Lisbon School of Economics & Management
Universidade de Lisboa

MASTER OF SCIENCE IN
FINANCE

MASTERS FINAL WORK
PROJECT

INVESTMENT POLICY STATEMENT:
JANG MOUSEL

JOÉ JEAN-RAYMOND LIPPERT

JUNE 2026

Lisbon School of Economics & Management
Universidade de Lisboa

MASTER OF SCIENCE IN
FINANCE

MASTERS FINAL WORK
PROJECT

INVESTMENT POLICY STATEMENT:
JANG MOUSEL

JOÉ JEAN-RAYMOND LIPPERT

SUPERVISED BY: JOÃO JORGE

JUNE 2026

Abstract

This Master's Final Work develops an Investment Policy Statement (IPS) for a fictional private client, Jang Mousel, a 28-year-old cryptocurrency trader whose wealth and human capital are highly concentrated in speculative digital assets. The objective is to design a separate long-term safety portfolio that can support retirement and future family needs while reducing the household's dependence on a single high-risk asset class. The project follows a structured advisory process. It defines objectives and constraints, profiles risk tolerance, builds forward-looking capital market assumptions for a compact universe of eleven liquid asset classes across global equities, fixed income and alternatives, and derives a strategic asset allocation through constrained mean-variance optimisation. The selected policy portfolio targets an expected nominal return of around 6% per year at a moderate volatility of under 9%, implemented via low-cost UCITS index funds and ETFs suited for a Luxembourg-based investor. The €1.19 million allocated to the IPS is managed over a 32-year horizon as a deliberate counterweight to the client's concentrated crypto book, with direct crypto exposure, structural leverage and complex products excluded from the portfolio. Governance rules, monitoring procedures and a graduated de-risking framework specify how realised crypto gains are transferred into the diversified safety bucket over time. The design is then tested through historical backtesting against an external reference portfolio, Monte Carlo simulation of goal attainment, value-at-risk and conditional value-at-risk analysis, and a qualitative risk matrix. Overall, the proposed IPS translates a concentrated, speculative starting point into a disciplined, multi-asset plan aligned with long-term financial security.

JEL classification: C6; G11; G17; D14

Keywords: Asset Management; Portfolio Theory; IPS; Individual Investors; Strategic Asset Allocation; Mean-Variance Optimisation; Risk Profiling; Portfolio Construction

Resumo

Este Trabalho Final de Mestrado desenvolve uma Investment Policy Statement (IPS) para um cliente privado fictício, Jang Mousel, um trader de criptomoedas de 28 anos cujo património e capital humano estão fortemente concentrados em ativos digitais especulativos. O objetivo é conceber uma carteira de segurança separada e de longo prazo, capaz de sustentar a reforma e as necessidades futuras da família, reduzindo ao mesmo tempo a dependência do agregado familiar de uma única classe de ativos de elevado risco. O projeto segue um processo de aconselhamento estruturado. Define objetivos e restrições, avalia a tolerância ao risco, constrói pressupostos de mercado prospetivos para um universo compacto de onze classes de ativos líquidas, abrangendo ações globais, obrigações e alternativos, e deriva uma alocação estratégica de ativos através de uma otimização média-variância com restrições. A carteira de política selecionada visa uma rendibilidade nominal esperada em torno de 6% ao ano, com uma volatilidade moderada inferior a 9%, implementada através de fundos de índice e ETF UCITS de baixo custo, adequados a um investidor residente no Luxemburgo. O €1,19 milhão alocado à IPS é gerido ao longo de um horizonte de 32 anos, como contrapeso deliberado à carteira de criptomoedas concentrada do cliente, excluindo a exposição direta a cripto, a alavancagem estrutural e os produtos complexos. As regras de governação, os procedimentos de monitorização e um enquadramento gradual de redução de risco especificam como os ganhos realizados em cripto são transferidos ao longo do tempo para a carteira de segurança diversificada. O desenho é depois testado através de backtesting histórico face a uma carteira de referência externa, simulação de Monte Carlo da probabilidade de atingir os objetivos, análise de value-at-risk e conditional value-at-risk, e uma matriz de risco qualitativa. No conjunto, a IPS proposta transforma um ponto de partida concentrado e especulativo num plano multi-ativo disciplinado, alinhado com a segurança financeira de longo prazo.

Classificação JEL: C6; G11; G17; D14

Palavras-Chave: Gestão de Activos; Teoria da Carteira; IPS; Investidores Individuais

Acknowledgements

I would like to thank my supervisor, João Jorge, for the guidance, feedback and patience offered throughout the development of this Master's Final Work. His input was instrumental in shaping both the structure and the rigour of the final document.

I am grateful to ISEG, Lisbon School of Economics and Management, for the academic environment, resources and training that made this work possible and that shaped my development throughout the programme.

I also wish to thank my classmates, who became good friends over the course of the programme, and whose discussions, shared effort and encouragement were a constant source of motivation.

Finally, I thank my girlfriend, family and friends for their support and understanding during this period. This achievement would not have been possible without them.

Abbreviations

AUM — Assets Under Management

CFA — Chartered Financial Analyst

CMA — Capital Market Assumptions

CVaR — Conditional Value-at-Risk

ECB — European Central Bank

EM — Emerging Markets

ESG — Environmental, Social and Governance

ETC — Exchange-Traded Commodity

ETF — Exchange-Traded Fund

EUR — Euro

GDP — Gross Domestic Product

GRG — Generalised Reduced Gradient

IG — Investment Grade

IMF — International Monetary Fund

IPS — Investment Policy Statement

JEL — Journal of Economic Literature

MAR — Minimum Acceptable Return

MFW — Master's Final Work

MSCI — Morgan Stanley Capital International

MVO — Mean-Variance Optimisation

REIT — Real Estate Investment Trust

S&P — Standard & Poor’s

SRI — Socially Responsible Investing

TER — Total Expense Ratio

UCITS — Undertakings for the Collective Investment in Transferable Securities

USD — US Dollar

USDT — Tether stablecoin pegged to the US dollar

VaR — Value-at-Risk

Table of Contents

List of Figures

List of Tables

The Advisory Process & IPS Proposal

This document presents the final Investment Policy Statement (IPS) for Mr. Jang Mousel, developed through a structured wealth management advisory process. The mandate was to design a personalised, long-term investment strategy that reduces the household's dependence on a single, highly concentrated asset class and provides a disciplined foundation for the client's retirement and family aspirations.

The process followed a disciplined five-phase approach. The discovery phase gathered the client's financial position, goals and preferences through a structured questionnaire, the Grable and Lytton (1999) Financial Risk Tolerance Scale and a complementary qualitative interview. The analysis phase diagnosed a balance sheet in which cryptocurrency represented more than 80% of total assets, an uncompensated concentration further compounded by human capital tied to the same market. This diagnosis was synthesised into a risk profile assessed as moderate to moderately aggressive, combining a high financial capacity to bear risk with a more moderate willingness to do so within this specific portfolio. The strategy formulation phase put these findings into a goals-based plan adopting a 6% planning return within a 12% volatility ceiling. The implementation and documentation phase records the agreed strategy in this statement, and the monitoring phase defines the procedures for ongoing oversight and periodic review.

The core output of this process is a strategic asset allocation of approximately 59% equities, 26% fixed income and 15% alternatives, derived through constrained mean-variance optimisation and implemented through low-cost UCITS ETFs. This is the least-risk portfolio that meets the client's 6% planning return, achieving it at an expected volatility of 8.69%, a clear margin below the stated ceiling. It is designed to grow the €1.19 million safety portfolio toward the retirement objective while acting as a deliberate counterweight to the client's concentrated digital asset exposure.

This IPS is recommended for implementation. It restructures the client's balance sheet from a position dominated by a single speculative market into a disciplined, diversified and well-documented plan, reducing crypto exposure from over 80% of total assets to approximately 41%. The sections that follow set out the full governance framework, risk profiling and investment design on which this recommendation rests.

1 Scope and Purpose

This Investment Policy Statement (IPS) establishes a structured framework for managing Mr. Jang Mousel's long-term investment portfolio. It sets out the investment strategy, risk parameters, governance structure, and asset allocation guidelines agreed upon between Mr. Mousel and his financial advisor. It serves as the primary reference for all portfolio decisions, performance evaluation, and risk management over the investment period.

A central motivation behind this IPS is Mr. Mousel's growing awareness of the risks inherent in a position so heavily concentrated in digital assets. In 2025, he experienced a portfolio drawdown of approximately €440,000. While this was not his largest decline in percentage terms, it was by far the most significant in nominal terms. As his wealth has grown, so too has his aversion to losing it. This is consistent with Prospect Theory, under which losses weigh more than relative gains (Kahneman & Tversky, 1979).

2 Governance

The governance framework is built around a strict separation between Mr. Mousel's speculative cryptocurrency trading book and the long-term safety portfolio governed by this IPS. The crypto book remains under the client's control, while the IPS is managed as disciplined, diversified pool of capital dedicated to retirement and future family needs. This separation is central to the policy since the safety portfolio must not become an extension of the client's trading activity.

2.1 Roles, Responsibilities and Delegation

Mr. Mousel is the owner of the assets and the final decision-maker. He is responsible for providing accurate information about his financial situation, goals and constraints, and for approving the final IPS. Strategic decisions require his explicit approval and a formal review, including changes to the overall risk level of the safety portfolio, to the set of asset classes, or to the de-risking rules between the crypto bucket and the IPS portfolio. Such decisions should be driven by changes in his life, his goals, or major shifts in the economic environment, rather than by short-term market moves. He also remains responsible for the cryptocurrency trading book, which lies outside the IPS mandate, except for the transfer rules described in Section 2.4.

The adviser is responsible for implementing the IPS portfolio in line with the agreed strategy. This covers setting the strategic asset allocation, selecting or replacing ETFs that provide the same intended exposure, executing trades, reinvesting cash flows, rebalancing when required,

and monitoring portfolio risk against the approved allocation ranges and policy constraints. These implementation decisions may be taken within the approved policy without further approval. In fulfilling this role, the adviser must act in the client's best interest, communicate clearly and document all material decisions.

2.2 Rebalancing and Use of Cash Flows

The portfolio is rebalanced through a proportional-band rule. Each broad asset class is assigned a tolerance band of ±15% around its strategic target weight, while the allocation corridors defined in Section 4.3.3 act as hard limits. Scaling the band to the size of each class keeps the trigger meaningful across very different weights, and a band of this width limits trading and tax costs while keeping the portfolio close to its target risk profile (Jaconetti, Kinniry & Zilbering, 2010).

Where possible, rebalancing is implemented through cash flows rather than sales. New contributions, especially transfers from realised crypto gains, are directed toward underweight asset classes. Later withdrawals, including the conditional mortgage contribution from year 12, are taken first from overweight classes. This approach keeps the portfolio close to target while limiting turnover, realised gains and transaction costs.

2.3 Monitoring, Reporting and IPS Review

The adviser prepares a quarterly report covering the value of the portfolio, its breakdown by asset class, transactions and cash flows over the period, and the performance and risk checks set out in Section 4.7. A broader review takes place at least once per year. This review assesses whether the portfolio remains aligned with the client's objectives, whether the risk level is still appropriate, and whether the client's personal or financial situation has changed. Given the special role of the speculative bucket, the annual review will also include a consolidated wealth view, showing the split between the crypto bucket, the safety portfolio, the emergency reserve, and other assets. This consolidated picture is essential to assess whether the overall balance between speculative and long-term capital remains in line with the spirit of the IPS, and the de-risking guidelines are applied at this level rather than to the safety portfolio in isolation.

The IPS itself is reviewed formally at least every three years, or earlier after a material change in circumstances. Relevant triggers include a major change in income or wealth, family formation, the purchase of a primary residence, a structural change in inflation or interest rates, or any other development that could affect the client’s objectives or capacity to bear risk.

2.4 Policy Exceptions and Link to the De-Risking Framework

Temporary deviations from the IPS may be permitted in exceptional circumstances, such as severe market stress, unusual liquidity conditions, regulatory change or major personal events. Any exception must be justified, communicated to the client and accompanied by a plan to return to the agreed policy once conditions normalise.

The de-risking framework gives structure to the gradual transfer of wealth from the crypto book into the safety portfolio. First, at least 50% of realised annual crypto gains are transferred into the IPS portfolio. This allows the client to retain upside while steadily converting speculative gains into diversified wealth. Second, the share of total wealth held in cryptocurrency should decline over time, to no more than 50% by age 35 and no more than 30% by age 45.

