flexibility is maintained without sacrificing long-term sustainability.

From a governance perspective, the implementation of flexibility in Supplementary Accounts requires a system infrastructure that is integrated between claims, investment, and risk management functions. Biometric verification and multi-layered authentication through the JMO application, frequency and nominal restrictions on disbursement, and real-time monitoring of withdrawal patterns are important instruments to reduce the risk of moral hazard and misuse of liquidity facilities. In addition, strengthening behavioural insight-based education through default framing of pension benefits, simple financial advisory services, as well as short-term and long-term goal separation campaigns, as well as lessons learned from the practices of EPF Malaysia and CPF Singapore, is needed to improve participants' financial literacy and saving discipline.

With a combination of proper behavioral design, strong governance, and portfolio supervision based on ALM principles and Modern Portfolio Theory (MPT), the JHT Dual Account policy has the potential to maintain a balance between participants' short-term liquidity needs and the sustainability of long-term benefits in a more measurable, accountable, and sustainable manner.

Formulation of Dual Account JHT Investment Allocation Scenario Using ALM and MPT Principles

The application of the principles of Asset Liability Management (ALM) and Modern Portfolio Theory (MPT) in this study aims to develop a scenario for the allocation of JHT Dual Account investments that can balance short-term liquidity needs with the sustainability of long-term benefits. The integration of ALM and MPT is carried out explicitly and measurably, so that the three allocation scenarios analyzed in the next stage are not normative assumptions, but rather the result of a quantitative process that can be traced.

The first step is carried out through a duration gap analysis between the assets and liabilities of the JHT Program. The duration of assets is calculated based on the composition of *BPJS Ketenagakerjaan*'s investment portfolio in 2024, which is dominated by government securities and corporate bonds, with an additional portion of deposits and money market instruments, mutual funds, as well as equity and participation. Each asset class is given a

duration that reflects the character of its maturity, then a weighted average duration is calculated based on the fair value of each asset class. The processing results show that the average duration of JHT's portfolio assets is in the range of 5.0 years.

The duration of the obligation is obtained from actual data on JHT claim cash flow for the 2020–2024 period. The claim pattern shows that the disbursement of benefits is dominated by participants of productive age and many occur before retirement age, so the economic obligations of the program are relatively short-term. By calculating the weighted average of the time of realization of claims against total liabilities, the duration of obligations is approximately 2.4 years. A summary of the results is shown in Table 2.

Table 2. JHT Portfolio Duration Gap Analysis Results

Component	Duration (years)
Average duration of JHT portfolio assets (Da)	5,0
Average duration of JHT liabilities (Dl)	2,4
Duration gap (Da − Dl)	2,6

Source: Processed 2025
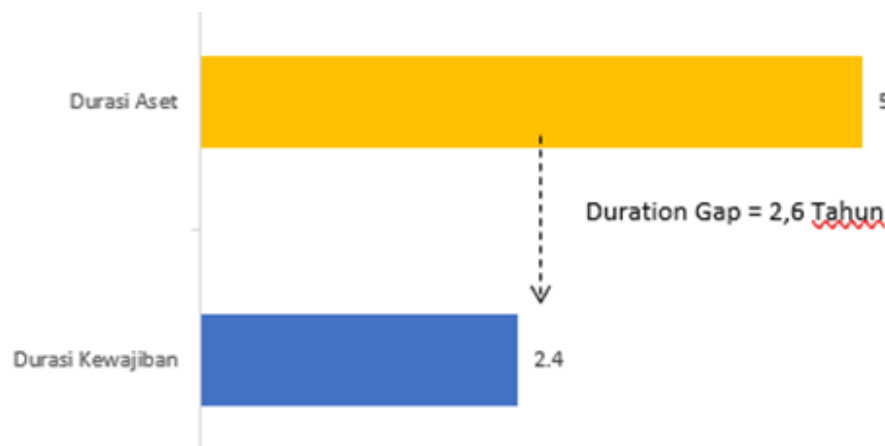
Gambar 2. Duration Matching
Source: Processed 2025

The positive duration gap of 2.6 years shows that the asset portfolio in aggregate is longer than JHT's effective liabilities. This condition indicates a risk that a decline in market value or a surge in short-term claims could occur before most assets mature, creating liquidity pressures. These findings provide the normative basis for the JHT Dual Account design, where some funds should be placed in highly liquid and short-term portfolios to protect short-term payability, while others can be directed to longer-term portfolios to support long-term benefit growth.