The first rule supplies contributions that supplement the safety portfolio over time, accelerating its growth without the plan depending on them. The second reflects lifecycle logic, since an investor's capacity to recover from large losses declines with remaining human capital (Bodie et al, 1992), so concentration risk should fall as the client ages.

These are default rules rather than rigid limits. If immediate transfers would create an inefficient tax outcome or force liquidation after a sharp decline in crypto markets, they may be phased over time. However, exceptions should remain rare and must not undermine the central purpose of the IPS of reducing the client’s long-term dependence on a single high-risk asset class.

3 Risk Profiling

3.1 Context and Investor

Mr. Mousel's financial position is one of considerable wealth but high concentration. As of March 2026, he holds total assets of approximately €2,660,000 and a net worth of €2,630,000, of which €2,410,000 is investable. The composition of these assets, however, tells a more uncomfortable story. Cryptocurrency holdings account for 82.7% of total assets, with Bitcoin alone representing 43.6%, while traditional financial assets make up just 3.8% of the portfolio. This leaves virtually all of his accumulated wealth exposed to a single underlying market, and it is the concentration this IPS is built to address. A detailed breakdown of Mr. Mousel's financial position and portfolio parameters is provided in Table A1 in the Appendix.

Mr. Mousel's non-trading income consists of approximately €30,000 per year gross from part-time consulting in the digital asset industry and approximately €8,450 from staking rewards and minor dividends, totaling roughly €38,450 per year. This covers about 70% of his annual living

expenses of €55,000. The remaining shortfall of €16,550 is funded through periodic liquidation of USDT holdings. His day-to-day financial sustainability remains therefore tied to the continued value of his crypto holdings, a dependency that works well in bull markets but leaves him acutely exposed if digital asset markets were to enter a sustained downturn.

This context shapes the core decision behind this IPS. Mr. Mousel has chosen to restructure his balance sheet (Table A2), reducing crypto exposure from 82% to approximately 41% of total assets and allocating €1,190,000 into the long-term safety portfolio governed by this document. His dedicated reserve of €150,000 in cash remains, and the student loan, given its small size and deferred repayment schedule, requires no immediate attention. His crypto exposure remains substantial after the restructuring, as crypto remains central to his professional life. What changes is that a meaningful share of his wealth now sits in a disciplined, long-term portfolio clearly separated from his trading activities. The sections that follow translate this into a concrete risk profile, return requirement, and investment strategy.

3.2 Investment Objectives

The primary objective is to grow the initial capital of €1,190,000 into a target real retirement fund of €3,500,000 by age 60, over a 32-year investment horizon. This target is based on an estimated retirement spending of €120,000 per year in today's terms, covering housing, healthcare, travel, family support, and a contingency buffer. At €3,500,000 this spending represents a 3.43% withdrawal rate, comfortably below the 4% level commonly treated as sustainable over a long retirement (Bengen, 1994; Cooley et al, 1998). The 4% benchmark is itself drawn from US historical returns over a 30-year horizon, so it is used here as a broad guide rather than a precise rule for a euro-based investor whose retirement may last longer.

Two further thresholds frame the range of acceptable outcomes. A minimum acceptable fund of €3,000,000 is the point at which the withdrawals reach the 4% sustainable ceiling and it marks the floor below which the plan is no longer secure. Then a stretch goal of €4,500,000 lowers the withdrawal rate to roughly 2.7%, leaving a wide margin and room for a higher standard of living.

Mr. Mousel's secondary objective is to buy a primary residence within 12 years, with a budget of approximately €1 million. The down payment of about €200,000 is funded from realised crypto gains, with the rest financed by a mortgage at an assumed rate of around 3.75% in line with current Luxembourg rates on new housing loans. From year 12, the IPS portfolio

contributes approximately €1,500 per month toward the mortgage, with the remainder covered by crypto income. This contribution is conditional and is only paid when the portfolio is on track, defined as prior-year wealth of at least 90% of the level needed to stay on the retirement path. If the portfolio is behind at that point, the contribution is skipped and funded from crypto income instead, so that a period of weak markets does not push the safety portfolio further from its main goal.

3.3 Return and risk requirements

The return requirement follows directly from the retirement objective. Starting from €1,190,000, the portfolio must grow to a nominal €6,595,892 over 32 years to reach the real target of €3,500,000, assuming 2% annual inflation in line with the ECB's target. Solving for the required growth rate gives a minimum nominal geometric return of 5.50% per annum in the base case, with no contributions or withdrawals during accumulation. This rises to 5.83% once the €1,500 monthly mortgage contribution from year 12 is included, since the ongoing outflow means the portfolio must grow faster to still reach the target. The 5.50% figure is treated as the binding requirement. The mortgage contribution that lifts the requirement to 5.83% is conditional rather than fixed. Under the guardrail rule of Section 3.2 it is paid only when the portfolio is on track, so it is met in the states where returns are already ahead and suspended in the states where they are not. Using it would therefore overstate the return the portfolio must achieve on its own. The 5.50% minimum requirement with no contributions or withdrawals, is the level that must hold in all cases, and it is the figure that anchors the minimum acceptable return.

The IPS adopts a planning return of 6% per annum. This sits only modestly above the 5.50% floor and still above the 5.83% requirement, leaving a small margin against the risk that realised returns fall short. On the risk side, the IPS targets an annualised volatility of 12% or less, consistent with the risk profile established in Section 3.4.

3.4 Risk Tolerance

Risk tolerance has two dimensions that must be assessed separately. Capacity is the financial ability to absorb losses without derailing the plan, while willingness is the psychological comfort with risk and the behavioural likelihood of staying invested through a downturn.

The first measure was the Financial Risk Tolerance Scale, a quantitative thirteen-item questionnaire designed to score general financial risk attitudes (Grable & Lytton, 1999). The

full questionnaire and scoring results are presented in Table A3 in the Appendix. Given Mr. Mousel's significant wealth, the hypothetical monetary amounts in the original instrument were scaled proportionally, since amounts that are trivial to a client's wealth may distort the psychological stakes each question is designed to test. This is a pragmatic adaptation rather than a validated variant of the scale, and is noted here as a minor methodological limitation. Under the original scoring, scores of 33 to 47 fall in the high tolerance category. Mr. Mousel's score of 38 therefore places him in that category.

The pattern of individual responses is more informative than the headline score. On the questions framed around potential gains, he consistently chose the most aggressive option, which is consistent with someone who has spent years operating in volatile crypto markets. Other answers were more reserved, for example by choosing the certain gain to a higher expected value gamble or by choosing a balanced multi-asset allocation over the more aggressive ones. The score therefore reflects a high appetite for risk in speculative, return-seeking situations rather than an indiscriminate appetite across all financial decisions.

The second measure was a complementary qualitative interview covering goals, portfolio purpose, drawdown tolerance and investment preferences. The full interview is in Appendix Table A4. The interview revealed a markedly more conservative attitude towards the safety portfolio specifically. Mr. Mousel expressed a clear preference for passive, rules-based management, discomfort with drawdowns beyond 35-40% and an explicit wish for this portfolio to act as a stable counterweight to his trading activities. This gap between his general risk appetite and his attitude toward this particular pool of money is not accidental. Behavioural research on mental accounting shows that investors assign different risk budgets to different pools based on the goals attached to them, even when their underlying financial capacity is the same (Thaler, 1999). For Mr. Mousel the safety portfolio is the foundation he is building for his future family and retirement. His willingness to take risk with this portfolio therefore sits below what the G&L questionnaire score would imply.

Capacity points in the opposite direction. After allocating €1,190,000 to the safety portfolio, Mr. Mousel retains a substantial capital in the speculative bucket and a separate near-term reserve of €150,000. His annual living expenses of €55,000 are low relative to his net worth of €2,630,000, he carries minimal debt and his investment horizon extends over three decades. The part-time consulting retainer provides a modest but stable income that partially insulates his spending from short-term market moves, though the residual shortfall leaves his day-to-day

finances substantially market dependent. Life-cycle portfolio theory judges financial risk-taking against the investor's wider economic position, including human capital and future income (Bodie et al, 1992), and here that position itself is concentrated. His trading and consulting income both move with the same market as his wealth, so his earnings cannot be counted on as a buffer in the downturn that would most stress the portfolio. Taken together, these characteristics still indicate a high financial capacity to bear risk qualified by the concentration of his human capital.

Capacity and willingness therefore point in different directions. Capacity is high, but it is the more moderate willingness that should temper the allocation, since the portfolio must not expose the investor to losses that would either financially impair the plan or lead him to abandon the strategy when markets fall. The final risk profile is therefore assessed as moderate to moderately aggressive, and the IPS portfolio should act as a diversifier rather than another source of speculative exposure. This profile is consistent with a diversified multi-asset portfolio carrying annualised volatility in the region of 10-14% and an equity allocation around 50-60%.

The IPS adopts a volatility ceiling of 12% per annum. This sits within the appropriate range for the client's profile while leaving a buffer below the upper bound. The ceiling translates his more moderate willingness into a practical portfolio constraint. The allocation must pursue the required return, but not at a level of risk likely to undermine his ability to remain invested during market stress.

3.5 Constraints

At 32 years, the horizon here is genuinely long. If the portfolio is also expected to fund retirement spending well into Mr. Mousel's eighties, the full economic horizon, including the decumulation phase, extends closer to 60 years. This matters for portfolio construction, since a longer horizon provides room to ride out bad years, which supports a clear lean toward equities and reduces the relevance of short-term volatility (Merton, 1969). The planned house purchase in 12 years does not change this. It is handled through a regular monthly mortgage contribution from year 12, as outlined in Section 3.2, without requiring any structural change to the investment strategy.

Liquidity needs are minimal. Day-to-day expenses are covered by consulting and trading income, and the client's €150,000 cash reserve sits outside this portfolio. No withdrawals are planned during the first 12 years, giving the capital time to compound without interruption.

Luxembourg tax law is relatively favourable for a long-term investor. Capital gains are generally exempt after a six-month holding period, which fits naturally with the buy-and-hold approach of this IPS. Taxes should therefore pose no issue in normal circumstances, but they do become relevant during rebalancing or larger allocation changes. In such a case, unnecessary realisation of gains should be avoided where possible. All instruments must be UCITS-compliant, excluding leveraged products, synthetic structures, and anything outside mainstream European regulation.

Mr. Mousel has a soft preference for avoiding obviously controversial sectors, though not a hard exclusion. He also wants the portfolio to be managed passively with minimal trading. Both preferences point naturally toward a diversified basket of low-cost index funds, which forms the basis of the investment approach in Section 4.

4 Investment Design

4.1 Investment Philosophy

The starting point is a view on market efficiency. The Efficient Market Hypothesis (Fama, 1970) holds that prices reflect all publicly available information, leaving no room for active managers to generate consistent excess returns net of costs. Prices can deviate from fair value in the short run, but the deviations are unpredictable in both direction and timing, so exploiting them adds cost without reliable return. French (2008) estimated the cost for that search at roughly 0.67% of US market value each year, and Sharpe (1991) showed that active management is a zero-sum game before costs and a negative-sum after. Cost minimisation is therefore the most reliable source of return improvement for a passive investor on a 32-year horizon. This portfolio is therefore managed without market timing, discretionary security selection or performance-chasing. While this rules out timing the market and selecting securities on a view, it does not rule out anchoring expected returns on current valuation and yields, since these are part of the information already in prices. That distinction is what allows a passive portfolio to rest on forward looking assumptions without claiming any ability to predict short-term moves.

Long-run returns compensate for bearing systematic, well-documented risk, and return differences reflect risk exposures rather than manager skill (Fama & French, 1993), with each asset class carrying its own premium (Ilmanen, 2011). This portfolio therefore seeks

compensated risk at the asset-class and regional level rather than through security selection or smart-beta mandates.

Diversification is the mechanism through which uncompensated risk is removed. Especially since his wealth is concentrated in a single volatile asset class, ensuring that returns are not driven by one source of risk is not a theoretical preference but a practical necessity.