Based on these results, this study established different roles for the two accounts. The Additional Account is designed as a liquidity buffer, with a composition of low-risk, easy-to-liquid, and short-duration assets (less than one year), so as to be able to respond to premature liquidation behavior without disrupting the stability of the long-term portfolio. The Main Account is positioned as a medium-long-term funding base with a duration of about five to seven years, utilizing higher-yield instruments but still within regulatory constraints and prudential principles. Thus, the design of Dual Accounts is directly derived from the results of ALM analysis, not just administrative considerations.

The next step uses the MPT approach to assess the efficiency of the combination between the Main Account and the Additional Account within the framework of the Dual Account. JHT's assets are grouped into two conceptual portfolios, namely the Main Account-style portfolio which represents medium-long-term assets with higher yield potential, and the Additional Account-style portfolio which represents short-term liquid assets with lower risk. The expected and risk yield parameters of each group were calibrated using historical data on BPJS Ketenagakerjaan's investment performance and the profile of financial market instruments for the 2020–2024 period. The calibration results show that the Main Account-style portfolio provides higher average returns with greater volatility than the Additional Account-style portfolio, which is more stable but has lower returns.

By using these parameters and including the constraints resulting from the ALM analysis, including the minimum requirement for liquid assets, the target aggregate duration, and regulatory provisions, a combination of the proportions of Main and Additional Accounts is compiled which forms an efficient frontier. From the ALM-feasible range (Main Account around 70–90 percent and Additional Account around 30–10 percent), three representative scenarios were selected that were at or very close to the efficient portfolio set,
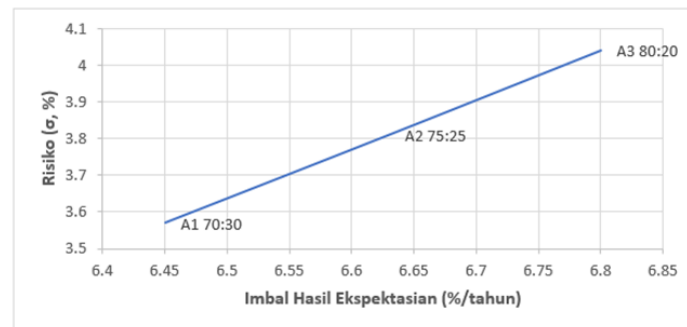

Figure 3 Efficient Frontier Curve

Table 3. Alternative JHT Dual Account Investment Scenarios on Efficient Frontier

Alternative Account Proportions	Expected Return (%/year)	Risk (σ, %)	Key Characteristics
A1 70:30	6,45	3,57	Liquidity is strong, duration gap is more controlled, returns are moderate.
A2 75:25	6,63	3,81	Additional returns are accompanied by increased risk and decreased liquidity space.
A3 80:20	6,80	4,04	The highest return but the greatest risk and liquidity pressure.

Source: Processed 2025

The three scenarios are then plotted on the efficient frontier curve (Figure 3), with the horizontal axis indicating portfolio risk and the vertical axis indicating the expected return. The mapping results show that A1, A2, and A3 are at or very close to an efficient portfolio set that meets duration and liquidity constraints. Purely from a risk-return perspective, all of them can be categorized as efficient; The difference lies in the level of aggressiveness and liquidity buffer capacity.

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In the context of the JHT Dual Account policy, A3 provides slightly higher yields but with the greatest increased risk and liquidity pressure, making it more suitable for conditions with tight control over early disbursement. A2 offers more aggressive compromise than A1, but the additional returns are relatively limited compared to increased risk and reduced liquidity flexibility. A1 provides a combination of competitive returns with more controlled risk, wider liquidity space, and is most consistent with the goal of reducing the duration gap identified in the ALM analysis.