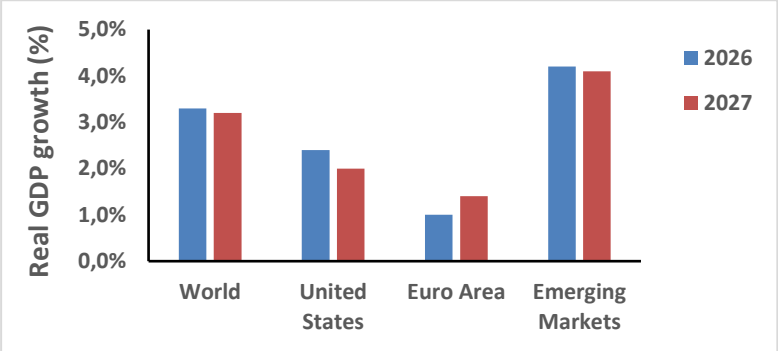
A well-designed portfolio creates the conditions for long-run success, but whether those conditions are met depends as much on investor behaviour as on the strategy itself. Kahneman and Tversky (1979) showed through Prospect Theory that psychological responses to gains and losses systematically push investors to deviate from their own plans. The problem for Mr. Mousel is not a lack of knowledge. Years of professional trading build instincts that are poorly suited to the patience that long-term wealth management requires. Barber and Odean (2000) found that the individual investors who trade most earn the lowest net returns, with overconfidence as the usual behavioural explanation. The portfolio is therefore designed to be simple and rules-based, minimising the number of active decisions required and reducing the points at which behavioural bias can act. Thaler and Shefrin (1981) described this kind of pre-commitment strategy by binding future behaviour to a plan agreed in advance, precisely because the temptation to deviate is predictable. The trading account and the IPS portfolio are kept deliberately separate, each governed by its own rules and logic. One is designed to operate in volatile, fast-moving markets. The other is designed to be indifferent to them.

4.2 Macroeconomic Outlook

The portfolio is managed passively and does not attempt to time the macroeconomic cycle, but the outlook still matters as the environment any long-term allocation must withstand. This section sets out the growth, inflation, and policy backdrop as it stood at the end of the sample period in March 2026, and draws out the implications for the allocation that follows.

Global growth is expected to remain steady but modest. The IMF projected world output to grow by 3.3% in 2026 and 3.2% in 2027 (IMF, 2026). The picture differs sharply across regions. The United States is expected to grow by 2.4% in 2026, supported by technology investment and fiscal policy, while the euro area remains steady at 1.3%, held back by structural headwinds and a smaller share in the technology-driven investment boom. Emerging markets are more resilient, with India near 6.3% and China's 5% supported by fresh stimulus (IMF, 2026). Figure 1 shows the regional breakdown.

Figure 1: Real GDP Growth Projection by Region

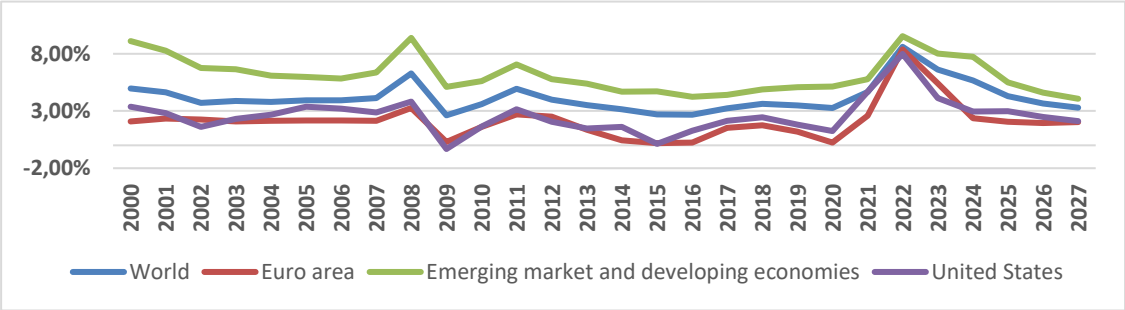


Source: IMF World Economic Outlook Update, January 2026.

The lesson is that growth is not concentrated in any one region. Strength in the United States sits alongside weakness in Europe and resilience across emerging markets. No single market has a clear and durable advantage over the others. A long-horizon investor therefore has little reason to bet on one region and good reason to spread exposure across several.

Inflation has been falling but is not yet back to target. The IMF expected global headline inflation to ease from 4.1% in 2025 to 3.8% in 2026 and 3.4% in 2027 (IMF, 2026). In the euro area the picture is closer to target. The European Central Bank projected euro area headline inflation of 2.6% in 2026 and 2.0% in 2027 (ECB, 2026). Figure 2 sets the recent path against these projections. This disinflation was interrupted late in the sample period. A conflict in the Middle East that began in early March 2026 pushed energy prices sharply higher and raised near-term inflation risk. Both major central banks responded by holding rates and waiting. The European Central Bank kept its deposit rate at 2.0% at its March 2026 meeting (ECB, 2026). The Federal Reserve held its policy rate in a range of 3.50% to 3.75%, citing uncertainty from the same conflict (Federal Reserve, 2026).

Figure 2: Inflation Rate by Region (Annual % Change)



Source: IMF WEO database

Two implications follow. First, inflation is close to target but not defeated. The energy shock and earlier tariff increases show how quickly price pressure can return and a long-horizon investor should have some protection against inflation. Second, the relationship between equities and bonds has changed. When inflation is the dominant risk, equities and bonds tend to fall together, because both react to the same inflation and rate surprises. Government bonds therefore offer less protection against falling equity markets than they did in the low-inflation decades. Diversification has to draw on more than the traditional mix of stocks and bonds. At the same time, with policy rates near neutral rather than near zero, high-quality bonds once again offer a positive real yield, which restores their value as a source of income and stability.

Several structural forces shape the longer horizon. The current expansion is narrowly based, with much of the growth tied to investment in artificial intelligence, and the IMF flags this concentration as a risk since a repricing of technology expectations would weigh on markets broadly (IMF, 2026). Ageing populations in developed markets are expected to drag on long-run growth and returns, public debt is high and still rising in many advanced economies, and geopolitical fragmentation continues, with the Middle East conflict as a current example. For a 32-year plan these forces are a reason not to extrapolate the strong recent performance of US equities and technology into the future. They favour conservative return expectations, genuine diversification across regions and asset types, and a permanent place for assets that hold up when markets are stressed.

4.3 Strategic Asset Allocation

The strategic asset allocation defines the long-term policy mix and is the decision that shapes portfolio risk and return. It translates the return objective, risk profile, and constraints of Section 3 into target weights across three functional blocks. Equities drive long-term capital appreciation, high-quality fixed income reduces volatility and limits drawdowns when equity markets fall, and alternatives improve resilience in the environments that neither handles well, particularly inflation surprises and periods when stocks and bonds sell off together.

4.3.1 Investable Universe and Asset Class Rationale

The investable universe is kept deliberately simple. It spans eleven liquid sub-asset classes, each implementable through low-cost, UCITS-compliant ETFs denominated in or hedged to euros. This is consistent with the constraints established in Section 3.5, which restrict the portfolio to passively managed, exchange-listed instruments with no leverage and no synthetic replication. Equities are split across four regions, being the US, Europe, emerging markets and

developed Pacific. Fixed income covers EUR-hedged US and euro government bonds, EUR-hedged investment grade corporates and EUR-hedged inflation-linked bonds. The diversifying block holds gold, included as a crisis hedge for its near-zero equity correlation and its tendency to hold value in stress (Baur & Lucey, 2010), together with global and European listed real estate. The rationale for each class is set out in Table II.

Several exposures are deliberately excluded by design. Direct cryptocurrency has no place in a portfolio whose entire purpose is to counterbalance Mr. Mousel's concentrated digital-asset wealth. High-yield bonds and leveraged loans are excluded because their credit risk behaves like equity risk in stressed markets, which would weaken the diversification the fixed income sleeve is meant to provide. Private markets and other illiquid alternatives are incompatible with the UCITS constraint and the operational simplicity this IPS requires. Leverage and short-selling are also ruled out by the constraints of Section 3.5.

4.3.2 Capital Market Assumptions

The strategic allocation is built on forward-looking capital market assumptions rather than realised historical averages. The reasoning is practical. A reliable estimate of an average return requires a long span of history, not simply more data points within a short one, and such spans are rarely available or still representative (Merton, 1980). Historical means are therefore estimated with considerable uncertainty. The 2017-2026 sample in particular was shaped by an exceptional run in US equities and a sharp repricing of bonds as interest rates rose, conditions unlikely to repeat at the same magnitude. Forward assumptions, by contrast, anchor on current valuations, prevailing yields, and long-run growth, which makes them a more defensible basis for this allocation (Ilmanen, 2011).

The expected-return estimates are a blend of the 2026 long-term capital market assumptions of six institutional houses (J.P. Morgan Asset Management, 2026; BlackRock Investment Institute, 2026; Amundi Investment Institute, 2026; Invesco, 2026; Lombard Odier, 2026; BNP Paribas Asset Management, 2026). Blending several independent sources reduces reliance on any single house view. A few classes are not well covered by these published sets. The US Treasury and short-dated USD corporate exposures are anchored instead on prevailing yields and credit spreads, while the Pacific and inflation-linked figures rest on a single provider. These thin-coverage inputs are the least robust in the table.

Each provider's figures are stated as geometric (compound) returns. Because mean-variance optimisation operates on arithmetic means, each blended geometric estimate is converted to its arithmetic equivalent using the standard relationship for lognormal returns

$$r_{arith} \approx r_{geo} + \tfrac{1}{2}\sigma^2 \quad (1)$$

Both are reported in Table I. The arithmetic figures are the optimiser inputs, while the geometric figures are the basis for the return target in Section 3.3. Volatilities are estimated from the monthly returns over the 2017-2026 sample. Unlike expected returns, volatilities are estimated far more reliably from historical data and are considerably more stable over time, so the realised sample provides a sounder basis for them than a blend of forward estimates would (Merton,1980).

Table I

Capital Market Assumptions

Asset class	Historical return (geometric)	Historical return (arithmetic)	Expected return (geometric)	Expected return (arithmetic)	Historical Volatility
US Equity	12.49%	12.92%	5.80%	6.90%	14.84%
Europe Equity	7.92%	8.56%	6.91%	7.83%	13.56%
EM Equity	6.82%	7.65%	6.73%	7.69%	13.87%
Pacific Equity	6.38%	7.36%	7.00%	8.01%	14.21%
US Government	-0.70%	-0.58%	3.39%	3.53%	5.30%
Euro Government	-0.30%	-0.15%	3.39%	3.54%	5.52%
IG Corporate	2.76%	2.74%	2.68%	2.70%	2.10%
Inflation-linked	1.15%	1.22%	3.70%	3.78%	3.90%
Gold	15.02%	14.88%	4.58%	5.39%	12.68%
Global REIT	2.21%	3.48%	6.60%	7.91%	16.19%
Europe REIT	-0.11%	1.90%	6.15%	8.21%	20.32%

Note: Historical returns and volatilities are calculated from monthly EUR-denominated total return indices over the sample period 01/01/2017–31/03/2026. Each asset class is represented by a corresponding benchmark proxy index. Expected returns are based on a blend of long-term capital market assumptions from selected financial institutions.

The gap between these forward estimates and the recent past is wide enough to matter. Over sample, US equities and gold compounded far above any sustainable long-run rate, while bonds delivered near-zero or slightly negative nominal returns as yields rose. An optimiser fed those realised numbers would load heavily into equities and gold and shun bonds, producing a portfolio fitted to the past decade rather than the next three. The forward assumptions deliberately temper the equity and gold figures and restore a positive expected return to high-quality bonds, which is why they, not the sample means, drive the allocation.

4.3.3 Strategic Policy Weights, Constraints and Allocation Intervals

At the broad level the strategic allocation is anchored at 50% equities, 40% fixed income and 10% alternatives. This split follows from the moderate-to-moderately-aggressive risk profile established in Section 3.4, which placed the portfolio equity weight in the region of 50-60%.

Rather than fixing the allocation at a single set of weights, each block and sub-asset class is assigned a corridor, a minimum and maximum band around its anchor. The corridors give the optimisation room to find the most efficient combination within the universe while translating the client's risk profile into hard limits it cannot cross. Binding weight bounds also act much like shrinking the covariance estimates, which reduces the effect of estimation error and tends to improve out-of-sample performance (Jagannathan & Ma, 2003). Where the final weights settle against those limits, this reflects the risk profile binding by design rather than a shortcoming of the optimisation. The full set is shown in Table II.

Table II

Strategic Policy Weights & Allocation Corridors

Asset Class	Policy weight	Min	Max	Rationale
Equity	50%	35%	65%	Main driver of long-term growth
U.S.	20%	12%	35%	Largest and most liquid developed equity market
Europe	15%	10%	25%	Regional and currency diversification for a EUR investor
EM	10%	0%	12%	Emerging market growth, capped for higher volatility
Pacific	5%	0%	8%	Developed Pacific markets, a distinct return source
Fixed Income	40%	25%	50%	Income, stability and drawdown control
US Gov	15%	5%	15%	High quality duration and defensive core
Euro Gov	12%	5%	25%	Home currency sovereign and safe haven
IG	8%	0%	8%	Modest yield premium at good credit quality
Inflation linked	5%	2%	10%	Direct claim on realised inflation
Alternatives	10%	5%	15%	Diversification and inflation resilience
Gold	5%	2%	10%	Crisis hedge with low correlation to stocks and bonds
REIT Global	2.5%	0%	7.5%	Real-asset income, capped for its equity overlap
REIT Europe	2.5%	0%	7.5%	Real-asset income, capped for its equity overlap
Total	100%			

The sub-asset corridors enforce diversification one level deeper, with the tighter ceilings placed on the more volatile sleeves. The REIT ceilings are kept low because listed real estate is highly correlated with equities, so a large allocation would add equity-like risk rather than genuine diversification. The 2% floors on inflation-linked bonds and gold keep a permanent inflation

claim and a structural crisis hedge in place at all times. The constraint set is kept deliberately simple, relying on these corridors rather than additional factor, sector, or duration limits, consistent with the low-complexity universe of Section 4.3.1.

4.4 Management Structure

The portfolio follows a fully passive management style. Each asset-class exposure is obtained through an index-tracking fund, and no active or tactical sleeve is added on top. A core-satellite structure, in which a passive core is complemented by active positions in selected asset classes, was considered but rejected. The investment philosophy in Section 4.1 gives no basis to expect a repeatable active edge net of costs, so a satellite would add cost and complexity without a reliable added return. The passive approach is therefore not a default but a deliberate choice.

This approach is implemented exclusively through physically replicated UCITS ETFs. Active managers, taken as a group, fail to beat their benchmarks net of fees over long horizons, and the minority that do outperform in one period rarely repeat it in the next (Fama & French, 2010). Over a 32-year accumulation horizon, the fee and turnover savings of a passive structure compound into a difference too large to justify for the uncertain prospect of active outperformance.

Performance is measured against a custom composite benchmark. The benchmark is built bottom-up, weighing the reference index of each holding by its final portfolio weight. Because the benchmark and the portfolio share the same weights, the only difference between them is the gap between each fund and the index it tracks. This means that the benchmark isolates implementation quality rather than the allocation itself. It mirrors the portfolio's specific regional and asset-class exposures and so provides a more relevant basis for evaluation than any single generic index. At the individual level, each holding is benchmarked against its own reference index, while the weighted composite serves as the benchmark for the overall portfolio.

4.5 Security Selection

Security selection determines how the strategic allocation is implemented in practice. Since the portfolio is passive, the objective is not to identify outperforming funds, but to select instruments that replicate the intended exposures accurately, cheaply and with sufficient liquidity. The process therefore follows two stages, a qualitative screen to define the eligible ETF universe and a quantitative score to rank the remaining candidates within each asset class.

4.5.1 Qualitative Screening

The qualitative stage applies a set of structural, operational, and practical filters to define a compliant and viable ETF universe before any cost or replication comparison takes place. Every instrument that enters the quantitative scoring stage must first pass all filters in Table III.

Table III

Qualitative Screening Criteria

Filter	Requirement
Replication Method	Physical replication only, full or optimised
Regulatory structure	UCITS-compliant
Domicile	Ireland or Luxembourg
Share class	Accumulating
Minimum AUM	€100m for equities and broad fixed income; €50m for alternatives and inflation-linked bonds
Currency	EUR or USD denominated; EUR-hedged share class required for fixed income, equities held unhedged

Accumulating share classes are required because the client has no income needs, automatic reinvestment supports long-term compounding and distributions would create taxable events. The domicile restriction reflects the depth and tax efficiency of the Irish and Luxembourg UCITS markets. No minimum track record requirement is imposed. A hard history threshold would exclude well-constructed funds on established indices simply for being new, while the replication quality is already measured directly by the tracking metrics in the scoring stage. The only exception to the UCITS fund requirement is gold, which cannot be held through a physically backed UCITS ETF and is therefore implemented through a physically backed ETC. This screening reduces the broad ETF market to a focused set of eligible candidates within each asset class.

4.5.2 Quantitative Scoring

Funds that pass the qualitative screen are then ranked using a four-criterion scoring model shown in Table IV. The model is designed to identify the instrument that most efficiently replicates its target index at the lowest cost with sufficient liquidity. Consistent with the passive investment philosophy of this IPS, the model deliberately excludes performance-based metrics such as the Sharpe ratio and alpha. Selecting on risk-adjusted returns would contradict the core rationale for passive management, which is to capture market returns efficiently rather than to identify funds that have outperformed their benchmark in the past. The aim is to choose the best vehicle for an exposure, not to predict which fund will perform best.

Table IV

Quantitative Screening Criteria

Criterion	Weight	Rationale
Tracking error (1y)	45%	Primary measure of replication consistency
Total Expense Ratio (TER)	35%	Structural cost efficiency
Assets Under Management (AUM)	10%	Fund viability and scalability
Average daily volume	10%	Liquidity

When several ETFs track the same index, gross returns differ little by construction, so funds are separated mainly by how faithfully and cheaply they replicate, and cost is one of the main determinants of tracking performance (Frino & Gallagher, 2001). Tracking error and the TER therefore carry 80% of the score between them, with assets under management and average daily volume treated as secondary and serving mainly to guard against funds that are too small or too illiquid to use.

Each ETF is scored using a percentile ranking approach within its asset class. For tracking error and TER, lower values receive higher scores. For AUM and average daily volume, higher values receive higher scores. Weighted percentile scores are aggregated to produce a composite score between 0 and 1, which allows us to rank each ETF based on their composite score within each asset class. The underlying fund data are reported in Appendix Table A10.

4.5.3 Final Selection

Applying the qualitative filters and the scoring model to each sub-asset class produces a clear ranking of the eligible instruments, separating the strong candidates from the weaker ones. The selected fund for each class is drawn from the top of its ranking, with the composite score the primary input and a check that no secondary consideration, such as liquidity or fund size, argues against it. The eleven resulting ETFs, listed in Table V, constitute the final investable set and are the instruments used in the optimisation in Section 4.6.

Table V

Final Portfolio Selection

Asset class	Sub-asset class	ETF Name	Ticker	Reference index
Equity	US Equity	SPDR S&P 500 UCITS ETF	SPYL GR	SPTR500N
Equity	Europe Equity	Amundi Core MSCI Europe UCITS ETF	CEU2 FP	M7EU
Equity	EM Equity	Xtrackers MSCI Emerging Markets UCITS ETF	XMME GR	NDUEEGF
Equity	Pacific Equity	iShares Core MSCI Pacific ex-Japan UCITS ETF	SXR1 GR	NDDUPXJ
Fixed Income	US Government	Vanguard USD Treasury Bond UCITS ETF (EUR Hedged)	VDTE GR	H21140EU
Fixed Income	Euro Government	Xtrackers II Eurozone Government Bond UCITS ETF	XGLE GR	QW1A
Fixed Income	IG Corporate	iShares USD Corp Bond 0-3Yr ESG SRI UCITS ETF	IU0E GR	BMSRTRUU
Fixed Income	Inflation-linked	UBS Core BBG TIPS 1-10 UCITS ETF	TIP1E SW	LTI1TREH
Alternative	Gold	WisdomTree Physical Gold	PHAU IM	GOLDLNPM
Alternative	Global REIT	Amundi FTSE EPRA NAREIT Global UCITS ETF	EPRA FP	TRNGLE
Alternative	Europe REIT	Xtrackers FTSE Developed Europe Real Estate UCITS ETF	D5BK GR	NEPRA

The portfolio holds one instrument per sub-asset class by design rather than necessity. Each selected ETF already tracks a broad index, so a second fund on a near-identical benchmark would add cost and monitoring effort without new diversification, and a single fund per sleeve keeps the structure transparent and cheap to run.

4.6 Portfolio Construction

The strategic policy weights established in Section 4.3 describe the portfolio in principle. This section determines it in practice, applying mean-variance optimisation to the eleven selected instruments to identify the most efficient allocation within the bounds the policy permits. The method follows directly from Modern Portfolio Theory (Markowitz, 1952), which judges an asset not in isolation but by its contribution to the risk and return of the portfolio. The optimisation combines the capital market assumptions of Section 4.3.2, the covariance structure of the selected funds, and the constraints of Section 4.3.3 into a single recommended portfolio.

4.6.1 Optimisation Framework and the Efficient Frontier

Under the mean-variance paradigm a portfolio is fully described by two moments of its return distribution, its expected return and its variance. For a portfolio of *n* assets with weight vector *w,* expected-return vector μ, and covariance matrix Σ, the expected return is

$$\mu_p = w^{\mathrm{T}}\mu \;=\; \Sigma_{\mathrm{i}}\, w_{\mathrm{i}}\, \mu_i \tag{2}$$

and the variance is

$$\sigma_p^2 = \; w^{\mathrm{T}}\Sigma w \;=\; \Sigma_{\mathrm{i}}\, \Sigma_{\mathrm{j}}\, w_{\mathrm{i}}\, w_{\mathrm{j}}\, \sigma_{\mathrm{i}j} \tag{3}$$

The efficient frontier is the set of portfolios that minimise variance for each attainable level of expected return. Each point on it solves the quadratic program

$$min_w\, \Sigma w \;\; subject\; to \;\; w^{\mathrm{T}}\mu = \mu^*, w^{\mathrm{T}}1 = 1, L \le w \le U, w \ge 0 \tag{4}$$

where μ* is the target return, 1 is a vector of ones enforcing full investment, and L and U are the lower and upper allocation bounds defined in Section 4.3.3. Solving (4) repeatedly across a range of values for μ* traces out the frontier (Merton, 1972). The optimisation is performed in Excel Solver using the GRG nonlinear method, with no short selling and no leverage.

Mean-variance optimisation is especially sensitive to the expected-return vector. Small differences in estimated means produce large, unstable swings in weights, so an unconstrained optimiser magnifies input errors rather than diversify them away (Michaud, 1989). Best and Grauer (1991) showed that optimal weights can shift sharply in response to minor changes in assumed means, and Chopra and Ziemba (1993) found that errors in expected returns are roughly an order of magnitude more damaging than errors in variances or covariances. Two design choices guard against this. The first anchors the return vector on valuation-based forward assumption of Section 4.3.2 rather than on noisy sample averages. The second is the set of corridors from Section 4.3.3 that constrain the optimisation.

The covariance matrix, used directly as the optimisation input, is estimated from monthly total returns over January 2017 to March 2026, a window of 111 months. Seven of the eleven funds have a complete live track record over this period. The remaining four, US equity, EM equity, US Treasury and IG Corporate, were launched after the start of the window, so their missing history is extended backward using the total return of the index each fund tracks, net of the

fund's TER. Because a physically replicating ETF is designed to deliver its index return net of costs, the index series is a close proxy for how the fund would have behaved had it existed, and netting the expense ratio avoids overstating the return the investor would have earned. This keeps all eleven funds on a common 111-month basis, at the cost of treating the spliced portion as if the funds had tracked their indices as faithfully before inception as after. The full correlation and covariance matrices are reported in Appendix Tables A5 and A6.