Thus, the 70:30, 75:25, and 80:20 scenarios that will be further evaluated through the AHP in Subchapter 4.4 are alternatives that have been tested first through the ALM and MPT frameworks. This ensures that the final recommendations not only reflect the subjective preferences of experts, but are also aligned with the liability profile, liquidity capacity, and long-term portfolio efficiency of the JHT Dual Account Program.

Determination of Priority of JHT Dual Account Investment Policy Strategy Using Analytical Hierarchy Process (AHP)

The formulation of an investment strategy on the JHT Dual Account scheme requires an analytical framework that balances the need for short-term liquidity and the long-term sustainability of the fund. The quantitative approach alone is insufficient because investment decisions are also influenced by professional considerations, policy makers and expert perceptions. AHP was chosen because of its ability to accommodate the uncertainty of judgment inherent in strategic decision-making. Compared to traditional optimization methods, AHP allows for non-quantitative factors such as regulatory compliance and social acceptance, which are crucial in the context of public policy.

This method breaks down complex problems into a hierarchy consisting of the main objectives, investment criteria synthesized from the principles of ALM and MPT, and three alternative JHT Dual Account investment allocations. A pairwise comparison process is carried out between elements at each level to obtain relative priority weights and consistency values, reflecting the collective perception of experts on key factors in investment strategies. Each respondent filled out a paired comparison matrix using the Saaty scale (1–9), for two matrix accounts, namely the Main Account and the Additional Account. The aggregation of expert perceptions was carried out using the Aggregate Individual Judgments (AIJ) method using geometric means, so that one group matrix was obtained for each account.
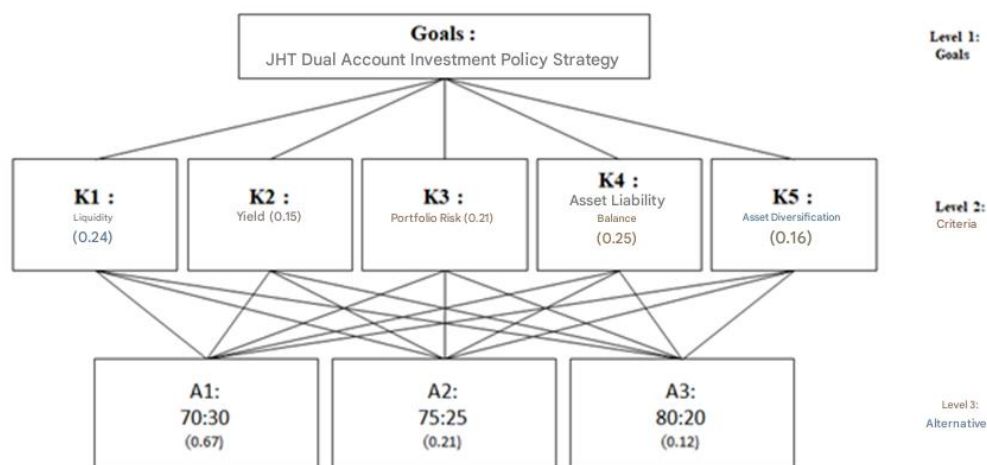

Figure 4. Hierarchy Structure of AHP JHT Dual Account

Source: Processed 2025

The AHP hierarchical structure used in this study consists of three levels. The first level *of goal* sets the main goal, which is to determine the most optimal JHT Dual Account investment policy strategy. The second level of criteria includes: K1 Liquidity, K2 Returns, K3 Portfolio Risk, K4 Asset Balance of Liabilities, and K5 Asset Diversification. These five criteria reflect the balance between the principles of prudence and investment productivity according to the ALM-MPT framework. The third alternative level consists of three investment proportion scenarios, namely A1 70:30, A2 75:25 and A3 80:20,

With this structure, the AHP allows researchers to quantify expert perceptions of the importance of each criterion and preference for each alternative. The result is in the form of priority weights that are the basis for determining the investment policy strategy of JHT Dual Account which is most in line with the principles of prudence (prudential management) and long-term portfolio efficiency. Each matrix was then tested for consistency using a Consistency Ratio (CR) with a validity limit of ≤ 0.10.

AHP Processing Procedures and Results

The Analytical Hierarchy Process (AHP) analysis is used to determine the level of relative importance between criteria in the JHT Dual Account investment policy strategy. The assessment was carried out by 10 internal experts from BPJS Ketenagakerjaan with experience in the fields of investment, risk management, and program policies. Each criterion was compared in pairs using the Saaty scale (1–9), then the results were combined through the Aggregate Individual Judgments (AIJ) method based on geometric averages to obtain a consistent and measurable priority weight. Aggregation was carried out using a geometric mean method that is robust for outliers.

This method was chosen because it maintains reciprocal consistency and is more resistant to extreme judgments than arithmetic means. Each comparison matrix is tested for consistency using the Consistency Ratio (CR), and is declared valid if the CR ≤ 0.10 (Saaty, 1980). The consistency test was carried out separately for each account because both have different management orientations: the Main Account is long-term oriented (long-term fund accumulation), while the Additional Account is oriented towards short-term liquidity buffer.

The initial stage of AHP analysis produced a pairwise comparison matrix that showed the relative perception between investment criteria in each account. Tables 4.4 and 4.5 present the aggregate value of the combined assessment of ten experts using the geometric mean method. The diagonal value (1.00) indicates the equivalence relationship between the criteria, while the value outside the diagonal represents the degree of dominance of one criterion over the other. Analysis of this dominance pattern is important to understand the orientation of fund management in both accounts before the normalization and weighting process is carried out.

Table 5. Results of Geometric Mean Pairwise Comparison of Main Accounts

Criterion	K1	K2	K3	K4	K5
	Liquidity	Yield	Risk portfolio	Balance of Assets Liabilities	Asset Diversification
K1	1.00	0.54	0.36	0.24	0.39
K2	1.85	1.00	0.62	0.42	1.60
K3	2.76	1.62	1.00	0.78	0.44
K4	4.17	2.39	1.28	1.00	1.46

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K5	2.58	0.62	2.27	0.68	1.00
Sum	12.37	6.17	5.53	3.12	4.90

Source: Processed 2025

Table 6. Pairwise Mean Geometric Results Additional Account Comparison

Criteria	K1	K2	K3	K4	K5
K1	1.00	4.47	2.62	1.54	4.21
K2	0.22	1.00	0.52	0.88	1.29
K3	0.38	1.92	1.00	1.79	2.16
K4	0.65	1.13	0.56	1.00	2.81
K5	0.24	0.78	0.46	0.36	1.00
Sum	2.49	9.30	5.17	5.57	11.46

Source: Processed 2025

After the paired comparison matrix on each account is processed using the geometric mean method, the next step is to calculate the eigenvector *value* to obtain the relative priority weight between the criteria. The normalization process is carried out by dividing each element of the matrix by its total columns, resulting in a standardized proportion that can be directly compared. The eigenvector value obtained represents the level of contribution of each criterion to the investment policy strategy in the context of the Main and Additional Accounts.

Table 7. Results of Normalization and Weighting of Main Accounts

Criteria	K1	K2	K3	K4	K5	Weight	Rank
K1	0.08	0.09	0.07	0.08	0.08	0.08	5
K2	0.15	0.16	0.11	0.13	0.33	0.18	4
K3	0.22	0.26	0.18	0.25	0.09	0.20	3
K4	0.34	0.39	0.23	0.32	0.30	0.31	1
K5	0.21	0.10	0.41	0.22	0.20	0.23	2
Sum	1.00	1.00	1.00	1.00	1.00	1.00	

Source: Processed 2025

The weighting results show that Asset Balance Liability (Q4) of 0.31 has the highest weight, followed by Asset Diversification (K5) of 0.23 and Portfolio Risk (K3) of 0.20. The dominance of these three criteria shows that the Main Account is directed to a growth with stability strategy, namely optimizing long-term growth by paying attention to the suitability of asset duration and investment risk control.