Introducing a risk-free asset extends the analysis from the frontier of risky portfolios to the Capital Market Line, the straight line from the risk-free rate that is tangent to the frontier. The risk-free rate used throughout is 2.08%, the three-month Euribor at the end of the sample (31 March 2026). The point of tangency is the portfolio with the highest Sharpe ratio,

$$SR_p = \frac{\mu_p - r_f}{\sigma_p} \tag{5}$$

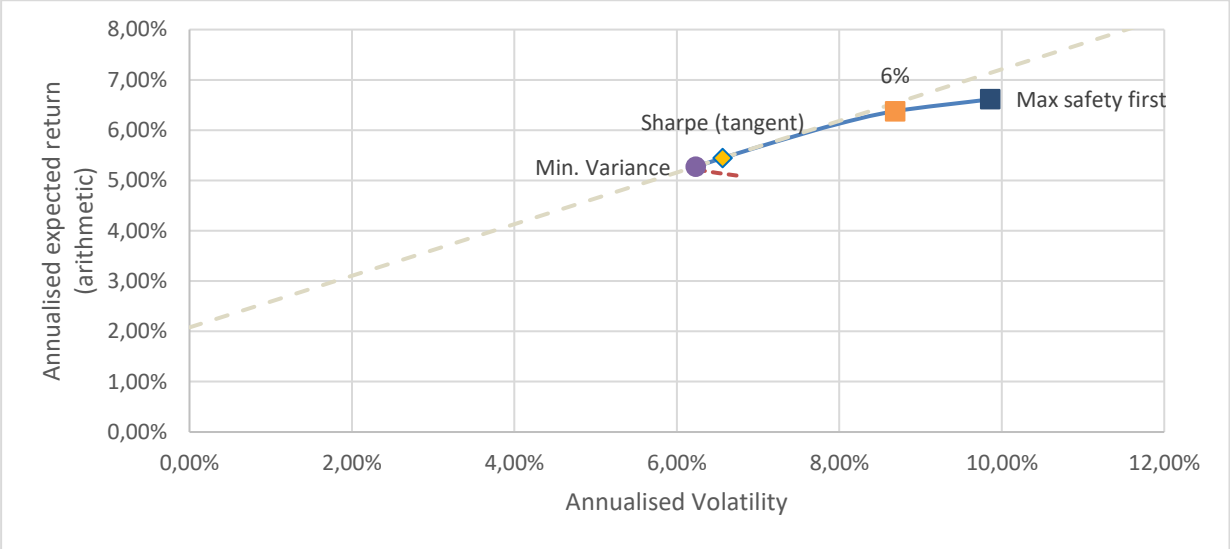
A complementary lens is provided by Roy's safety-first criterion, which evaluates a portfolio by the probability that its return falls below a disaster threshold R_L (Roy, 1952). When returns are assumed to be normally distributed, this criterion is equivalent to maximising the safety-first ratio,

$$SF_p = \frac{\mu_p - R_L}{\sigma_p} \tag{6}$$

with R_L set to the client's minimum acceptable return of 5.50%.

Figure 3 plots the efficient frontier, the Capital Market Line drawn from the 2.08% risk-free rate through the tangency portfolio, and the four reference portfolios. The efficient segment runs from the minimum-variance portfolio at the low-risk end up to the maximum-return corner permitted by the constraints.

Figure 3: Efficient Frontier with Capital Market Line



4.6.2 Portfolio Selection and Performance Comparison

The four portfolios on the frontier that frame the decision are compared in Table VI, with their full weight reported in Appendix Table A9. Returns are shown on a geometric (compound) basis for comparability with the return target, while Sharpe ratio is computed on the excess arithmetic return over the 2.08% risk-free rate and the safety-first ratio against the 5.50% minimum acceptable return.

Each portfolio embodies a different selection rule. The minimum-variance portfolio is the lowest-risk point the universe allows, the tangency portfolio maximises the Sharpe ratio, the 6% target portfolio is the lowest-risk portfolio that still meets the client's planning return, and the safety-first portfolio maximises the probability of clearing the 5.50% minimum acceptable return under Roy's criterion. Setting the four side by side shows how the client's return requirement interacts with the frontier to decide which of them is admissible.

Table VI

Comparison of Eligible Portfolios

Portfolio	Expected Return (geo.)	Volatility	Sharpe Ratio	Safety-first ratio
Minimum Variance	5.08%	6.23%	0.512	-0.06758
Tangency	5.23%	6.57%	0.513	-0.04037
Target 6%	6.00%	8.69%	0.495	0.05787
Roy safety-first	6.13%	9.86%	0.460	0.06419

The two most risk-efficient portfolios, minimum variance at 5.08% and the tangency portfolio at 5.23%, both fall below the client's 5.50% minimum acceptable return and carry negative safety-first ratios. They are therefore not admissible, since efficiency is of no use if the resulting return misses the objective. This is not a flaw in the optimisation, but the direct consequence of combining a demanding return requirement with conservative forward assumptions, and it pushes the viable choices into the upper part of the frontier. Roy's safety-first criterion makes the same point from the opposite direction. Because the minimum acceptable return lies above the minimum-variance return, the safety-first ratio rises along the frontier and is maximised at the highest feasible return. The result is a corner solution rather than an interior optimum. It confirms that given these assumptions, the safety-first logic favours more return-seeking risk, not less. This portfolio overshoots the planning return with additional risk the client has no reason to take.

The selected portfolio is the one targeting a 6% expected return, which by construction is the minimum-variance portfolio for that return and so the least-risk route to the client's goal. It meets the planning return precisely, at an annualised volatility of 8.69% that sits a clear margin below the 12% ceiling, and it retains a Sharpe ratio of 0.495, close to the frontier maximum of 0.513.

4.6.3 Final Portfolio Composition

The selected portfolio and its full weights are presented in Table VII. The composition reflects the optimisation working under the binding 6% target. Equities take 59.39%, sitting in the upper part of their range and tilted toward the regions with the strongest forward return assumptions, with Europe, emerging markets, and Pacific each held at their sub-class ceilings and US equity taking a smaller 14.39% on the back of its more cautious valuation-adjusted return. Fixed income takes 25.61% and splits mainly between the EUR-hedged US Treasury holding and the inflation-linked sleeve, with a smaller position in euro government bonds and no IG corporate position.

Table VII

Final Portfolio Composition

Sub-asset class	Weight	Block	Weight
US Equity	14.39%	Equity	59.39%
Europe Equity	25.00%		
EM Equity	12.00%		
Pacific Equity	8.00%		
US Government	10.61%	Fixed income	25.61%
Euro Government	5.00%		
IG Corporate	0.00%		
Inflation-linked	10.00%		
Gold	10.00%	Alternatives	15.00%
Global REIT	5.00%		
Europe REIT	0.00%		

The two zero weights are the most informative structural results. The Corporate sleeve is dominated within the fixed income block, and the optimiser meets its defensive need more efficiently through sovereigns. The European REIT sleeve, having the highest volatility in the universe and being highly correlated with Equities, adds variance without improving the risk-return trade-off at this point on the frontier. This pattern is consistent with the logic that governs the whole framework. An asset earns its weight only by improving the efficient combination, and on these assumptions, at this return target, corporate credit and European real estate do not.

4.7 Monitoring

The monitoring process applies the governance rules of Section 2 to the final portfolio selected in Section 4.6. Since the portfolio is passive, diversified and implemented through a small number of ETFs, quarterly monitoring is sufficient. At each review, the adviser checks actual weights against target weights, confirms that the portfolio remains within its risk budget, reviews performance against the custom composite benchmark, and verifies whether any rebalancing trigger has been reached.

Rebalancing follows the proportional-band rule established in Section 2.2, with each class assigned a band of plus or minus 15% of its target weight and assessed at the quarterly review. Table VIII reports the resulting band and corridor limits for each block. The asset-class corridors of Section 4.3.3 act as hard limits over these bands. If a class reaches the edge of its corridor, the portfolio is brought back inside regardless of the proportional band, since a corridor breach represents a departure from the agreed risk profile rather than ordinary drift.

Table VIII

Rebalancing Bands and Corridor Limits

Asset Class	Target weight	Proportional band (±15%)	Corridor hard limit	Final Corridor
Equity	59.39%	50.48% - 68.30%	35% - 65%	50.48% - 65%
Fixed Income	25.61%	21.77% - 29.45%	25% - 50%	25% - 29.45%
Alternatives	15.00%	12.75% - 17.25%	5% - 15%	12.75% - 15%

The interaction between the two layers differs by block. Equities are close to the upper limit, but the downside band gives equities room to fall before action is required, which avoids rebalancing prematurely during a drawdown. The alternatives block sits at its 15% corridor ceiling, so its tolerance is effectively one-sided on the downside and caps any further increase.

Performance is measured against the custom composite benchmark of Section 4.4. Three dimensions are tracked at each review: absolute return against the 6% planning objective, risk-adjusted return through the Sharpe ratio, and benchmark-relative performance through tracking error. The detailed risk diagnostics are addressed separately in the risk analysis of Section 4.9.

4.8 Portfolio Performance

The portfolio constructed in Section 4.6 is efficient under its own assumptions, but those assumptions are forecast. This section therefore tests the design against both realised and simulated conditions.

4.8.1 Historical backtest

The portfolio's realised behaviour is assessed by applying the final weights to the monthly returns of the selected funds over the sample period and comparing the results to the custom composite benchmark of Section 4.4. The results are summarised in Table IX and figure A7.

The portfolio tracks its benchmark almost exactly, with tracking error below 1% and a negative information ratio that reflects fund costs rather than a flawed strategy. More informative for a multi-asset portfolio is its beta of roughly 0.57 against the MSCI World. This is the direct result of holding around 40% of capital outside of equities and confirms a profile participating in equity growth without behaving like an equity portfolio.

Table IX

Backtest results: Portfolio, Benchmark and 60/40 Reference

Metrics	Portfolio	Benchmark	60/40 Reference
Annualised return	6.89%	6.98%	6.31%
Annualised volatility	8.69%	8.80%	8.63%
Sharpe ratio	0.553	0.557	0.491
Sortino ratio	0.854	0.853	0.773
Tracking error	0.79%	-	-
Information ratio	-0.13	-	-
Beta vs Benchmark	0.98	-	-
Beta vs MSCI World	0.57	-	-

Note: 60% MSCI World total return (EUR) and 40% Bloomberg Global Aggregate US Treasury Float Adjusted, hedged EUR. It is a simple two-fund comparator, not a risk-matched portfolio.

To judge whether the allocation itself adds value, and not merely whether the funds track their indices, the portfolio is also compared against a simple two-fund reference of 60% global equities and 40% EUR-hedged government bonds, rebalanced monthly. This is the diversified alternative a passive investor could hold without any optimisation, and it provides the external comparison the custom composite benchmark cannot. Over the sample the constructed portfolio delivered a higher return at almost the same volatility, and a better risk-adjusted outcome on both the Sharpe and Sortino measures.

4.8.2 Forward-looking performance

The backtest describes one realised path but the central question for a 32-year plan is whether the portfolio is likely to reach the retirement target across the many paths the future could take. This is assessed with a Monte Carlo simulation of 5,000 wealth paths, each drawing annual returns from the portfolio's expected arithmetic return of 6.38% and volatility of 8.69% and deflating by 2% inflation. The €18,000 annual mortgage contribution from year 12 onward is modelled three ways. In the first it is always paid no matter what, in the second it is ignored and not paid at all, and in the third it is paid only when the portfolio is on track under the guardrail rule of Section 3.2. This way the effect on the outcome can be isolated and compared.

The simulation models the mortgage outflow but assumes no future transfers from the crypto bucket, even though the de-risking rules of Section 2.4 would direct a share of realised crypto gains into the portfolio over time. The assumption is conservative by construction, since those transfers could only add capital, so the probabilities reported are a lower bound.

The distribution of real terminal wealth in the guardrail scenario is shown in Figure 4. The median path finishes above the €3.5 million base target, while the spread between the lower and upper percentiles is wide, which shows how much of the final outcome is driven by realised market returns over a horizon this long. The full set of percentiles is reported in Table A8.