The relatively small Liquidity Weight (Q1) of 0.08 indicates that the availability of cash funds is not a top priority in this account, in line with the long-term oriented nature of the program. This weighting pattern reflects a balance between the MPT principle which emphasizes diversification for yield risk efficiency, and the ALM principle to maintain the suitability of the asset structure of liabilities. This result is also consistent with the policy direction of JHT fund management as stipulated in Government Regulation Number 55 of 2015, where the long-term portfolio is directed to instruments with a moderate risk profile by considering the stability of results and the continuity of participant benefits.

Table 8. Normalization Results and Additional Account Weighting

Criteria	K1	K2	K3	K4	K5	Weight	Rank

K1	0.40	0.48	0.51	0.28	0.37	0.41	1
K2	0.09	0.11	0.10	0.16	0.11	0.11	4
K3	0.15	0.21	0.19	0.32	0.19	0.21	2
K4	0.26	0.12	0.11	0.18	0.24	0.18	3
K5	0.10	0.08	0.09	0.06	0.09	0.08	5
Sum	1.00	1.00	1.00	1.00	1.00	1.00	

Source: Processed 2025

In the Additional Accounts, the weighting results show that Liquidity (Q1) of 0.41 is the top priority, followed by Portfolio Risk (Q3) of 0.21 and Balance of Assets Liabilities (Q4) of 0.18. The dominance of liquidity factors confirms the main function of this account as a short-term claim buffer. The Yield (Q2) criteria of 0.11 and Asset Diversification (K5) of 0.08 received the lowest weight, indicating that the management of Additional Accounts is more directed towards the security and readiness of funds rather than efforts to pursue maximum returns. This pattern is consistent with the principle of prudent investment in the risk management literature (Elton et al., 2014) and the provisions in Government Regulation Number 99 of 2013 and Government Regulation Number 55 of 2015, which requires *BPJS Ketenagakerjaan* to maintain a balance between security, liquidity, and investment returns in a balanced manner, where the main priority is to maintain liquidity adequacy) while minimizing the risk of asset degradation.

Table 9. Account Consistency Test Results Main and Extras

Matrix	λmax	THERE	CR
Main Account	5,28	0,07	0,06
Additional Accounts	5,14	0,04	0,03

Source: Processed 2025

A Consistency Ratio (CR) value of 0.06 for the Main Account and 0.03 for the Additional Account indicates that the entire assessment matrix meets the set consistency limit (CR ≤ 0.10). This means that experts' perceptions of the relationship between criteria are rational and not contradictory. A lower CR value on the Supplementary Account indicates a stronger understanding among experts on the importance of liquidity as a top priority in the management of the account.

To obtain the overall criterion weight, the weighting results of the Main and Additional Accounts are combined proportionally (50:50). The final weight reflects the balance between the long-term and short-term objectives in the JHT Dual Account investment policy.

Table 11. Priority Weight Results Criteria JHT Dual Account Strategy

Criteria	Priority Weights	Rank
K1 Liquidity	0,24	2
K2 Yield	0,15	5
K3 Risk Portfolio	0,21	3
K4 Balance of Assets and Liabilities	0,25	1
K5 Asset Diversification	0,16	4

Source: Processed 2025

The criteria with the highest weight are Balance of Assets and Liabilities (Q4) of 0.25, followed by Liquidity (Q1) of 0.24 and Portfolio Risk (Q3) of 0.21. These three criteria are the

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main pillars in the ALM framework because they determine the ability of the institution to maintain a balance of solvency and liquidity simultaneously.

Yield Weight (Q2) of 0.15 and Asset Diversification (Q5) of 0.16 rank next, indicating that increased returns are still considered, but in the context of risk adjusted performance. This weighting pattern shows that JHT Dual Account investment policy strategy is directed to achieve an optimal balance between long-term stability and short-term liquidity resilience. These findings are in line with the view of Barr & Diamond (2006) that a sustainable pension system must balance three main functions, namely sustainability, adequacy, and liquidity resilience.

The dominance of the Balance of Assets, Liabilities and Liquidity marks a strategic shift in *BPJS Ketenagakerjaan*'s investment culture. If previously the main orientation was more focused on the pursuit of returns (return driven strategy), this result shows a tendency towards liability-driven and liquidity-resilient strategies. This shift is an adaptive response to liquidity pressures that occurred after the surge in JHT claims for the 2020–2022 period, where the mismatch between asset cash flows and liabilities lowered the funding ratio and demanded increased ALM discipline.