Figure 4: Monte Carlo Simulation of Real Portfolio Value

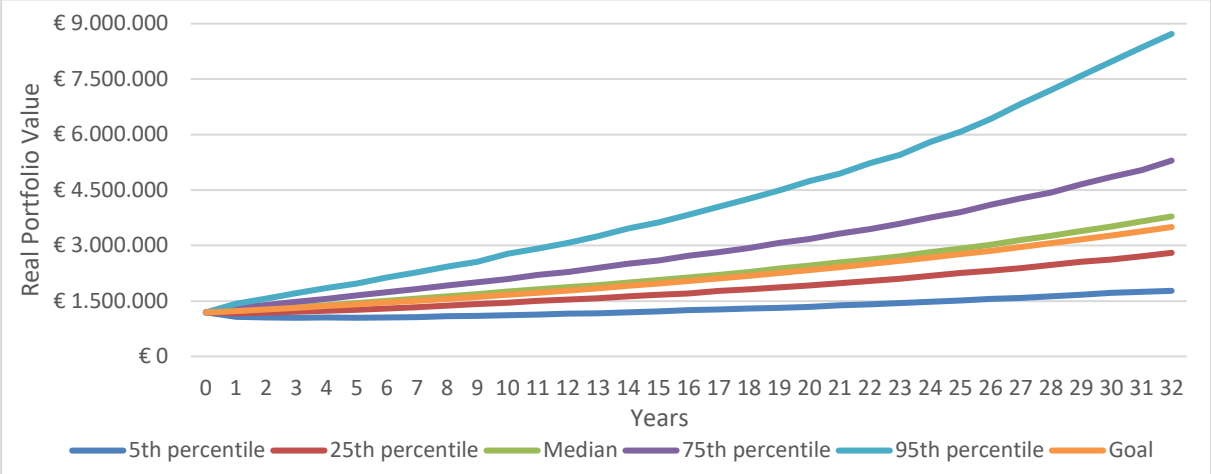
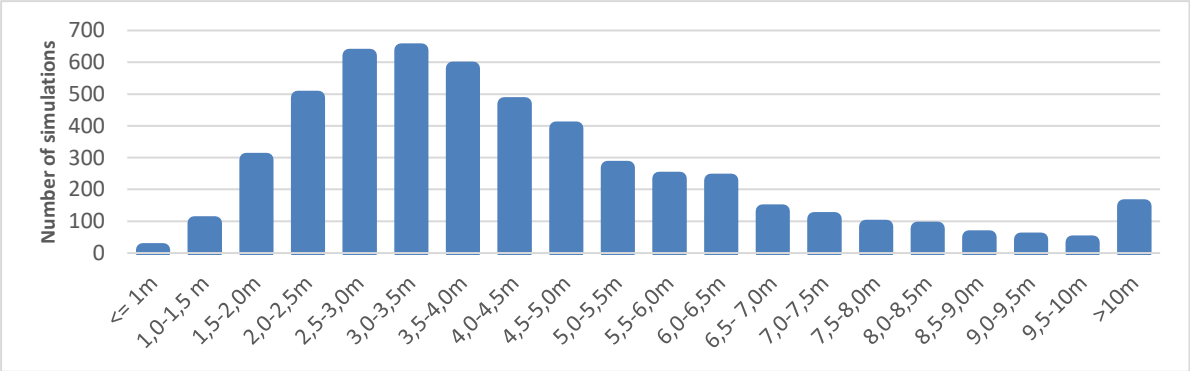


Figure 5 shows the distribution of real terminal wealth at age 60 across 5,000 paths. The distribution is right-skewed, with most outcomes clustered between €2.5m and €4.5m and a longer upper tail of more favourable paths. The shape explains why the median sits close to the base target while the mean is pulled higher by the minority of strong market outcomes.

Figure 5: Distribution of Final Real Wealth at Age 60



The probability of reaching each target are reported in Table X. The minimum €3 million target is the likely outcome, the €3.5 million base target is close to a balance of probabilities, and the €4.5 million stretch goal is a minority result. The guardrail improves the base-case odds by few points over paying the mortgage unconditionally, precisely because it suspends the contribution in the paths where the portfolio is already behind.

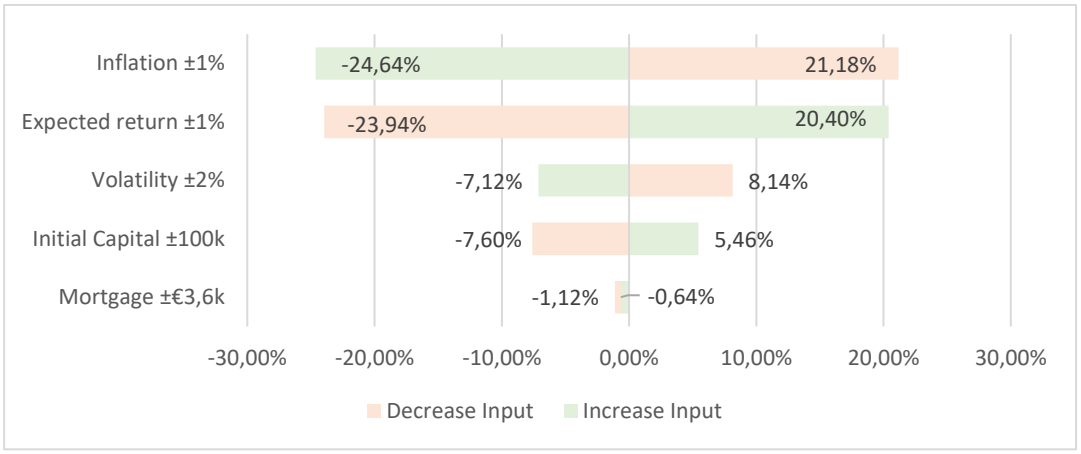
Table X

Probability of Reaching Each Wealth Target

Target	With mortgage	With guardrail	No mortgage
Minimum (€3.0m)	65%	70%	72%
Base (€3.5m)	54%	57%	62%
Stretch (€4.5m)	36%	36%	41%

The sensitivity of these probabilities to the underlying assumptions is examined in Figure 6. Inflation and the expected return have by far the largest impact. A one-percentage-point change in either moves the base-target probability by roughly twenty points. Volatility has a smaller effect, and the treatment of the mortgage contribution smaller still. The outcome therefore depends mainly on the two assumptions the construction already treats most conservatively.

Figure 6: Sensitivity of Goal Attainment to Key Assumptions



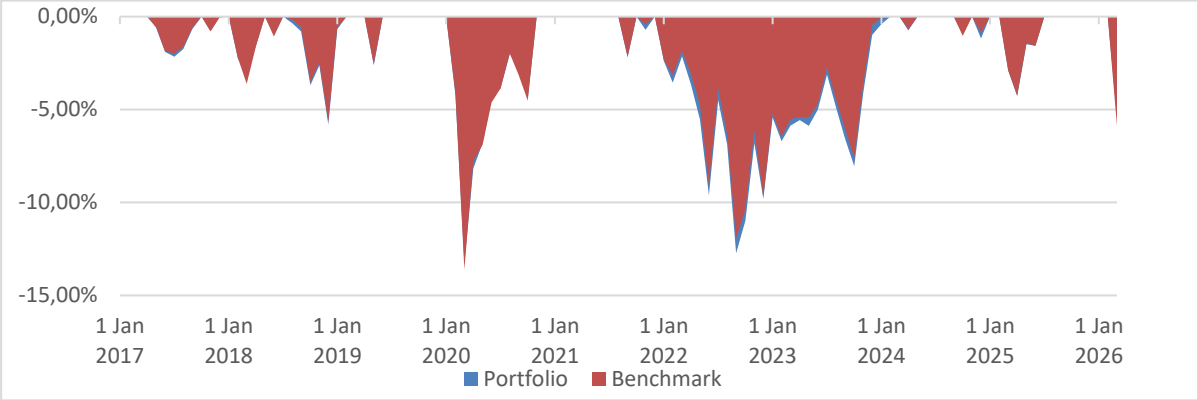
4.9 Risk Analysis

4.9.1 Drawdown, Value-at-Risk and Expected Shortfall

The previous section assessed the probability of reaching the retirement objective. This section assesses the size of the losses incurred along the way, since even a path that reaches the target can pass through substantial interim declines. The downside is examined in two dimensions, the largest decline realised over the sample and the loss expected at a given probability.

The largest peak-to-trough drawdown over the sample was 13.30%, recorded during the Covid-19 sell-off in 2020 and closely matches the benchmark's 13.60%. This remains well within the client's stated drawdown tolerance of 35 to 40%. Figure 7 plots the portfolio's drawdown path against the benchmark for comparison over the sample. The sample period does not, however, include a systemic equity bear market comparable to 2008.

Figure 7: Historical Drawdown: Portfolio vs Benchmark



Value-at-Risk measures the loss that is exceeded only with a small probability over a set horizon, and conditional VaR, or expected shortfall, measures the average loss across the cases that exceed it. Both can be estimated from the empirical distribution of past returns, which preserves whatever shape the data had, as well as parametrically, which assumes the returns are normally distributed. This distinction matters here because the monthly return distribution is left-skewed (skewness -0.70) and has fatter tails than the normal (excess kurtosis +1.99). The effect is concentrated in the deep tail. At the 99% level, the normal approximation understates the loss, while at the 95% level the two methods are close.

The results are reported in Table XI. In the worst 5% of months the portfolio loses more than about 3.20%, or roughly €38,600 on the initial capital. The average loss across those months is closer to 5.50% or €65,300. The historical expected shortfall is larger than the parametric one, because the heaviest losses cluster further into the left tail than the normal distribution permits. Expected shortfall is reported alongside VaR for this reason, since it captures the severity of the extreme cases that the threshold alone does not.

Table XI

Value-at-Risk and Expected Shortfall

Measure	Monthly Loss (%)			Monthly Loss (€)		
	90%	95%	99%	90%	95%	99%
Historical VaR	2.37%	3.24%	6.20%	€28,247.61	€38,615.25	€73,747.34
Historical CVaR	4.12%	5.49%	7.89%	€49,011.86	€65,285.94	€93,901.64
Parametric VaR	2.62%	3.53%	5.24%	€31,177.88	€42,018.35	€62,353.24
Parametric CVaR	3.81%	4.58%	6.09%	€45,304.47	€54,486.72	€72,464.57

Note: Monthly VaR and CVaR on the initial capital of €1,190,000. Historical estimates from the empirical distribution, parametric estimates under normality.

The measures above describe short-horizon losses. Over the 32-year horizon, compounding substantially reduces the risk of ending below the initial capital. At the 5th percentile the simulation finishes at approximately €1.78 million, around 50% above the initial capital in real terms, so even a poor path tends to preserve and grow the real value of the portfolio. Outcomes below that level can include real capital erosion, but the probability of finishing the horizon below the starting capital is low.

4.9.2 Qualitative assessment and limitations

The value-at-risk measures above do not capture the broader external forces that could affect the portfolio over a 32-year horizon, which are assessed qualitatively in Table XII. Each risk is rated on a five-point scale for probability and impact, set against the portfolio's specific exposures rather than estimated from historical data..

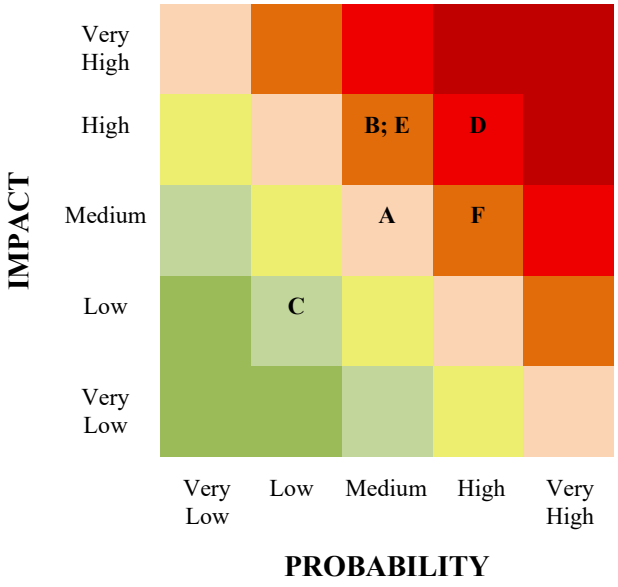
Table XII

External Risk Factors and Implications

Risk	Probability	Impact	Description and implication
A. Interest rate risk	3 (medium)	3 (medium)	Rising or volatile rates reduce the value of the fixed income sleeve and can pressure equities at the same time. The shorter-dated bonds and diversified duration limit the hit.
B. Inflation risk	3 (medium)	4 (high)	Persistent inflation erodes the real value of the retirement target, which is defined in real terms. The inflation-linked sleeve and gold give partial protection, but not a complete hedge.
C. Currency risk	2 (low)	2 (low)	The portfolio earns and spends in euro but holds unhedged global equity. The fixed income is EUR-hedged, which removes the currency risk where it would most distort a low-return sleeve, while the equity is left unhedged for diversification, so the residual risk is modest.
D. Geopolitical and market shock risk	4 (high)	4 (high)	Conflicts, trade disputes and political instability can widen spreads and trigger broad equity sell-offs, and over a 32-year horizon at least one severe episode is highly probable. Global diversification and the gold and bond sleeves cushion the impact, but a systemic shock would still produce a significant drawdown.
E. Concentration spillover from crypto	3 (medium)	4 (high)	A sustained crypto downturn would hit the client's wider wealth, his income and the planned de-risking transfer at once. The portfolio is deliberately separated and holds no crypto, so it acts as the counterweight rather than amplifying the shock.
F. Technology and concentration risk in equity markets	4 (high)	3 (medium)	Much of recent equity growth is concentrated in a narrow set of technology names, so a repricing of those expectations would weigh on broad indices. The portfolio's regional diversification and its tempered US weight reduce, but don't remove this exposure.

Figure 8 plots the six risks on a probability and impact grid. The upper-right region where probability and impact are both high, is dominated by geopolitical and market shock, with inflation and the crypto spillover close behind on impact.

Figure 8: Risk Matrix



The highest-rated risks are the macro and market shocks and the crypto spillover, and these are the exposures carried into the annual review and the consolidated wealth view of Section 2.3, where the overall balance between speculative and long-term capital is reassessed.