Thus, the results of this AHP not only represent the technical preferences of experts, but also reflect the institutional paradigm shift in the management of JHT funds, which was previously oriented towards yield-based growth, has now shifted towards a paradigm of sustainability and liquidity resilience. This is in line with the policy direction of the post-P2SK Law and international literature recommendations which emphasizes the importance of a balance between long-term fund growth and liquidity adequacy for the sustainability of the social security system.

Priority of JHT Dual Account Investment Policy Strategy

Once the weight of the criteria is established, the next stage in the AHP analysis is to determine the alternative priorities of investment policy strategies that best suit the interest structure. The main objective of this stage is not simply to select the highest-value alternative, but to ensure that the investment decisions taken are truly aligned with the risk profile, liquidity needs, and ALM-MPT policy direction that have been formulated in advance. Therefore, each alternative fund proportion between the Main Account and the Additional Account is assessed based on its contribution to five key criteria (Liquidity, Return, Portfolio Risk, Asset Balance of Liabilities, and Asset Diversification), so that the end result can represent an optimal compromise between long-term fund growth and short-term liquidity resilience. At this stage, three alternative investment proportions were evaluated, namely A1 (70:30), A2 (75:25), and A3 (80:20) based on five main criteria that have been set. Each alternative comparison matrix is synthesized using geometric mean to obtain a collective assessment, and then normalized through eigenvector to generate a local priority per criterion. All matrices are tested for consistency so that the preferences formed are stable and rational. The alternative global priorities are then calculated using the weighted sum model, by multiplying the local weights against the weighting of the combined criteria between the Primary and Additional Accounts. With this draft, the final decision is not determined by a single dimension, but by the composition of interests that reflect the consensus of experts.

The results of alternative comparisons across all criteria show a consistent pattern. A1 (70:30) systematically outperformed A2 (75:25) and A3 (80:20). In the Liquidity criterion, A1

provides the highest liquidity buffer capacity to deal with short-term claims volatility. In Return, A1 shows a more risk-efficient rate of return, in line with the principle of risk-adjusted return. In Portfolio Risk, A1 occupies the most stable position because it has the lowest volatility exposure. In the Balance of Assets and Liabilities, A1 is also best suited to the purpose of duration matching the results of ALM analysis. Meanwhile, in Asset Diversification, A1 produces the most balanced portfolio spread between short- and medium-term instruments. The consistency of A1's dominance in all criteria shows that there is an understanding among experts that the 70:30 ratio is the optimal configuration to achieve liquidity resilience without sacrificing long-term fund growth.

Table 14. Alternative Weights for Each Criterion

Criteria	Weight	70:30	75:25	80:20
K1 Liquidity	0,24	0,51	0,28	0,21
K2 Yield	0,15	0,75	0,16	0,09
K3 Risk Portfolio	0,21	0,75	0,14	0,11
K4 Balance of Assets and Liabilities	0,25	0,68	0,23	0,09
K5 Asset Diversification	0,16	0,74	0,18	0,09

Source: Processed 2025

To obtain the weights in Table 15, a second round of pairwise comparison was carried out in which the experts compared the three alternatives (70:30, 75:25, 80:20) separately for each criterion. For example, for the 'Liquidity' criterion, experts judge which is more liquid: 70:30 vs 75:25, 70:30 vs 80:20, and 75:25 vs 80:20. The results of these paired comparisons are then aggregated and normalized to produce the weights in Table 15.

Table 15. Comparative Consistency Test Results Alternatives to Criteria

Criteria	λmax	THERE	CR	Information
K1 Liquidity	3,003	0,001	0,003	Consistent
K2 Yield	2,989	0,000	0,000	Consistent
K3 Risk Portfolio	2,990	0,000	0,000	Consistent
K4 Balance of Assets and Liabilities	3,023	0,011	0,020	Consistent
K5 Asset Diversification	3,010	0,005	0,009	Consistent

Source: Processed 2025

The Consistency Ratio (CR) value of all criteria was below 0.1, indicating that the assessment between the alternatives was logically consistent. The CR value is close to zero, for example in the Portfolio Yield and Risk criteria, because the result of geometric mean aggregation results in an almost perfect matrix in consistency

Based on the results of the priority weight of the criteria in Table 4.15, a global weight was obtained for each alternative investment policy strategy. This analysis was conducted to determine the optimal proportion between the Main Account and the Additional Account in the JHT Dual Account scheme, considering five main criteria, namely liquidity, return, portfolio risk, asset balance liability, and asset diversification. The global weights are calculated through a weighted sum model, where each alternative local weight to the criteria is multiplied by the weights of the combined AHP result criteria. For example, for alternative A1 (70:30):(0.51×0.24) + (0.75×0.15) + (0.75×0.21) + (0.68×0.25) + (0.74×0.16) = 0.67.

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These calculations are verified through eigenvector normalization to ensure the mathematical consistency of the aggregation results.

Table 18. Priority Weight Results Dual Account JHT Strategy Alternatives

Alternative	Total Weight	Rank
A1 70:30	0,67	1
A2 75:25	0,21	2
A3 80:20	0,12	3

Source: Processed 2025

The total weights in Table 4.17 are obtained by combining the criteria weights and alternative local weights (Table 4.15) using the weighted sum model. The final value is normalized to ensure the total weight of the entire alternative is equal to one. The results show that A1 (70:30) has the highest global weight (0.67), indicating the greatest preference of experts as the most optimal investment strategy in the context of JHT Dual Accounts.

Table 19. Value Recapitulation Aggregate Consistency of the AHP Model

Alternative	λmax	THERE	CR
A1 70:30	3.015	0.007	0.013
A2 75:25	3.005	0.002	0.004
A3 80:20	3.002	0.001	0.002

Source: Processed 2025

All results showed a CR < 0.1, indicating that the experts' preferences were very stable. Thus, the A1 alternative (70:30) is set as the most optimal investment policy strategy for JHT Dual Accounts. This configuration is in line with the principles of liability-driven investment and liquidity-resilient portfolios, as well as consistent with the policy direction of the post-P2SK Law which emphasizes a balance between fund sustainability and liquidity readiness.

Policy Implications and Implementation

The study finds that the investment strategy with a 70% Main Account and 30% Additional Account (A1) is the optimal configuration for balancing risk, return, and liquidity. This strategy is supported by a duration gap analysis showing a 2.6-year difference between asset and liability durations, highlighting the need for more short-term liquid assets without compromising long-term returns. The A1 strategy is not only an expert recommendation but also a response to this duration gap, aligning with Asset Liability Management (ALM) principles and investment prudence.

The strategy should be implemented gradually, using coupon reinvestment, maturity adjustments, and natural roll-overs, while actively managing the duration gap through an automatic rebalancing mechanism. This approach supports BPJS Ketenagakerjaan's solvency and liquidity, ensuring short-term claims can be met without sacrificing long-term growth. To ensure sustainability, risk mitigation strategies include strengthening governance, establishing an Investment Committee, developing an early warning system, and enhancing participant financial literacy. The synergy of these efforts will enable the effective and sustainable implementation of the A1 (70:30) strategy.

CONCLUSION

This study concludes that successful implementation of the Dual Account Old Age
Guarantee (JHT) program hinges on an investment strategy balancing risk and liquidity,
achieved by differentiating approaches: long-term growth for the Main Account and high
liquidity for the Additional Account to avert asset-liability mismatches. Integrating Asset
Liability Management (ALM) and Modern Portfolio Theory (MPT) identified the 70:30 fund
ratio as optimal, prioritizing short-term liquidity without compromising long-term growth,
while Analytical Hierarchy Process (AHP) prioritization confirmed its dominance in ensuring
stability and sustainability. These results underscore that, beyond regulatory design, an ALM-
MPT framework—periodically reassessed via AHP—drives program success. Future research
could empirically test the 70:30 strategy's performance through longitudinal simulations under
varying economic scenarios in Indonesia.

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