5 Investment Policy Proposal

This section presents the culmination of the analysis developed in the preceding chapters. The strategic asset allocation that results from the advisory process is restated below, followed by a concluding statement on how it meets the client's objectives within his risk constraints.

Table XIII

Proposed Strategic Asset Allocation

Asset class	Policy weight
Equity	59.39%
Fixed Income	25.61%
Alternatives	15.00%
Expected return (geometric)	6.00%
Expected volatility	8.69%
Sharpe ratio (ex-ante)	0.495

The proposed allocation of approximately 59% equities, 26% fixed income and 15% alternatives is designed to meet Mr. Mousel's 6% planning return while remaining within his moderate to moderately aggressive risk profile and the 12% volatility ceiling. Its global diversification and reliance on low-cost UCITS ETFs keep costs low and reduce exposure to the idiosyncratic risk that dominates his wider balance sheet. Combined with the de-risking framework that gradually transfers realised crypto gains into the portfolio, the strategy provides a disciplined route toward the retirement objective over the 32-year horizon, with a reasonable probability of success.

References

Amundi Investment Institute. (2026). Adapting to ruptures: Capital market assumptions.

Barber, B. M., & Odean, T. (2000). Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. *The Journal of Finance*, *55*(2), 773–806. https://doi.org/10.1111/0022-1082.00226

Baur, D. G., & Lucey, B. M. (2010). Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold. *Financial Review*, *45*(2), 217–229. https://doi.org/10.1111/j.1540-6288.2010.00244.x

Bengen, W. P. (1994). Determining withdrawal rates using historical data. *Journal of Financial Planning*, *7*(4), 171–180.

Best, M. J., & Grauer, R. R. (1991). On the Sensitivity of Mean-Variance-Efficient Portfolios to Changes in Asset Means: Some Analytical and Computational Results. *The Review of Financial Studies*, *4*(2), 315–342. https://doi.org/10.1093/rfs/4.2.315

BlackRock. (2026). Capital market assumptions. https://www.blackrock.com/institutions/en-global/institutional-insights/thought-leadership/capital-market-assumptions

BNP Paribas Wealth Management. (2025). Long-Term Expected Returns.

Bodie, Z., Merton, R. C., & Samuelson, W. F. (1992). Labor supply flexibility and portfolio choice in a life cycle model. *Journal of Economic Dynamics and Control*, *16*(3), 427–449. https://doi.org/10.1016/0165-1889(92)90044-F

Chopra, V. K., & Ziemba, W. T. (1993). The effect of errors in means, variances, and covariances on optimal portfolio choice. *Journal of Portfolio Management*, *19*(2), 6-11. https://doi.org/10.3905/jpm.1993.409440

Cooley, P. L., Hubbard, C. M., & Walz, D. T. (1998). Retirement savings: Choosing a withdrawal rate that is sustainable. *AAII journal*, *20*(2), 16-21.

European Central Bank. (2026, March 19). *Combined monetary policy decisions and statement*. https://www.ecb.europa.eu/press/press_conference/monetary-policy-statement/shared/pdf/ecb.ds260319~30247d385d.en.pdf

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*, *25*(2), 383–417. https://doi.org/10.2307/2325486

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3–56. https://doi.org/10.1016/0304-405X(93)90023-5

Fama, E. F., & French, K. R. (2010). Luck versus Skill in the Cross-Section of Mutual Fund Returns. *The Journal of Finance*, *65*(5), 1915–1947. https://doi.org/10.1111/j.1540-6261.2010.01598.x

Federal Reserve. (2026, March 18). *Federal Reserve issues FOMC statement*. https://www.federalreserve.gov/newsevents/pressreleases/monetary20260318a.htm

French, K. R. (2008). Presidential Address: The Cost of Active Investing. *The Journal of Finance*, *63*(4), 1537–1573. https://doi.org/10.1111/j.1540-6261.2008.01368.x

Frino, A., & Gallagher, D. R. (2001). Tracking S&P 500 Index Funds. *The Journal of Portfolio Management*, *28*(1), 44–55. https://doi.org/10.3905/jpm.2001.319822

Grable, J., & Lytton, R. H. (1999). Financial risk tolerance revisited: The development of a risk assessment instrument☆. *Financial Services Review*, *8*(3), 163–181. https://doi.org/10.1016/S1057-0810(99)00041-4

Ilmanen, A. (2011). *Expected Returns: An Investor's Guide to Harvesting Market Rewards*. John Wiley & Sons.

International Monetary Fund. (2026, January). *World economic outlook update, January 2026: Global economy — Steady amid divergent forces*. https://www.imf.org/en/publications/weo/issues/2026/01/19/world-economic-outlook-update-january-2026

Invesco. (2026). 2026 Invesco Capital Market Assumptions. https://www.invesco.com/content/dam/invesco/emea/en/pdf/invesco-capital-market-assumption-eur.pdf

Jaconetti, C. M., Kinniry, F. M., & Zilbering, Y. (2010). Best practices for portfolio rebalancing. *Vanguard research*, *2010*, 1-17.

Jagannathan, R., & Ma, T. (2003). Risk Reduction in Large Portfolios: Why Imposing the Wrong Constraints Helps. *The Journal of Finance*, *58*(4), 1651–1683. https://doi.org/10.1111/1540-6261.00580

J. P. Morgan Asset Management. (2026). 2026 Long-Term Capital Market Assumptions: 30th annual edition.

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, *47*(2), 263–291. https://doi.org/10.2307/1914185

Lombard Odier. (2026). Rethink capital market assumptions: how to invest for the decade ahead amidst global shifts. https://www.lombardodier.com/insights/2026/february/rethink-capital-market-assumptions.html

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance*, *7*(1), 77–91. https://doi.org/10.2307/2975974

Merton, R. C. (1969). Lifetime Portfolio Selection under Uncertainty: The Continuous-Time Case. *The Review of Economics and Statistics*, *51*(3), 247–257. https://doi.org/10.2307/1926560

Merton, R. C. (1972). An Analytic Derivation of the Efficient Portfolio Frontier. *Journal of Financial and Quantitative Analysis*, *7*(4), 1851–1872. https://doi.org/10.2307/2329621

Merton, R. C. (1980). On estimating the expected return on the market: An exploratory investigation. *Journal of Financial Economics*, *8*(4), 323–361. https://doi.org/10.1016/0304-405X(80)90007-0

Michaud, R. O. (1989). The Markowitz Optimization Enigma: Is 'Optimized' Optimal? *Financial Analysts Journal*, *45*(1), 31–42. https://doi.org/10.2469/faj.v45.n1.31

Roy, A. D. (1952). Safety First and the Holding of Assets. *Econometrica*, *20*(3), 431–449. https://doi.org/10.2307/1907413

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. *The Journal of Finance*, *19*(3), 425–442. https://doi.org/10.1111/j.1540-6261.1964.tb02865.x

Sharpe, W. F. (1991). The Arithmetic of Active Management. *Financial Analysts Journal*, *47*(1), 7–9. https://doi.org/10.2469/faj.v47.n1.7

Thaler, R. H. (1999). Mental accounting matters. *Journal of Behavioral Decision Making*, *12*(3), 183–206. https://doi.org/10.1002/(SICI)1099-0771(199909)12:3%3C183::AID-BDM318%3E3.0.CO;2-F

Thaler, R. H., & Shefrin, H. M. (1981). An Economic Theory of Self-Control. *Journal of Political Economy*, *89*(2), 392–406.

Appendix

Table A1: Client Profile & Financial Position

Personal Details	Name & Age	Jang Mousel, 28 years old
	Status	Single, no dependents
	Occupation	Self-employed cryptocurrency trader, part-time consulting in digital assets
	Education	Bachelor of Economics
	Residency	Luxembourg (tax resident)
	Housing	Renting (€1,800/month)
Income & Financial Position	Annual Income (Gross)	€38,450 (consulting, staking, dividends)
	Annual Living Expense	€55,000
	Annual Shortfall	€16,550 (funded by crypto liquidations)
	Total Assets	€2,660,000
	- Cryptocurrencies	€2,200,000 (82.7%)
	- Other assets	€460,000 (17.3%)
	Student loan (liability)	€30,000 (deferred; repayment from age 30 at ECB rate or max 2%)
	Net Worth	€2,630,000
	Investable Assets	€2,410,000
Investment Profile	Capital Allocated to IPS	€1,190,000
	Investment Horizon	32 years (age 28 to 60)
	Cryptocurrency exposure after restructuring	41% of total assets
Investment Goals	Primary Goal	€3,500,000 real retirement fund by age 60 (min €3.0m / stretch €4.5m)
	Secondary Goal	Primary Residence €1,000,000 at 40 years old
	Retirement Spending	€120,000/year (inflation adjusted)

Table A2: Financial balance sheet before vs proposed

Category	Current	Proposed	% change of total assets
Total Assets	2,660,000	2,660,000	-
Cryptocurrencies	2,200,000	1,110,000	82.71% -> 41.73%
Strategic holdings	1,590,000	710,000	59.77% -> 26.70%
Stablecoins (USDT)	610,000	400,000	22.93% -> 15.04%
Cash	150,000	150,000	-
Equity	100,000	0	3.76% -> 0.00%
IPS	0	1,190,000	0.00% -> 44.74%
Personal Assets	210,000	210,000	-
Liabilities	30,000	30,000	-
Student Loan	30,000	30,000	-
Net Worth	2,630,000	2,630,000	-

Table A3: Quantitative Risk Questionnaire

Instrument: Grable & Lytton (1999) Financial Risk Tolerance Scale — adapted for client wealth context. Monetary values have been scaled proportionally to reflect the client's financial position and preserve the psychological validity of each question. Selected answers are highlighted in green and marked as 'Selected'.			
4 points	3 points	2 points	1 point
Part 1 — General Risk Disposition			
Q1. In general, how would your best friend describe you as a risk taker?			
A real gambler	**Willing to take risks after completing adequate research**	Cautious	A real risk avoider
Q2. You are on a TV game show and can choose one of the following. Which would you take?			
5% chance of winning €1,000,000	25% chance of winning €500,000	50% chance of winning €100,000	€10,000 in cash
Q3. You have just finished saving for a once-in-a-lifetime holiday. Three weeks before your departure, you lose your job. You would:			
Extend your holiday, since it might be your last chance to travel first class	Go as originally planned, reasoning that you need the break	**Take a much more modest holiday**	Cancel the holiday
Part 2 — Financial Investment Risk			
Q4. If you unexpectedly received €200,000 to invest, what would you do?			
Invest it in options and futures	**Invest it in stocks or mutual funds**	Invest it in safe, high-grade bonds or bond funds	Deposit it in a bank account or money market fund
Q5. In terms of experience, how comfortable are you investing in stocks or stock mutual funds?			
Very comfortable	**Fairly Comfortable**	Somewhat comfortable	Not at all comfortable
Q6. When you think of the word 'risk', which of the following words comes to mind first?			
Thrill	Opportunity	Uncertainty	Loss
Q7. Some experts are predicting prices of assets such as gold, real estate, and collectibles (as well as inflation) will increase. Most of your assets are in high-interest accounts. What would you do?			

Shift all the money into inflation-hedging assets	Shift half the money into inflation-hedging assets	Shift some money into inflation-hedging assets	Leave the money where it is
Q8. Given the best and worst case returns of the four investment choices below, which would you prefer? (Scaled to reflect your investment capital)			
€60,000 gain best case / €20,000 worst case	**€26,000 gain best case / €8,000 loss worst case**	€8,000 gain best case / €2,000 loss worst case	€2,000 gain best case / €0 loss worst case
Q9. In addition to whatever you own, you have been given €5,000. You are now asked to choose between:			
50% chance to gain €10,000 and 50% chance to gain nothing		**A sure gain of €5,000**	
Q10. In addition to whatever you own, you have been given €5,000. You are now asked to choose between:			
50% chance to lose €10,000 and 50% chance to lose nothing		A sure loss of €5,000	
Q11. Suppose a relative left you an inheritance of €1,000,000, stipulating in the will that you must invest all the money in one of the following choices. Which would you select?			
Commodities like gold, silver, and oil	A portfolio of 15 common stocks	**A mutual fund that owns stocks and bonds**	A savings account or money market fund
Q12. If you had to invest €200,000, which of the following investment mixes would you prefer?			
100% in high-risk investments	**10% in low-risk / 40% in medium-risk / 50% in high-risk investment**	30% in low-risk / 40% in medium-risk / 30% in high-risk investment	60% in low-risk / 30% in medium-risk / 10% in high-risk investment
Q13. Your trusted friend and neighbour, an experienced geologist, is putting together a group of investors to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the mine is a bust, the entire investment is worthless. Your friend estimates the probability of success is only 20%. If you had the money, how much would you invest?			
Six months' salary equivalent	**Three months' salary equivalent**	One month's salary equivalent	Nothing
Total Risk Tolerance Score			**38 out of 47**

Results and Classification				
13-18	19-22	23-28	29-32	**33-47**
Low tolerance for risk	Below-average tolerance for risk	Average / Moderate tolerance for risk	Above average tolerance for risk	**High tolerance for risk**

Note: Scores reflect Mr. Mousel's responses with respect to his general financial risk tolerance. A score of 38 places him in the high-risk tolerance category.

Source: Adapted from Grable, J. E., and Lytton, R. H. (1999). Financial risk tolerance revisited: The development of a risk assessment instrument. Financial Services Review, 8(3), 163–181.

Table A4: Qualitative Client Questionnaire

The following interview was conducted by the advisor as a supplement to the Grable & Lytton (1999) risk tolerance assessment. Its purpose is to capture client-specific preferences, behavioural attitudes, and constraints that a standardized instrument cannot adequately reflect.

Goals & Time horizon	
Advisor:	When do you plan to retire and what annual income will you need?
Client:	At 60. I would need around €120,000 per year in today's money. For housing, travel, family and a buffer.
Advisor:	Do you have any major financial milestones before retirement?
Client:	A house, within the next 12 years. It will probably be around €1 million
Portfolio Purpose & Separation	
Advisor:	How do you want this portfolio to behave relative to your trading book?
Client:	Completely different. My trading book is aggressive and I am fine with that. This is supposed to be my safety net. I do not want to be checking it every day. It should just grow quietly in the background.
Advisor:	Are you comfortable with the planned mortgage contribution from year 12 onward.
Client:	Yes, €1,500 a month is fine. As long as the retirement target is still on track, I have no issues with it.
Risk & Drawdown	
Advisor:	How would you react if this portfolio lost 20% in a single year.
Client:	Uncomfortable, but I would stay invested. I have seen far worse in crypto. One bad year does not change the long-term plan.
Advisor:	Is there a loss level that would make you reconsider the strategy entirely?
Client:	If it fell 35 to 40% and I did not recover for a long time, yes. That would feel wrong for what this portfolio is supposed to be.
Investment Preferences	
Advisor:	Are there any asset classes or instruments you want to exclude?
Client:	No crypto in this portfolio. No leverage, no short-selling. Otherwise I am open to a globally diversified approach.
Advisor:	How actively do you want this portfolio managed?
Client:	Passively. Set the strategy, rebalance when needed, and let it compound. I do not want frequent trading or tactical bets.

Source: Author, Interview conducted in January 2026

Table A5: Correlation Matrix of Asset-Class Returns

Correlation Matrix

Note: Correlations are based on monthly EUR-denominated total returns over the sample period 01/01/2017 - 31/03/2026. Values range from -1 to +1

	SPYL	CEU2	XMME	SXR1	VDTE	XGLE	IU0E	TIP1E	PHAU	EPRA	D5BK
SPYL	**1,00**	0,75	0,58	0,71	0,06	0,35	0,42	0,38	-0,03	0,74	0,58
CEU2	0,75	**1,00**	0,66	0,80	0,13	0,35	0,50	0,42	0,00	0,76	0,77
XMME	0,58	0,66	**1,00**	0,75	0,13	0,29	0,47	0,30	0,15	0,54	0,53
SXR1	0,71	0,80	0,75	**1,00**	0,13	0,33	0,50	0,41	0,03	0,78	0,68
VDTE	0,06	0,13	0,13	0,13	**1,00**	0,58	0,43	0,64	0,21	0,23	0,36
XGLE	0,35	0,35	0,29	0,33	0,58	**1,00**	0,47	0,59	0,26	0,46	0,54
IU0E	0,42	0,50	0,47	0,50	0,43	0,47	**1,00**	0,62	0,19	0,49	0,59
TIP1E	0,38	0,42	0,30	0,41	0,64	0,59	0,62	**1,00**	0,27	0,51	0,60
PHAU	-0,03	0,00	0,15	0,03	0,21	0,26	0,19	0,27	**1,00**	0,09	0,07
EPRA	0,74	0,76	0,54	0,78	0,23	0,46	0,49	0,51	0,09	**1,00**	0,81
D5BK	0,58	0,77	0,53	0,68	0,36	0,54	0,59	0,60	0,07	0,81	**1,00**

Table A6: Annualised Variance-Covariance Matrix of Asset-Class Returns

Covariance Matrix

	SPYL	CEU2	XMME	SXR1	VDTE	XGLE	IU0E	TIP1E	PHAU	EPRA	D5BK
SPYL	220,17										
CEU2	151,39	183,78									
XMME	120,19	124,80	192,32								
SXR1	150,57	154,60	148,64	201,98							
VDTE	4,68	9,23	9,44	10,10	28,07						
XGLE	28,52	26,26	22,50	26,14	17,09	30,51					
IU0E	12,96	14,33	13,66	14,79	4,77	5,45	4,41				
TIP1E	21,99	22,32	16,12	22,77	13,19	12,64	5,06	15,22			
PHAU	-5,73	-0,01	25,59	5,61	14,03	18,10	5,03	13,40	160,66		
EPRA	178,63	165,76	121,60	179,04	19,30	41,40	16,75	32,11	18,92	262,11	
D5BK	175,28	213,35	150,17	195,00	38,28	60,74	25,27	47,89	17,69	267,94	412,92

Note: Covariances are calculated from monthly EUR-denominated total returns over the sample period 01/01/2017–31/03/2026 and annualised by multiplying monthly covariances by 12. Values are scaled by 10,000 for readability. Diagonal values represent annualised variances.

Figure A7: Total wealth index, Portfolio vs Benchmark

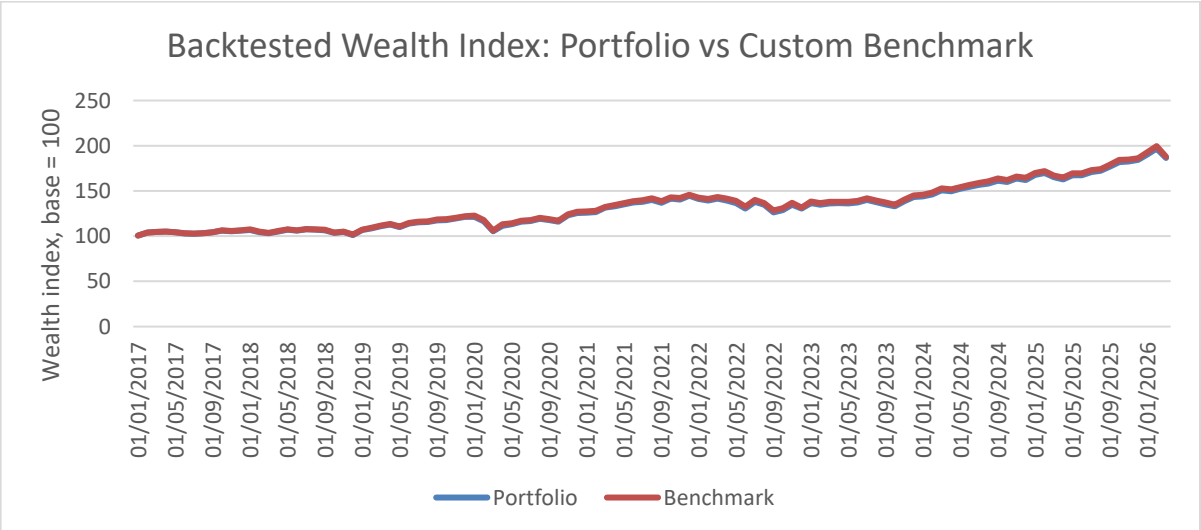


Table A8: Monte Carlo terminal real-wealth percentiles

Percentile	No mortgage	Guardrail	With mortgage
5th percentile	€1,795,296	€1,775,035	€1,553,625
25th percentile	€2,881,969	€2,801,910	€2,608,267
50th percentile	€4,086,167	€3,786,324	€3,706,474
75th percentile	€5,604,700	€5,296,446	€5,271,476
95th percentile	€9,051,084	€8,722,295	€8,577,641

Table A9: Optimised Weights by Candidate Portfolio

Securities	Min. Variance	Tangency	Target 6%	Safety first
SPYL GR	0.12	0.12	0.143932868	0.15
CEU2 FP	0.144947	0.138914	0.25	0.25
XMME GR	0.12	0.12	0.12	0.12
SXR1 GR	0.015053	0.060558	0.08	0.08
VDTE GR	0.15	0.15	0.106067132	0.1
XGLE GR	0.17	0.130527	0.05	0.05
IU0E GR	0.08	0.08	0	0
TIP1E SW	0.1	0.1	0.1	0.1
PHAU IM	0.1	0.1	0.1	0.02
EPRA FP	0	0	0.05	0.075
D5BK GR	0	0	0	0.055
Exp Return	0.05076	0.052323	0.06	0.061303
Volatility	0.062341	0.06565	0.086860731	0.098597
Sharpe ratio	0.511914	0.513147	0.494842404	0.460189

Table A10: Selected ETF Characteristics and Scoring Data

Ticker	ISIN	Inception	Replication	UCITS	Curr.	Payment	AUM (€m)	30-D Avg Volume	TER	TE
SPYL GR	IE000XZSV718	11/01/23	Full	Y	EUR	Acc.	36719	199237	0.03%	0.04%
CEU2 FP	LU1437015735	11/10/16	Full	Y	EUR	Acc.	10986	35418	0.12%	0.09%
XMME GR	IE00BTJRMP35	06/26/17	Optimized	Y	EUR	Acc.	12061	107197	0.18%	1.73%
SXR1 GR	IE00B52MJY50	03/10/10	Full	Y	EUR	Acc.	3860.8	7679	0.20%	1.49%
VDTE GR	IE00BMX0B631	09/02/20	Optimized	Y	EUR	Acc.	3020	9376	0.08%	0.31%
XGLE GR	LU0290355717	12/31/11	Optimized	Y	EUR	Acc.	3536.2	3651	0.07%	0.02%
IU0E GR	IE00BG5QQ390	01/11/19	Optimized	Y	EUR	Acc.	1202.3	25717	0.14%	0.14%
TIP1E SW	LU1459801780	11/07/16	Full	Y	EUR	Acc.	1622.3	6558	0.13%	0.15%
PHAU IM	JE00B1VS3770	06/20/07	--	--	EUR	--	7913.9	17923	0.39%	1.57%
EPRA FP	LU1437018838	11/11/16	Full	Y	EUR	Acc.	856.96	3241	0.24%	0.14%
D5BK GR	LU0489337690	03/22/10	Full	Y	EUR	Acc.	871.98	22615	0.33%	0.17%

Disclosures and Disclaimer

Disclaimer

This report is published for educational purposes by Master students and does not constitute a real Investment Policy Statement, although it follows the CFA Institute guidelines. The client, either individual or institutional is fictional.

This report was prepared by a Master's student in Finance at ISEG – Lisbon School of Economics and Management, exclusively for the Master's Final Work. The opinions expressed and estimates contained herein reflect the personal views of the author about the subject company, for which he/she is sole responsible. Neither ISEG, nor its faculty accepts responsibility whatsoever for the content of this report or any consequences of its use. The report was revised by the supervisor.

The information set forth herein has been obtained or derived from sources generally available to the public and believed by the author to be reliable, but the author does not make any representation or warranty, express or implied, as to its accuracy or completeness. The information is not intended to be used as the basis of any investment decisions by any person or entity.

AI Disclosure

I disclose that artificial intelligence tools, including large language models, were used during the preparation of this Master's Final Work. Their use was as follows.

AI tools were used to assist with drafting, structuring and refining the written text, to improve clarity, grammar and consistency of language, and to help organise and express arguments more effectively. Beyond language, I used these tools to review my own drafts for clarity and consistency of argument, and to test whether each section was structured and expressed as effectively as possible

All analytical work underlying this project is my own. The quantitative model, including the capital market assumptions, the mean-variance optimisation, the simulations and the risk analysis, was built and run by me. Every methodological choice, every interpretation of results, and every conclusion drawn in this document reflects my own decisions and judgement. Where AI tools suggested content, that content was reviewed, verified against my own model and sources, and accepted, revised or rejected by me.

I have taken care to ensure that the use of AI tools has not compromised the academic integrity or originality of this work. The substance, analysis and conclusions are my own responsibility.